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APPENDIX A – KEY FEDERAL STATUTES RELATED TO NATURAL RESOURCES MANAGEMENT

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Sikes Act, as amended 1997 (16 USC 670a – et seq.)

The Sikes Act requires each military installation to manage natural resources for multipurpose uses and public access appropriate for those uses, as well as ensuring no net less to training, testing or other defined missions of the installation. Management of these resources is accomplished through development and implementation of an INRMP. Each INRMP must be prepared in consultation with the USFWS and the cognizant state fish and wildlife agency. The public must be afforded an opportunity to review and comment on INRMPs prior to their finalization. The Sikes Act also requires, to the extent practicable using available resources, sufficient numbers of professionally-trained natural resource management personnel and natural resources law enforcement personnel, be available and assigned responsibility to perform tasks necessary to carry out Title I of the Sikes Act, including preparing and implementing INRMPs.

Endangered Species Act of 1973, as amended (16 USC 1531 et seq.)

The Endangered Species Act (ESA) of 1973 (16 USC §1531 et seq.), as amended, is the primary federal regulatory protection for threatened and endangered species on federal lands. The law is administered by the USFWS and NMFS**,** depending on the species. The ESA is federal legislation that is intended to provide a means to conserve the ecosystems upon which endangered and threatened species depend and provide programs for the conservation of those species to prevent extinction of plants and animals. Endangered species include any species that is in danger of extinction throughout all or a significant portion of its range. Threatened species include any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Candidate species are those species that are actively being considered for listing as endangered or threatened under ESA, as well as those species that USFWS and/or NMFS has initiated an ESA status review announced in the Federal Register (FR). The designation of candidate species does not carry any procedural or substantive protections under the ESA (50 Code of Federal Regulations [CFR] §424.02 and 69 FR 19975).

A guide to Section 7 consultations is available at:

http://www.fws.gov/endangered/what-we-do/consultations-overview.html

Section 7 of the ESA requires all federal agencies to consult with USFWS and/or NMFS to insure that their actions are not likely to jeopardize the continued existence of listed species or result in destruction or adverse modification of critical habitat. The proponent of a proposed action must conduct an analysis for actions that "may affect" listed species. If the action is determined likely to have an adverse effect, a formal consultation is initiated. Consultations conclude with a jeopardy or non-jeopardy determination and the issuance of a biological opinion (BO) and incidental take statement by the USFWS and/or NMFS. Section 7(a)(1) of the Act further directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species.

Section 9 of the ESA prohibits the take of endangered or threatened species without special exemption. Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. However, Section 7 affords some flexibility through exemptions from the Section 9 prohibitions on take. In the case of non-jeopardy determinations for actions, incidental take statements exempt federal agencies from the Section 9 prohibitions on take if they comply with the reasonable and prudent measures and terms and conditions of an incidental take statement. This exemption allows takings of listed species that are incidental to otherwise lawful military activities, thus providing the military with the flexibility to accommodate new missions.

Section 4(a)(3)(B)(i) of the ESA exempts military installations from critical habitat designations as long as an INRMP acceptable to the Secretary of the Interior is in place. In order to qualify for the exemption, INRMPs must provide for the implementation of effective conservation measures that will sustain and advance the recovery of listed species. Department of Defense Manual (DoDM) 4715.03 summarizes the criteria to determine if an INRMP provides adequate special management or protection to obviate the need for critical habitat designation as follows:

- The INRMP provides a conservation benefit to the listed species. The cumulative benefits of the management activities identified in the INRMP for its duration maintains or provides for an increase in a species' population or the enhancement or restoration of its habitat within the area included in the INRMP (i.e., those areas essential to the conservation of the species). A conservation benefit may result from reducing habitat fragmentation, maintaining or increasing populations, insuring against catastrophic events, enhancing and restoring habitats, buffering protected areas, or testing and implementing new conservation strategies.

- The INRMP provides certainty that relevant agreed-on actions will be implemented. Persons implementing the INRMP can accomplish its goals and objectives, have adequate funding to implement agreed upon activities, have implementation authority, and have obtained all the necessary authorizations or approvals. The INRMP includes an implementation schedule, including completion dates, for the conservation effort.

- The INRMP provides certainty that the conservation effort will be effective. The USFWS considers the following criteria when determining the effectiveness of the conservation effort:
    - Biological goals, which are broad guiding principles for the program, and objectives, which are measurable targets for achieving the goals.
    - Quantifiable, scientifically valid parameters that demonstrate achieving objectives and standards measuring progress.
    - Provisions for monitoring and, where appropriate, adaptive management.
    - Provisions for reporting progress on implementation based on compliance with the implementation schedule and effectiveness based on evaluation of quantifiable parameters of the conservation effort.
    - A period of time sufficient to implement the actions and achieve the benefits of its goals and objectives.

Pursuant to the ESA, contemplated actions at PMRF with potential to impact a protected species must be assessed via a biological assessment (BA) to determine whether the proposed action is likely to adversely affect a listed species, proposed species, or designated critical habitat. After review of the BA, the USFWS and/or NMFS issue a BO stating their opinion on whether or not the action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. Management requirements that ensure a non-jeopardy determination may be identified by the USFWS or NMFS during the consultation process. Additionally, the terms and conditions under which incidental take may occur may be identified.

PMRF has worked with the USFWS and NMFS for many years to facilitate the conservation and management of listed species and critical habitat and requests formal and/or informal consultations whenever a proposed action has potential to affect a federally listed species.

PMRF Base-wide Infrastructure, Operations, and Maintenance, Biological Opinion

A 2014 formal section 7 consultation with the USFWS resulted in the issuance of biological and conference opinions for Pacific Missile Range Facility Base-wide Infrastructure, Operations, and Maintenance, Kaua‘i, 2014-F-0066 (USFWS 2014). This Base-wide BO addresses potential impacts to the federally listed endangered Hawaiian Black-necked Stilt or Ae’o (*Hinumtopus mexicanus knudseni*), Hawaiian Moorhen or ‘Alae ‘ula (*Gallinula chloropus sandvicensis*), Hawaiian Coot or Alae ke‘oke‘o (*Fulica alai*), Hawaiian Duck or Koloa Maoli (*Anas wyvilliana*), Hawaiian Goose or Nēnē (*Branta sandvicensis*), Hawaiian Petrel or ‘Ua‘u (*Pterodroma phaeopygia sandwichensis*), and Hawaiian hoary bat or ope ‘ape ‘a (*Lasiurus cinereus semotus*), and the threatened Newell's Shearwater or ‘A‘o (*Puffinus auricularis newelli*). The conference opinion was made in regards to the federal candidate species, Band-rumped Storm-petrel or ‘Ake’ake (*Oceanodroma castro*) (now listed as endangered). The USFWS concurred with the no effect determination to the two federally protected plant species, dwarf ili’au (*Wilkesia hobdyi*) and Hawai‘i scaleseed (*Spermolepis hawaiiensis*); Short-tailed Albatross (*Phoebastria albatrus*), two species of-endangered Hawaiian picture-wing flies (*Drosophila musaphilia* and *Drosophila sharpi*), and the critical habitat (currently unoccupied) for the endangered Ni‘ihau panicgrass or lau’ehu plant (*Panicum niihauense*) that occur at PMRF. Potential impacts to the federally listed endangered Hawaiian monk seal *(Neomonachus schauinslandi*), which is under the jurisdiction of the NMFS, were not addressed.

In order to be exempt from the prohibition of take of endangered or threatened species, under section 9 of the ESA, the Navy must comply with a number of terms and conditions set forth in the Base-wide BO. Included are the amount of anticipated incidental take for each species addressed in the BO (Table 1) and reporting requirements to monitor the impact of incidental take. Reporting requirements are as follow:

USFWS will be notified by telephone and email within 24 hours (hrs) upon the discovery of an injured or dead Newell’s Shearwater, Hawaiian Petrel, Band-rumped Storm-petrel, Hawaiian hoary bat, Hawaiian Goose, Hawaiian Moorhen, Hawaiian Coot, HawaiianDuck, or Hawaiian Stilt. This includes notification for listed or candidate species turned into the SOS aid station by Navy personnel or

members of the public. The Navy will provide USFWS a written notification, summarizing the event, within 30 days.

- USFWS will be notified by telephone and email within 24 hrs upon the discovery of an abandoned Hawaiian goose nest or listed Hawaiian waterbird nest. The Navy will provide USFWS a written notification, summarizing the event, within 30 days.
- Access to any of the PMRF sites will be provided by the Navy to USFWS with 24 hour notification so that they may independently monitor for downed seabirds and retrieve reported carcasses.
- The Navy will submit annual reports detailing the implementation of conservation measures used to minimize impacts and compensate for effects of the action. Annual reports will also summarize survey and monitoring results, BASH hazing efforts, and levels of take of all ESA-listed species.

The non-discretionary conservation measures developed by the USFWS and Navy as well as the reasonable and prudent measures, which are necessary to minimize impacts of incidental take, identified in the Base-wide BO were used to guide and inform the development of management actions presented in this INRMP. A number of discretionary conservation measures recommended to avoid or minimize impacts to listed and/or candidate species have also been incorporated into threatened and endangered species management at PMRF.

Table 1. Anticipated Take as Per Pacific Missile Range Facility Base-wide Infrastructure, Operations, and Maintenance

Scientific Name	Common/Hawaiian Name	Anticipated Take
Anas wyvilliana	Hawaiian Duck or Koloa Maoli	Up to an average of one Hawaiian Duck per year and a maximum of two ducks in one year may be taken in the form of injury of death due to collision with fences, other manmade structures, or vehicles as a result of hazing activities.
Branta sandvicensis	Hawaiian Goose or Nēnē	Up to an average of two Hawaiian Geese per year and a maximum of four geese in one year may be taken in the form of injury of death due to collision with fences, other manmade structures, or vehicles as a result of hazing activities. Ten eggs or goslings may also be incidentally taken indirectly in the form of injury or mortality due to nest failure or abandonment of two nests (five eggs per nest) as a result of inadvertent hazing of nesting adults. Fifty eggs or goslings may be taken indirectly in the form of injury or mortality due to nest failure or reduced breeding success of ten nests laid in sub-optimal, unprotected habitats of Hawaiian Geese which were precluded from nesting at PMRF as a result of hazing activities.
Fulica alai	Hawaiian Coot or Alaekeʻokeʻo	Up to an average of one Hawaiian Coot per year and a maximum of two coots in one year may be taken in the form of injury of death due to collision with fences, other manmade structures, or vehicles as a result of hazing activities.
Gallinula chloropus sandvicensis	Hawaiian Moorhen or ʻAlae ʻula	Up to an average of two Hawaiian Moorhen per year and a maximum of four moorhens in one year may be taken in the form of injury of death due to collision with fences, other manmade structures, or vehicles as a result of hazing activities.

Hinumtopus mexicanus knudseni	Hawaiian Black-necked Stilt or Ae‘o	Up to an average of one Hawaiian Stilt per year and a maximum of two stilts in one year may be taken in the form of injury of death due to collision with fences, other manmade structures, or vehicles as a result of hazing activities. Twenty eggs or chicks may be taken indirectly in the form of injury or mortality due to nest failure or reduced breeding success of five nests (four eggs per nest) laid in sub-optimal, unprotected habitats of Hawaiian stilts which were precluded from nesting at PMRF as a result of hazing activities.
Lasiurus cinereus semotus	Hawaiian Hoary Bat or ope ‘ape ‘a	Up to an average of one Hawaiian hoary bat every three years and a maximum of three Hawaiian hoary bats in one year may be taken in the form of injury or death due to entanglement on barbed-wire fences.
Oceanodroma castro	Band-rumped Storm-petrel or ‘Ake‘ake	Up to an average of two fledgling Band-rumped Storm-petrels every ten years and a maximum of four fledgling Band-rumped Storm-petrels in one year may be taken in the form of injury or death due to attraction and fallout from lighting associated with the project.
Pterodroma phaeopygia sandwichensis	Hawaiian Petrel or ‘Ua‘u	Up to an average of one fledgling Hawaiian Petrel every ten years and a maximum of two fledgling Hawaiian Petrels in one year may be taken in the form of injury or death due to attraction and fallout from lighting associated with the project.
Puffinus auricularis newelli	Newell’s Shearwater or ‘A‘o	Up to an average of three fledgling Newell’s Shearwaters per year and a maximum of nine fledgling Newell’s Shearwaters in one year may be taken in the form of injury or death due to attraction and fallout from lighting associated with the project.

Migratory Bird Treaty Act (16 USC 703–712)

The current list of MBTA-protected species is available at:

http://www.fws.gov/migratorybirds/regulationspolicies/mbta/MBTANDX.HTML

Migratory birds includes a large, diverse group of birds that utilize breeding grounds in the United States and Canada, and overwinter in southern North America, Central and South America, the West Indies, and the Caribbean. The Migratory Bird Treaty Act (MBTA) of 1918 (16 USC §703-711), as amended, is the primary legislation in the United States established to conserve migratory birds. The MBTA prohibits the taking, killing, or possessing of migratory birds their eggs, parts, and nests unless permitted by regulation. As of November 2013, 1,026 species were included on the list of migratory birds (78 FR 65844). Non-native species that were introduced into the United States, such as House Sparrow (*Passer domesticus*), Common Myna or Piha'ekelo (*Acridotheres tristis*), Rock Pigeon (*Columba livia*), and Warbling White-eyes (*Zosterops japonicas*) are not protected by the MBTA. Note, though, that native species that are introduced into parts of the United States where they are not native are still protected under the MBTA regardless of where they occur in the United States or its territories. The MBTA also does not apply to various other species including Red Junglefowl or Moa (*Gallus gallus*), Francolin or Kokee (*Francolinus* sp.), Wild Turkeys or Pelehu (*Meleagris gallopavo*), and other non-migratory game species (78 FR 65844). A complete list of bird species known to occur at PMRF and their protected status under the MBTA is in Appendix C.

Section 315 of the 2003 National Defense Authorization Act and the Military Readiness Rule (50 CFR Part 21) authorize, with certain limitations, the incidental take of migratory birds during military readiness activities. Military readiness activities include all training and operations of the Armed Forces that relate to combat, and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use. Military readiness does not include the routine operation of installation support functions, such as: administrative offices, military exchanges, commissaries, water treatment facilities, storage facilities, schools, housing, motor pools, laundries, MWR activities; shops, mess halls; the operation of industrial activities; or, the construction or demolition of facilities used for training and testing operations (72 FR 8931). If the DoD determines that a proposed or an ongoing military readiness activity may result in a significant adverse effect on a population of a migratory bird species, they must confer and cooperate with the USFWS to develop appropriate and reasonable conservation measures to minimize or mitigate identified significant adverse effects. During annual INRMP reviews, the Navy must report any migratory bird conservation measures that have been implemented and the effectiveness of the conservation measures in avoiding, minimizing, or mitigating take of migratory birds.

Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) of 1972 (16 USC §1361), as amended, prohibits the taking of marine mammals and defines "take" as "the act of hunting, killing, capture, and/or harassment of any marine mammal; or, the attempt at such." In regards to military readiness activities, the National

Defense Authorization Act (NDAA) of 2004 amended the MMPA to define harassment to mean: 1) any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or 2) any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered (Level B harassment) (NDAA 2004, Sect. 319).

All marine mammals, including those not listed under the ESA, are protected by the MMPA. The NMFS has jurisdiction over cetaceans (whales, dolphins, porpoises) and most pinnipeds (seals and sea lions), whereas the USFWS has jurisdiction over polar bears, sea otters, walruses, manatees, and dugong (*Dugong dugon*).

The Navy is required to assess potential impacts to marine mammals from training and testing, construction, and other in-water activities an effects analysis must be conducted in cases where naval activities may introduce high levels of sound or explosive energy into the marine environment. Authorization may be obtained by NMFS or USFWS to "take" marine mammals incidental to Navy activities if it is determined Navy action will: (1) have a negligible impact on the species or stock(s), and (2) include measures to mitigate adverse impacts on the availability of the species or stock(s) for subsistence uses (OPNAV M-5090.1).

The MMPA requires NMFS to ensure that activities with a potential to impact marine mammal populations are conducted in a manner, time, and location most appropriate to minimizing possible adverse effects to those populations. The NMFS may authorize the incidental take of marine mammals under a Letter of Authorization (LOA), which authorizes take for harassment or serious injury and may be valid for a specific training event or for a period of up to five years (NMFS 2015a). If a proposed action has no potential for serious injury or mortality, an Incidental Harassment Authorization (IHA) may be sought.

If an action proponent determines incidental takes are likely due to Navy-generated effects of the action on land or in the water, the action proponent must notify and receive concurrence from OPNAV (N45) via the chain of command prior to notifying the regulatory agencies. The action proponent must also notify the appropriate region commander and or the Navy area environmental coordinator.

National Environmental Policy Act of 1969 (42 USC 4321 et seq.)

Pursuant to the National Environmental Policy Act (NEPA) of 1969 (42 USC §4321 et seq.), as amended, and in accordance with the regulations of the Council on Environmental Quality (CEQ) that implement NEPA procedures (40 CFR parts 1500-1508), all federal agencies must take into consideration the potential environmental consequences of proposed actions in their decision-making process. The objectives of NEPA are to ensure that the government makes informed decisions and the public is included in the decision-making process and that all reasonable alternatives for an action are considered.

The Secretary of the Navy Instruction (SECNAVINST) 5090.6A and OPNAVINST 5090.1E establish Navy policy, procedures, and responsibilities for NEPA documentation for Navy actions. It is Navy policy to initiate the NEPA processes at the earliest possible time to be an effective decision-making tool in the course of identifying a proposed action and to develop and carefully consider a reasonable range of alternatives for achieving the purpose of the proposed action. The IEPD at PMRF is responsible for implementing the requirements of NEPA. NAVFAC HI provides extra staffing and support for NEPA review on an as needed basis. The Environmental Program also supports the NEPA environmental impact analysis process through providing subject matter expertise and reviewing or contributing to NEPA documents, as required. The IEPD reviews all proposed projects to determine the appropriate level of NEPA analysis and works with project proponents to minimize or avoid impacts through the development of practicable alternatives and/or project modifications.

Project Approval Process

OPNAVINST 11010.20H - Navy Facilities Projects requires a thorough sites approval process be conducted for active and reserve Navy projects, regardless of general type of construction (i.e., permanent, semi-permanent, demolition, or temporary), work classification, and funding source. PMRF Environmental Program staff follows a routine procedure to assure coordination among facilities planners, resource managers, and government agencies. The PMRF IEPD is the primary point of contact to provide relevant information on issues with potential to affect natural resources. All new construction projects at Barking Sands and other PMRF locations are vetted by the IEPD to minimize natural resource impacts while meeting operational needs. The PMRF IEPD specifically reviews planned actions to ensure compliance with natural resources laws and regulations, including avoidance of protected species and their habitats, wetlands protection, migratory bird protection, critical habitat protection, and erosion control. New facilities are sited preferentially in ruderal or developed land-use categories.

Levels of Documentation: CEQ regulations prescribe three levels of NEPA documentation: categorical exclusions (CATEX), Environmental Assessments (EAs), or Environmental Impact Statements (EISs), depending on the expected significance of impacts from a proposed action and its alternatives.

Categorical Exclusions

A CATEX includes a category of actions that do not individually or cumulatively have a significant effect on the human environment, do not result in any significant change from existing conditions, or whose effect is primarily economic or social, and therefore do not require an EA or an EIS. Procedures on how to record a CATEX and the current list of CATEXs are provided in OPNAVIST 5090.1E Reference (c), Chapter 10, Section 10-3.14.

Environmental Assessments

An EA is a concise public document for which a federal agency is responsible that serves to briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact

statement or a finding of no significant impact (FONSI) and aids an agency's compliance with NEPA when no EIS is necessary. It may further facilitate preparation of a statement when one is necessary. An EA must include brief discussion of the need for the proposal, alternatives for the action, environmental impacts of the proposed action and alternatives, and a listing of agencies and persons consulted. OPNAVIST 5090.1E, Reference (c), Chapter 10, Section 10-3.15 provides guidance on procedures, a list of actions that would generally require and EA, and a description of the core components of an EA.

Environmental Impact Statements

An EIS is an environmental document prepared for major federal actions that may have a significant impact on the quality of the human environment. According to 40 CFR part 1502, "The primary purpose of an EIS is to serve as an action-forcing device to insure that the policies and goals defined in NEPA are infused into the ongoing programs and actions of the Federal Government. It shall provide full and fair discussion of significant environmental impacts and shall inform decision makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment". A list of actions that would require preparation of an EIS and detailed Navy guidance on EIS procedures are provided in OPNAVINST 5090.1E Reference (c), Chapter 10, Section 10-3.16.

Mitigation Measures: The purpose of mitigation is to reduce or eliminate potential negative impacts of an action on affected resources. CEQ regulations (40 CFR part 1508.20) state that mitigation includes:

- Avoiding the impact altogether by not taking a certain action or parts of an action,
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation,
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment,
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action, and
- Compensating for the impact by replacing or providing substitute resources or environments.

Regulations established by CEQ state that all relevant reasonable mitigation measures that could alleviate the environmental effects of an action must be identified, even if they are outside the jurisdiction of the lead agency or the cooperating agencies. This serves to alert agencies or officials who can implement these extra measures, and will encourage them to do so.

Clean Water Act (Federal Water Pollution Control Act) as amended 1987 (33 USC 1251 et seq.)

The Clean Water Act (CWA) of 1972 (33 USC §1251 et seq.), as amended, establishes the basic structure for regulating discharges of pollutants into the waters of the U.S. and regulating quality standards for surface waters. Under Section 404 of the CWA, discharge of dredge and fill material into waters of the United States is prohibited unless a permit is issued by the U.S. Army Corps of Engineers (USACE). Waters of the U.S. include all surface waters such as all navigable waters and their tributaries, all interstate waters and their tributaries, all wetlands adjacent to these waters, and all impoundments of these waters (40 CFR 230.3).

A determination of waters of the United States under the jurisdiction of the USACE requires on-site documentation of indicators of hydrophytic vegetation, hydric soils, and wetland hydrology in accordance with criteria set out in the *Corps of Engineers Wetlands Delineation Manual* (USACE 1987) and *Regional Supplement to the Army Corps of Engineers Wetland Delineation Manual: Hawai'i and Pacific Region, Version 2.0* (USACE 2012). These criteria are mandatory and must all be met for an area to be identified as wetland, except under circumstances when a wetland is considered a disturbed area or problem wetland. Jurisdictional determinations are generally valid for a period of five years, but may differ as site conditions and policies can change. Any Navy Facilities or other activities with the potential to disturb waters of the United States, including wetlands, must be reviewed individually with regard to impacts, state and federal permits are sought as needed.

Section 402 of the CWA establishes the National Pollutant Discharge Elimination System (NPDES) permit program to regulate point source discharges of pollutants into waters of the U.S. A NPDES permit sets specific discharge limits for point sources discharging pollutants into waters of the United States and establishes monitoring and reporting requirements, as well as special conditions. The NPDES permit program, administered by the Environmental Protection Agency (EPA), controls such discharges. However, the EPA may approve state administration of the program and the state assumes permitting authority in lieu of EPA.

Section 401 of the CWA requires additional certification from the appropriate state regulatory agency. In accordance with Section 401, federal agencies must obtain a water quality certificate from the state for any action requiring a federal license or permit.

In Hawai'i, the Hawai'i Department of Health, Clean Water Branch has regulatory authority over the discharges of pollutants to the waters of the U.S. under Section 402 of the CWA, the NPDES Program, and Section 401 of the CWA. These authorities require an applicant for any federal permit covering an activity that may result in a discharge into the state's waters to first obtain a state certification, to ensure that the project will comply with state water quality standard.

State Water Protection Laws

Additional state laws regulate stream channel alterations and stream channel diversions in order to protect stream channels from alteration whenever practicable to provide for fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses (Hawai'i Administrative Rules 13-169). Stream Channel Alteration Permits (SCAP) and Stream Diversion Works Permits (SDWP) are required for activities with potential to impact these resources. The SOH DLNR, Commission of Water

Resources administers this program. Routine streambed and drainage way maintenance activities and the repair of existing facilities are exempt from the SCAP and SDWP requirements (SOH DLNR, Commission of Water Resources 2015).

Coastal Zone Management Act of 1972 (16 USC 1451-1456)

The federal Coastal Zone Management Act (CZMA) of 1972 (16 USC §1451 et seq.) establishes a policy to preserve, protect, develop, and, where possible, restore or enhance valuable natural coastal resources such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife supported by those habitats. The CZMA provides for state implementation of coastal zone management upon federal approval of the state plan. The Office of Planning (OP) oversees Hawai‘i’s Coastal Zone Management (CZM) Program, although county authorities administer Special Management Area (SMA) permits and shoreline setback provisions. The SMA permitting system is part of the CZM Program approved by state and federal agencies. The entire shorelines of Kaua‘i, excluding Barking Sands, and Ni‘ihau are defined as SMAs under the state’s CZM Program (SOH OP 2015).

Although federal lands and actions are exempt from state law jurisdiction, the CZMA requires federal consistence with the enforceable policies of the SOH CZM Program. To ensure consistency, the Navy must consult with the SOH OP when the proposed action has the potential for reasonably foreseeable direct or indirect effects on any coastal use or resource of the state’s coastal zone. Objectives of the state CZM Program are to:

- Provide coastal recreational opportunities accessible to the public;
- Protect, preserve, and where desirable, restore those natural and man-made historic and pre-historic resources in the coastal zone management area that are significant in Hawaiian and American history and culture;
- Protect, preserve and where desirable, restore or improve the quality of coastal scenic and open space resources;
- Protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems;
- Provide public or private facilities and improvements important to the state’s economy in suitable locations;
- Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, and subsidence;
- Improve the development review process, communication, and public participation in the management of coastal resources and hazards;
- Stimulate public awareness, education, and participation in coastal management

- Protect beaches for public use and recreation, and
- Implement the state's ocean resources management plan.

The Navy must provide the state with a consistency determination for any activity that is in, or affects land use, water use or any natural resource in the coastal zone, if the activity is conducted by or on behalf of a federal government agency, requires a federal license or permit, or receives federal funding.

Magnuson-Stevens-Fishery Conservation and Management Act (16 USC 1801 et seq.)

The Magnuson-Stevens-Fishery Conservation and Management Act, frequently referred to as the Magnuson-Stevens Act (MSA) of 1976 (16 USC §1801 et seq.), as amended, is the principal law governing marine fisheries in the United States. It sets mandates for the NMFS, regional fishery management councils, and federal action agencies to identify and protect important marine and anadromous fish habitat. The Hawai‘i archipelago is under the jurisdiction of the Western Pacific Regional Fishery Management Council (WPRFMC). In addition to overseeing fishing activities, the WPRFMC, with assistance from NMFS, is required to delineate essential fish habitat (EFH) of all managed species in fishery ecosystem plans (previously, fishery management plans). EFH includes both waters and substrate necessary to a species or species group or complex, for spawning, breeding, feeding or growth to maturity. EFH may be designated for a species' complete life cycle, including spawning, feeding, and growth to maturity, or may be specific for each life stage (e.g., eggs, larvae).

Pursuant to the MSA, the Navy must consult with NMFS prior to undertaking any action that may reduce the quality or quantity of EFH. A written evaluation of the effect of the proposed action on EFH may be submitted as part of a draft environmental planning document (EA or EIS, as appropriate) if an action is likely to result in minimal adverse effects on EFH. However, a stand-alone EFH assessment should be prepared if an action is likely to have more than minimal adverse effects on EFH (OPNAV M-5090.1).

Marine Debris Act

The Marine Debris Act (33 USC 1951 et seq.), as amended, established the Interagency Marine Debris Coordinating Committee, which is a multi-agency body responsible for streamlining the federal government's efforts to address marine debris. As a member of this committee, the Navy participates in research, educational efforts, and developing strategies and recommendations to reduce the sources and impacts of marine debris to the Nation's marine environment.

In support of the Marine Debris Act, the Navy has completed installation of upgraded plastic waste processors on all surface warships. The plastic waste processors have greater capacity and reliability than previous versions and have limitations on their use. In addition, the Navy has begun to examine methods and equipment to be integrated into new design warships to enable zero discharge of paper, cardboard, metal, and glass in order to fully comply with new domestic and international discharge regulations.

At the local level, the Navy partners with state and local authorities to assist in the removal of marine debris, as well as conduct beach and shore clean-ups at its installations (Interagency Marine Debris Coordinating Committee 2014).

Clean Air Act (42 USC 7401 et seq.)

The Clean Air Act (CAA) of 1970 (42 USC §7401 et seq.), as amended, is the comprehensive federal law that regulates air emissions from stationary and mobile sources. Among other things, this law authorizes the EPA to establish National Ambient Air Quality Standards to protect public health and public welfare and to regulate emissions of hazardous air pollutants. The PMRF Air Program Manager is responsible for ensuring compliance with the CAA at the installation. The IEPD discusses potential CAA impacts related to natural resources projects with the Air Program Manager as necessary. CAA consultation, if required, would be conducted by the Air Program Manager.

EXECUTIVE ORDERS AND OTHER DIRECTIVES

EO 11990 – Protection of Wetlands

The term "wetlands" means 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. This EO was issued to avoid long- and short-term adverse impacts associated with the destruction or modification of wetlands. EO 11990 requires that federal agencies provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands (42 FR 26961). A national policy directive that requires that federal agency actions avoid resulting in a net loss of wetlands supports this EO.

EO 11988 – Floodplain Management

Floodplains receive protection through this EO, which instructs federal agencies to restore and preserve floodplains and to reduce the risk of flood-related loss. EO 11988 specifically directs federal agencies to:

- Avoid actions located in or adversely affecting floodplains unless there is no practicable alternative,
- Take action to mitigate losses if avoidance is not practicable,
- Establish a process for flood hazard evaluation based upon the 100-year base flood standard of the National Flood Insurance Program, and
- Issue implementing procedures (42 FR 26951).

EO 12962 – Recreational Fisheries

Federal agencies, to the extent permitted by law and where practicable, should improve the quality, function, and sustainable productivity and distribution of U.S. aquatic resources for increased

sustainable recreational fishing opportunities. Among other activities, this EO requires federal agencies to:

- Foster sound aquatic conservation and restoration endeavors to benefit recreational fisheries,
- Provide access to and promoting awareness of opportunities for public participation and enjoyment of U.S. recreational fishery resources, and
- Support outreach programs designed to stimulate angler participation in the conservation and restoration of aquatic systems.

EO 13089 – Coral Reef Protection

Coral reef ecosystems are unique and among the earth's most complex and diverse ecosystems. However, coral reef resources have become over exploited by fishing, recreation, and other uses, and degraded by dredging and shoreline modifications, decreases in water quality, sedimentation, aquatic nuisance species or invasive native species, destructive fishing practices, vessel groundings and anchoring, disease outbreaks, and global climate change (U.S. Coral Reef Task Force 2000).

In response to this growing global coral reef crisis, EO 13089 on Coral Reef Protection was issued in 1998 (64 FR 32701). Through the policies set forth in the EO, federal agencies are directed to identify their actions that may affect U.S. coral reef ecosystems, utilize their programs and authorities to protect and enhance the conditions of these ecosystems and ensure that any actions they authorize, fund, or carry out will not degrade the conditions of coral reef ecosystems. In support of this EO, DoD developed the *Department of Defense Coral Reef Protection Implementation Plan* (DoD 2000), sates DoD policy is:

- To protect U.S. and International coral reef ecosystems and to avoid impacting coral reefs to the maximum extent feasible.
- To responsibly manage and restore coral reef ecosystems in carrying out the terms of all laws, regulations, and policies concerning coastal zone management and coral reef protection.
- To conduct an environmental review of any action likely to affect U.S. coral reef ecosystems in accordance with the National Environmental Policy Act, EO 12114 - Environmental Effects Abroad of Major Federal Actions, and current DoD policies. Mitigating measures are required where coral reef impacts are unavoidable.

EO 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds

This EO encourages incorporation of comprehensive migratory bird management objectives in agency management plans and requires federal agencies to enter into a Memorandum of Understanding (MOU) on migratory birds with the USFWS. The DoD-USFWS MOU on migratory birds, originally signed in 2006, directs DoD and USFWS to strive to protect, restore, enhance, and manage habitat of migratory birds on DoD-managed lands; and to promote collaborative projects such as the Monitoring Avian Productivity and Survivorship (MAPS), Breeding Bird Survey (BBS), Christmas Bird Counts, bird atlas projects, or game bird surveys on DoD lands. The MOU is a five-year agreement that must

be reviewed and renewed by the participating parties every five years. Responsibilities identified in the MOU specific to DoD include:

- Incorporating conservation measures addressed in Regional or State Bird Conservation Plans in INRMPs,
- When consistent with safety and security, allowing USFWS and other partners reasonable access to military lands for conducting surveys,
- Engaging in early planning and scoping with the USFWS prior to starting any activity that is likely to affect populations of migratory birds in order to proactively address migratory bird conservation and in order to initiate appropriate actions to avoid or minimize the take of migratory birds, and
- Managing military lands and non-military readiness activities in a manner that support migratory bird conservation.

PMRF participates in regional projects including State of Hawai‘i biannual waterbird surveys and annual Nēnē surveys as well as incorporates measures from the Hawaiian Bird Conservation Action Plan (VanderWerf 2012) into their migratory bird management efforts.

EO 13751 – Safeguarding the Nation from the Impacts of Invasive Species

Invasive species are any species that are not native to a given ecosystem, and whose introduction causes, or is likely to cause, economic or environmental harm and/or harm to human health. EO 13751 specifically addresses the control of invasive nonnative species on federal lands and requires federal agencies, to the extent practicable and subject to the availability of appropriations, to:

- prevent the introduction, establishment, and spread of invasive species;
- detect and respond rapidly to eradicate or control populations of invasive species in a manner that is cost-effective and minimizes human, animal, plant, and environmental health risks;
- monitor invasive species populations accurately and reliably;
- provide for restoration of native species and habitats that have been impacted by invasive species;
- conduct research on invasive species and develop and apply technologies to prevent their introduction, and provide for environmentally sound methods of eradication and control of invasive species;
- promote public education on invasive species; and coordinate with and complement similar efforts of States, territories, federally recognized American Indian tribes, Alaska Native Corporations, Native Hawaiians, local governments, nongovernmental organizations, and the private sector.

SOH currently has a list of plant species designated as “Noxious Weeds for Eradication or Control Purposes”, which was developed in 1992 (Hawai‘i Invasive Species Council 2015a). In addition, the state has a list of high-profile species that are informally considered to be invasive due to their ability or potential to cause harm to Hawai‘i’s environment, economy, or way of life and is in the process of drafting and adopting administrative rules to formally define species that are invasive in Hawai‘i. The

SOH DOA's Plant Pest Control Branch conducts statewide programs to eradicate or control plant pests and develops new pest advisories (SOH DOA 2015b).

On Kaua'i, KISC has identified a number of invasive plant and animal species that are highly invasive species of concern that are thought to be in limited distribution and are a priority for control. KISC requests sightings of these pests be reported immediately. KISC also identifies invasive species that are commonly found or widespread on Kaua'i. Their removal is recommended, but is not conducted by KISC (KISC 2015).

Presidential Memorandum on Pollinators

Pollinators are fundamental to functioning ecosystems and are essential to both agriculture and natural ecosystems as they are responsible for the reproduction of 75 percent of the world's flowering plants, including thousands of fruit and vegetable crops (USFWS 2013). A Presidential Memorandum of June 2014, *Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators*, directs Federal agencies to take steps to protect and restore domestic populations of pollinators. The Memorandum states:

"Executive departments and agencies shall, as appropriate, take immediate measures to support pollinators during the 2014 growing season and thereafter. These measures may include planting pollinator-friendly vegetation and increasing flower diversity in plantings, limiting mowing practices, and avoiding the use of pesticides in sensitive pollinator habitats through integrated vegetation and pest management practices."

Information on the DoD Pollinator Initiatives is available at:

http://www.dodpollinators.org/index.html

An MOU between the DoD and the Pollinator Partnership, a collaboration of partners working to promote awareness and scientific understanding of pollinators, was signed in 2015. The MOU further directs DoD to undertake activities that help, conserve, protect and restore pollinators and their habitats, subject to the availability of resources. The MOU also stresses that pollinator management should be incorporated into INRMPs, where practicable.

DoD has made pollinator conservation a natural resources priority in order to meet its readiness and stewardship obligations. In support of pollinator conservation, the DoD Natural Resources Program has developed and distributed pollinator fact sheets, formed the DoD Pollinator Working Group, funded Legacy grants benefiting pollinator research and conservation, funded National Public Lands Day events, and is a partner in the North American Pollinator Protection Campaign (NAPPC).

Primary recommendations for pollinator conservation developed by the DoD Natural Resources Program include:

- Reducing pesticide use (particularly neonicotinoids, which strongly impact bees),
- Controlling invasive plants using an integrated pest management approach,
- Restoring land with native plants that attract pollinators, and integrate pollinator friendly plants into gardens,
- Creating corridors between pollinator habitats to minimize fragmentation, and
- Monitoring sites over time, and make note of pollinator species habitat composition.

Monarch butterflies (*Danaus plexippus plexippus*), which are under review for ESA listing (USFWS 2017b), would also benefit from pollinator conservation. Monarchs occurring in Hawai‘i are considered to be the same subspecies as the migratory populations of eastern and western North America, *D. p. plexippus*.

APPENDIX B – MEMORANDA OF UNDERSTANDING AND AGREEMENTS

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MEMORANDUM OF UNDERSTANDING BETWEEN THE U.S. DEPARTMENT OF DEFENSE AND THE U.S. FISH AND WILDLIFE SERVICE AND THE ASSOCIATION OF FISH AND WILDLIFE AGENCIES FOR A COOPERATIVE INTEGRATED NATURAL RESOURCE MANAGEMENT PROGRAM ON MILITARY INSTALLATIONS

A. PURPOSE

The purpose of this Memorandum of Understanding (MOU) is to further a cooperative relationship between the U.S. Department of Defense (DoD), U.S. Department of the Interior-Fish and Wildlife Service (FWS), and state fish and wildlife agencies (states) acting through the Association of Fish and Wildlife Agencies (AFWA) (hereafter referred to as the Parties) in preparing, reviewing, revising, updating and implementing Integrated Natural Resource Management Plans (INRMPs) for military installations.

B. BACKGROUND

In recognition that military lands have significant natural resources, Congress enacted the Sikes Act in 1960 to address wildlife conservation and public access on military installations. The 1997 amendments to the Sikes Act require the DoD to develop and implement an INRMP for each military installation with significant natural resources. A 2012 amendment to the Sikes Act now authorizes the preparation of INRMPs for state-owned National Guard installations used for training pursuant to chapter 5 of title 32 of the United States Code. DoD must prepare all INRMPs in cooperation with the FWS and states. Each INRMP must reflect the mutual agreement of the Parties concerning conservation, protection, and management of fish, wildlife, plants and their habitats on military lands.

INRMPs provide for the management of natural resources, including fish and wildlife and their habitats. To the maximum extent practicable, they incorporate ecosystem management principles, and describe procedures and projects that manage and maintain the landscapes necessary to sustain military-controlled lands for mission purposes. INRMPs also allow for multipurpose uses of resources, including public access appropriate for those uses, provided such access does not conflict with military land use, security requirements, safety, or ecosystem needs, including the needs of fish and wildlife resources. Effective communications and coordination among the Parties, initiated early in the planning process at national, regional, and the military installation levels, is essential to developing, reviewing, and implementing comprehensive INRMPs. When such partnering involves the participation and coordination of all Parties regarding existing FWS and state natural resources management plans or initiatives, such as threatened and endangered species recovery plans or State Wildlife Action Plans, the mutual agreement of all Parties is achieved more easily. INRMPs provide for the conservation and rehabilitation of natural resources on military lands in ways that help ensure the readiness of the Armed Forces. Thus, a clear understanding of land use objectives for military lands should enable the Parties to have a common understanding of DoD's land management requirements.

This MOU addresses the responsibilities of the Parties to facilitate optimum management of natural resources on military installations. It replaces a DoD-FWS-AFW A MOU for *Cooperative Integrated Natural Resources Management Program on Military Installations* dated January 31, 2006, which expired January 31, 2011.

C. AUTHORITIES

This MOU is established under the authority of the Sikes Act, as amended, 16 U.S.C. 670a-670f, which requires the Secretary of Defense to carry out a program to provide for the conservation and rehabilitation of natural resources on military installations in cooperation with the FWS and states. The DoD's primary mission is national defense. DoD manages approximately 28 million acres of land and waters under the Sikes Act to support sustained military activities while conserving and protecting biological resources.

The FWS manages approximately 150 million acres of the National Wildlife Refuge System, and administers numerous fish and wildlife conservation and management statutes and authorities, including the: Fish and Wildlife Coordination Act, Migratory Bird Treaty Act of 1918, Endangered Species Act, Marine Mammal Protection Act, Bald and Golden Eagle Protection Act, Anadromous Fish Conservation Act, Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, Federal Noxious Weed Act, Alien Species Prevention Enforcement Act of 1992, North American Wetland Conservation Act, and Coastal Barrier Resources Act.

The states in general possess broad trustee and police powers over fish and wildlife within their borders, including - absent a clear expression of Congressional intent to the contrary - fish and wildlife on federal lands within their borders. Where Congress has given federal agencies certain conservation responsibilities, such as for migratory birds or species listed as threatened or endangered under the Endangered Species Act, the states, in most cases, have cooperative management responsibilities.

The Sikes Act (16 U.S.C. 670c-l) allows the Secretary of a military department to enter into cooperative agreements with the states, local governments, Indian tribes, nongovernmental organizations, and individuals to provide for the maintenance and improvement of natural resources, or to benefit natural and historic research, both on and off DoD installations.

The Sikes Act (16 U.S.C. 670a(d)(2) also encourages the Secretary of Defense, to the greatest extent practicable, to enter into agreements to use the services, personnel, equipment, and facilities, with or without reimbursement, of the Secretary of the Interior or states in carrying out the provisions of this section.

The Economy Act (31 U.S.C. 1535 and 1536) allows a federal agency to enter into an agreement with another federal agency for services, when those services can be rendered in a more convenient or cost effective manner by another federal agency.

D. RESPONSIBILITIES

The Parties to this agreement hereby enter into a cooperative program of INRMP development, review, and implementation with mutually agreed-upon fish and wildlife conservation objectives to satisfy Sikes Act goals.

1. The DoD, the FWS and AFWA (Parties) mutually agree:

a. To meet at least annually at the headquarters' level to discuss implementation of this MOU. The DoD and FWS will alternate responsibilities for coordinating this annual meeting and any other meetings related to this MOU. Proposed amendments to the MOU should be presented in writing to the parties at least 15 days prior to the annual meeting. The terms of this MOU and any proposed amendments may be reviewed at the annual meeting. The meeting may also review mutual Sikes Act research and technology needs, accomplishments, and other emerging issues.

b. To participate in a Sikes Act Tripartite Core Group consisting of representatives from the Parties. This Core Group will meet at least quarterly, coordinated by the DoD, to discuss and develop projects and guidance to help prepare and implement INRMPs and to discuss Sikes Act issues of national importance.

c. To engage in sound management practices for natural resource protection and management pursuant to this MOU with full consideration for military readiness; native fish and wildlife; threatened, endangered and at-risk species; and the environment.

d. To promote the sustainable multipurpose use of natural resources on military installations - including hunting, fishing, trapping, and non-consumptive uses such as wildlife viewing, boating, and camping - in ways that are consistent with DoD's primary military mission and to the extent reasonably practicable.

e. To develop and implement supplemental Sikes Act MOUs or other agreements, as needed, at the regional and/or state level.

f. To recognize the most current DoD and FWS Sikes Act Guidance as the guidance for communication and cooperation of the Parties represented by this MOU.

g. To post current DoD, FWS, and state Sikes Act guidance documents within 14 days of completion on the following sites:

    i. For DoD: https://www.denix.osd.mil/nr

    ii. For FWS: http://www.fws.gov/habitatconservation/sikes_act.html

iii. For the states: http://www.fishwildlife.org

h. To cooperatively prepare and conduct full reviews of all new INRMPs in a timely manner.

i. To require the DoD Components and appropriate FWS and state offices to conduct a review for operation and effect of each INRMP no less often than every five years, as required by the Sikes Act, and to document these reviews. As a means of facilitating and streamlining this statutory requirement, use the annual progress review of each INRMP as conducted by each DoD Component per DoD policy.

j. To encourage collaboration in annual progress reviews between representatives from each military installation with an INRMP and appropriate representatives from the other Parties.

i. The Parties shall discuss the performance of each military installation in meeting relevant DoD Natural Resources Focus Area metrics, and potential improvements to INRMP implementation, such as new projects or management practices.

ii. Meetings may be in person or by another mutually acceptable means.

iii. The Parties shall discuss methods and projects that the FWS and states can implement that support INRMP goals and objectives.

k. To streamline and expedite the review of INRMP updates or revisions, and to effectively address review for critical habitat exclusions based on the INRMP conservation benefit, when feasible:

i. DoD and the FWS will develop and implement a streamlined review process within six months of signature of this MOU that will allow for expedited review and approval (new signatures) of updated sections of each INRMP.

ii. DoD will provide a means of easily identifying all changes to each updated or revised INRMP when forwarding it for review.

iii. FWS will focus review on those parts of updated INRMPs that reflect changes from the previously reviewed version.

iv. FWS and the appropriate states will review all INRMPs with major revisions (e.g., changes required by mission realignments, the listing of new species or other significant action that has the

potential to affect military operations or readiness).

v. DoD, FWS, and the states (acting through AFWA) will continue to seek opportunities to make INRMP review processes more efficient while sustaining and enhancing INRMP conservation effectiveness.

vi. The DoD Components may submit to the USFWS, a priority INRMP list to address those installations seeking critical habitat exclusions to facilitate coordination with USFWS Endangered Species office.

vii. To ensure consistency, the Parties accept the following definitions:

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

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

c) INRMP update: Any change to an INRMP that, if implemented, 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 to comment on the decision to continue implementing the updated INRMP.

d) 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.

l. That none of the Parties to the MOU is relinquishing any authority, responsibility, or duty established by law, regulation, policy, or directive.

m. To designate the officials listed below, or their delegates to participate in the activities

pursuant to this MOU.

i. DoD: Deputy Director, Natural Resources Conservation Compliance, ODUSD (I&E) ESOH
ii. FWS: National Sikes Act Coordinator, Fish and Aquatic Conservation
iii. AFWA: Director, Government Affairs

2. DoD agrees to:

a. Communicate the establishment of this MOU to all DoD Components.

b. Take the lead in developing policies and guidance related to INRMP development, updates, revisions, and implementation, and to ensure the involvement, as appropriate, in these processes of the FWS and state fish and wildlife agencies.

c. Ensure distribution of the DoD and FWS Sikes Act Guidance to all appropriate DoD Components.

d. Encourage DoD Components to invite appropriate FWS and state fish and wildlife agency offices to participate in annual INRMP reviews. All such invitations should be extended at least 15 business days in advance of the scheduled review to facilitate meaningful participation by all three Parties. Meetings may be in person or by other mutually agreed upon means.

e. Encourage DoD Components to take full advantage of FWS and state fish and wildlife agency natural resources expertise through the use of Economy Act transfers and cooperative agreements. Encourage DoD Components and FWS to explore the use of the Fish and Wildlife Coordination Act for technical assistance, fish stocking, and other conservation projects. Priority should be given to projects that:

i. Sustain the military mission.

ii. Effectively apply ecosystem management principles.

iii. Consider the strategic planning priorities of the FWS and the state fish and wildlife agency.

f. Encourage DoD Components to give priority to INRMP requirements that:

i. Sustain military mission activities while ensuring conservation of natural resources.

ii. Provide adequate staffing with the appropriate expertise for updating, revising, and implementing each INRMP within the scope of DoD Component responsibilities, mission, and funding constraints.

g. Encourage DoD Components to discuss with the FWS and state fish and wildlife agencies all issues of mutual interest related to the protection, conservation, and management of fish and wildlife resources on DoD installations.

h. Subject to mission, safety, security, and ecosystem requirements, provide public access to military installations to facilitate the sustainable multipurpose use of its natural resources.

i. Identify natural resource research needs, and develop research proposals with input from the Parties.

j. Identify opportunities to work with the DoD Components to facilitate:

i. Cooperative regional and local natural resource conservation partnerships and initiatives with FWS and state fish and wildlife agency offices.

ii. Natural resources conservation technology transfer and training initiatives between the DoD Components, federal land management agencies, and state fish and wildlife agencies.

k. Provide law enforcement support to protect fish, wildlife, and plant resources on military installations consistent with jurisdiction and authority.

3. FWS agrees to:

a. Communicate the establishment of this MOU to each FWS Regional Office and appropriate field offices in close proximity to military installations.

b. Distribute the DoD and FWS Sikes Act Guidelines to each FWS Regional Office and appropriate field office in close proximity to military installations.

c. Designate regional and field office FWS liaisons to develop partnerships and help DoD implement joint management of ecosystem-based natural resource management programs, and provide a list of those liaisons to the DoD as needed.

d. Provide technical assistance with the appropriate expertise to the DoD in managing

its resources within the scope of FWS responsibilities and funding constraints.

e. Encourage field offices to coordinate current and proposed FWS natural resource initiatives and research efforts with those that may relate to DoD installations, and to provide applicable installations with new and relevant information pertaining to distribution and/or research regarding listed and candidate species and species at-risk.

f. Inform DoD Components and affected installations regarding upcoming and reasonably foreseeable proposed listing and critical habitat designations that may potentially affect military installations in a timely manner before publication of such proposals in the Federal Register.

g. Encourage regional and field offices to expedite pending INRMP reviews that may affect foreseeable proposed listing of threatened and endangered species and critical habitat designations.

h. Provide law enforcement support as appropriate to protect fish, wildlife, and plant resources on military installations within the jurisdiction of the FWS.

i. Identify FWS refuges and other potential federal management areas in close proximity to military installations, and, where appropriate, participate in the joint management of ecosystem-based natural resource management projects that support INRMP and other planning goals, objectives, and implementation.

4. AFWA agrees to:

a. Communicate the establishment of this MOU to each state fish and wildlife agency director and appropriate personnel.

b. Distribute the DoD and FWS Sikes Act Guidelines to each state fish and wildlife agency director and appropriate staff.

c. Facilitate and coordinate with the states to encourage them to:

i. Participate in developing, reviewing, updating, revising, approving and, as appropriate implementing INRMPs in a timely way upon request by military installation personnel.

ii. Designate state liaisons to help develop partnerships and to help DoD installation staff implement natural resource conservation and management programs.

iii. Identify state wildlife management areas in close proximity to military installations and, where appropriate, participate in the joint management

of ecosystem-based natural resources projects that support INRMP goals, objectives, and implementation.

iv. Provide technical assistance to DoD installation staff in adaptively managing natural resources within the scope of state responsibilities, funding constraints, and expertise.

v. Identify state personnel needs to develop, review, update/revise, approve, and implement INRMPs, and facilitate the identification of funding opportunities to address the fulfillment of state priorities.

vi. Coordinate current and proposed state natural resources research efforts with those that may relate to DoD installations.

vii. Coordinate with DoD installations to develop new, and implement existing, conservation plans and strategies, including, but not limited to State Wildlife Action Plans; the National Fish, Wildlife and Plants Climate Adaptation Strategy; goals or initiatives of the North American Bird Conservation Initiative (NABCI) and/or Partners in Amphibian and Reptile Conservation (PARC); and the National Fish Habitat Action Plan.

E. STATEMENT OF NO FINANCIAL OBLIGATION

This MOU does not impose any financial obligation on the part of any signatory.

F. ESTABLISHMENT OF COOPERATIVE AGREEMENTS

The Parties are encouraged to enter into cooperative or interagency agreements to coordinate and implement natural resource management on military installations. If fiscal resources are required, the Parties must develop a separately funded cooperative or interagency agreement. Such cooperative or interagency agreements may also be entered into under the authority of the Sikes Act (16 U.S.C. 670c-l). Interagency agreements may be entered into under the authority of the Economy Act (31 U.S.C. 1535 and 1536). The Parties should also explore opportunities to utilize the Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661-666c) to facilitate agreements for FWS technical assistance, fish stocking, and other conservation activities. Each funded cooperative or interagency agreement shall include a work plan and a financial plan that identify goals, objectives, and a budget and payment schedule. A cooperative or interagency agreement to accomplish a study or research also will include a study design and methodology in the work plan. It is understood and agreed that any funds allocated via these cooperative or interagency agreements shall be expended in accordance with its terms and in the manner prescribed by the fiscal regulations and/or

administrative policies of the party making the funds available.

G. AMENDMENTS

This MOU may be amended at any time by mutual written agreement of the Parties.

H. TERMINATION

Any party to this MOU may remove itself upon sixty (60) days written notice to the other parties.

I. EFFECTIVE DATE AND DURATION

This MOU will be in effect upon date of final signature, and will continue for ten years from date of final signature. The parties will meet six (6) months prior to the expiration of this MOU to discuss potential modifications and renewal terms.

7-29-13
Date

John Conger
Acting Deputy Under Secretary of Defense
(Installations and Environment)
U.S. Department of Defense

6.24.13
Date

Dan Ashe
Director
Fish and Wildlife Service
U.S. Department of Interior

7-15/2013
Date

Ron Regan
Executive Director
Association of Fish and Wildlife Agencies

MEMORANDUM OF UNDERSTANDING BETWEEN THE DEPARTMENT OF DEFENSE AND THE POLLINATOR PARTNERSHIP

This Memorandum of Understanding (MOU) is entered into by and between the Department of Defense, hereinafter written as DoD, and the Pollinator Partnership (the "Parties").

ARTICLE I - BACKGROUND AND OBJECTIVES

The objective of this MOU is to establish a framework for cooperative programs that promote the conservation and management of pollinators, their habitats and associated ecosystems.

The DoD has a long history of commitment to protecting the environment and the natural resources that have been entrusted to its care, while at the same time accomplishing its primary mission of national defense.

Through federal law and regulations, DoD is responsible for the conservation and management of natural and cultural resources, ecological processes, and threatened, endangered and sensitive or rare plant and animal species and their habitats.

Cooperative relationships are essential to the effectiveness of resource management on and off military owned lands.

The Pollinator Partnership's mission is to act as a catalyst for stewardship, working to improve the health and survival of all species by promoting the health of pollinating animals, and by protecting and restoring their habitats. The Pollinator Partnership coordinates the North American Pollinator Protection Campaign (NAPPC), a unique, tri- national collaboration working to promote awareness and scientific understanding of pollinators; to gather, organize and disseminate information about pollinators; to provide a forum to identify and discuss pollinator issues; and to promote projects, initiatives and activities that enhance pollinators and their habitats.

It is the goal of both Parties to cooperate with each other in matters relating to the management and conservation of pollinators and the ecosystems they depend upon. The framework for cooperation and coordination is especially important to ensure that pollinator management activities are incorporated, where practicable, into installation integrated natural resource management plans (INRMPs) and practices.

ARTICLE II - AUTHORITIES

This MOU is made and entered into pursuant to the provisions of the Sikes Act (16 U.S.C. 670a-670o, as amended), and supports the Presidential Memorandum *Creating* a *Federal Strategy to Promote the Health of Honey Bees and Other Pollinators* (June 2014). In addition, requirements under other applicable laws, regulations, and specific DoD directives and guidance also apply.

ARTICLE III - RESPONSIBILITIES

A. DoD will, subject to the availability of resources and under the terms of separately funded sub-agreements to this MOU, and consistent with requirements and activities described in its INRMPs, undertake such tasks as:

1. Support and, as feasible, undertake activities that help, conserve, protect, and restore pollinators and their habitats in accordance with DoD mission and policies.

2. Conserve and manage pollinators and their habitats in accordance with applicable federal laws and regulations to foster conservation.

3. Enter into supplemental sub-agreements with the Pollinator Partnership, including but not limited to special use permits, research permits, cooperative agreements, or contracts to accomplish work projects agreed upon by both Parties.

4. Provide unclassified/publicly releasable information on DoD mission requirements and constraints that will assist the understanding of for Pollinator Partnership personnel performing activities on DoD lands.

5. Meet annually, or as necessary, to identify projects and activities of mutual benefit and to plan and implement agreed to projects.

6. Work with the INRMP signatories to identify pollinator management activities in support of the Presidential Memorandum.

B. The Pollinator Partnership will:

1. Cooperate with DoD to implement actions that both Parties have agreed upon.

2. Provide DoD with expertise to implement agreed upon projects.

3. Enter into appropriate sub-agreements with DoD to accomplish specific projects agreed upon by both Parties.

4. Meet annually, or as necessary, to identify projects/activities of mutual benefit and to plan and implement agreed upon projects.

5. Help implement specific projects on DoD lands that support both Parties' missions while conserving pollinators and their habitats in accordance with DoD policies.

6. Inform the general public about DoD pollinator conservation projects.

7. Help train DoD personnel about pollinators and pollinator habitat conservation and management.

ARTICLE IV- DELEGATION

A. Authorized representatives of NAPPC and the DoD may execute special use authorizations, and enter into supplemental sub-agreements within the scope of this MOU.

B. Any supplemental sub-agreement negotiated under the authority of this MOU will remain in full force and effect, unless and until modified or terminated by local signatory Parties, per the terms of said supplemental sub-agreements.

ARTICLE V - TERMS OF AGREEMENT

This MOU will remain in effect from the date of final signature until it is terminated pursuant to Article VII.

ARTICLE VI - KEY OFFICIALS

Key officials are essential to ensure maximum coordination and communication among the Parties regarding the work being performed. The designated officials are:

Department of Defense
L. Peter Boice
Deputy Director, Natural Resources Program

Office of the Assistant Secretary of Defense (Energy, Installation & Environment)
4800 Mark Center Drive, 16G14
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ARTICLE VII - MODIFICATION AND TERMINATION

A. This MOU will remain in effect until one of the Parties executes item B or C under this article.

B. This MOU may be amended upon written request of either the DoD or the Pollinator Partnership, and the subsequent written concurrence of the other.

C. Either Party may terminate this MOU by providing the other Party with sixty (60) days advance written notice.

ARTICLE VIII - STANDARD CLAUSES

- A. Public Information Release

1. The Pollinator Partnership will not publicize or otherwise circulate promotional material (such as advertisements, sales brochures, press releases, speeches, pictures, still and motion pictures, articles, manuscripts, or other publications) that states or implies federal government, departmental, bureau, or federal government employee endorsement of a product, service or position that the Pollinator Partnership represents. No release of information relating to this MOU may state or imply that the federal government approves of the work product of the Pollinator Partnership or considers the Pollinator Partnership's work product to be superior to other products or services.

2. The Pollinator Partnership will ensure that all information submitted for publication or other public releases of information regarding this project will carry the following disclaimer:

   'The views and conclusions contained in this document are those of the authors, and should not be interpreted as representing the opinions or policies of the U.S. Government. Mention of trade names or commercial products does not constitute their endorsement by the U.S. Government."

3. The Pollinator Partnership will obtain prior DoD approval from the key DoD official for this MOU for any DoD-wide public information release that refers to DoD, the Military Services, offices, programs, or employee (by name or title), or to this MOU. For specific installation information, the Pollinator Partnership will obtain prior approval form that installation's public affairs office. The specific text, layout, photographs, etc., of the proposed release must be submitted to the MOU's technical representative, who will forward such materials to the public affairs office, along with the request for approval, or from the specific DoD installation public affairs office.

4. The Pollinator Partnership agrees to include the above provisions of this Article in any sub-award, except for a sub-award to a state government, a local government, or to a federally recognized Indian tribal government.

8. **Freedom of Information Act (FOIA).** Any information furnished to DoD under this MOU is subject to the Freedom of Information Act (5 U.S.C. 552).

C. **Participation in Similar Activities.** This MOU in no way restricts DoD or the Pollinator Partnership from participating in similar activities with other public or private agencies, organizations, or individuals.

D. **Non-Fund Obligating Document.** Nothing in this MOU shall require either DoD or the

Pollinator Partnership to obligate, expend, or transfer any funds. Specific work projects or activities that involve the transfer of funds, services or property among the various agencies and offices of DoD and the Pollinator Partnership will require execution of separate agreements and be contingent upon the availability of appropriated funds. Such activities must be independently authorized by appropriate statutory authority. This MOU does not provide such authority. Negotiation, execution and administration of each such agreement must comply with all applicable statutes and regulations.

E. **Establishment of Responsibility** This MOU is not intended to, nor does it, create any right, benefit, or trust responsibility, substantive or procedural, enforceable at law or equity, by a Party against the United States, its agencies, its officers, or any person.

F. **Authorized Representatives.** By signing below, the individuals listed in this document certify that they are representatives of their organizations, and are authorized to act in their respective areas for matters related to this MOU.

THE PARTIES HERETO have executed this MOU:

POLLINATOR PARTNERSHIP

Laurie Davies Adams

Laurie Davies Adams
Executive Director
Pollinator Partnership

02/09/15
Date

DEPARTMENT OF DEFENSE

John Conger

John Conger
Performing the Duties of the Assistant Secretary of Defense
(Energy, Installations & Environment)
Department of Defense

1/28/2015
Date

MEMORANDUM OF UNDERSTANDING BETWEEN THE U.S. DEPARTMENT OF DEFENSE AND THE U.S. FISH AND WILDLIFE SERVICE TO PROMOTE THE CONSERVATION OF MIGRATORY BIRDS

This Memorandum of Understanding (MOU) is entered into between the U.S. Department of Defense (DoD) and the U.S. Fish and Wildlife Service (FWS) (hereinafter "the Parties").

Purpose and Scope

This MOU is entered into pursuant to Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds* (66 FR 3853 [January 17, 2001]). The purpose of this MOU is to promote the conservation of migratory bird populations while sustaining the use of military managed lands and airspace for testing, training, and operations.

This MOU does not address incidental take resulting from military readiness activities or active DoD airfield operations. Military readiness activities are covered by 50 CFR 21.15 (Authorization of take incidental to military readiness activities). Bird-related management activities with a potential to affect airfield operations or safety will be managed according to DoDI 4165.57 and the airfield's Bird/Wildlife Aircraft Strike Hazards (BASH) Program.

Installation commanders responsible for military airfields will not implement wildlife conservation prescriptions set forth in this MOU if they conclude that such actions will negatively impact military mission or combat capability, or if such action will increase the possibility of aircraft-wildlife strikes. Should installation commanders choose to implement wildlife conservation measures, they must follow BASH guidelines, and consider military mission impacts and elevated risk to aircraft and aircrew.

This MOU specifically pertains to the following categories of DoD activities:

1) Natural resource management activities, including, but not limited to, habitat management, erosion control, forestry activities, hunting, fishing, agricultural out leasing, conservation law enforcement, invasive-weed management, and prescribed burning [1]

2) Installation support activities, including, but not limited to, administration, retail sales, food service, health care, water and sewage treatment, supply and storage, education, housing, equipment maintenance, base transportation, laundry and dry cleaning, recreation, and religious activities;

3) Operation of industrial activities;

[1] Vegetation management within the airfield environment shall be governed by the installation Integrated Natural Resource Management Plans (INRMP) and associated Bird/Wildlife Aircraft Strike Hazard (BASH) Plan.

4) Construction, maintenance, renovation, or demolition of facilities that support the activities described in items 1 through 3; and

5) Prevention or abatement of pollution or detrimental alteration of the environment for the benefit of migratory birds, as practicable.

This MOU identifies specific activities where cooperation between the Parties will contribute substantially to the conservation of migratory birds and their habitats. This MOU does not alter or waive any responsibilities ofDoD or FWS, as applicable, under the Migratory Bird Treaty Act (MBTA), the Bald and Golden Eagle Protection Act (Eagle Act), and the Endangered Species Act (ESA); nor does it authorize the take of migratory birds.

Authorities

The Parties' responsibilities under the MOU are authorized by provisions of the following laws and authorities:

- Alaska National Interest Lands Conservation Act of 1980 (16 U.S.C. 410hh-3233)
- Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. 668-668d)
- Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1544)
- Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds, 2001 (66 FR 3853 [January 17, 2001])
- Fish and Wildlife Act of 1956, as amended (16 U.S.C. 791a *et seq.)*
- Fish and Wildlife Conservation Act of 1980, as amended (16 U.S.C. 2901-2911)
- Fish and Wildlife Coordination Act of 1980, as amended (16 U.S.C. 661-667)
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715 *et seq.)*
- Migratory Bird Treaty Act, of 1918, as amended (16 U.S.C. 703-711)
- National Environmental Policy Act of 1969 (42 U.S.C. 4321-4347)
- Sikes Act Improvement Act of 1997 (16 U.S.C. 670a-670o)
- Agreements to limit encroachments and other constraints on military training, testing, and operations (10 U.S.C. 2684a)

Background

Department of Defense

The DoD mission is to provide for the Nation's defense. DoD's Natural Resources Program works to ensure continued access to land, air, and water resources for realistic military training and testing, while ensuring that the natural and cultural resources entrusted to DoD's care are sustained in a healthy condition.

The DoD is an active participant in international bird conservation partnerships including Partners in Flight (PIF) and the North American Bird Conservation Initiative (NABCI). Through PIF and NABCI, DoD works in partnership with numerous federal and state agencies and nongovernmental organizations to conserve migratory and resident birds and to enhance their survival. Military lands frequently provide some of the best remaining habitat for migratory and resident bird species, and DoD plans to continue supporting bird conservation activities.

Integrated Natural Resources Management Plans (INRMPs) offer a coordinated approach for incorporating habitat conservation efforts into installation management. INRMPs provide significant baseline information that can be used when preparing National Environmental Policy Act (NEPA) documents for all DoD management activities. This linkage helps to ensure that appropriate conservation and mitigation measures are identified in NEPA documents and committed to, when appropriate, in final decision documents.

The DoD develops INRMPs cooperatively with the FWS and appropriate state fish and wildlife agencies. DoD's strategy focuses on inventorying and long-tenn monitoring to determine changes in migratory bird populations on DoD installations. Effective on-the-ground management may then be applied to those areas identified as having the highest conservation value. DoD's goal is to support military training and testing by providing for no net loss of an installation's military readiness capability and capacity. DoD implements cooperative projects and programs on military lands to benefit the health and well-being of birds and their habitats, when consistent with the military mission, military readiness, and the safety of DoD personnel.

The DoD has a cooperative network of natural resources personnel and others from military installations across the United States that provides technical assistance, including how to incorporate landbird, shorebird, and waterbird habitat management efforts into INRMPs. These bird conservation experts work collaboratively to conserve migratory and resident birds and their habitats on DoD lands.

The DoD implements bird inventories and monitoring programs in numerous ways, including Next Generation Radar (NEXRAD) for studying bird movements in the atmosphere, and maintains an integrated pest management (1PM) program designed to reduce the use of pesticides, herbicides, fungicides, etc. In addition, the management of natural resources on DoD properties benefits migratory birds through efforts such as invasive-species control, habitat enhancement/restoration, water-quality improvement, and wetland conservation.

Fish and Wildlife Service

As a federal agency within the U.S. Department of the Interior, the FWS mission is to work with others to conserve, protect, manage, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. The FWS Migratory Bird Program serves as a focal point in the United States for policy development and strategic planning, program implementation, and evaluation of actions designed to conserve migratory birds and their habitats.

The FWS is legally mandated to implement the conservation provisions of the MBTA, which includes responsibilities for managing migratory bird populations, domestic and international coordination, and the development and enforcement of regulations that govern authorized take of migratory birds. The Migratory Bird Conservation Act established the Migratory Bird Conservation Commission to approve land acquisition with Migratory Bird Conservation Funds. The Fish and Wildlife Coordination Act (FWCA) requires consultation under certain circumstances and added provisions to recognize the important contribution of wildlife resources to the Nation. The FWCA requires consideration and coordination of wildlife conservation, including habitat protection, through acquisition, enhancement, and/or management and avoidance and minimization of avian stressors related to federal activities.

The following FWS programs have responsibilities with regards to bird conservation activities:

1) The Division of Migratory Bird Management and the Migratory Bird Programs in FWS Regional Offices serve as focal points for policy development and strategic planning. These offices develop and implement monitoring and management initiatives that help maintain healthy populations of migratory birds and their habitats, and provide continued opportunities for citizens to enjoy bird-related recreation.

2) The Division of Bird Habitat Conservation is instrumental in supporting habitat conservation partnerships through the administration of bird conservation grant programs and development of Joint Ventures that serve as major vehicles for implementing the various bird conservation plans across the country.

3) Ecological Services Field Offices across the country serve as the primary contacts for technical assistance and environmental reviews involving migratory bird issues. The Field Offices coordinate with the Regional Migratory Bird Offices, as necessary, regarding permits and overall migratory bird conservation coordination.

4) The Office of Law Enforcement is the principal FWS program that enforces the legal provisions of the MBTA, Eagle Act, ESA, and other laws pertaining to migratory birds.

5) The National Wildlife Refuge (NWR) System manages NWRs and Waterfowl Production Areas across the country, many of which were established to protect and conserve migratory birds. NWRs not only protect important bird habitat, but also focus on monitoring migratory bird populations, restoring and maintaining native habitats, and educating the public on recreational and economic benefits of migratory birds.

6) The Science Applications program works with other FWS programs and partners to ensure that the necessary science, tools, and capacity are available for planning and implementing the most efficient and effective conservation actions to protect fish and wildlife, including migratory birds. The office facilitates regional self-directed science management partnerships called Landscape Conservation Cooperatives to develop and apply shared science capacity to conservation.

Statement of Mutual Interest and Benefit

The Parties have a common interest in the conservation and management of America's natural resources. The Parties agree that migratory birds are important components of biological diversity, and that the conservation of migratory birds will help sustain ecological systems and help meet the public demand for conservation education and outdoor recreation, such as wildlife viewing and hunting opportunities. The Parties also agree that it is important to focus on reducing stressors on bird populations, restore and enhance habitat where actions can benefit specific ecosystems and migratory birds dependent upon them, and recognize that actions taken to benefit some migratory bird populations may adversely affect other migratory bird populations. The Parties also agree that while it is the FWS' aim to ensure biologically diverse, thriving habitat for migratory birds away from airfields, it is DoD's aim to ensure flight safety by making airfield environments as unattractive as possible to migratory birds while supporting FWS' efforts away from airfields.

Responsibilities of Both Parties

The Parties agree that this MOU shall be implemented to the extent permitted by law and in harmony with evolving requirements of agency missions, subject to the availability of appropriations and budgetary limits. Both Parties shall:

1) Support the conservation intent of Executive Order 13186, and the migratory

bird conventions by:

a) Integrating bird conservation principles, measures, and practices into agency planning and actions; and

b) Avoiding or minimizing, to the extent practicable, the exposure of birds and their resources to avian stressors that result in take.

2) Emphasize an interdisciplinary, collaborative approach to migratory bird conservation in cooperation with other governments, state and federal agencies, and non-federal partners within the geographic framework of the NABCI Bird Conservation Regions.

3) Work to protect, restore, and enhance migratory bird habitats, as practicable, on DoD-managed lands, in ways that do not conflict with or impede military training and testing, by:

a) Designing and executing actions to minimize, to the extent practicable and consistent with the military mission, avian stressors on migratory bird populations, including impacts to breeding, migration, or wintering habitats; and by developing and implementing, as appropriate, conservation measures that could reduce the take of migratory birds or enhance the quality of the habitats they use;

b) Working to identify, conserve, and manage significant bird conservation sites that occur on DoD-managed lands;

c) Preventing or abating pollution or detrimental alteration of the environment for the benefit of migratory birds, as practicable; and

d) Preventing the introduction and establishment of, and controlling and reducing the spread of existing, non-native invasive species that may be harmful to native flora and fauna, including migratory bird populations, as required by Executive Order 13112 on Invasive Species.

4) Work with willing landowners to prevent or minimize the loss or degradation of migratory bird habitats on lands adjacent or near military installation boundaries. This cooperative conservation may include:

a) Participating in efforts to identify, protect, and conserve important migratory bird habitats or other significant bird conservation sites and ecological conditions that occur in landscapes or watersheds that may be of conservation value to migratory birds found on DoD lands, and that also buffer one or more installations from adverse impacts to DoD mission or resource-management activities:

b) Providing information on migratory bird resources found on DoD lands for partners to include and integrate into their outreach and education materials and activities; and

c) Using available authorities to enter into agreements with federal, state, tribal, or other governmental entities, or nongovernmental organizations to conserve and enhance habitats in a manner compatible with military operations.

5) Promote collaborative projects such as:

a) Developing or using existing inventory and monitoring programs, at appropriate scales, with national or regional standardized protocols, to assess the status and trends of bird populations and habitats, including migrating, breeding, and wintering birds;

b) Designing management studies and research/monitoring projects using national or regional standardized protocols and programs to identify the habitat conditions needed by applicable species of concern, to understand interrelationships of co- existing species, and to evaluate the effects of management activities on habitats and populations of migratory birds;

c) Sharing inventory, monitoring, research, and study data for breeding, migrating, and wintering bird populations and habitats in a timely fashion with national data repositories such as the Avian Knowledge Network, National Point Count Database, and Monitoring Avian Productivity and Survivorship (MAPS);

d) Working in conjunction with each other and federal and state agencies to develop reasonable and effective conservation measures for actions that reduce the exposure of birds and their habitats to avian stressors;

e) Participating in or promoting the implementation of existing regional or national inventory and monitoring programs such as Breeding Bird Survey (BBS), Christmas Bird Counts, bird atlas projects, or game-bird surveys (e.g., mid-winter waterfowl surveys) on DoD lands where practicable and feasible;

f) Using existing partnerships and exploring opportunities for expanding and creating new partnerships to facilitate combined funding for inventory, monitoring, management studies, and research; and

g) Improving habitat on lands adjacent to DoD-managed lands through programs such as the DoD Readiness and Environmental Protection Integration and Land and Water Conservation Fund programs.

6) Work cooperatively to identify and utilize existing conservation measures to avoid or minimize the effects of avian stressors, and develop new conservation measures as needed.

7) Per Executive Order 13186 (Sec. 3(12)), provide training opportunities to appropriate personnel on responsibilities under the MBTA, the Eagle Act, and other regulations protecting birds, current processes for coordination on bird conservation issues, strategies for properly assessing how actions effect bird populations, and recommended approaches on how to avoid or minimize the exposure of birds and their habitats to avian stressors.

8) Participate annually in the interagency Council for the Conservation of Migratory Birds. The duties of the Council include the following:

a) Sharing resource information to help conserve and manage migratory birds;

b) Fostering partnerships to further the goals of Executive Order 13186;

c) Reporting annually on Executive Order accomplishments and recommendations; and

d) Selecting an annual recipient of a Presidential Migratory Bird Federal Stewardship Award.

9) Promote migratory bird conservation nationally and internationally through activities such as National Public Lands Day and International Migratory Bird Day.

Department of Defense Responsibilities

1) Follow all migratory bird permitting requirements for intentional take under 50 CFR 21.22 (banding or marking), 21.23 (scientific collecting), 21.26 (special Canada Goose permit), 21.27 (special purposes), or 21.41 (depredation). Though no permit is required to take birds in accordance with *50* CFR 21.43 - 21.47 (depredation orders), follow all regulatory requirements set forth in those sections when applicable.

2) Consistent with military mission requirements, encourage incorporation of comprehensive migratory bird management objectives into relevant DoD planning documents, including INRMPs, Integrated Pest Management Plans (IPMPs), Installation Master Plans, NEPA analyses, and other relevant documents. Comprehensive planning efforts for migratory birds include PIF Bird Conservation Plans, the North American Waterfowl Management Plan, U.S. Shorebird Conservation Plan, North American Waterbird Conservation Plan, and associated regional plans where available.

3) Consistent with current and emerging mission requirements, manage military lands and non-military readiness activities in a manner that supports migratory bird conservation, habitat protection, restoration, and enhancement.

4) Inventory and monitor bird populations on DoD lands to the extent feasible to facilitate decisions about the need for, and effectiveness of, conservation efforts

5) In accordance with DoD *INRMP Implementation Manual* (DoDM 4715.03, 2013), work cooperatively with FWS and state and fish and wildlife agencies to promote timely development, effective review, and revisions of INRMPs, including any potential revisions to promote the conservation of migratory birds.

6) Incorporate conservation measures addressed in regional or state bird conservation plans in the INRMP development process.

7) Consistent with safety and security requirements, allow the FWS and other partners reasonable access to military lands for conducting sampling or survey programs, including but not limited to MAPS, BBS, International Shorebird Survey, game-bird surveys, and breeding bird atlases.

8) Consistent with safety and security requirements and bird conservation responsibilities, support the economic and recreational benefits of bird-related activities by allowing public access to military lands for recreational uses, such as bird watching and other non-- consumptive activities.

9) Develop policies and procedures for facilities design that will promote the conservation of migratory bird populations and habitat, including:

    a) Mitigating the negative impacts of reflective glass in building design by considering building location and orientation with respect to migratory bird areas, and use of other mitigation techniques, such as reducing the amount of reflective glass on buildings;

    b) Maximizing the use of native landscaping to promote migratory bird habitat, except in areas subject to BASH hazards.

    c) Turning off interior building lighting at night, especially lighting in offices with exterior windows that face outward to exterior building surfaces that may be visible to migratory or resident birds.

10) Prior to implementing any activity that has, or is likely to have, a measurable negative effect on migratory bird populations:

    a) Identify the migratory bird species likely to occur in the area of the proposed action, and determine if any species of concern could be affected by the activity;

    b) Assess and document, through the project planning process (e.g., NEPA), the potential effects of the proposed action on species of concern. Use best available demographic, population, or habitat-association data in the assessment of effects upon species of concern; and

    c) Engage in early planning and scoping with the FWS to proactively address migratory bird conservation, and to initiate appropriate actions to avoid or minimize the exposure of birds and their habitats to avian stressors that may result in the take of migratory birds.

11) Continue to promote the conservation of migratory birds on military lands, to the extent permitted by law, subject to the availability of appropriations, within Administration budgetary limits, and where in harmony with DoD missions.

a) Fire and fuels-management practices. Fire plays an important role in shaping plant and animal communities, and is a valuable tool in restoring habitats altered by decades of fire suppression. Fire management may include fire suppression, fire prevention, fuels treatment, and prescribed burning. Prescribed burning is one of the most effective tools in managing grassland and longleaf pine/wiregrass ecosystems. Fire-management planning efforts will consider the effects of fire management strategies on the conservation of migratory bird populations, and should be combined with monitoring to properly assess fire management on relevant habitats and species.

b) Management practices for invasive and aquatic nuisance species. Invasive and aquatic nuisance species are a threat to native plants and wildlife throughout the United States, including on military lands. Efforts to prevent, control, and contain these species must take into account both the impacts from invasive species and the effects of the control efforts on migratory bird populations. Invasive species that can threaten migratory birds and their habitats include, but are not limited to, exotic grasses, trees and weeds, terrestrial and aquatic insects and organisms, non- native birds, and stray and feral cats.

c) Communications towers, utilities, and energy development. Increased communications demand, changes in technology, and the development of alternative energy sources have resulted in additional exposure of migratory birds and their resources to avian stressors. DoD will review best practices outlined in FWS Guidance, and consult with FWS as needed when considering the development of these technologies on military lands. Construction of new utility and energy systems and associated infrastructure should avoid or minimize the exposure of birds and their resources to avian stressors. Consideration also may be given to retrofitting existing utilities to reduce impacts. Available guidance includes (but is not limited to):

I. Avian Power Line Interaction Committee - *Suggested Practices for Avian Protection on Power Lines* (2006)

II. Avian Power Line Interaction Committee - *Reducing Avian Collisions with Power Lines* (2012)

III. U.S. Fish and Wildlife Service *Land-based Wind Energy Guidelines* (2012)

iv. U.S. Fish and Wildlife Service *Guidance on the Siting, Construction, Operation, and Decommissioning of Communication Towers* (2000) and FWS comments to the FCC on towers and lighting (2007)

12) To the extent reasonable and practicable, use a best-practices approach for routine maintenance, retrofitting, and management actions to the extent they do not diminish military readiness, including:

a) Turning out lights in buildings, especially multiple-story buildings, at night, except where needed for safety or security reasons;

b) Reducing or eliminating activities that can attract invasive species, including feeding or managing outdoor or feral cats;

c) Minimizing or eliminating the use of pesticides (e.g., insecticides, herbicides, rodenticides);

d) Covering open pipes in which birds may be able to enter but not escape (e.g., in- ground pipes, outhouses, roofs);

e) Minimizing exposure to hazardous chemicals, including covering or removing open pits containing oil or other chemicals; and

f) Minimizing vegetation removal and manipulation during the breeding season, as practicable and when not in conflict with airfield BASH management.

Responsibilities of the Fish and Wildlife Service

1) Work with DoD by providing recommendations to minimize the effects of avian stressors on migratory birds from DoD actions.

2) Through the Division of Migratory Bird Management, maintain a Web page of permits that provides links to all offices responsible for issuing migratory bird take permits and permit applications.

3) Provide essential background information to DoD, when requested, to ensure sound management decisions. This may include information on migratory bird distributions, status, key habitats, conservation guidelines, and risk factors within each BCR. FWS will regularly update its *Birds of Conservation Concern* publication so it can be reliably referenced.

4) Work to identify special migratory bird habitats (e.g., nesting, stopover, migration corridors), and the ecological conditions important in those habitats.

5) Using the Points of Contact list (Appendix A), the FWS will continue to provide general guidance and information regarding migratory birds and their habitats to DoD, upon request. This guidance includes technical assistance for avoiding or minimizing project- related impacts on migratory birds.

6) The Migratory Bird Program will develop and provide FWS guidance to the Ecological Services Field Offices to ensure consistency in the interpretation and implementation of the MBTA as it applies to all federal actions.

7) In accordance with FWS Guidelines for Coordination with DoD and Implementation of the 1997 Sikes Act, promote timely and effective review of INRMPs, including any potential recommendations and revisions related to the conservation of migratory birds.

8) Review and comment on NEPA and other planning documents forwarded by military installations.

9) Notify installations of any proposed or current actions that may result in a significant take of migratory birds.

Dispute Resolution

Preventing potential conflicts or resolving disagreements between *the* Parties will be attempted first at staff levels and elevated through the respective organizational levels if necessary. If staff level resolution is not possible, the conflict will be addressed through Alternative Dispute Resolution processes.

Mutual Agreement

1) This MOU will not change or alter requirements associated with the MBTA, Eagle Act, ESA, NEPA, Sikes Act, or other statutes or legal authority. This MOU is intended to provide internal guidance to federal agency staff.

2) The discretionary responsibilities established by this MOU may be incorporated into planned DoD actions; however, DoD may not *be* able to implement these discretionary responsibilities until DoD has successfully included them in formal planning, programming, and budgeting processes. This MOU is intended to be implemented when new actions are initiated as well as when INRMPs, IPMPs, and BASH plans are initiated or revised, and if the MOU's discretionary responsibilities are successfully included in formal planning, programming, and budgeting processes.

3) This MOU in no way restricts either Party from participating in similar activities with other public or private agencies, governments, organizations, or individuals.

4) This MOU is neither a fiscal nor a funds-obligation document. Any endeavor involving reimbursement, contribution of funds, or transfer of anything of value between the Parties will be handled in accordance with applicable laws, regulations, and procedures, including those for government procurement and printing. Such endeavors will be outlined in separate agreements that shall be made in writing by representatives of the Parties, and shall *be* independently authorized by appropriate statutory authority.

5} The Parties shall schedule periodic meetings to review progress and identify opportunities for advancing the principles of this MOU.

6) This MOU is intended to improve the internal management of the executive branch, and does not create any right or benefit, substantive or procedural, separately enforceable as law or equity by a party against the United States, its agencies or instrumentalities, its officers or employees, or any other person.

7) Modifications to the MOU's scope shall be made by the Parties' mutual consent, through issuance of a written modification, signed and dated by the Parties, prior to any changes.

8) Either Party may terminate this MOU, in whole or in part, at any time before the

expiration date by providing the other Party with a written statement to that effect.

Definitions

Action - a program, activity, project, official policy, rule, regulation, or formal plan directly carried out by one of the Parties.

Airfield Environment - UFC 3-260-01 defines what an airfield is and all of its component parts, and defines clearance criteria. DoDI 4165.57 AICUZ describes the acceptable land uses for component parts of the airfield. The Airfield's BASH Program is responsible for maintaining hazard-free airfields.

Avian Knowledge Network - an international organization of government and non-government institutions focused on understanding the patterns and dynamics of bird populations across the Western Hemisphere (www.avianknowledge.net).

Avian Stressor - any alteration of or addition to the environment that affects birds or their resources.

Bird/Wildlife Aircraft Strike Hazard (BASH) an actual or potential collision between wildlife (i.e., a bird, mammal, or reptile) and an aircraft (e.g., plane or helicopter).

Breeding Bird Survey (BBS) - a standardized international survey that provides information on population trends of breeding birds, through volunteer observations located along randomly selected roadside routes in the United States, Canada and Mexico (www.mbr-pwrc.usgs.gov/bbs/bbs.html).

Bird Conservation Region (BCR)- a geographic unit used to facilitate bird conservation actions under the North American Bird Conservation Initiative (www.nabci-us.org/bcrs.htm).

Birds of Conservation Concern - a list that is published and periodically updated by the FWS Division of Migratory Bird Management intended to identify the migratory and non-migratory bird species that-- in addition to species already listed under the ESA, proposed or candidate-- represent the FWS's highest conservation priorities, including ESA candidate species. The most current version of the list, Birds of Conservation Concern 2008, is available at www.fws.gov/migratorybirds/CurrentBirdIssues/Management?BBC.html.

Cantonment Area - the principal built-up area of a DoD installation, typically containing housing, barracks, military organizational areas, and community support infrastructure.

Comprehensive Planning Efforts for Migratory Birds - includes Partners in Flight, North American Waterfowl Management Plan, U.S. Shorebird Conservation Plan, Western Hemisphere Shorebird Reserve Network, North American Waterbird Conservation Plan, and other partnership planning efforts integrated through the North American Bird Conservation Initiative.

Conservation Measure - any action undertaken to address project-related stressors/impacts that ultimately improve the conservation status of one or more migratory bird species. Conservation measures split into two categories: Ecological/Habitat measures (driven by EO 13186) and Avian Mortality measures (driven by MBTA). Conservation measures work to avoid or minimize an impact, reduce the impact over time, or rectify or compensate for the impact. Conservation Measures are also referred to as Mitigation, Best Practices, and Best Management Practices.

Conservation Planning - strategic and tactical planning of agency activities for the long-term conservation of migratory birds and their habitats.

Council for the Conservation of Migratory Birds - an interagency council established by the Secretary of the Interior to oversee the implementation of Executive Order 13186.

Ecological Condition - the composition, structure, and processes of ecosystems over time and space. This includes the diversity of plant and animal communities, the productive capacity of ecological systems and species diversity, ecosystem diversity, disturbance processes, soil productivity, water quality and quantity, and air quality. Often referred to in terms of ecosystem health, which is the degree to which ecological factors and their interactions are reasonably complete and functioning for continued resilience, productivity, and renewal of the ecosystem.

Effect (adverse or beneficial) - the biological consequences of an impact or the implementation of a conservation measure. Effects can be adverse (habitat avoidance) or beneficial (improved habitat quality). The effect is determined by the exposure of the bird or resource to the stressor/impact and the response to the impact. Effects may be direct, indirect, or cumulative, and refer to effects from actions or categories of actions on migratory birds, their populations, habitats, ecological conditions, and significant bird conservation sites.

Impact - the combined result of an action/project, all of its associated activities and components, and the stressors (see below) produced by those actions.

Integrated Natural Resources Management Plan (INRMP) - an integrated plan based, to the maximum extent practicable, on ecosystem management that shows the interrelationships of individual components of natural resources management (e.g., fish and wildlife, forestry, land

management, outdoor recreation) to military mission requirements and other land use activities affecting an installation's natural resources. INRMPs are required for all DoD installations with significant natural resources, pursuant to the Sikes Act.

International Shorebird Survey- a monitoring program started in 1974 to survey shorebirds (sandpipers, plovers, etc.) across the Western Hemisphere (www.pwrc.usgs.gov/iss/iss.html).

International Migratory Bird Day (IMBD) - IMBD celebrates, brings attention to, and educates people about the migration of nearly 350 species of migratory birds that nest and breed throughout the Western Hemisphere. IMBD is celebrated in Canada, the United States, Mexico, Central and South America, and the Caribbean (http://birdday.org/birdday).

Management Action- an activity by a government agency that could cause a positive or negative impact to migratory bird populations or habitats. Conservation measures to mitigate potential activity-related stressors may be required.

Migratory Bird - an individual of any species protected by the Migratory Bird Treaty Act (MBTA) as listed in 50 CFR § 10.13.

Military Readiness Activity - all Armed Forces training and operations that relate to combat, including but not limited to the adequate and realistic testing of military equipment, vehicles, flight operations, weapons, and sensors for proper operation and suitability for use in combat.

Monitoring Avian Productivity and Survivorship (MAPS) - a program that uses the banding of birds during the breeding season to track the changes and patterns in the number of young produced, and the survivorship of adults and young (www.birdpop.org/maps.htm).

National Environmental Policy Act (NEPA) - a federal statute that requires federal agencies to prepare a detailed analysis of the environmental impacts of a proposed action and alternatives, and to include public involvement in the decision making process for major federal actions significantly affecting the quality of the human environment 42 U.S.C. 4321, et seq.

North American Bird Conservation Initiative (NABCI) - a partnership to align the avian conservation community to implement bird conservation through regionally-based, biologically driven, landscape-oriented partnerships across the North American continent. NABCI includes federal agencies of Canada, Mexico and the United States, as well as most landbird, shorebird, waterbird, and waterfowl conservation initiatives (www.nabci-us.org).

North American Waterbird Conservation Plan- a partnership of federal and state government agencies, non-governmental organizations, and private interests focusing on the conservation of waterbirds, primarily including marshbirds and inland, coastal, and pelagic colonial waterbirds (www.waterbirdconservation.org/plans.html). The partnership's vision is that the distribution, diversity, and abundance of breeding, migratory, and nonbreeding waterbirds are sustained throughout the lands and waters of North America, Central America, and the Caribbean.

North American Waterfowl Management Plan - a partnership of federal and state agencies, non- governmental organizations, and private interests focusing on the restoration of waterfowl populations through habitat restoration, protection, and enhancement (http://birdhabitat.fws.gov/NAWMP/nawmphp.htm).

Partners in Flight (PIF) - a cooperative partnership of more than 300 partners including federal and state government agencies, non-governmental organizations, conservation groups, foundations, universities, and industry focusing on the conservation of landbirds. DoD was an original signatory to the 1991 PIF Federal Agencies' MOA (www.partnersinflight.org).

Ranges & Training Areas (RTAs)- as defined within each installation's INRMP.

Species of Concern - refers to several categories of birds including: 1) species listed in the periodic report, *Birds of Conservation Concern,* published by the FWS Division of Migratory Bird Management (www.fws.gov/migratorybirds); 2) priority migratory bird species documented in the comprehensive bird conservation plans (North American Waterbird Conservation Plan, United States Shorebird Conservation Plan, Partners in Flight Bird Conservation Plans); 3) species or populations of waterfowl identified as high, or moderately high, continental priority in the North American Waterfowl Management Plan; 4) listed threatened and endangered bird species in 50 CFR § 17.11; and 5) MBTA-listed gamebirds of management concern, as listed in the *Birds of Management Concern* list (www.fws.gov/migratorybirds/CurrentBirdIssues/Management/BMC.html).

Take - to pursue, hunt, shoot, wound, kill, trap, capture or collect or attempt to pursue, hunt, wound, kill trap, capture or collect (50 CFR § 10.12). The Executive Order 13186 further defines "take" to include intentional take, meaning take that take is the purpose of the activity in question, and unintentional (incidental) take, meaning take that results from, but is not the purpose of, the activity in question. Both intentional and unintentional take constitute take as defined by the MBTA. The regulations implementing the Eagle Act define take to mean pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb bald and golden eagles (50 CFR § 22.3).

U.S. Shorebird Conservation Plan - a partnership of federal and state government agencies, non- governmental organizations, and private interests focusing on restoring and protecting stable and self-sustaining populations of all shorebird species (www.shorebirdplan.org).

K. Agreement Contacts and Execution

The principal contacts for this instrument are as follows:

Brad Bortner, Chief Division of Migratory Bird Management US Fish and Wildlife Service	L. Peter Boice, Deputy Director Natural Resources Program Office of the Secretary of Defense

This MOU is executed as of the last date signed below and expires no later than five (5) years thereafter, at which time it is subject to review and renewal, or expiration.

The Parties hereto have executed this agreement as of the date shown below:

Dan Ashe Director US Fish and Wildlife Service	John Conger Acting, Deputy Under Secretary of Defense (Installations & Environment) US Department of Defense
9.5.2014	7/10/2014
Signature Date	Signature Date

MEMORANDUM OF UNDERSTANDING BETWEEN THE DEPARTMENT OF DEFENSE AND BAT CONSERVATION INTERNATIONAL

PREFACE

1. This agreement establishes a policy of cooperation and coordination between the Department of Defense (DoD) and Bat Conservation International (BCI) to identify, document and maintain bat populations and their habitats on DoD installations.

2. The DoD has a long history of commitment to protection of the environment and the natural resources that have been entrusted to its care while at the same time accomplishing its primary mission of national defense.

3. DoD wishes to receive technical assistance in techniques for improving management of bat populations and their habitats, and to gain access to a nationwide network of compatible data and support that can be used to assess the significance of bat populations and habitat found on DoD lands.

4. BCI was formed to promote conservation, education, and research initiatives involving bats and the ecosystems they serve. BCI provides information and service to scientists, land managers, and the public.

5. Both BCI and the DoD have responsibilities and interests in the management of wildlife and their habitats. Both parties agree that wildlife habitats need to be conserved and managed to protect wildlife and to meet the growing public demand for wildlife conservation and related scientific opportunities. Furthermore, BCI and DoD desire to assist each other in conducting inventories, monitoring, and research; initiating actions which will increase the productivity of bats and enhance their habitats; and educating the public about the roles and values of bats in ecosystems on lands managed or used by the DoD.

PURPOSE

The purpose of this MOU is to establish procedures for planning and conducting cooperative efforts by BCI and DoD on DoD lands. It also establishes policies and procedures for BCI to provide technical assistance to DoD to maintain or increase the productivity of bats and their habitats on DoD lands; to keep once-common bat species from being Federally-listed as threatened or endangered; and to work to recover presently listed species of bats and prevent species extinction.

RESPONSIBILITIES

The Department of Defense and Bat Conservation International do mutually agree that:

1. The DoD will, subject to the availability of resources and under the terms of separately funded subagreements to this MOU, undertake such tasks as:

a. Provide leadership for the planning, implementation, and monitoring of work undertaken pursuant to this agreement and supplemental subagreements.

b. Designate a point of contact for coordination of BCI activities at the Service Headquarters, major command, and/or installation, as deemed appropriate by each Service.

c. Provide BCI representatives at the end of each fiscal year with a summary report of project accomplishments executed supplemental to this agreement.

d. Identify and evaluate appropriate proposed bat conservation proposals and existing projects for possible implementation as partnership initiatives with BCI.

e. Coordinate project planning with appropriate Federal and State agencies to ensure that planned projects are consistent with Federal and State management objectives for bats and other Federal and State legal and statutory requirements.

f. Identify a DoD representative to serve as liaison for any proposal field study.

g. Compensate BCI for their assistance, as mutually agreed upon in supplemental subagreements.

h. Communicate the establishment of this MOU to all Military Departments, major commands, and appropriate installations.

2. Bat Conservation International will, subject to the availability of resources and under the terms of separately funded subagreements to this MOU, undertake such tasks as:

a. Provide expertise, as well as labor, materials, and/or funds for the implementation of agreed-upon inventory, monitoring, and habitat improvement projects; education and public awareness efforts; or research efforts; as feasible and in accordance with BCI policy.

b. Designate a point of contact for coordination of DoD initiatives at BCI, as

deemed appropriate.

c. Enter into separate subagreements (e.g. specific collection or donation agreements, volunteer agreements, or contracts) with the DoD to accomplish agreed-upon work developed supplemental to

this agreement Such work may include training, consultation, inventories, monitoring, habitat improvement projects, education. or research projects.

d. Refrain from referring to this MOU in commercial advertising in a manner which states or implies that the activities of the BCI are approved or endorsed by the DoD.

e. Submit for review to the DoD prior to release any proposed releases to the public media which reference this MOU or any employee of the DoD.

f. Communicate the establishment of this MOU to appropriate BCI cooperative units.

g. Make training available for DoD personnel in the survey, inventory and monitoring of bats.

3. DoD and BCI will hold an annual meeting to review progress made under this document and to discuss new project proposals within the purposes of this MOU.

4. Each project requiring a payment of funds by BCI to the DoD will be documented and signed by the responsible organizational unit line officer of the DoD and a BCI representative using an appropriate agreement.

5. Special matching fund projects will be documented via cooperative agreements and signed by the responsible DoD official and BCI representatives.

6. The implementation of this MOU and subsequent supplemental subagreements is subject to required funds being available to both parties of the MOU. Nothing in this MOU shall be construed as obligating the DoD to the expenditure of funds.

7. Nothing herein contained shall be construed as limiting or affecting in any way the delegated authority of the Department of Defense.

8. Nothing herein shall impede the parties from using other mechanisms to accomplish the purposes set out above.

DELEGATION

1. Authorized representatives of BCI and the DoD may execute special use authorizations and enter into supplemental subagreements within the scope of this document

2. Any supplemental subagreement negotiated under the authority of this MOU will remain in full force and effect, unless and until modified or terminated by local signatory parties, per the terms of said supplemental subagreements.

MODIFICATION AND TERMINATION

1. This MOU may be modified or amended upon written request of either party and the written concurrence of the other. The MOU may be terminated with 60-day written notice of either party; however, sufficient attempts should be made to modify, rather than to terminate, the MOU.

2. Five years after signature by both parties, this MOU shall be reviewed and considered for renewal. Signatures must be obtained from both parties to fully execute the renewal.

IMPLEMENTATION

This MOU becomes effective when signed by both parties.

Alex Albert Beehler 10/11/06
Assistant Deputy Under Secretary of Defense Date
(Environment, Safety and Occupational Health)

Mark D. Fuller 10/2/06
Executive Director Date
Bat Conservation International

MEMORANDUM OF UNDERSTANDING BETWEEN THE U.S. DEPARTMENT OF DEFENSE AND BAT CONSERVATION INTERNATIONAL TO PROMOTE BAT CONSERVATION

The Memorandum of Understanding (MOU) between the Bat Conservation International and the Department of Defense (hereinafter referred to "the Parties"), signed in 2006, expired on October 11, 2011. Both Parties have agreed to extend the MOU as currently written for eight years to meet its stated purpose, scope and responsibilities.

The principal contacts for this instrument are as follows:

Mylea Bayless
Conservation Programs Manager
Bat Conservation International
PO Box 162603
Austin, Texas 78716

Deputy Director, Natural Resources
Office of the Secretary of Defense
1225 S. Clark St.
Suite 1500
Arlington, VA 22202-4336

The Parties hereto have extended this agreement as of the date shown below to remain effective through October 11, 2019.

Nina Fascione
Executive Director
Bat Conservation International

12/19/11
Signature Date

VP Operations
David L. Waldien
for
Nina Fascione

John Conger
Assistant Deputy Under Secretary of Defense
(Installations and Environment)
U.S. Department of Defense

12/9/2011
Signature Date

APPENDIX C – PMRF FLORAL AND FAUNAL SPECIES LISTS

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PMRF PLANT SPECIES BY BASE

Family	Scientific Name	Common name	Hawaiian Name	Location	Reference	Origin	Status	Vegetation Type
Malvaceae	*Abutilon grandifolium*	hairy abutilon	Mao	Barking Sands	10	Intro		K,R
Fabaceae	*Acacia farnesiana*	sweet acacia	Klu	Barking Sands	10	Intro		K,A,R
Agvaceae	*Agave sisalana*	sisal	Malina	Barking Sands	10	Intro		K,S
Liliaceae	*Aloe vera*	aloe		Barking Sands	10	Intro		S
Amaranthaceae	*Alternanthera sessilis*	sessile joyweed		Barking Sands	10	Intro		R
Fabaceae	*Alysicarpus vaginalis*	alysicarpus		Barking Sands	10	Intro		R
Amaranthaceae	*Amaranthus spinosus*	spiny amaranth	Pakai kuku	Barking Sands	10	Intro		R
Amaranthaceae	*Amaranthus viridis*	slender amaranth	Pakai	Barking Sands	10	Intro		A
Ploygonaceae	*Antigonon leptopus*	Mexican creeper		Barking Sands	10	Intro		K
Acanthaceae	*Asystasia gangetica*	chinese violet		Barking Sands	10	Intro		K,R
Chenoppdiaceae	*Atriplex semibaccata*	Australian saltbush		Barking Sands	10	Intro		PND,S,D,R
Asteraceae	*Bidens cynapiifolia*	West Indian beggar's tick		Barking Sands	10	Intro		K
Asteraceae	*Bidens pilosa*	hairy beggarticks	Ki, Ki nehe	Barking Sands	10	Intro		K,A,PND,R
Nyctaginaceae	*Boerhavia coccinea*	scarlet spiderling	Pohapoha	Barking Sands	10	Intro		K,A,S,R
Nyctaginaceae	*Boerhavia repens*	anena		Barking Sands	10	Ind		A,PND,S,R
Cyperaceae	*Bolboschoenus maritimus spp Paladosus*	cosmopolitan bulrush	Kaluha	Barking Sands	10	Ind		D
Poaceae	*Bothriochloa sp*	beardgrass		Barking Sands	10	Intro		R

Family	Scientific Name	Common name	Hawaiian Name	Location	Reference	Origin	Status	Vegetation Type
Poaceae	*Brachiaria mutica*	California grass		Barking Sands	10	Intro		
Asclepiadaceae	*Calotropis procera*	small crown flower		Barking Sands	10	Intro		S
Lauraceae	*Cassytha filiformis*	Kaunaoa pehu	Kaunaoa pehu	Barking Sands	10	Ind		K,PND,S
Casuarinaceae	*Casuarina equisetifolia*	Ironwood	Paina	Barking Sands	10	Intro		PND,S,D
Poaceae	*Cenchrus ciliaris*	buffelgrass		Barking Sands	10	Intro		
Poaceae	*Cenchrus echinatus*	common sandbur	Ume, Ale	Barking Sands	10	Intro		
Euphorbiaceae	*Chamaesyce celastroides*	ekoko	‘Akoko	Barking Sands	10	End		PND
Euphorbiaceae	*Chamaesyce hirta*	hairy spurge, garden spurge		Barking Sands	10	Intro		A,R
Euphorbiaceae	*Chamaesyce hypericifolia*	graceful spurge		Barking Sands	10	Intro		R
Euphorbiaceae	*Chamaesyce hyssopifolia*	spurge		Barking Sands	10	Intro		R
Chenoppdiaceae	*Chenopodium carinatum*	clammy goosefoot		Barking Sands	10	Intro		A,R
Chenoppdiaceae	*Chenopodium murale*	Goosefoot	Aheahea	Barking Sands	10	Intro		K,PND,S,R
Poaceae	*Chloris barbata*	swollen fingergrass	Mau‘u lei	Barking Sands	10	Intro		
Capparaceae	*Cleome gynandra*	wild spider flower	Hohohina	Barking Sands	10	Intro		A,R
Poaceae	*Coix lachryma-jobi*	Job's tears		Barking Sands	10	Intro		
Asteraceae	*Conyza bonariensis*	hairy horseweed	Ilioha	Barking Sands	10	Intro		K,A
Fabaceae	*Crotalaria pallida*	smooth rattlebox	Pikakani	Barking Sands	10	Intro		R

Family	Scientific Name	Common name	Hawaiian Name	Location	Reference	Origin	Status	Vegetation Type
Cucurbitaceae	*Cucumis dipsaceus*	wild cucumber, hedgehog gourd		Barking Sands	10	Intro		K,S
Cuscutaceae	*Cuscuta sandwichiana*	kaunaoa	Kaunaoa	Barking Sands	10	End		S
Poaceae	*Cynodon dactylon*	Bermuda grass	Manienie	Barking Sands	10	Intro		
Cyperaceae	*Cyperus rotundifolia*	nutgrass, nut sedg		Barking Sands	10	Intro		A,R
Poaceae	*Dactyloctenium aegyptium*	beach wiregrass		Barking Sands	10	Intro		
Fabaceae	*Desmanthus pernambucanus*	Slender mimosa		Barking Sands	10	Intro		
Fabaceae	*Desmodium incanum*	Spanish clover	Ka‘imi	Barking Sands	10	Intro		
Poaceae	*Digitaria insularis*	sourgrass		Barking Sands	10	Intro		
Poaceae	*Digitaria setigera*	East Indian crabgrass	Kukarpuaa	Barking Sands	10	Intro		
Poaceae	*Digitaria sp.*	crabgrass		Barking Sands	10	Intro		
Sapindaceae	*Dodonaea viscosa*	Florida hopbush	A`ali`i	Barking Sands	10	Intro		K,A,PND,S,D
Poaceae	*Eleusine indica*	wiregrass, goosegrass		Barking Sands	10	Intro		
Poaceae	*Eragrostis amabilis*	lovegrass		Barking Sands	10	Intro		
Euphorbiaceae	*Euphorbia cyathophora*	wild poinsettia		Barking Sands	10	Intro		A
Cyperaceae	*Fimbristylis cymosa*	hurricanegrass		Barking Sands	10	Ind		A,S
Asteraceae	*Gaillardia pulchella*	blanket flower	Melekuli wai	Barking Sands	10	Intro		A
Asteraceae	*Galinsoga parviflora*	gallant soldier	Galinsoga	Barking Sands	10	Intro		R
Asteraceae	*Gamochaeta purpurea*	purple cudweed		Barking Sands	10	Intro		R

Family	Scientific Name	Common name	Hawaiian Name	Location	Reference	Origin	Status	Vegetation Type
Boraginaceae	*Heliotropium procumbens* var. *depressum*	fourspike heliotrope		Barking Sands	10	Intro		R
Asteraceae	*Heterotheca grandiflora*	telegraph plant		Barking Sands	10	Intro		R
Lamiaceae	*Hyptis pectinata*	comb hyptis		Barking Sands	10	Intro		D,R
Fabaceae	*Indigofera suffruticosa*	Indigo	Iniko	Barking Sands	10	Intro		
Convolvulaceae	*Ipomoea imperati*	Hunakai	Hunakai	Barking Sands	10	Ind		PND,S,R
Convolvulaceae	*Ipomoea indica*	Oceanblue morning glory	Koali'awania	Barking Sands	10	Ind		K
Convolvulaceae	*Ipomoea obscura*	field bindweed		Barking Sands	10	Intro		K,R
Convolvulaceae	*Ipomoea pes-caprae*	Beach morning glory	Pohuehue	Barking Sands	10	Ind		PND,S,R
Convolvulaceae	*Jacquemontia ovalifolia ssp. Sandwicensis*	oval-leaf clustervine	Pauohiiaka	Barking Sands	10	End		S,R
Verbenaceae	*Lantana camara*	lantana	Ikana, l'au kalakala	Barking Sands	10	Intro		K,A,R
Lamiaceae	*Leonotis nepetifolia*	lion's ear		Barking Sands	10	Intro		K,A,R
Fabaceae	*Leucaena leucocephala*	koa haole	Koa haole	Barking Sands	10	Intro		
Fabaceae	*Macroptilium atropurpureum*	purple bushbean		Barking Sands	10	Intro		
Fabaceae	*Macroptillium lathyroides*	wild bushbean		Barking Sands	10	Intro		
Malvaceae	*Malva parviflora*	cheeseweed		Barking Sands	10	Intro		R
Malvaceae	*Malvastrum coromandelianum*	false mallow	Hauuoi	Barking Sands	10	Intro		K,R

Family	Scientific Name	Common name	Hawaiian Name	Location	Reference	Origin	Status	Vegetation Type
Fabaceae	*Medicago polymorpha*	bur clover		Barking Sands	10	Intro		
Poaceae	*Melinis minutiflora*	molasses grass		Barking Sands	10	Intro		
Poaceae	*Melinis repens*	natal redtop, natal grass		Barking Sands	10	Intro		
Convolvulaceae	*Merremia aegyptia*	hairy merremia	Koali kua hulu	Barking Sands	10	Intro		K
Nyctaginaceae	*Mirabilis jalapa*	four-o' clock	Nani ahiahi	Barking Sands	10	Intro		K,A
Cucurbitaceae	*Momordica charantia*	wild bitter melon		Barking Sands	10	Intro		K,A
Hydrophyllaceae	*Nama sandwicensis*	nama	Nama	Barking Sands	10	End	SOC,	A,PND,R
Lamiaceae	*Ocimum gratissimum*	wild basil		Barking Sands	10	Intro		K
Ophioglossaceae	*Ophioglossum polyphyllum*	pololei	Pololei	Barking Sands	10	Ind		A
Cactaceae	*Opuntia ficus-indica*	pricklypear	Papipi, Panini	Barking Sands	10	Intro		K
Poaceae	*Panicum maximum*	Guinea grass		Barking Sands	10	Intro		
Poaceae	*Panicum niihauense*	Niihau panicgrass	Lau'ehu	Barking Sands	10	End	FE, SE	
Poaceae	*Paspalum conjugatum*	hilo grass	Mauu Hilo	Barking Sands	10	Intro		
Poaceae	*Paspalum vaginatum*	seashore paspalum		Barking Sands	10	Intro		
Passifloraceae	*Passiflora foetida*	running pop	Pohapoha	Barking Sands	10	Intro		A,S,R
Passifloraceae	*Passiflora suberosa*	corkystem passionflower	Huehue haole	Barking Sands	10	Intro		K
Arecaceae	*Phoenix sp.*	date plam		Barking Sands	10	Intro		K,S

Family	Scientific Name	Common name	Hawaiian Name	Location	Reference	Origin	Status	Vegetation Type
Fabaceae	*Pithecellobium dulce*	opiuma		Barking Sands	10	Intro		
Asteraceae	*Pluchea carolinensis*	sourbush		Barking Sands	10	Intro		K,PND,D,R
Asteraceae	*Pluchea fosbergii*	pluchea hybrid		Barking Sands	10	Intro		R
Asteraceae	*Pluchea indica*	Indian fleabane		Barking Sands	10	Intro		K,A,S,D,R
Portulacaceae	*Portulaca oleraceae*	little hogweed	Akulikuli kula, ihi	Barking Sands	10	Intro		K,S
Portulacaceae	*Portulaca pilosa*	kiss me quick		Barking Sands	10	Intro		A,PND,S,R
Fabaceae	*Prosopis juliflora*	long-thorn kiawe		Barking Sands	10	Intro		
Fabaceae	*Prosopis pallida*	kiawe	Kiawe	Barking Sands	10	Intro		
Euphorbiaceae	*Ricinus communis*	castor bean	Pʻaila, Kaʻapeh	Barking Sands	10	Intro		K,R
Phytolaccaceae	*Rivina humlis*	coral berry		Barking Sands	10	Intro		K
Goodneiaceae	*Scaevola sericea*	naupaka	Naupaka kahaki	Barking Sands	10	Ind		A,PND,S,D,R
Anacardiaceae	*Schinus terebinthifolius*	Christmas berry		Barking Sands	10	Intro		A
Fabaceae	*Sesbania tomentosa*	Oahu riverhemp	Ōhai	Barking Sands	10	End	FE, SE	
Aizoaceae	*Sesuvium portulacastrum*	sea purslane	Akulikuli	Barking Sands	10	Ind		PND,S
Poaceae	*Setaria verticillata*	bristly foxtail	Mauu pilipili	Barking Sands	10	Intro		
Cucurbitaceae	*Sicyos pachycarpus*	kupala	Kupala	Barking Sands	10	End		K
Malvaceae	*Sida fallax*	ilima	Ilima	Barking Sands	10	Ind		K,A,PND,S,R
Malvaceae	*Sida rhombifolia*	Cuba jute		Barking Sands	10	Intro		R

Family	Scientific Name	Common name	Hawaiian Name	Location	Reference	Origin	Status	Vegetation Type
Solanaceae	*Solanum americanum*	glossy nightshade	Popolo	Barking Sands	10	Ind		K,A
Solanaceae	*Solanum lycopersicon* var. *cerasiforme*	currant tomato		Barking Sands	10	Intro		K,PND
Asteraceae	*Sonchus oleraceus*	sowthistle	Pualele	Barking Sands	10	Intro		A,PND,S,R
Rubiacaea	*Spermacoce assurgens*	buttonweed		Barking Sands	10	Intro		R
Poaceae	*Sporobolus virginicus*	beach dropseed	Akiaki	Barking Sands	10	Ind		
Lamiaceae	*Stachys arvensis*	staggerweed		Barking Sands	10	Intro		R
Verbenaceae	*Stachytarpheta jamaicensis*	Jamaican vervian	Owi, oi	Barking Sands	10	Intro		D,R
Myrtaceae	*Syzygium cumini*	Java plum, jambolan plum		Barking Sands	10	Intro		D,R
Malvaceae	*Thespesia populnea*	milo	Milo	Barking Sands	10	PI?		D
Zygophyllaceae	*Tribulus terrestris*	puncture vine, goat head		Barking Sands	10	Intro		S,R
Asteraceae	*Tridax procumbens*	coat buttons		Barking Sands	10	Intro		A
Verbenaceae	*Verbena litoralis*	seashore vervain	Owi, Oi	Barking Sands	10	Intro		K
Asteraceae	*Verbesina encelioides*	golden crown-beard		Barking Sands	10	Intro	Invasive	K,A,PND,S,D,R
Verbenaceae	*Vitex rotundifolia*	beach vitex	Pohinahina	Barking Sands	10	Ind		A,PND,S
Sterculiaceae	*Waltheria indica*	uhaloa	Uhaloa, hialoa	Barking Sands	10	Ind		K,A,PND,S,R
Asteraceae	*Xanthium strumarium* var. *canadense*	cocklebur	Kikania	Barking Sands	10	Intro		S,R
Malvaceae	*Abutilon grandifolium*	hairy abutilon	Mao	Kamokala	9, 11	Intro		K

Family	Scientific Name	Common name	Hawaiian Name	Location	Reference	Origin	Status	Vegetation Type
Malvaceae	*Abutilon incanum*	hoary abutilon	Mao	Kamokala	9, 11	Ind		K,R
Fabaceae	*Acacia farnesiana*	sweet acacia	Klu	Kamokala	9, 11	Intro		K
Asteraceae	*Ageratum conyzoides*	tropical whiteweed	Maile honohono	Kamokala	11	Intro		R
Euphorbiaceae	*Aleurites moluccanus*	indian walnut	Kukui	Kamokala	9, 11	PI		K
Amaranthaceae	*Amaranthus spinosus*	spiny amaranth	Pakai kuku	Kamokala	11	Intro		R
Acanthaceae	*Barleria cristata*	barleria		Kamokala	11	Intro		K
Asteraceae	*Bidens pilosa*	hairy beggarticks	Ki,ki nehe	Kamokala	11	Intro		K,R
Nynctaginaceae	*Boerhavia coccinea*	scarlet spiderling		Kamokala	11	Intro		R
Poaceae	*Bothriochloa sp*	beardgrass		Kamokala	11	Intro		K,R
Fabaceae	*Caesalpinia bonduc*	yellow nicker	Kakalaioa	Kamokala	11	Ind		K
Asteraceae	*Calyptocarpus vialis*	straggler daisy		Kamokala	11	Intro		R
Solanaceae	*Capsicum frutescens*	chili pepper	Nioi	Kamokala	11	Intro		K
Apocyaceae	*Cascabela thevetia*	be-still tress		Kamokala	11	Intro		K
Poaceae	*Cenchrus ciliaris*	buffelgrass		Kamokala	9, 11	Intro		K,R
Euphorbiaceae	*Chamaesyce hirta*	hairy spurge, garden spurge		Kamokala	11	Intro		R
Euphorbiaceae	*Chamaesyce hypericifolia*	graceful spurge		Kamokala	11	Intro		R
Poaceae	*Chloris barbata*	swollen fingergrass	Mau‘u lei	Kamokala	11	Intro		R

Family	Scientific Name	Common name	Hawaiian Name	Location	Reference	Origin	Status	Vegetation Type
Commelinaceae	*Commelina benghalensis*	Benghal dayflower	Hairy honohono	Kamokala	11	Intro		K
Fabaceae	*Crotalaria pallida*	smooth rattlebox	Pikakani	Kamokala	11	Intro		K,R
Poaceae	*Cynodon dactylon*	Bermuda grass	Manienie	Kamokala	11	Intro		R
Apiaceae	*Daucus pusillus*	American carrot		Kamokala	11	Intro		R
Fabaceae	*Desmanthus pernambucanus*	slender mimosa		Kamokala	11	Intro		K,R
Poaceae	*Digitaria insularis*	sourgrass		Kamokala	11	Intro		K,R
Poaceae	*Digitaria sp.*	crabgrass		Kamokala	11	Intro		R
Sapindaceae	*Dodonaea viscosa*	Florida hopbush	A`ali`i	Kamokala	9, 11	Intro		K
Pteridaceae	*Doryopteris decora*	lance fern	Kumuniu	Kamokala	9	End		
Asteraceae	*Emilia fosbergii*	Florida tasselflower	Paulele	Kamokala	9	Intro		K
Poaceae	*Eragrostis amabilis*	lovegrass		Kamokala	11	Intro		R
Fabaceae	*Erythrina sandwicensis*	Wiliwili	Wiliwili	Kamokala	9, 11	End		K
Moraceae	*Ficus mircocarpa*	Chinese banyan		Kamokala	11	Intro		K
Asteraceae	*Gamochaeta purpurea*	purple cudweed		Kamokala	11	Intro		R
Proteaceae	*Grevillea robusta*	silk oak	‘Oka kilika, Ha‘ik ke‘oke‘o	Kamokala	11	Intro		K
Boraginaceae	*Heliotropium procumbens* var. *depressum*	fourspike heliotrope		Kamokala	11	Intro		R
Poaceae	*Heteropogon contortus*	pili grass	Pili, Lule	Kamokala	9, 11	Ind		K

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Lamiaceae	*Hyptis pectinata*	comb hyptis		Kamokala	11	Intro		K
Fabaceae	*Indigofera suffruticosa*	indigo	Iniko	Kamokala	11	Intro		K
Convolvulaceae	*Ipomoea indica*	Oceanblue morning glory	Koali'awania	Kamokala	9, 11	Ind		K
Convolvulaceae	*Ipomoea obscura*	field bindweed		Kamokala	11	Intro		K
Verbenaceae	*Lantana camara*	lantana	lkana, L‘au kalakala	Kamokala	9, 11	Intro		K,R
Lamiaceae	*Leonotis nepetifolia*	lion’s ear		Kamokala	9, 11	Intro		K,R
Fabaceae	*Leucaena leucocephala*	koa haole	Koa haole	Kamokala	9, 11	Intro		K,R
Malvaceae	*Malva parviflora*	cheeseweed		Kamokala	11	Intro		R
Malvaceae	*Malvastrum coromandelianum*	false mallow	Hauuoi	Kamokala	11	Intro		K,R
Poaceae	*Melinis repens*	natal redtop		Kamokala	9	Intro		
Convolvulaceae	*Merremia aegyptia*	hairy merremia	Koali kua hulu	Kamokala	11	Intro		K,R
Cucurbitaceae	*Momordica charantia*	wild bitter melon		Kamokala	11	Intro		K,R
Cactaceae	*Opuntia ficus-indica*	pricklypear	Papipi, Panini	Kamokala	9, 11	Intro		K
Poaceae	*Panicum maximum*	Guinea grass		Kamokala	11	Intro		K,R
Poaceae	*Panicum maximum* var.*trichoglume*	green panicgrass		Kamokala	11	Intro		K,R
Passifloraceae	*Passiflora suberosa*	corkystem passionflower	Huehue haole	Kamokala	11	Intro		K

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Piperaceae	*Peperomia leptostachyon*	Polynesian peperomia	Ala`ala`wainui	Kamokala	9, 11	Ind		K
Euphorbiaceae	*Phyllanthus debilis*	niruri	Niruri	Kamokala	11	Intro		K
Asteraceae	*Pluchea carolinensis*	sourbush		Kamokala	11	Intro		R
Plumbaginaceae	*Plumbago zeylanica*	wild leadwort	Ilie`e	Kamokala	9, 11	Ind		K
Portulacaceae	*Portulaca oleraceae*	little hogweed	Akulikuli kula	Kamokala	9, 11	Intro		K,R
Portulacaceae	*Portulaca pilosa*	kiss me quick		Kamokala	9, 11	Intro		K,R
Fabaceae	*Prosopis pallida*	kiawe	Kiawe	Kamokala	9, 11	Intro		K
Euphorbiaceae	*Ricinus communis*	castor bean	P‘aila, Ka‘apeh	Kamokala	11	Intro		R
Poaceae	*Setaria gracilis*	yellow foxtail	Mauu kaleponi	Kamokala	11	Intro		R
Poaceae	*Setaria verticillata*	bristly foxtail	Mauu pilipili	Kamokala	11	Intro		K
Malvaceae	*Sida fallax*	Ilima	Ilima	Kamokala	9, 11	Ind		K
Malvaceae	*Sida rhombifolia*	Cuba jute		Kamokala	11	Intro		R
Sapindaceae	*Solanum americanum*	glossy nightshade	Popolo	Kamokala	9, 11	Ind		R
Solanaceae	*Solanum lycopersicon* var. *cerasiforme*	currant tomato		Kamokala	11	Intro		K
Solanaceae	*Solanum seaforthianum*	blue potato vine		Kamokala	11	Intro		K
Asteraceae	*Sonchus oleraceus*	sowthistle	Pualele	Kamokala	11	Intro		R
Myrtaceae	*Syzygium cumini*	Java plum		Kamokala	11	Intro		K
Asteraceae	*Tridax procumbens*	coat buttons		Kamokala	9, 11	Intro		R

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Asteraceae	*Verbesina encelioides*	golden crown-beard		Kamokala	11	Intro	Invasive	R
Sterculiaceae	*Waltheria indica*	uhaloa	Uhaloa	Kamokala	9, 11	Ind		K,R
Amaranthaceae	*Amaranthus viridis*	slender amaranth		Kaula Island	3, 4, 5	Intro		
Chenoppdiaceae	*Atriplex semibaccata*	Australian saltbush		Kaula Island	3, 4	Intro		
Nyctaginaceae	*Boerhavia diffusa*	red spiderling	Alena	Kaula Island	3, 5	Ind		
Capparaceae	*Capparis sandwichiana*	Native caper	Maiapilo	Kaula Island	3, 4, 5	End	SOC, State	
Gramineae	*Cenchrus echinatus*	common sandbur	Ume'alu	Kaula Island	3, 4	Intro		
Euphorbiaceae	*Chamaesyce celastroides*	ekoko	‘Akoko	Kaula Island	3, 4, 5	End		
Chenoppdiaceae	*Chenopodium oahuense*	Alaweo	Alaweo	Kaula Island	3, 4, 5	End		
Poaceae	*Chloris barbata*	swollen fingergrass	Mau‘u lei	Kaula Island	3, 4	Intro		
Gramineae	*Digitaria setigera*	East Indian crabgrass	Kakaipau'a	Kaula Island	3, 4	Intro		
Gramineae	*Echinochola colonum*	jungle rice		Kaula Island	3, 4	Intro		
Asteraceae	*Erigeron canadensis*	horseweed		Kaula Island	3, 4	Intro		
Boraginaceae	*Heliotropium curassavicum*	nena	Nena	Kaula Island	3, 4, 5	Ind		
Convolvulaceae	*Ipomoea cairica*	Mile-a-minute vine	Sweet koalai	Kaula Island	3, 4	Ind		
Convolvulaceae	*Ipomoea indica*	Oceanblue morning glory	Koali'awania	Kaula Island	5	Ind		
Leguminosae	*Leuceana luecocephala*	koa haole	Koa haole, Koa, Lilikoa	Kaula Island	3, 4	Intro		

Family	Scientific Name	Common name	Hawaiian Name	Location	Reference	Origin	Status	Vegetation Type
Solanaceae	*Lycium sandwicense*	Hawaii desert-thorn	Ohelo kai	Kaula Island	3, 4	Ind		
Cactaceae	*Opuntia megacantha*	mission pricklypear	Pa nini	Kaula Island	3, 5	Intro		
Poaceae	*Panicum lanaiense*			Kaula Island	5	Intro		
Poaceae	*Panicum torridum*	torrid panicgrass	Hkonakona (Ni‘ihau)	Kaula Island	3, 4	End		
Plumbaginaceae	*Plumbago zeylanica*	wild leadwort	Ilie`e	Kaula Island	3, 4	Ind		
Portulacaceae	*Portulaca lutea*	native yellow purslane	Ihi	Kaula Island	3, 5	Ind		
Portulacaceae	*Portulaca oleraceae*	little hogweed	Akulikuli kula, Ihi	Kaula Island	3, 4, 5	Intro		
Portulacaceae	*Portulaca villosa*	hairy purslane	Ihi	Kaula Island	3, 4, 5	End		
Gramineae	*Setaria verticillata*	bristly foxtail	Mauu pilipili	Kaula Island	3, 4	Intro		
Malvaceae	*Sida fallax*	ilima	Ilima	Kaula Island	3, 4, 5	Ind		
Solanaceae	*Solanum nigrum*	black nightshade	Popolo	Kaula Island	3, 4, 5	Ind		
Asteraceae	*Sonchus oleraceus*	sowthistle	Pualele	Kaula Island	3, 4	Intro		
Malvaceae	*Thespesia populnea*	milo	Milo	Kaula Island	4	PI?		
Zygophyllaceae	*Tribulus cistiodes*	Jamaican feverplant	Nohu	Kaula Island	3, 4, 5	Ind		
Fabaceae	*Acacia koa*	koa	Koa	Koke'e	8	End		
Rhamnaceae	*Alphitonia ponderosa*	Kauila	Kauila	Koke'e	8	End		
Apocynaceae	*Alyxia oliviformis*	Maile	Maile	Koke'e	8	End		

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Euphorbiaceae	*Antidesma platyphyllum*	Hame	Hame	Koke'e	8	End		
Poaceae	*Axonopus fissifolius*	common carpetgrass		Koke'e	7	Intro		
Rubiaceae	*Bobea brevipes*	`Ahakea	`Ahakea	Koke'e	8	End		
Cyperaceae	*Carex meyenii*	Meyen's sedge		Koke'e	8	Ind		
Cyperaceae	*Carex wahuensis*	O'ahu sedge		Koke'e	8	Ind		
Amaranthaceae	*Charpentiera elliptica*	Papala	Papala	Koke'e	8	End		
Araliaceae	*Cheirodendron trigynum*	Olapa	Olapa	Koke'e	8	End		
Euphorbiaceae	*Clayoxylon sandwicense*	Laukea	Laukea	Koke'e	8	End		
Rubiaceae	*Coprosma kauaensis*	Pilo	Pilo	Koke'e	8	End		
Agavaceae	*Cordyline fruticosa*	Ti plant	K, Ti	Koke'e	7	PI		PPMS
Corynocarpaceae	*Corynocarpus laevigatus*	karaka nut		Koke'e	7	Intro		
Poaceae	*Dactylis glomerata*	orchardgrass		Koke'e	7	Intro		
Liliaceae	*Dianella sandwicensis*	‘uki‘uki	‘Uki‘uki, ‘Uki	Koke'e	8	Ind		
Gleicheniaceae	*Dicranoptorus linearis*	Uluhe	Uluhe	Koke'e	8	Ind		
Sapindaceae	*Dodonaea viscosa*	Florida hopbush	A`ali`i	Koke'e	8	Intro		
Dryoteridaceae	*Dryopteris fuscoatra*	crowned woodfern	`I`i	Koke'e	8	End		
Dryoteridaceae	*Dryopteris glabra*	kilaw	Kilau	Koke'e	8	End		
Poaceae	*Eragrostris variabilis*	kawelu	Kāwelu, ‘Emoloa	Koke'e	8	End		

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Asteraceae	*Erigeron karvinskianus*	Latin American fleabane		Koke'e	7	Intro		
Euphorbiaceae	*Euphorbia halemanui*	Halemanu ‘akoko	‘Akoko	Koke'e	8	Intro	FE, SE	C
Cyperaceae	*Gahnia beecheyi*	forest sawsedge	Uki	Koke'e	8	End		
Proteaceae	*Grevillea robusta*	silk oak	‘Oka kilika, Ha‘ik ke‘oke‘o	Koke'e	8	Intro		
Rubiaceae	*Hedyotis terminalis*	Manono	Manono	Koke'e	8	End		
Hydrangeaceae	*Hydrangea macrophylla*	French hydrangea		Koke'e	7	Intro		
Asteraceae	*Hypochaeris radicata*	hairy cat's-ear		Koke'e	7	Intro		
Aquifoliaceae	*Ilex anomala*	Hawai'i holly	`Aiea	Koke'e	8	Ind		
Cyperaceae	*Kyllinga brevifolia*	shortleaf spikesedge		Koke'e	7	Intro		
Aizoaceae	*Lampranthus glomeratus*	ice plant	Akulikuli lei	Koke'e	7	Intro		
Rosaceae	*Malus sp.*	apple		Koke'e	7	Intro		
Myrtaceae	*Melaleuca quinquenervia*	Paperbark		Koke'e	8	Intro		
Melastomataceae	*Melastome candidum*	Asian melastome		Koke'e	8	Intro	Invasive	
Rutaceae	*Melicope anisata*	Mokihana	Mokihana	Koke'e	8	End		
Rutaceae	*Melicope barbigera*	U`ahiapele	U`ahiapele	Koke'e	8	End		
Poaceae	*Melinis minutiflora*	molasses grass		Koke'e	7	Intro		
Myrtaceae	*Metrosideros polymorpha*	`Ohia	`Ohia lehua	Koke'e	8	End		

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Dennstaedtiaceae	*Microlepia strigosa*	Palapalai	Palapalai	Koke'e	8	Ind		
Musaceae	*Musa x paradisiaca*	French plantain		Koke'e	7	Intro		
Myoporaceae	*Myrica faya*	Firetree		Koke'e	8	Intro	Invasive	
Myrsinaceae	*Myrsine alyxifolia*	forest colicwood		Koke'e	8	End		
Myrsinaceae	*Myrsine lanaiensis*	Kolea	Kolea	Koke'e	8	End		
Oleaceae	*Nestigis sandwicensis*	Hawaii olive	Olopua	Koke'e	8	End		
Poaceae	*Paspalum dilatatum*	dallis grass		Koke'e	7	Intro		
Poaceae	*Paspalum scrobiculatum*	kodo millet		Koke'e	7	Intro		
Passifloraceae	*Passiflora mollissima*	banana poka		Koke'e	8	Intro	Invasive	
Poaceae	*Pennisetum clandestinum*	Kikuyu grass		Koke'e	7	Intro		R
Piperaceae	*Peperomia sp.*	Ala`ala`wai nui	Ala`ala`wai nui	Koke'e	8	Ind		
Lauraceae	*Persea americana*	avocado		Koke'e	7	Intro		
Pittosporaceae	*Pittosporum glabrum*	koolau range cheesewood	Hoawa	Koke'e	8	End		
Plantaginaceae	*Plantago lanceolata*	narrowleaf plantain, English plantain		Koke'e	7	Intro		C,R
Agavaceae	*Pleomele aurea*	golden hala pepe	Halapepe	Koke'e	8	End		
Sapotaceae	*Pouteria sandwicensis*	Ala`a	Ala`a	Koke'e	8	End		
Rosaceae	*Prunus cerasifera x salicina*	Plum tree		Koke'e	7	Intro		

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Myrtaceae	*Psidium cattleianum*	strawberry guava		Koke'e	8	Intro	Invasive	
Rubiaceae	*Psychotria greenwelliae*	Kauai wild coffee	Kopiko	Koke'e	8	End		
Rubiaceae	*Psychotria mariniana*	forest wild coffee	Kopiko	Koke'e	8	End		
Rosaceae	*Pyracantha angustifolia*	narrowleaf firethorn		Koke'e	7	Intro	Invasive	
Rosaceae	*Rosa cultivar*	planted rose		Koke'e	7	Intro		
Rosaceae	*Rubus argatus*	Florida blackberry		Koke'e	7	Intro	Invasive	
Rosaceae	*Rubus communis*	common pear		Koke'e	7	Intro		
Rosaceae	*Rubus sp.*	Blackberry		Koke'e	8	Intro		
Poaceae	*Sacciolepis indica*	glenwood grass		Koke'e	7	Intro		
Santalaceae	*Santalum freycinetianum*	sandalwood	`Iliahi	Koke'e	8	End		
Goodeniaceae	*Scaevola gaudichaudiana*	mountain naupaka		Koke'e	7	End		
Goodeniaceae	*Scaevola procera*	naupaka kuahiwi	Naupaka kuahiwi	Koke'e	8	End		
Poaceae	*Sporobolus indicus*	smut grass		Koke'e	7	Intro		
Moraceae	*Streblus pendulinus*	A`ai`a	A`ai`a	Koke'e	8	Ind		
Epacridaceae	*Styphelia tameiameiae*	Pu`kiawe	Pu`kiawe	Koke'e	8	Ind		
Asteraceae	*Taraxacum officinale*	common dandelion		Koke'e	7	Intro		
Araliaceae	*Tetraplasandra kavaiensis*	Ohe`ohe	Ohe`ohe	Koke'e	8	End	SOC, State	
Fabaceae	*Trifolium repens*	white clover		Koke'e	7	Intro		

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Ericaceae	*Vaccinium sp*	blueberry	Ohelo	Koke'e	8	End		
Verbenaceae	*Verbena litoralis*	seashore vervain	Owi, Oi	Koke'e	7	Intro		
Thymelaeceae	*Wikstroemia furcata*	forest false ohelo	Akia	Koke'e	8	End		
Flacourtaceae	*Xylosma hawaiiense*	Maua	Maua	Koke'e	8	End		
Rutaceae	*Zanthoxylum dipetalum*	kawa'u	A`e	Koke'e	8	End		
Fabaceae	*Acacia confusa*	formosa koa		Makaha Ridge	2, 6	Ind		
Fabaceae	*Acacia koa*	koa	Koa	Makaha Ridge	2, 6	End		PPMS
Asteraceae	*Acanthospermum australe*	spiny bur, Paraguay bur	Kkaehipa,‘Ihi kkae hipa	Makaha Ridge	2, 6	Intro		R
Pteridaceae	*Adiantum hispidulum*	rough maidenhair fern		Makaha Ridge	6	Intro		
Pteridaceae	*Adiantum raddianum*	delta maidenhair		Makaha Ridge	6	Intro		
Asteraceae	*Ageratina riparia*	spreading mist flower	Hamakua pamakani	Makaha Ridge	6	Intro		
Asteraceae	*Ageratum conyzoides*	tropical whiteweed	Maile hohono	Makaha Ridge	2, 6	Intro		R
Asteraceae	*Ageratum houstonianum*	floss flower	Maile hohono	Makaha Ridge	2, 6	Intro		R
Primulaceae	*Anagallis arvensis*	scarlet pimpernel		Makaha Ridge	6	Intro		R
Poaceae	*Andropogon glomeratus*	bushy bluestem		Makaha Ridge	6	Intro		
Papaveraceae	*Argemone glauca*	smooth pricklypoppy	Pua kala, kala	Makaha Ridge	12	End		C

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Asteraceae	*Artemisia australis*	Oahu wormwood	‘Hinahina, Hinahina	Makaha Ridge	2, 6	End		C
Asteraceae	*Bidens sandvicensis*	Shrubland beggarticks	Ko‘oko‘olau	Makaha Ridge	6, 12	End		R, C
Asteraceae	*Bidens pilosa*	hairy beggarticks	K, K nehe, K pipili, Nehe	Makaha Ridge	2, 6	Intro		R
Blechnaceae	*Blechnum appendiculatum*	palm fern		Makaha Ridge	6, 12	Intro		C
Blechnaceae	*Blechnum occidentale*	blechnum		Makaha Ridge	2	Intro		PPMS
Nyctaginaceae	*Boerhavia coccinea*	scarlet spiderling		Makaha Ridge	2, 6	Intro		R
Poaceae	*Bothriochloa pertusa*	pitted beardgrass		Makaha Ridge	2, 6	Intro		C,PPMS,R
Poaceae	*Bromus hordeaceus*	soft chess		Makaha Ridge	6	Intro		
Asteraceae	*Calyptocarpus vialis*	straggler daisy		Makaha Ridge	6	Intro		R
Capparaceae	*Capparis sandwichiana*			Makaha Ridge	12	End	SOC, State	C
Cyperaceae	*Carex wahuensis*	O'ahu sedge		Makaha Ridge	2, 6	End		PPMS
Casuarinaceae	*Casuarina cunninghamiana*	River-oak casuarina		Makaha Ridge	2, 6	Intro		PPMS
Gentianaceae	*Centaurium erythraea*	bitter herb, European centaury		Makaha Ridge	12	Intro		C
Fabaceae	*Chamaecrista nictitans var. glabrata*	partridge pea	Lauk	Makaha Ridge	2, 6, 12	Intro		PPMS,R, C
Euphorbiaceae	*Chamaesyce hirta*	hairy spurge, garden spurge	Koko kahiki	Makaha Ridge	2, 6, 12	Intro		C
Euphorbiaceae	*Chamaesyce hyssopifolia*	spurge		Makaha Ridge	2, 6	Intro		C

Family	Scientific Name	Common name	Hawaiian Name	Location	Reference	Origin	Status	Vegetation Type
Poaceae	*Chloris barbata*	swollen fingergrass	Mau‘u lei	Makaha Ridge	6	Intro		
Thelypteridaceae	*Christella parasitica*	parasitic maiden fern		Makaha Ridge	12	Intro		C
Poaceae	*Chrysopogon aciculatus*	golden beardgrass	Mnienie ‘ula	Makaha Ridge	2, 6, 12	Intro		C,PPMS
Apiaceae	*Ciclospermum leptophyllum*	fir-leaved celery		Makaha Ridge	2, 6	Intro		C
Asteraceae	*Cirsium vulgare*	bull thistle	Pua kala	Makaha Ridge	2, 6	Intro		C,PPMS,R
Menispermaceae	*Cocculus orbiculatus*	huehue, hue	Huehue, hue	Makaha Ridge	2, 6	Ind		PPMS
Asteraceae	*Conyza bonariensis*	hairy horseweed	Ilioha, ‘aw‘aw, pua mana	Makaha Ridge	2, 6	Intro		C,R
Agavaceae	*Cordyline fruticosa*	Ti plant	K, Ti	Makaha Ridge	2, 6	PI		PPMS
Fabaceae	*Crotalaria incana*	fuzzy rattlepod	Kkaehoki, Kolomona	Makaha Ridge	2, 6	Intro		R
Fabaceae	*Crotalaria pallida*	smooth rattlebox	Pikakani, Kolomona	Makaha Ridge	2, 6	Intro		R
Asteraceae	*Cyanthillium cinereum*	little ironweed		Makaha Ridge	2, 6, 12	Intro		PPMS, C
Poaceae	*Cynodon dactylon*	Bermuda grass	Manienie	Makaha Ridge	2, 6	Intro		R
Cyperaceae	*Cyperus polystachyos*	manyspike flatsedge		Makaha Ridge	2, 6	Ind		R
Cyperaceae	*Cyperus sp.*	flatsedge		Makaha Ridge	2	Intro		R
Apiaceae	*Daucus pusillus*	American carrot		Makaha Ridge	12	Intro		C
Fabaceae	*Desmanthus pernambucanus*	slender mimosa		Makaha Ridge	12	Intro		C
Fabaceae	*Desmodium incanum*	Spanish clover	Ka‘imi	Makaha Ridge	2, 6	Intro		PPMS,R

Family	Scientific Name	Common name	Hawaiian Name	Location	Reference	Origin	Status	Vegetation Type
Fabaceae	*Desmodium sandwicense*	Spanish clover, chili clover	Pua pilipili, Kknia pipili	Makaha Ridge	2, 6	Intro		R
Fabaceae	*Desmodium triflorum*	tick trefoil		Makaha Ridge	2, 6	Intro		C
Liliaceae	*Dianella sandwicensis*	‘uki‘uki	‘Uki‘uki, ‘Uki	Makaha Ridge	2, 6	Ind		PPMS
Poaceae	*Digitaria sp.*	crabgrass		Makaha Ridge	2	Intro		R
Poaceae	*Digitaria ciliaris*	Henry's crabgrass	Kukaepua‘a	Makaha Ridge	2, 6	Intro		PPMS,R
Poaceae	*Digitaria pentzil*	panola grass		Makaha Ridge	2	Intro		R
Poaceae	*Digitaria setigera*	East Indian crabgrass	Kukaepua‘a, Mau‘u	Makaha Ridge	6, 12	Intro		C
Sapindaceae	*Dodonaea viscosa*	Florida hopbush	A`ali`i	Makaha Ridge	2, 6	Intro		C,PPMS,R
Pteridaceae	*Doryopteris decipiens*	triangleleaf lipfern	Kumuniu, ‘Iwa‘iwa	Makaha Ridge	2, 6	End		C
Asteraceae	*Emilia fosbergii*	Florida tasselflower	Pualele	Makaha Ridge	2, 6	Intro		C,R
Asteraceae	*Emilia sonchifolia* var. *javanica*	Flora's paintbrush	Purple pualele	Makaha Ridge	2, 6	Intro		R
Poaceae	*Eragrostis variabilis*	kawelu	Kāwelu, ‘emoloa	Makaha Ridge	2, 6	End		C
Asteraceae	*Erigeron karvinskianus*	Latin American fleabane		Makaha Ridge	2, 6	Intro		R
Geraniaceae	*Erodium cicutarium*	pin clover		Makaha Ridge	6	Intro		
Myrtaceae	*Eucalyptus sp.*	gum		Makaha Ridge	2, 6	Intro		PPMS
Cyperaceae	*Gahnia beecheyi*	forest sawsedge		Makaha Ridge	2, 6	End		PPMS

Family	Scientific Name	Common name	Hawaiian Name	Location	Reference	Origin	Status	Vegetation Type
Asteraceae	*Gamochaeta purpurea*	purple cudweed		Makaha Ridge	2, 6	Intro		R
Proteaceae	*Grevillea robusta*	silk oak	‘Oka kilika	Makaha Ridge	6	Intro		C,PPMS
Poaceae	*Heteropogon contortus*	pili grass	Pili, Lule	Makaha Ridge	2, 6	Ind		C
Malvaceae	*Hibiscus kokio subsp saintjohnianus*	Hawaiian red hibiscus	Koki‘o, Koki‘o ‘ula	Makaha Ridge	12	End	SOC, State	C
Poaceae	*Hyparrhenia rufa*			Makaha Ridge	12	Intro		C
Asteraceae	*Hypochaeris glabra*	smooth cat's-ear		Makaha Ridge	2, 6, 12	Intro		C
Asteraceae	*Hypochaeris radicata*	hairy cat's-ear, gosmore		Makaha Ridge	6, 12	Intro		C
Fabaceae	*Indigofera suffruticosa*	indigo	Iniko	Makaha Ridge	2, 6	Intro		C,R
Verbenaceae	*Lantana camara*	lantana	lkana, L‘au kalakala	Makaha Ridge	2, 6	Intro		C,PPMS,R
Epacridaceae	*Leptecophylla tameiameiae*		Pūkiawe, ‘A‘ali‘i mahu	Makaha Ridge	12	Ind		C
Fabaceae	*Leucaena leucocephala*	koa haole	Koa haole	Makaha Ridge	2, 6	Intro		R
Asteraceae	*Lipochaeta connata var acris*	nehe	Nehe	Makaha Ridge	12	End		C
Campanulaceae	*Lobelia niihauensis*	Ni‘ihau lobelia		Makaha Ridge	12	End	FE, SE	C
Onagraceae	*Ludwigia octovalvis*	primrose willow	Kmole, Alohalua	Makaha Ridge	6	Ind		R
Solanaceae	*Lycium sandwicense*	Hawai'i desert-thorn	Ohelo kai	Makaha Ridge	12	Ind		C
Fabaceae	*Macroptilium lathyroides*	wild bushbean		Makaha Ridge	2, 6	Intro		C

Family	Scientific Name	Common name	Hawaiian Name	Location	Reference	Origin	Status	Vegetation Type
Fabaceae	*Medicago lupulina*	black medick		Makaha Ridge	2, 6	Intro		R
Meliaceae	*Melia azedarach*	chinaberry	‘Nia	Makaha Ridge	2, 6	Intro		PPMS
Poaceae	*Melinis minutiflora*	molasses grass		Makaha Ridge	2	Intro		C,PPMS,R
Poaceae	*Melinis repens*	natal redtop		Makaha Ridge	2, 6	Intro		C,PPMS,R
Fabaceae	*Mimosa pudica var. unijuga*	sensitive plant, sleeping grass	Hilahila, Pua	Makaha Ridge	2, 6	Intro		R
Cucurbitaceae	*Momordica charantia*	balsam pear, bitter melon		Makaha Ridge	12	Intro		C
Myoporaceae	*Myoporum sandwicense*	bastard sandalwood	Naio, Naeo, Naieo	Makaha Ridge	2, 6	End		C,PPMS
Nephrolepidaceae	*Nephrolepis multiflora*	hairy swordfern	Okupukupu	Makaha Ridge	2, 6	Intro		PPMS
Oleaceae	*Olea europaea*	olive	‘Oliwa, ‘Oliwa haole	Makaha Ridge	2, 6, 12	Intro		PPMS, C
Poaceae	*Oplismenus hirtellus*	basketgrass	Honohono kukui	Makaha Ridge	2, 6, 12	Intro		PPMS
Cactaceae	*Opuntia ficus-indica*	pricklypear	Pānini, Pāpipi	Makaha Ridge	12	Intro		C
Oxalidaceae	*Oxalis corniculata*	yellow wood sorrel	‘Ihi ‘ai, ‘Ihi ‘awa	Makaha Ridge	2, 6	PI?		C,PPMS,R
Oxalidaceae	*Oxalis debilis*	pink wood sorrel	‘Ihi pehu	Makaha Ridge	6, 12	Intro		C
Poaceae	*Panicum maximum*	Guinea grass		Makaha Ridge	12	Intro		C
Poaceae	*Panicum torridum*	torrid panicgrass	Kākonakona, Hākonakona	Makaha Ridge	12	End		C

Family	Scientific Name	Common name	Hawaiian Name	Location	Reference	Origin	Status	Vegetation Type
Poaceae	*Paspalum fimbriatum*	Panama paspalum, Colombia grass		Makaha Ridge	2, 6	Intro		R
Poaceae	*Pennisetum clandestinum*	Kikuyu grass		Makaha Ridge	2, 6	Intro		R
Apiaceae	*Peucedanum sandwicense*	makou	Makou	Makaha Ridge	12	End	FT, ST	C
Arecaceae	*Phoenix hybrid*			Makaha Ridge	12	Intro		C
Euphorbiaceae	*Phyllanthus debilis*		Niruri	Makaha Ridge	12	Intro		C
Pinaceae	*Pinus elliottii Engelm.*	slash pine		Makaha Ridge	12	Intro		C
Pinaceae	*Pinus radiata*	Monterey Pine		Makaha Ridge	6	Intro		PPMS
Pteridaceae	*Pityrogramma calomelanos*	Dixie silverback fern		Makaha Ridge	6	Intro		C
Plantaginaceae	*Plantago lanceolata*	narrowleaf plantain		Makaha Ridge	12	Intro		C
Plantaginaceae	*Plantago major*	broad-leaved plantain	Laukahi, Khkili	Makaha Ridge	2, 6	Intro		C,R
Asteraceae	*Pluchea carolinensis*	sourbush		Makaha Ridge	2, 6	Intro		R
Caryophyllaceae	*Polycarpon tetraphyllum*			Makaha Ridge	12	Intro		C
Portulacaceae	*Portulaca oleraceae*	little hogweed	Akulikuli kula, Ihi	Makaha Ridge	2, 6	Intro		R
Myrtaceae	*Psidium cattleianum*	strawberry guava	Waiaw ‘ula‘ula	Makaha Ridge	2, 6	Intro		PPMS
Myrtaceae	*Psidium cattleianum* var. *littorale*	strawberry guava	Waiawi	Makaha Ridge	2	Intro		PPMS
Myrtaceae	*Psidium guajava*	common guava	Kuawa, Kuawa ke‘oke‘o	Makaha Ridge	2, 6	Intro		PPMS

Family	Scientific Name	Common name	Hawaiian Name	Location	Reference	Origin	Status	Vegetation Type
Psilotaceae	*Psilotum nudum*	upright whiskfern	Moa, Moa nahele	Makaha Ridge	6	Ind		
Rubiaceae	*Psydrax odorata*	alahe‘e	Alahe‘e, ‘He‘e, Walahe‘e	Makaha Ridge	2, 6	Ind		C,PPMS
Dennstaedtiaceae	*Pteridium aquilinum var. decompositum*			Makaha Ridge	12	End		
Pteridaceae	*Pteris vittata*	ladder brake, cliff brake		Makaha Ridge	12	Intro		C
Rubiaceae	*Richardia brasiliensis*	tropical Mexican clover		Makaha Ridge	2, 6	Intro		R
Euphorbiaceae	*Ricinus communis*	castor bean	P‘aila, Ka‘apeh	Makaha Ridge	2, 6	Intro		R
Goodeniaceae	*Scaevola gaudichaudii*	ridgetop naupaka	Naupaka kuahiwi	Makaha Ridge	2, 6	End		PPMS
Caryophyllaceae	*Schiedea apokremnos*	Kauai schiedea	Ma‘oli‘oli	Makaha Ridge	12	SIE	FE, SE	C
Poaceae	*Schizachyrium condensatum*	little bluestem, beardgrass		Makaha Ridge	2, 6	Intro		C,PPMS
Selaginellaceae	*Selaginella arbuscula*	dwarf spikemoss	Lepelepe a moa	Makaha Ridge	6	End		
Poaceae	*Setaria gracilis*	marsh bristlegrass	Mau‘ kaleponi	Makaha Ridge	2	Intro		PPMS,R
Poaceae	*Setaria parviflora*	yellow foxtail, perennial foxtail	Mau‘ kaleponi	Makaha Ridge	12	Intro		C
Malvaceae	*Sida fallax*	‘ilima	‘Ilima	Makaha Ridge	2, 6	Intro		PPMS
Solanaceae	*Solanum americanum*	glossy nightshade	Popolo	Makaha Ridge	2, 6	Ind		R
Asteraceae	*Sonchus oleraceus*	sow thistle	Pualele	Makaha Ridge	12	Intro		C

Family	Scientific Name	Common name	Hawaiian Name	Location	Reference	Origin	Status	Vegetation Type
Rubiaceae	*Spermacoce assurgens*	buttonweed		Makaha Ridge	2, 6	Intro		R
Apiaceae	*Spermolepis hawaiiensis*			Makaha Ridge	12	End	SE	C
Asteraceae	*Sphagneticola trilobata*	wedelia		Makaha Ridge	2, 6	Intro		PPMS,R
Poaceae	*Sporobolus indicus*	smut grass		Makaha Ridge	2, 6, 12	Intro		R, C
Epacridaceae	*Styphelia tameiameiae*	Pu`kiawe	Pu`kiawe	Makaha Ridge	6	Ind		PPMS
Myrtaceae	*Syzygium cumini*	Java plum		Makaha Ridge	12	Intro		C
Thelypteridaceae	*Thelypteris parasitica*	Woodfern		Makaha Ridge	2, 6	Intro		PPMS,R
Verbenaceae	*Verbena litoralis*	vervain	W, O, Ha‘uoi	Makaha Ridge	2, 6	Intro		R
Verbenaceae	*Verbena litoralis*	vervain	Ōwī, Oī, Ha‘uoi	Makaha Ridge	12	Intro		C
Poaceae	*Vulpia bromoides*	brome fescue		Makaha Ridge	2, 6	Intro		C
Sterculiaceae	*Waltheria indica*	uhaloa	Uhaloa, Hialoa	Makaha Ridge	2, 6	Ind		C,PPMS,R
Asteraceae	*Wilkesia hobdyi*	dwarf iliau		Makaha Ridge	2, 6, 12	SIE	FE, SE	C
Asteraceae	*Youngia japonica*	Oriental hawksbeard		Makaha Ridge	2, 6	Intro		R
Lauraceae	*Cassytha filiformis*	Kaunaoa pehu		Nohili dunes	1	Ind		
Casuarinaceae	*Casuarina equisetifolia*	Ironwood	Paina	Nohili dunes	1	Intro		
Euphorbiaceae	*Chamaesyce celastroides* var. *celastroides*	‘Akoko	‘Akoko	Nohili dunes	1	End		
Poaceae	*Chloris barbata*	swollen fingergrass	Mau‘u lei	Nohili dunes	1	Intro		

Family	Scientific Name	Common name	Hawaiian Name	Location	Reference	Origin	Status	Vegetation Type
Poaceae	*Cynodon dactylon*	Bermuda grass	Manienie	Nohili dunes	1	Intro		
Sapindaceae	*Dodonaea viscosa*	Florida hopbush	A`ali`i	Nohili dunes	1	Intro		
Boraginaceae	*Heliotropium anomalum*	Hinahina	Hinahina	Nohili dunes	1	Ind		
Convolvulaceae	*Ipomoea imperati*	Hunakai	Hunakai	Nohili dunes	1	Ind		
Convolvulaceae	*Ipomoea pes-caprae*	Beach morning glory	Pohuehue	Nohili dunes	1	Ind		
Fabaceae	*Leucaena leucocephala*	koa haole	Koa haole	Nohili dunes	1	Intro		
Asteraceae	*Pluchea carolinensis*	sourbush		Nohili dunes	1	Intro		
Fabaceae	*Prosopis pallida*	kiawe	Kiawe	Nohili dunes	1	Intro	Noxious Weed	
Goodneiaceae	*Scaevola sericea*	naupaka	Naupaka kahaki	Nohili dunes	1	Ind		
Aizoaceae	*Sesuvium portulacastrum*	sea purslane	Akulikuli	Nohili dunes	1	Ind		R
Malvaceae	*Sida fallax*	Ilima	Ilima	Nohili dunes	1	Ind		
Poaceae	*Sporobolous virginicus*	beach dropseed	Akiaki	Nohili dunes	1	Ind		
Asteraceae	*Verbesina encelioides*	golden crown-beard		Nohili dunes	1	Intro	Invasive	
Verbenaceae	*Vitex rotundifolia*	beach vitex	Pohinahina	Nohili dunes	1	Ind		

Key for origin:

End=Endemic; Intro=Introduced; Ind=Indigenous; PI=Polynesian intro;PI?=likely Polynesian intro; SIE=Single Island Endemic

Key for vegetation type:

K= Kiawe-Koa Haole Scrub; A= Aalii-Name Scrub; PND= Pohinahina-Naupaka Dune; S= Strand; D= Drainage/Wetlands; C= cliff; PPMS= Planted Pine/Mixed scrub; R=Ruderal

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PMRF AVIAN SPECIES BY BASE

Scientific Name	Common Name	Hawaiian Name	Location	Reference	Origin	Status	Current Abundance
Acridotheres tristis	Common Myna		Barking Sands	2, 3, 5	Non-native		Abundant
Alauda arvensis	Eurasian Skylark		Barking Sands	2	Non-native	MBTA	Unknown
Amandava amandava	Red Avadavat		Barking Sands	5	Non-native	MBTA	
Anas acuta	Northern Pintail	Koloa māpu	Barking Sands	5	Winter visitor	MBTA	Rare
Anas clypeata	Northern Shoveler	Koloa moha	Barking Sands	2, 3	Winter visitor	MBTA	Rare
Anas crecca	Green-winged Teal		Barking Sands	2	Winter visitor	MBTA	Very Rare
Anas wyvilliana	Hawaiian Duck	Koloa maoli	Barking Sands	2, 3, 5	Native	FE, SE, MBTA	Abundant
Arenaria interpres	Ruddy Turnstone	‘Akekeke	Barking Sands	2, 3	Native	MBTA	Common
Asio flammeus sandwichensis	Short -eared Owl	Pueo	Barking Sands	5	Native	SE Oahu, MBTA	Common
Branta hutchinsii	Cackling Goose		Barking Sands	5	Winter visitor	MBTA	Rare
Branta sandvicensis	Hawaiian Goose	Nene	Barking Sands	5	Native	FE, SE, MBTA	Abundant
Bubulcus ibis	Cattle Egret		Barking Sands	2, 3, 5	Non-native	USFWS Control Order, MBTA	Abundant
Calidris alba	Sanderling	Hunakai	Barking Sands	2, 3	Winter visitor	MBTA	Common
Cardinalis cardinalis	Northern Cardinal		Barking Sands	2, 3, 5	Non-native	MBTA	Abundant
Carpodacus mexicanus	House Finch		Barking Sands	2, 3, 5	Non-native	MBTA	Abundant
Cettia diphone	Japanese Bush Warbler		Barking Sands	5	Non-native		Rare
Columba livia	Rock Pigeon		Barking Sands	2, 3	Non-native		Rare

Scientific Name	Common Name	Hawaiian Name	Location	Reference	Origin	Status	Current Abundance
Copsychus malabaricus	White-rumped Shama		Barking Sands	2, 3, 5	Non-native		Uncommon
Cygnus columbianus	Tundra Swan		Barking Sands	5	Vagrant	MBTA	Very Rare
Euodice cantans	African Silverbill		Barking Sands	5	Non-native		
Francolinus erckelii	Erckel's Francolin		Barking Sands	2, 3, 5	Non-native gamebird		Common
Francolinus francolinus	Black Francolin		Barking Sands	2, 3, 5	Non-native gamebird		Common
Fregata minor	Great Frigatebird	ʻIwa	Barking Sands	5	Breeding visitor	MBTA	Common
Fulica americana alai	Hawaiian Coot	ʻAlae keʻokeʻo	Barking Sands	2, 3, 5	Native	FE, SE, MBTA	Abundant
Gallinula chloropus sandvicensis	Hawaiian Moorhen	ʻAlae ʻula	Barking Sands	2, 3, 5	Native	FE, SE, MBTA	Common
Gallus gallus	Red Junglefowl	Moa	Barking Sands	2, 3, 5	Non-native		Abundant
Garrulax canorus	Chinese Hwamei		Barking Sands	2, 3, 5	Non-native		Uncommon
Geopelia striata	Zebra Dove		Barking Sands	5	Non-native		Abundant
Himantopus mexicanus knudseni	Hawaiian Stilt	Ae'o	Barking Sands	2, 3, 5	Native	FE, SE, MBTA	Common
Larus atricilla	Laughing Gull		Barking Sands	3, 5	Vagrant	MBTA	Rare
Larus canus	Mew Gull		Barking Sands	5	Vagrant	MBTA	Very Rare
Larus glaucescens	Glaucous-winged Gull		Barking Sands	5	Winter visitor	MBTA	Rare
Lonchura atricapilla	Chestnut Munia		Barking Sands	2, 5	Non-native		Common

Scientific Name	Common Name	Hawaiian Name	Location	Reference	Origin	Status	Current Abundance
Lonchura malacca	Chestnut Mannikin		Barking Sands	3	Non-native		Common
Lonchura oryzivora	Java Finch		Barking Sands	5	Non-native		
Lonchura punctulata	Nutmeg Manikin		Barking Sands	3, 5	Non-native		Common
Melegris gallopavo	Wild Turkey	Pelehu	Barking Sands	2	Non-native		Rare
Mimus polyglottos	Northern Mockingbird		Barking Sands	2, 3, 5	Non-native	MBTA	Common
Nycticorax nycticorax	Black-crowned Night-heron	ʻAukuʻu	Barking Sands	2, 3, 5	Native	MBTA	Abundant
Oceanodroma castro	Band-rumped Storm-petrel	ʻAkeʻake	Barking Sands	6	Native	FE, SE, MBTA	
Paroaria coronata	Red-crested Cardinal		Barking Sands	2, 3, 5	Non-native		Abundant
Passer domesticus	House Sparrow		Barking Sands	2, 3, 5	Non-native	MBTA	Common
Phasianus colchius	Ring-necked Pheasant		Barking Sands	2, 3, 5	Non-native gamebird		Common
Phoebastria albatrus	Short-tailed Ablatross		Barking Sands		Native	FE, SE, MBTA	Very Rare
Phoebastria immutabilis	Laysan Albatross	Mōlī	Barking Sands	2, 3, 5	Breeding visitor	MBTA	Abundant
Phoebastria nigripes	Black-footed Albatross	Kaʻupu	Barking Sands	2	Native	MBTA	Very Rare
Pluvialis fulva	Pacific Golden Plover	Kōlea	Barking Sands	2, 3, 5	Winter visitor	MBTA	Common
Pluvialis squatarola	Black-bellied Plover		Barking Sands	2	Winter visitor	MBTA	Rare
Pterodroma phaeopygia sandwichensis	Hawaiian Petrel	ʻUaʻu	Barking Sands	6	Native	FE, SE, MBTA	
Puffinus auricularis newelli	Newell's Shearwater	ʻAʻo	Barking Sands	6	Native	FT, ST, MBTA	

Scientific Name	Common Name	Hawaiian Name	Location	Reference	Origin	Status	Current Abundance
Puffinus pacificus	Wedge-tailed Shearwater	ʻUaʻu kani	Barking Sands	2, 5	Breeding visitor	MBTA	Abundant
Streptopelia chinensis	Spotted Dove		Barking Sands	5	Non-native gamebird		Abundant
Sturnella neglecta	Western Meadowlark		Barking Sands	3, 5	Non-native	MBTA	Uncommon
Sula leucogaster	Brown Booby	ʻĀ	Barking Sands	2, 5	Breeding visitor	MBTA	Common
Tringa incana	Wandering Tattler	ʻŪlili	Barking Sands	2, 3, 5	Breeding visitor	MBTA	Common
Tyto alba	Barn Owl		Barking Sands	5	Non-native	USFWS Control Order, MBTA	Common
Zosterops japonicus	Warbling White-eye		Barking Sands	2, 3, 5	Non-native		Common
Acridotheres tristis	Common Myna		Kamokala Ridge	2	Non-native		Common
Alectoris chukar	Chukar Partridge		Kamokala Ridge	2	Non-native gamebird		Unknown
Bubulcus ibis	Cattle Egret		Kamokala Ridge	2	Non-native	USFWS Control Order, MBTA	Rare
Cardinalis cardinalis	Northern Cardinal		Kamokala Ridge	2	Non-native	MBTA	Common
Carpodacus mexicanus	House Finch		Kamokala Ridge	3	Non-native	MBTA	Common
Copsychus malabaricus	White-rumped Shama		Kamokala Ridge	2	Non-native		
Francolinus erckelii	Erckel's Francolin		Kamokala Ridge	2	Non-native gamebird		Uncommon
Gallus gallus	Red Junglefowl	Moa	Kamokala Ridge	2	Non-native		Common
Garrulax canorus	Chinese Hwamei		Kamokala Ridge	2	Non-native		Uncommon

Scientific Name	Common Name	Hawaiian Name	Location	Reference	Origin	Status	Current Abundance
Geopelia striata	Zebra Dove		Kamokala Ridge	2	Non-native		Common
Lonchura malacca	Chestnut Mannikin		Kamokala Ridge	3	Non-native		Common
Lonchura punctulata	Nutmeg Manikin		Kamokala Ridge	3	Non-native		Abundant
Mimus polyglottos	Northern Mockingbird		Kamokala Ridge	2	Non-native	MBTA	Common
Nycticorax nycticorax	Black-crowned Night-heron	ʻAukuʻu	Kamokala Ridge	3	Native	MBTA	Rare
Paroaria coronata	Red-crested Cardinal		Kamokala Ridge	3	Non-native		Unknown
Pluvialis fulva	Pacific Golden Plover	Kōlea	Kamokala Ridge	3	Winter visitor	MBTA	Uncommon
Streptopelia chinensis	Spotted Dove		Kamokala Ridge	2	Non-native gamebird		Abundant
Tyto alba	Barn Owl		Kamokala Ridge	3	Non-native	USFWS Control Order, MBTA	Unknown
Zosterops japonicus	Warbling White-eye		Kamokala Ridge	2	Non-native		Abundant
Anous minutus	Black Noddy	Noio	Kaula Island	1	Breeding visitor	MBTA	Common
Anous stolidus	Brown Noddy	Noio kōhō	Kaula Island	1, 4	Breeding visitor	MBTA	Abundant
Arenaria interpres	Ruddy Turnstone	ʻAkekeke	Kaula Island	1	Winter visitor	MBTA	Uncommon
Bulweria bulwerii	Bulwer's Shearwater	ʻOu	Kaula Island	1, 4	Breeding visitor	MBTA	Common
Cardinalis cardinalis	Northern Cardinal		Kaula Island	1	Non-native	MBTA	
Carpodacus mexicanus	House Finch		Kaula Island	1	Non-native	MBTA	Uncommon
Fregata minor	Great Frigatebird	ʻIwa	Kaula Island	1, 4	Breeding visitor	MBTA	Common

Scientific Name	Common Name	Hawaiian Name	Location	Reference	Origin	Status	Current Abundance
Gygis alba	White Tern	Manu-o-kū	Kaula Island	1, 4	Breeding visitor	ST, MBTA	Uncommon
Lonchura punctulata	Nutmeg Manikin		Kaula Island	1	Non-native		Uncommon
Mimus polyglottos	Northern Mockingbird		Kaula Island	1	Non-native	MBTA	Rare
Onychoprion fuscatus	Sooty Tern	ʻEwa ʻewa	Kaula Island	1, 4	Breeding visitor	MBTA	Abundant
Onychoprion lunatus	Gray-backed Tern	Pakalakala	Kaula Island	1	Breeding visitor	MBTA	Common
Phaethon lepturus	White-tailed Tropicbird	Koaʻe kea	Kaula Island	1	Breeding visitor	MBTA	Rare
Phaethon rubricauda	Red-tailed Tropicbird	Koaʻeʻula	Kaula Island	1, 4	Breeding visitor	MBTA	Common
Phoebastria immutabilis	Laysan Albatross	Mōlī	Kaula Island	1	Breeding visitor	MBTA	Common
Phoebastria nigripes	Black-footed Albatross	Kaʻupu	Kaula Island	1	Breeding visitor	MBTA	Uncommon
Pluvialis fulva	Pacific Golden Plover	Kōlea	Kaula Island	1	Winter visitor	MBTA	Uncommon
Procelsterna cerulea	Blue-gray Noddy		Kaula Island	1, 4	Breeding visitor	MBTA	Rare
Pterodroma hypoleuca	Bonin Petrel	Nunulu	Kaula Island	1	Breeding visitor	MBTA	Rare
Puffinus nativitatis	Christmas Island Shearwater		Kaula Island	1, 4	Breeding visitor	MBTA	Common
Puffinus pacificus	Wedge-tailed Shearwater	ʻUaʻu kani	Kaula Island	1	Breeding visitor	MBTA	Abundant
Sula dactylatra	Masked Booby	ʻĀ	Kaula Island	1, 4	Breeding visitor	MBTA	Common
Sula leucogaster	Brown Booby	ʻĀ	Kaula Island	1, 4	Breeding visitor	MBTA	Common
Sula sula	Red-footed Booby	ʻĀ	Kaula Island	1, 4	Breeding visitor	MBTA	Abundant
Tringa incana	Wandering Tattler	ʻŪlili	Kaula Island	1	Breeding visitor	MBTA	Rare

Scientific Name	Common Name	Hawaiian Name	Location	Reference	Origin	Status	Current Abundance
Tyto alba	Barn Owl		Kaula Island	1	Non-native	USFWS Control Order, MBTA	Rare
Zosterops japonicus	Warbling White-eye		Kaula Island	1	Non-native		Rare
Acridotheres tristis	Common Myna		Kokee	2, 5	Non-native		Uncommon
Asio flammeus sandwichensis	Short -eared Owl	Pueo	Kokee	3	Native	SE Oahu, MBTA	Rare
Cardinalis cardinalis	Northern Cardinal		Kokee	2, 5	Non-native	MBTA	Common
Carpodacus mexicanus	House Finch		Kokee	3	Non-native	MBTA	Uncommon
Cettia diphone	Japanese Bush Warbler		Kokee	2	Non-native		
Chasiempis sclateri	Oahu Elepaio	Kaua'i 'Elepaio	Kokee	2, 5	Native		Rare
Copsychus malabaricus	White-rumped Shama		Kokee	2	Non-native		Rare
Drepanis coccinea	Scarlet Honeycreeper	I'iwi	Kokee	3	Native	FT, SE, MBTA	Rare
Francolinus erckelii	Erckel's Francolin		Kokee	2	Non-native gamebird		Unknown
Gallus gallus	Red Junglefowl	Moa	Kokee	2, 5	Non-native		Uncommon
Garrulax canorus	Chinese Hwamei		Kokee	2	Non-native		Rare
Geopelia striata	Zebra Dove		Kokee	2, 5	Non-native		Rare
Hemignathus kauaiensis	Kauai Amakihi	Amakihi	Kokee	2	Native	MBTA	Rare
Lonchura punctulata	Nutmeg Manikin		Kokee	3	Non-native		Rare

Scientific Name	Common Name	Hawaiian Name	Location	Reference	Origin	Status	Current Abundance
Oceanodroma castro	Band-rumped Storm-petrel	ʻAkeʻake	Kokee	6	Native	FE, SE, MBTA	
Paroaria coronata	Red-crested Cardinal		Kokee	2, 5	Non-native		Common
Pluvialis fulva	Pacific Golden Plover	Kōlea	Kokee	2, 5	Winter visitor	MBTA	Common
Pterodroma phaeopygia sandwichensis	Hawaiian Petrel	ʻUaʻu	Kokee	6	Native	FE, SE, MBTA	
Puffinus auricularis newelli	Newell's Shearwater	ʻAʻo	Kokee	6	Native	FT, ST, MBTA	
Streptopelia chinensis	Spotted Dove		Kokee	2	Non-native gamebird		Rare
Zosterops japonicus	Warbling White-eye		Kokee	2	Non-native		Abundant
Himatione sanguinea	Apapane	ʻApapane	Kokee Site	2	Native	MBTA	Unknown
Tyto alba	Barn Owl		Kokee Sites	5	Non-native	USFWS Control Order, MBTA	Common
Acridotheres tristis	Common Myna		Makaha Ridge	2, 3, 5	Non-native		Common
Alectoris chukar	Chukar Partridge		Makaha Ridge	2, 3	Non-native gamebird		Abundant
Branta sandvicensis	Hawaiian Goose	Nēnē	Makaha Ridge	2, 5	Native	FE, SE, MBTA	Common
Bubulcus ibis	Cattle Egret		Makaha Ridge	2, 5	Non-native	USFWS Control Order, MBTA	Rare
Cardinalis cardinalis	Northern Cardinal		Makaha Ridge	2, 3, 5	Non-native	MBTA	Abundant
Carpodacus mexicanus	House Finch		Makaha Ridge	2, 3	Non-native	MBTA	Common
Cettia diphone	Japanese Bush Warbler		Makaha Ridge	2	Non-native		

Scientific Name	Common Name	Hawaiian Name	Location	Reference	Origin	Status	Current Abundance
Francolinus erckelii	Erckel's Francolin		Makaha Ridge	2, 3, 5	Non-native gamebird		Common
Francolinus francolinus	Black Francolin		Makaha Ridge	2, 5	Non-native gamebird		Common
Gallus gallus	Red Junglefowl	Moa	Makaha Ridge	2, 3	Non-native		Uncommon
Garrulax canorus	Chinese Hwamei		Makaha Ridge	2, 3	Non-native		Rare
Geopelia striata	Zebra Dove		Makaha Ridge	2, 3, 5	Non-native		Common
Lonchura punctulata	Nutmeg Manikin		Makaha Ridge	3	Non-native		Abundant
Mimus polyglottos	Northern Mockingbird		Makaha Ridge	2, 3, 5	Non-native	MBTA	Common
Oceanodroma castro	Band-rumped Storm-petrel	ʻAkeʻake	Makaha Ridge	6	Native	FE, SE, MBTA	
Paroaria coronata	Red-crested Cardinal		Makaha Ridge	2, 5	Non-native		Common
Phaethon lepturus	White-tailed Tropicbird	Koaʻe kea	Makaha Ridge	2, 5	Breeding visitor	MBTA	Common
Phasianus colchicus	Ring-necked Pheasant		Makaha Ridge	2, 3	Non-native gamebird		Rare
Pluvialis fulva	Pacific Golden Plover	Kōlea	Makaha Ridge	2, 5	Winter visitor	MBTA	Uncommon
Pterodroma phaeopygia sandwichensis	Hawaiian Petrel	ʻUaʻu	Makaha Ridge	6	Native	FE, SE, MBTA	
Puffinus auricularis newelli	Newell's Shearwater	ʻAʻo	Makaha Ridge	6	Native	FT, ST, MBTA	
Streptopelia chinensis	Spotted Dove		Makaha Ridge	2, 3, 5	Non-native gamebird		Common
Zosterops japonicus	Warbling White-eye		Makaha Ridge	2, 3	Non-native		Abundant

Key for Status:

MBTA = Migratory Bird Treaty Act; FE= Federal Endangered; FT= Federal Threatened; SE= State Endangered; ST= State Endangered;
USFWS Control Order 50 CFR Section 21.55

Sources:

1. Pepi, V.E., A. Kumar, M.E. Laut, J. Hallman, J. Kim, and A.D. Anders. 2009. Kaula Island ship-based seabird and marine mammal surveys, 21-22 July 2009. Prepared for Commander, Pacific Fleet. NAVFAC Pacific.
2. Naval Facility Engineering Command Pacific (NAVFAC PAC). 2006. Summary of Bird Species Observed at PMRF. May 2006.
3. Bruner, Phillip L. 2000. Survey of avifauna and feral mammals for the Integrated Natural Resources Management Plan (INRMP) Pacific Missile Range Facility (PMRF) Barking Sands, Kauai, Hawaii.
4. Fujimoto, J. 2012. Kaula ship-based seabird surveys, 30 June 2011. Prepared by Naval Facilities Engineering Command Pacific for Commander, U.S. Pacific Fleet.
5. Incidental Observation by Natural Resources Program biologists

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PMRF TERRESTRIAL WILDLIFE

Family	Scientific Name	Common name	Location	Origin	Status	Abundance
Bovidae	*Capra hircus*	Feral Goat	Makaha Ridge	Introduced		Common
Bufonidae	*Bufo marinus*	Marine Toad	Barking Sands	Introduced		Uncommon
Canidae	*Canis familaris*	Feral Dog	Kokee, Barking Sands	Introduced		Uncommon
Cervidae	*Odocoileus hemionus*	Black-tailed Deer	Kokee, Makaha Ridge, Kamokala	Introduced		Common
Dactyloidae	*Anolis carolinensis*	Green Anole	Makaha Ridge	Introduced		Common
Drosophilidae	*Drosophila musaphilia*	Hawaiian Picture-wing Fly	Kokee	Single Island Endemic	FE, SE	Rare
Drosophilidae	*Drosophila sharpi*	Hawaiian Picture-wing Fly	Kokee	Endemic	FE, SE	Rare
Felidae	*Felis catus*	Feral Cat	Barking Sands, Makaha Ridge, Kokee, Kamokala	Introduced		Common
Gekkonidae	*Hemidactylus frenatus*	House Gecko	Barking Sands, Makaha Ridge	Introduced		Common
Gekkonidae	*Lepidodactylus lugubrus*	Mourning Gecko	Barking Sands, Makaha Ridge	Introduced		Uncommon
Muridae	*Mus muscalus*	Common House Mouse	Barking Sands	Introduced		Rare
Muridae	*Rattus norvegicus*	Norwegian Rat	Kokee	Introduced		Rare
Muridae	*Rattus rattus*	Roof Rat	Kokee, Barking Sands	Introduced		Common
Muridae	*Rattus exulans*	Polynesian Rat	Barking Sands, Kaula	Introduced		Uncommon
Scincidae	*Cryptoblepharus poecilopleurus*	Snake-eyed Skink	Barking Sands	Introduced		Uncommon
Scincidae	*Lampropholis delicata*	Metalic Skink	Kokee	Introduced		Common

Family	Scientific Name	Common name	Location	Origin	Status	Abundance
Suidae	*Sus scrofa*	Feral Pig	Kokee, Makaha Ridge, Kamokala	Introduced		Common
Vespertilionidae	*Lasiurus cinereus semotus*	Hawaiian Hoary Bat	Kokee, Barking Sands, Makaha Ridge, Kamokala	Endemic	FE, SE	Uncommon

Key for Status:

FE= Federal Endangered; FT= Federal Threatened; SE= State Endangered; ST= State Endangered

Sources:

1. Naval Facility Engineering Command Pacific (NAVFAC PAC). 2006. Pacific Missile Range Facility Barking Sands INRMP Herpetological and Mammal Survey. April 2006.

2. Bruner, P. 2000. Survey of avifauna and feral mammals for the Integrated Natural Resources Management Plan (INRMP) Pacific Missile Range Facility (PMRF) Barking Sands, Kauai, Hawaii.

3. Incidental Observation by Natural Resources Program biologists

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PMRF MARINE MAMMALS

Family	Scientific Name	Common name	Hawaiin Name	Special Status	Location	Reference
Balaenopteridae	*Megaptera novaeangliae*	Humpback Whale	Koholā	ESA	O	2
Delphinidae	*Feresa attenuata*	Pygmy killer whale		Protected	O potentially	2
Delphinidae	*Globicephala macrorhynchus*	Pilot whale		Protected	O potentially	2
Delphinidae	*Peponocephala electra*	Melon-headed whale		Protected	O potentially	2
Delphinidae	*Psuedorca crassidens*	False killer whale		Protected	O potentially	2
Delphinidae	*Stenella artenuata*	Spotted dolphin	Nai‘a	Protected	O potentially	2
Delphinidae	*Stenella longirostris*	Spinner dolphin	Nai‘a	Protected	O	2
Delphinidae	*Tursiops truncatus gilli*	Bottlenose dolphin	Nai‘a	Protected	O potentially	2
Phocidae	*Monachus schauinslandi*	Hawaiian Monk Seal	‘Ilio-holo-i-ka-uaua	ESA	K, BS 1, BS 2, BS 3, O	1, 2

Key:
K= Ka'ula Island, BS 1= Nohili, BS 2= Mana, BS 3= Majors, O= Offshore

Sources:

1. Incidental Observation by Natural Resources Program biologists
2. Miller, J., Dollar, S., Millan, A., Ericksen, M., Conger, C., Tumino, G. 2022. Biological and Benthic Habitat Surveys in Support of the Pacific Missile Range Facility (PMRF), Barking Sands Integrated Natural Resource Management Plan (INRMP). Kauai, Hawaii.

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PMRF AQUATIC WILDLIFE

Family/Phylum	Scientific Name	Common Name	Hawaiian Name	Special Status	Location	Reference
Acanthuridae	*Acanthurus achilles*	Achilles tang	Pakuʻikuʻi		BS 1	2, 5
Acanthuridae	*Acanthurus blochii*	Ringtail surgeonfish	Pualu		K, BS 1, BS 2, BS 3, O	1, 2, 3, 5
Acanthuridae	*Acanthurus dussumieri*	Eyestripe surgeonfish	Palani		BS 1, BS 2, BS 3, O	2, 3, 5
Acanthuridae	*Acanthurus glaucopareius*	Gold-rim tang	--		BS 1	3
Acanthuridae	*Acanthurus leucoparieus*	Whitebar surgeonfish	Maikoiko		K, BS 1, BS 2	1, 2, 3, 5
Acanthuridae	*Acanthurus nigrofuscus*	Brown surgeonfish	Maʻiʻiʻ		BS 1, BS 2, BS 3, O	2, 3, 5
Acanthuridae	*Acanthurus nigroris*	Blue-hued surgeonfish	Maiko		BS 1, BS 2, O	2, 3,
Acanthuridae	*Acanthurus olivaceus*	Orangeband surgeonfish	Naenae		BS 1, BS 2, BS 3, O	2, 3, 5
Acanthuridae	*Acanthurus triostegus*	Convict tang	Manini		K, BS 1, BS 2	1, 2, 3, 5
Acanthuridae	*Acanthurus xanthopterus*	Yellowfin surgeonfish	Pualu		BS 1, BS 2, O	2, 3, 5
Acanthuridae	*Ctenochaetus hawaiiensis*	Chevron tang	--		BS 1	3
Acanthuridae	*Ctenochaetus strigosus*	Goldring surgeon	Kole		BS 1, BS 2, O	2, 3, 5
Acanthuridae	*Naso brevirosrtis*				BS 1, O	2, 3
Acanthuridae	*Naso hexacanthus*	Sleek unicornfish	Kala holo		BS 1, O	2, 3, 5
Acanthuridae	*Naso lituratus*	Orangespine unicornfish	Umaumalei		BS 1, BS 2, O	2, 3, 5
Acanthuridae	*Naso unicornis*	Bluespine unicornfish	Kala		BS 1, BS 2, O	2, 3
Acanthuridae	*Zebrasoma flavescens*	Yellow tang	Lauʻipala		BS 1, BS 2	2, 3, 5
Acroporidae	*Montipora capitata*				BS 1, BS 2, BS3, O	3, 5

Family/Phylum	Scientific Name	Common Name	Hawaiian Name	Special Status	Location	Reference
Acroporidae	*Montipora flabellata*				BS 1, BS 2, BS3, O	3, 5
Acroporidae	*Montipora patula*	Ringed rice coral	--		BS 1, BS 2, BS3, O	3, 5
Acroporidae	*Montipora verrilli*				BS 1, BS 2, BS3, O	3
Agariciidae	*Pavona duerdeni*				BS 1, BS 2, BS3, O	3, 5
Agariciidae	*Pavona varians*				BS 1, BS 2, BS3, O	3, 5
Albulidae	*Albula glossodonta*				BS 3	3
Algea	*Amansia glomerata*				BS 1, BS 2	2, 3
Algea	*Acanthophora sp.*				BS 1, BS 2	5
Algea	*Asparagopsis taxiformis*	--	Limu kohu		BS 1, BS 2	2, 3, 5
Algea	*Cladymenia pacifica*				BS 3	3
Algea	*Corallina sp.*				BS 1, BS 2, BS 3, O	3, 5
Algea	*Cyanobacteria*				BS 1, BS 2, BS 3	5
Algea	*Dasya iridescens*				BS 2	5
Algea	*Desmia hornemannii (genus change to portieria?)*				BS 1,BS 2, BS 3, O	2, 3
Algea	*Dictyosphaeria cavernosa*				BS 3	5
Algea	*Dictyota sp.*				BS 1, BS 2, BS 3	5
Algea	*Galaxaura sp.*				BS 1, BS 3	5
Algea	*Gibsmithia hawaiiensis*				BS 1, BS 2, BS 3	5
Algea	*Halimeda opuntia*				BS 2, BS 3	3

Family/Phylum	Scientific Name	Common Name	Hawaiian Name	Special Status	Location	Reference
Algea	*Halimeda sp*				BS 1, BS 2, BS 3	5
Algea	*Jania sp.*				BS 1, BS 3	3
Algea	*Laurencia sp.*				BS 1, BS 2, BS 3	5
Algea	*Liagora sp.*				BS 1, BS 2, BS 3	5
Algea	*Lithophyllum sp.*				BS 1, BS 2, BS 3	5
Algea	*Lobophora variegata*				BS 1, BS 2, BS 3	5
Algea	*Lyngbya majuscula*				BS 1, BS 2, BS 3	5
Algea	*Martensia flabelliformis*				BS 1, BS 2, BS 3	5
Algea	*Microdictyon sp.*				BS 1, BS 2	5
Algea	*Neomeris sp.*				BS 1, BS 2, BS 3	5
Algea	*Padina sp.*				BS 1, BS 2	5
Algea	*Peyssonellia rubra*				BS 1	3
Algea	*Plocamium sandvicense*				BS 1, BS 2	5
Algea	*Porolithon onkodes*				BS 1, BS 2	3
Algea	*Portiera harnemannii*				BS 1, BS 2	5
Algea	*Predaea sp.*				BS 1, BS 2	5
Algea	*Sarcinochrysis marina*				BS 1, BS 2	5
Algea	*Spyridia filamentosa*				BS 2	5
Algea	*Symploca hynoides*				BS 1, BS 2, BS 3	5

Family/Phylum	Scientific Name	Common Name	Hawaiian Name	Special Status	Location	Reference
Algea	*Tolypiocladia sp.*				BS 3	3
Algea	*Thrichogloea requenii*				BS 2	5
Algea	*Turbinaria ornata*				BS 2	5
Annelida	*Loimia medusa*				BS 1, BS 2, O	2, 5
Annelida	*Spirobranchus giganteus*	Christmas tree worm	--		BS 1, BS 3, O	3
Annelida	*Sabellastarte spectabilis*				BS 1	5
Annelida	*Unknown Tube Worm*				BS 1, BS 2	5
Antipathidae	*Antipathes griggi*	black coral	--		BS 1, BS 2, BS3, O	3
Antipathidae	*Cirrhipathes anguina*	wire coral	--		BS 1, BS 2, BS3, O	3
Apogonidae	*Apogon kallopterus*	Iridescent cardinalfish	ʻUpapalu		BS 1, BS 2, BS 3, O	2, 3, 5
Arthropoda	*Panulirus marginatus*	Spiny lobster	Ula		BS 1, BS 2, BS 3	2, 3
Arthropoda	*Paribaccus antarcticus*	Slipper lobster	ʻUlaʻpapa		BS 1, O	2, 3
Arthropoda	*Paribaccus penicillatus*	Spiny lobster	Ula		BS 2	3
Arthropoda	*Rhinolambrus sp.*				BS 3	5
Arthropoda	*Stenopus hispidus*				BS 2	5
Arthropoda	*Crab*				BS 1	5
Aulostomidae	*Aulostomus chinensis*	Trumpetfish	Nunu		BS 1, BS 2, BS 3	2, 3
Balistidae	*Cantherhines dumerili*	Barred filefish	Oʻili		BS 1, BS 3	3
Balistidae	*Cantherhines sandwichiensis*	Squaretail filefish	Oʻili lepa		BS 1, BS 2	2, 3

Family/Phylum	Scientific Name	Common Name	Hawaiian Name	Special Status	Location	Reference
Balistidae	*Canthigaster cornata*	Crown toby	Puu oiai		K, BS 1, BS 3, O	1, 2, 3
Balistidae	*Canthigaster jactator*	Hawaiian whitespotted toby	--		BS 1, BS 2, BS 3, O	2, 3
Balistidae	*Canthigaster rivulata*				BS 2	3
Balistidae	*Melichthys niger*	Black durgon	Humuhumu		BS 1, BS 2, O	2, 3, 5
Balistidae	*Melichthys vidua*	Pinktail durgon	Humuhumu		BS 1, BS 2, BS 3,O	2, 3, 5
Balistidae	*Ostracion meleagris*	Spotted boxfish	Moa		K, BS 1, BS 3, O	1, 2, 3,
Balistidae	*Rhinecanthus rectangulus*	Reef triggerfish	Humuhumu nukunuku	State Fish	K, BS 1, BS 2, BS 3, O	1, 2, 3,5
Balistidae	*Sufflamen bursa*	Lei triggerfish	Humuhumu		BS 1, BS 2, O	2, 3, 5
Balistidae	*Sufflamen fraenatus*	Bridled triggerfish	Humuhumu mimi		BS 1, BS 3, O	2, 3
Balistidae	*Xanthichthys auromarginatus*	Gilded triggerfish	--		O	2, 3
Balistidae	*Xanthichthys mento*	Crosshatch triggerfish	--		O	3
Blenniidae	*Exallias brevis*	Shortbodied blenny	Pao'o kauila		BS 1, BS 2	3,5
Blenniidae	*Plagiotremus ewaensis*				O	2
Blenniidae	*Plagiotremus goslinei*	Biting blenny	--		BS 1, BS 2, O	2, 3
Bryozoa	*Bryozoan spp.*				BS 2	5
Caracanthinae	*Caracanthus sp*	Coral coucher	--		K	1
Carangidae	*Carangoides orthogrammus*	Island trevally	Papio		BS 1	2, 3
Carangidae	*Caranx cheilio*				O	2
Carangidae	*Caranx melampygus*	Bluefin trevally	ʻOmilu		BS 1, BS 2, O	2, 3, 5

Family/Phylum	Scientific Name	Common Name	Hawaiian Name	Special Status	Location	Reference
Carangidae	*Decapterus macarellus*	Mackerel scad	ʻOpelu		BS 1, O	2, 3
Carangidae	*Gnathanodon speciosus*	Yellow jack or golden travally	Ulua paʻopaʻo		BS 2, O	2, 3
Carcharhinidae	*Carcharhinus galapagensis*	Galapagos shark	Mano	Cultural Sign.	K	1
Carcharhinidae	*Carcharhinus plumbaus*	Sandbar shark	Mano	Cultural Sign.	K	1
Carcharhinidae	*Carcharinus lonigmanus*	Oceanic whitetip shark	--	FT, ST	BS 1, BS 2, BS3, O	4
Chaetodontidae	*Chaetodon auriga*	Threadfin butterflyfish	Kikakapu		K, BS 1, BS 2, O	1, 2, 3, 5
Chaetodontidae	*Chaetodon ephippeum*				BS 1	5
Chaetodontidae	*Chaetodon fremblii*	Bluestripe butterflyfish	Kikakapu		BS 1	2
Chaetodontidae	*Chaetodon kleini*	Butterflyfish	Kikakapu		BS 2,O	2, 3, 5
Chaetodontidae	*Chaetodon lunula*	Raccoon butterflyfish	Kikakapu		BS 1, BS 2	2, 3, 5
Chaetodontidae	*Chaetodon milliaris*	Milletseed butterflyfish	Lau wiliwili		BS 1, BS 2, O	2, 3, 5
Chaetodontidae	*Chaetodon multicinctus*	Multiband butterflyfish	Kikakapu		BS 1, BS 2, O	2, 5
Chaetodontidae	*Chaetodon ornatissimus*	Ornate butterflyfish	Kikakapu		BS 1, BS 2	2, 3, 5
Chaetodontidae	*Chaetodon quadrimaculatus*	Fourspot butterflyfish	Lauhau		BS 1, BS 2,BS 3, O	2, 3, 5
Chaetodontidae	*Chaetodon unimaculatus*	Teardrop butterflyfish	Lauhau		BS 1	2, 3, 5
Chaetodontidae	*Forcipiger flavissimus*	Longnose butterflyfish	Lau wiliwili nukunuku		BS 1, BS 2, O	2, 3, 5
Chaetodontidae	*Forcipiger longirostris*				BS 1	5
Chaetodontidae	*Hemitaurichthys polylepis*	Pyramid butterflyfish	--		O	2, 3

Family/Phylum	Scientific Name	Common Name	Hawaiian Name	Special Status	Location	Reference
Chaetodontidae	*Heniochus diphreutes*	Pennantfish	--		O	2, 3
Cheloniidae	*Chelonia mydas*	Green sea turtle	Honu	FT - Central North Pacific DPS, ST	BS 2, BS 3	4, 5
Chordata	*Colonial Tunicate*				BS 1	5
Cnidaria	*Cyphastrea agassizi*				BS 1	5
Cnidaria	*Halocordyle disticha*	Christmas tree hydroid	--		BS 3	3
Cnidaria	*Hydroid sp.*				BS 1	5
Cnidaria	*Lobactis scutaria*				BS1, BS 2	5
Cnidaria	*Pennaria disticha*				BS 1, BS 3	5
Cnidaria	*Sertularella diaphana*				BS 1	5
Cirrhitidae	*Cirrhitops fasciatus*	Red-barred hawkfish	--		BS 1, BS 2, BS 3, O	2, 3, 5
Cirrhitidae	*Cirrhitus pinnulatus*	Stocky hawkfish	Poʻopaʻa		BS 1, O	2, 3,
Cirrhitidae	*Paracirrhites arcatus*	Arc-eye hawkfish	Pilikoa		BS 1, BS 2, BS 3, O	2, 3, 5
Cirrhitidae	*Paracirrhites forsteri*	Blackside hawkfish	Hilu pilikoa		BS 1, BS 2, O	2, 3, 5
Diodontidae	*Diodon hysrix*	Porcupine fish	Kokala		K	1
Echinodermata	*Acanthaster planci*	Crown-of-thorns starfish	--		BS 1	3
Echinodermata	*Actionpyge mauritana*	Sea cucumbers	--		BS 1	2, 3
Echinodermata	*Culcita novaeguineae*				O	2, 3
Echinodermata	*Echinometra matheai*				O	2

Family/Phylum	Scientific Name	Common Name	Hawaiian Name	Special Status	Location	Reference
Echinodermata	*Echinostrephus aciculatus*	Sea urchin	--		BS 1, BS 2, O	2, 3, 5
Echinodermata	*Echinothrix calamaris*	Sea urchin	--		BS 1, BS 2, BS 3, O	2, 3, 5
Echinodermata	*Echinothrix diadema*	Sea urchin	--		BS 1, O	2, 3
Echinodermata	*Eucardus metularia*				O	2
Echinodermata	*Holothuria atra*	Sea cucumber	--		BS 1, BS 2, BS 3, O	2, 3
Echinodermata	*Holothuria whitmaei*	Sea Cucumber	--		BS 3	3
Echinodermata	*Linckia diplax*				O	2
Echinodermata	*Linckia multiflora*	Sea star	--		BS 1, O	2, 3
Echinodermata	*Tripneustes gratilla*	Sea urchin	--		BS 1, BS 2, O	2, 3, 5
Holocentridae	*Myriprises amaena*	menpachi*	--		BS 1	2, 3
Holocentridae	*Myripristis amanea*	Brick soldierfish	ʻUʻu		BS 2	2, 3
Holocentridae	*Myripristis berndti*				BS 1, BS 2	5
Holocentridae	*Myripristis sp.*				BS 1, BS 2	5
Holocentridae	*Sargocentron diadema*	Crown squirrelfish	Alaihi		BS 1	2, 3
Holocentridae	*Sargocentron punctatissimum*	Peppered squirrelfish	ʻAlaiʻihi		BS 1, BS 3	2, 3,
Holocentridae	*Sargocentron xantherythrum*	Hawaiian squirrelfish	ʻAlaiʻihi		BS 1	2, 3
Holocentridae	*Sargocentron sp.*				BS 1	5
Kyphosidae	*Kyphosus bigibbus*	Gray chub, rudderfish	Nenue		BS 1, BS 2	2, 3
Kyphosidae	*Kyphosus sp.*				BS 1	5

Family/Phylum	Scientific Name	Common Name	Hawaiian Name	Special Status	Location	Reference
Labridae	*Anampses chrysocephalus*	Psychedelic wrasse	Hi nalea	Endemic	K	1
Labridae	*Anampses cuvier*	Pearl wrasse	Opule		BS 1, BS 2	2
Labridae	*Bodianus albotaeniatus*				BS 1, BS 2	5
Labridae	*Bodianus bilunulatus*	Hawaiian dogfish	ʻAʻawa		BS 1, BS 2, BS 3, O	2, 3
Labridae	*Cheilinus rhodochrous*				O	2
Labridae	*Cheilio ineris*	Cigar wrasse	Kupoupou		BS 3	3
Labridae	*Coris flavovittata*	Yellowstripe coris	Hilu		BS 1, O	2, 3
Labridae	*Coris gaimard*	Yellowtail coris	Hinalea ʻakilolo		BS 1, BS 2, O	2, 3, 5
Labridae	*Coris venusta*	Wrasse	Hinalea		BS 1, BS 2, BS 3	2, 3, 5
Labridae	*Gomphosus varius*	Bird wrasse	Hinalea ʻiʻiwi		BS 1, BS 2	2, 3, 5
Labridae	*Halichoeres ornatissimus*	Ornate Wrasse	ʻOhua		BS 1, BS 2, O	2, 3, 5
Labridae	*Labroides phthirophagus*	Hawaiian cleaner wrasse	--		BS 1, BS 2, BS 3, O	2, 3, 5
Labridae	*Macropharyngodon geoffroy*	Shortnose wrasse	Hi nalea	Endemic	K	1
Labridae	*Novaculichthys taeniourus*				BS 1, BS 3	5
Labridae	*Pseudocheilinus octotaenia*	Eightstripe wrasse	--		K, BS 1, BS 2	1, 3, 5
Labridae	*Pseudocheilinus tetrataenia*				O	2
Labridae	*Pseudojuloides cerasinus*	Smalltail wrasse	--		O	2, 3
Labridae	*Stethojulis balteata*	Belted wrasse	Omaka	Endemic	K, BS 1	1, 2
Labridae	*Thalassoma ballieui*	Blacktail wrasse	Hinalea luahine	Endemic	K, BS 1, BS 3	1, 2

Family/Phylum	Scientific Name	Common Name	Hawaiian Name	Special Status	Location	Reference
Labridae	*Thalassoma duperrey*	Saddleback wrasse	Hinalea lauwili		BS 1, BS 2, BS 3, O	2, 3, 5
Labridae	*Thalassoma purpureum*	Rainbow or surge wrasse	Hou		BS 1	3
Labridae	*Thalassoma quinquevittatum*	Fivestripe wrasse	Hi nalea	Endemic	K	1
Labridae	*Thalassoma trilobatum*	Christmas wrasse	Awela		BS 1, BS 2	2
Labridae	*Xyrichtys pavo*	Peacock razorfish	Laenihi		BS 3	3
Lethrinidae	*Monotaxis grandoculis*	Bigeye emperor	Mu		BS 1, BS 2, O	2, 3, 5
Lutjanidae	*Aprion virescens*	Gray snapper / green jobfish	Uku		BS 1, BS 3, O	2, 3
Lutjanidae	*Lutjanus fulvus*	Blacktail snapper	To‘au		BS 1, BS 2, BS 3, O	2, 3, 5
Lutjanidae	*Lutjanus kasmira*	Bluestripe snapper	Ta‘ape		BS 1, BS 2, BS 3, O	2, 3, 5
Malacanthidea	*Malacanthus brevirostris*	Flagtail tilefish	Maka‘a		BS 3, O	3
Microdesmidae	*Novaculichthys taeniourus*	Wormfish	--		BS 1	5
Microdesmidae	*Gunnellichthys curiosus*				BS 2	5
Microdismidae	*Ptereleotris heteroptera*	Dartfish	--		BS 1, BS 2	5
Mobulidae	*Manta birostris*	Giant manta ray	--	ST	BS	4
Mollusca	*Bivalve sp.*	Bivalve	--		BS 1	5
Mollusca	*Conus distans*	Cone shells	--		O	2, 3
Mollusca	*Conus ebreus*	Cone shells	--		BS 1	2, 3
Mollusca	*Conus imperaialis*	Cone shells	--		O	2
Mollusca	*Conus leopardus*	Cone shells	--		BS 1, O	2, 3

Family/Phylum	Scientific Name	Common Name	Hawaiian Name	Special Status	Location	Reference
Mollusca	*Conus lividus*	Cone shells	--		BS 1, BS 2, O	2, 3
Mollusca	*Conus miles*	Cone shells	--		O	2, 3
Mollusca	*Conus miliaris*	Cone shells	--		O	2
Mollusca	*Cypraea tigris*	Tiger cowry snail	Leho-kiko		BS 1, BS 2,	3, 5
Mollusca	*Cypraea sp.*	Cowry shell	--		BS 1	5
Mollusca	*Halgerda terramtuentis*				BS 2	5
Mollusca	*Lyncina leviathan*				BS 2	5
Mollusca	*Octopus cyanea*	Octopus	He'e		BS 1, BS 2, O	2, 3, 5
Mollusca	*Pinctada margaritifera*	Black-lipped oyster	Pa		BS 1	3
Mollusca	*Phyllidiella pustulosa*				BS 1, BS 2	5
Mollusca	*Spondylus tenebrosus*	Rock oyster	--		BS 1, O	2, 3
Mollusca	*Turbo sandwicensis*				BS 1	5
Mollusca		Snail, Cone	--		BS 1, BS 2	5
Mollusca		Snail, Horn	--		BS 1, BS 2, BS 3	5
Mollusca		Snail, Drupe	--		BS 1, BS 2	5
Mullidae	*Mulloidichthys flavolineatus*	Yellowstripe goatfish	Weke'a		K, BS 1, BS 2, BS 3, O	1, 2, 3, 5
Mullidae	*Mulloidichthys vanicolensis*	Yellowfin goatfish	Weke'ula		BS 1, BS 2, O	2, 3
Mullidae	*Parupeneus bifasciatus*	Doublebar goatfish	Munu		BS 1, BS 2, O	2, 3
Mullidae	*Parupeneus cyclostomus*	Blue goatfish	Moano kea		BS 1, O	2, 3, 5

Family/Phylum	Scientific Name	Common Name	Hawaiian Name	Special Status	Location	Reference
Mullidae	*Parupeneus multifasciatus*	Manybar goatfish	Moano		BS 1, BS 2, BS 3, O	2, 3, 5
Mullidae	*Parupeneus pleurostigma*	Sidespot goatfish	Malu		BS 1, BS 2, BS 3, O	2, 3
Mullidae	*Parupeneus porphyreus*	Whitesaddle goatfish	Kumu		BS 3	3
Muraenidae	*Conger cinerus*				BS 1	2
Muraenidae	*Gymnothorax flavimarginatus*				BS 1, O	2
Muraenidae	*Gymnothorax meleagris*				BS 1	2
Muraenidae	*Gymnothorax steindachneri*				BS 3	3
Muraenidae	*Gymnothorax undulatas*	--	Puhi laumilo		BS 1, BS 3, O	2, 3
Myliobatidae	*Aetobatis narninari*				BS 3	3
Oplegnathidae	*Oplegnathus punctatus*	Spotted knifejaw	--		BS 1, BS 3	3
Platyheminthes	*Pseudobiceros cf. dimidiatus*	Flatworm	--		BS 1, BS 2	5
Pocilloporidae	*Pocillopora damicornis*				BS 1, BS 2	5
Pocilloporidae	*Pocillopora eydouxi*	Antler coral	--		BS 1, BS 2, BS3, O	3
Pocilloporidae	*Pocillopora grandis*				BS 1, BS 2, BS 3	5
Pocilloporidae	*Pocillopora meandrina*	Cauliflower coral	kKo'a	ESA candidate	BS 1, BS 2, BS3, O	3, 5
Pomacanthidae	*Centropyge fisheri*		--		O	2
Pomacanthidae	*Centropyge loriculus*	Flame angelfish	Wekea		K	1
Pomacanthidae	*Centropyge potteri*	Potter's angelfish	--		O	2, 3
Pomacanthidae	*Holocanthus arcuatus*	Bandit angelfish	--		O	2, 3

Family/Phylum	Scientific Name	Common Name	Hawaiian Name	Special Status	Location	Reference
Pomacentridae	*Abudefduf abdominalis*	Hawaiian sergeant major	Mamo	Endemic	K, BS 1, BS 2, BS 3	1, 2, 3, 5
Pomacentridae	*Abudefduf sordidus*	--	--		BS 2	3
Pomacentridae	*Chromis agilis*	Agile chromis	--		BS 1, O	2, 3, 5
Pomacentridae	*Chromis hanui*	Hawaiian bicolor chromis	--		BS 1, O	2, 3, 5
Pomacentridae	*Chromis ovalis*	Oval chromis	--	Endemic	K, BS 1, BS 2, BS 3	1, 2, 5
Pomacentridae	*Chromis vanderbiliti*	Blackfin chromis	--		BS 1, BS 2, BS 3, O	2, 3
Pomacentridae	*Chromis verator*	Threespot chromis	--		O	2, 3
Pomacentridae	*Dascyllus albisella*	Hawaiian damsel	ʻAloʻiloi		BS 1, BS 2, BS 3, O	2, 3
Pomacentridae	*Plectroglyphidodon imparipennis*	Damselfish	--		BS 1, BS 2, BS 3	2, 3, 5
Pomacentridae	*Plectroglyphidodon johnstonianus*	Blue-eye damselfish	--		BS 1, BS 2, BS 3, O	2, 3, 5
Pomacentridae	*Plectroglyphidodon marginatus*				BS 1, BS 2	5
Pomacentridae	*Pycnochromis vanderbilti*				BS 1, BS 2, BS 3	5
Pomacentridae	*Stegastes fasciolatus*	Pacific gregory	--	Endemic	K, BS 1	1, 2, 3
Porifera	*Chondrosia chucalla*				BS 3	3
Porifera	*Dactylospongia sp.*				BS 3	3
Porifera	*Spirastrella vagabunda*				BS 1, BS 2, BS 3	5
Porifera	*Porifera sp.*				BS 1, BS 2, BS 3	5
Poritidae	*Porites brighami*				BS 1	5

Family/Phylum	Scientific Name	Common Name	Hawaiian Name	Special Status	Location	Reference
Poritidae	*Porites compressa*				BS 1, BS 2, BS3, O	3, 5
Poritidae	*Porites evermanni*				BS 1, BS 2, BS3, O	3, 5
Poritidae	*Porites lobata*	Lobe coral	Pōhaku puna		BS 1, BS 2, BS3, O	3, 5
Poritidae	*Porites solida*				BS 1	5
Priacanthidae	*Heteropriacanthus cruentatus*	Glasseye	Aweoweo		BS 1	3
Scaridae	*Chlorurus perspicillatus*				BS 2	5
Scaridae	*Chlorurus spilurus*				BS 1,	5
Scaridae	*Calotomus carolinus*	Stareye parrotfish	Ponuhunuhu		BS 1, BS 3	2, 3
Scaridae	*Scarus perspicillatus*	Spectacled parrotfish	Uhu uli uli, Ulu ʻahuʻula		BS 1, O	2, 3
Scaridae	*Scarus psittacus*	Palenose parrotfish	Uhu		BS 1, BS 2	2, 3, 5
Scaridae	*Scarus rubroviolaceus*	Redlip parrotfish	Palukaluka		BS 1, BS 2, O	2, 3, 5
Scaridae	*Scarus sordidus*	Bullethead parrotfish	Uhu		BS 1, BS 3	2, 3
Scleractinia incertae sedis	*Leptastrea bewickensis*				BS 1, BS 2	5
Scleractinia incertae sedis	*Leptastrea purpurea*				BS 1, BS 2, BS3, O	3, 5
Scleractinia incertae sedis	*Leptastrea transversa*				BS 1, BS 2	5
Scorpaenidae	*Scorpaenopsis cacopsis*	Jenkin's scorpionfish	Nohu		BS 1	3
Scorpaenidae	*Scorpaenopsis dibolus*	Devil scorpionfish	Nohu ʻo mākaha		BS 1, BS 2	2, 3

Family/Phylum	Scientific Name	Common Name	Hawaiian Name	Special Status	Location	Reference
Serranidae	*Cephalopholis argus*	Peacock grouper	Roi		BS 1, BS 2, B 3	2, 3, 5
Serranidae	*Pseudanthis thompsoni*				O	2, 3
Sphenopidae	*Palythoa tuberculosa*				BS 1, BS 2	5
Synodontidae	*Synodus gracilis*				BS 3	3
Synodontidae	*Synodus varegatus*	Reef lizardfish	‘Ulae		BS 1, O	2, 3
Tetraodontidae	*Arothron meleagris*	Spotted puffer	Moa		K	1
Tetraodontidae	Canthigaster amboinensis				BS 1, BS 2	5
Tetraodontidae	Canthigaster jacator				BS 1, BS 2	5
Zanclidae	*Zanclus cornutus*	Moorish idol	Kihikihi		BS 1, BS 2, O	2, 3, 5

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3. Dollar, S. and R. Brock. 2006. Survey of Marine and Fishery Resources for an Integrated Natural Resources Management Plan (INRMP) for the Pacific Missile Range Facility (PMRF), Barking Sands, Kauai, Hawaii.
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5. Miller, J., Dollar, S., Millan, A., Ericksen, M., Conger, C., Tumino, G. 2022. Biological and Benthic Habitat Surveys in Support of the Pacific Missile Range Facility (PMRF), Barking Sands Integrated Natural Resource Management Plan (INRMP). Kauai, Hawaii.

Key:
K= Ka'ula Island
BS 1= Nohili
BS 2= Mana
BS 3= Majors
O= Offshore

APPENDIX D – INRMP PROJECT, SCHEDULE, AND IMPLEMENTATION

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OBJECTIVE	ACTION / STRATEGY	KEY DRIVER	YEAR	EPR#
General Habitat Management (Multiple Sites)				
Erosion Management				
Monitor, minimize, and restore erosion and soil compaction sites.	Conduct general surveys for erosion and soil compaction issues annually to prioritize restoration sites.	ESA, SA	annual	610642N002
Monitor, minimize, and restore erosion and soil compaction sites.	Mitigate and prevent erosion of coastal dune habitat by out-planting, establishing, and monitoring native dune building plants in areas identified as having erosion issues.	ESA, SA	annual	610641N001
Monitor, minimize, and restore erosion and soil compaction sites.	Implement additional security measures such as increased signage and roping off certain areas to reduce off-road vehicle presence in the Nohili Dunes area.	ESA, BO, CH, SA	annual	610641N001
Monitor, minimize, and restore erosion and soil compaction sites.	Participate in future cooperative studies assessing potential shoreline loss that threatens base infrastructure or sensitive habitats.	Infrastructure, CH, ESA, SA	annual	(program labor)
Monitor, minimize, and restore erosion and soil compaction sites.	Monitor ungulate exclusion fence for areas vulnerable to ingress monthly and regularly monitor site for ungulate presence. Remove ungulates when identified within the fenced area.	Infrastructure, ESA, SA	annual	6106411R20
Monitor, minimize, and restore erosion and soil compaction sites.	Maintain Mākaha Ridge ungulate exclusion fencing for erosion control and to maintain water quality.	Infrastructure, ESA, SA	annual	6106411R20
Monitor, minimize, and restore erosion and soil compaction sites.	Out-plant native, drought tolerant plants in areas identified as having erosion and soil compaction issues. Ensure that a regular monitoring schedule and a sufficient irrigation system is in place until plants are well established.	Infrastructure, ESA	annual	6106411R08 6106411R19 6106411R22 610641N001

Invasive Plant Management				
Minimize and prevent encroachment of invasive species into protected species habitats and other priority native vegetation communities to the greatest extent practicable.	Include biosecurity requirements and provisions in Base Operating Support and construction contracts to reduce the risk of introduction of invasive species and plant diseases.	EO 13751, ESA, CH, SA, Infrastructure	annual	6106411R06
Minimize and prevent encroachment of invasive species into protected species habitats and other priority native vegetation communities to the greatest extent practicable.	Ensure that species identified as invasive in Hawai‘i, including those on the Plant Pono “Black List”, are not utilized for landscaping or erosion control projects by developing a Landscaping Guide to include in all base contracts, integrate into the installation appearance plan, and provide to project managers that specifies an approval process for species selection. Conduct outreach and education to base personnel and residents.	EO 13751, ESA, CH, SA, Infrastructure	annual	6106411R06
Minimize and prevent encroachment of invasive species into protected species habitats and other priority native vegetation communities to the greatest extent practicable.	Ensure early detection and a rapid response to invasive plant species through a minimum of annual surveys at all high-risk and sensitive areas.	EO 13751, ESA, CH, SA, Infrastructure	annual	6106411R08 6106411R19 6106411R22 610641N001
Minimize and prevent encroachment of invasive species into protected species habitats and other priority native vegetation communities to the greatest extent practicable.	Conduct removal of invasive plant species in sensitive areas, monitor for re-growth, and restore using out-plantings if necessary, with a target of 80% reduction in invasive species within the areas of concern.	EO 13751, ESA, CH, SA, Infrastructure	annual	6106411R08 6106411R19 6106411R22 610641N001
Minimize and prevent encroachment of invasive species into protected species habitats and other priority native vegetation communities to the greatest extent practicable.	Decrease driving on dune vegetation, which can further increase the spread of invasive species into native habitats; continue to prohibit driving in designated Ni‘ihau panicgrass critical habitat and culturally sensitive areas.	EO 13751, ESA, CH, SA, Infrastructure	annual	(program labor)
Native Plant Management				
Conserve and enhance native plant communities to the greatest extent	Update baseline floral surveys to improve understanding of plant community at PMRF.	ESA, CH, SA	annual	6106411R12

practicable in a manner consistent with BASH requirements.				
Conserve and enhance native plant communities to the greatest extent practicable in a manner consistent with BASH requirements.	Ensure and assist in the selection of locally sourced, non-invasive, and preferably native species, with a minimum of 50 percent native species for all new landscape planting projects by 2022 and 100 percent by 2028 while adhering to BASH requirements.	ESA, CH, SA, Infrastructure	annual	6106411R06
Conserve and enhance native plant communities to the greatest extent practicable in a manner consistent with BASH requirements.	Ensure that post planting care, including irrigation, invasive plant/weed control, and long-term monitoring and maintenance is implemented for all native plan restoration projects.	ESA, CH, SA, Infrastructure	annual	6106411R08 6106411R19 6106411R22 610641N001
Conserve and enhance native plant communities to the greatest extent practicable in a manner consistent with BASH requirements.	Identify suitable locations for planting native Hawaiian plants, particularly those that benefit native pollinators in support of national pollinator objectives.	SA	annual	6106411R08 6106411R19 6106411R22 610641N001
Conserve and enhance native plant communities to the greatest extent practicable in a manner consistent with BASH requirements.	Strive to find new opportunities to collaborate with partners on removing invasive and exotic vegetation and planting opportunities.	ESA, CH, SA, Infrastructure	annual	(program labor)
Wildland Fire Management				
Provide technical support to tenant commands and base planners to help identify and mitigate wildland fire issues.	Coordinate with the PMRF Fire Department on developing updates to the existing Fire Management Plan.	Infrastructure, SA	annual	(program labor)
Provide technical support to tenant commands and base planners to help identify and mitigate wildland fire issues.	Remove deadfall in high-risk areas including near the Barking Sands missile launch site and the Kamokala Magazines and replant with native, low fire risk species.	Infrastructure, SA	annual	(program labor)
Invasive Animal Management				
Reduce established non-native predator populations to the greatest extent practicable and reduce the risk of further introductions to protect	Continue to fund control measures for non-native predator species at Barking Sands, Mākaha Ridge	BO, ESA, EO 13751, SA, Infrastructure	annual	6106412036

special status species and other native wildlife.	Tracking Station, and Kōkeʻe Site C (PMRF Biological Opinion, 2014).			
Reduce established non-native predator populations to the greatest extent practicable and reduce the risk of further introductions to protect special status species and other native wildlife.	Develop a PMRF Biosecurity Plan and include those requirements and provisions in BOS and construction contracts to ensure invasive ants, frogs, and other non-native wildlife are not introduced via equipment or landscaping efforts.	ESA, EO 13751, SA, Infrastructure	annual	6106411R06
Reduce established non-native predator populations to the greatest extent practicable and reduce the risk of further introductions to protect special status species and other native wildlife.	Increase outreach to base personnel on reporting and early detection for invasive species not yet established at PMRF. Ensure all observations or reports of high-risk invasive species are communicated to KISC and to all other appropriate contacts.	ESA, EO 13751, SA	annual	6106411R06 (program labor)
Reduce established non-native predator populations to the greatest extent practicable and reduce the risk of further introductions to protect special status species and other native wildlife.	Conduct surveys to improve baseline knowledge of populations of invasive animals at PMRF.	BO, EO 13751, ESA, SA, Infrastructure	annual	6106411R20 6106412003 6106412036
Reduce established non-native predator populations to the greatest extent practicable and reduce the risk of further introductions to protect special status species and other native wildlife.	Work with partner organizations to identify sources of Feral Cats and Dogs off base so as to reduce the population of these non-native predators.	BO, EO 13751, ESA, SA	annual	6106412036 (program labor)
Reduce established non-native predator populations to the greatest extent practicable and reduce the risk of further introductions to protect special status species and other native wildlife.	Consider partnering with the Department of Land and Natural Resources – Division of Forestry and Wildlife to do auditory predator deterrent studies on base and utilize the technology at PMRF if proven to be effective against predators.	BO, EO 13751, ESA, SA	annual	6106412036 (program labor)

Reduce established non-native predator populations to the greatest extent practicable and reduce the risk of further introductions to protect special status species and other native wildlife.	Conduct ant surveys to assess presence of invasive ants including the little fire ants at the Nohili Dune's Wedge-tailed Shearwater colony. If Little Fire Ants are detected, report to KISC and implement active control by using granular bait after fledglings have left the area.	MBTA, EO 13751, SA, Infrastructure	annual	6106412036 6106411R04
Reduce established non-native predator populations to the greatest extent practicable and reduce the risk of further introductions to protect special status species and other native wildlife.	Increase outreach about the hazards of feeding feral/invasive species with all personnel on PMRF and assist in the enforcement of such policies by practicing good communication with Security.	BO, ESA, EO 13751, SA, Infrastructure	annual	6106412036 (program labor)
Reduce established non-native predator populations to the greatest extent practicable and reduce the risk of further introductions to protect special status species and other native wildlife.	Continue to partner with the Hawai'i Department of Agriculture to ensure Coconut Rhinocerus Beetle traps are checked and maintained at PMRF.	EO 13751, SA	annual	6106411R06 (program labor)
Special Status Species Management				
Endangered Seabird Management				
Minimize possible negative impacts to federally listed, endangered Hawaiian seabird species while providing maximum flexibility for training and operations.	Continue to promote base-wide awareness and implementation of the PMRF Dark Skies Program (PMRF Biological Opinion, 2018) through early annual trainings.	BO, ESA, SA	annual	6106410R01 610642N002 (program labor)
Minimize possible negative impacts to federally listed, endangered Hawaiian seabird species while providing maximum flexibility for training and operations.	Continue to improve the Dark Skies Program lighting waiver system and grant standing waivers where applicable to stream-line the waiver process.	BO, ESA, SA	annual	6106410R01 610642N002 (program labor)

Minimize possible negative impacts to federally listed, endangered Hawaiian seabird species while providing maximum flexibility for training and operations.	Continue Dark Skies implementation in areas adjacent to colonial nesting grounds at high elevation nesting sites during critical fledging timeframes.	BO, ESA, SA	annual	6106410R01 610642N002 (program labor)
Minimize possible negative impacts to federally listed, endangered Hawaiian seabird species while providing maximum flexibility for training and operations.	Conduct systematic ground searches for fallen out seabirds after high risk night operations.	BO, ESA, SA	annual	6106410R01 610642N002
Minimize possible negative impacts to federally listed, endangered Hawaiian seabird species while providing maximum flexibility for training and operations.	Continue to fund and implement surveys to assess mortality from tower strikes at Kōkeʻe Site C to include scavenger trials, searcher efficiency trials, and carcass searches in accordance with USFWS communication tower monitoring protocols (PMRF Biological Opinion, 2018).	BO, ESA, SA	annual	6106410R01 610642N002
Minimize possible negative impacts to federally listed, endangered Hawaiian seabird species while providing maximum flexibility for training and operations.	Continue to fund and implement acoustic and visual monitoring programs of communication towers at Kōkeʻe Site C for seabird strikes to inform management and provide data to be used in the re-evaluation of the Newell's Shearwater portion of the PMRF Base-wide BO.	BO, ESA, SA	annual	6106410R01 610642N002
Minimize possible negative impacts to federally listed, endangered Hawaiian seabird species while providing maximum flexibility for training and operations.	Minimize the potential for death or injury of Newell's Shearwater due to collisions with PMRF communication towers located at Kōkeʻe Site C (PMRF Biological Opinion, 2018) by installing bird diverters.	BO, ESA, SA	annual	6106410R01 610642N002
Minimize possible negative impacts to federally listed, endangered Hawaiian seabird species while providing maximum flexibility for training and operations.	Incorporate results of radar studies into future programs. Consider conducting additional radar studies at the Mākaha Ridge and Kōkeʻe sites.	BO, ESA, SA	annual	6106410R01 610642N002
Minimize possible negative impacts to federally listed, endangered Hawaiian seabird species while	Pursue avenues to provide funding to SOS to assist with seabird rehabilitation costs.	BO, ESA, SA	annual	6106410R01

providing maximum flexibility for training and operations.				
Minimize possible negative impacts to federally listed, endangered Hawaiian seabird species while providing maximum flexibility for training and operations.	Continue to host a SOS shearwater aid station at PMRF and monitor station during business days with SOS monitoring on weekends and holidays (PMRF Biological Opinion, 2014).	BO, ESA, SA	annual	(program labor)
Minimize possible negative impacts to federally listed, endangered Hawaiian seabird species while providing maximum flexibility for training and operations.	Advise various tenants on base on appropriate safety lighting that is less attractive to endangered seabirds (i.e., motion sensing lights that go off after a set time period, shielded lights, facing light away from the coast, lower lumen, and lower to the ground).	BO, ESA, SA	annual	6106410R01 610642N002 (program labor)
Minimize possible negative impacts to federally listed, endangered Hawaiian seabird species while providing maximum flexibility for training and operations.	Provide a 10-year calendar to mission planners with high-risk dates for endangered seabird fallout clearly depicted.	BO, ESA, SA	annual	6106410R01 610642N002 (program labor)
Minimize possible negative impacts to federally listed, endangered Hawaiian seabird species while providing maximum flexibility for training and operations.	Develop a Wildlife Friendly Lighting Guide for installation personnel and tenants to assist in planning for lighting needs.	BO, ESA, SA	annual	6106410R01 610642N002 (program labor)
Nēnē Management				
Reduce impacts to the federally endangered Nēnē while providing maximum flexibility for testing and training.	Collaborate with USFWS, PMRF Air Ops, and DOFAW to continue to revise action plans for Nēnē that attempt to or successfully nest on the airfield to facilitate rapid response, based on past observations and new knowledge.	ESA, BASH, SA	annual	610642N002 (program labor)
Reduce impacts to the federally endangered Nēnē while providing maximum flexibility for testing and training.	Coordinate with USFWS, DOFAW, PMRF Air Ops, and PMRF Public Works to annually review and update the PMRF Nēnē Management Plan (PMRF Biological Opinion, 2014).	BO, ESA, BASH, SA	annual	610642N002 (program labor)

Reduce impacts to the federally endangered Nēnē while providing maximum flexibility for testing and training.	Work with PMRF Air Ops and USDA-WS to insure nēnē hazing efforts are increased prior to and during the breeding season with the possibility of including weekends especially if a nēnē pair has been regularly observed on or near the airfield.	BO, ESA, BASH, SA	annual	610642N002 (program labor)
Reduce impacts to the federally endangered Nēnē while providing maximum flexibility for testing and training.	Continue to conduct regular, standardized surveys for Nēnē at PMRF Barking Sands, Mākaha Ridge, and Kōke'e sites to improve detections of Nēnē nests determine habitat types that attract the species, and to update management (PMRF Biological Opinion, 2014).	BO, ESA, BASH, SA	annual	610642N002 (program labor)
Reduce impacts to the federally endangered Nēnē while providing maximum flexibility for testing and training.	Continue to communicate with facilities maintenance personnel about nēnē nest locations and collaborate with them to develop effective protective measures for the species and ensure that no vegetation removal or other persistent disturbances occur within 100 ft. (30.5m) of nest sites and goslings to reduce risk of take.	BO, ESA, SA	annual	610642N002 (program labor)
Reduce impacts to the federally endangered Nēnē while providing maximum flexibility for testing and training.	Support regular outreach to base visitors and personnel on the importance of not providing food and water to Nēnē (PMRF Biological Opinion, 2014), and develop outreach material aimed at increasing awareness of the species.	BO, ESA, BASH, SA	annual	610642N002 (program labor)
Reduce impacts to the federally endangered Nēnē while providing maximum flexibility for testing and training.	For all new construction at Barking Sands, including construction for tenant or customer DoD commands or other federal agencies, concrete, asphalt, gravel, xeriscaping, or native vegetation, rather than lawn, will be installed in open areas surrounding buildings and parking areas to decrease attraction of Nēnē (PMRF Biological Opinion, 2014).	BO, ESA, BASH, SA	annual	(program labor)
Reduce impacts to the federally endangered Nēnē while providing maximum flexibility for testing and training.	Fund habitat modification that discourages nene presence near roadways, the airfield, and construction sites at Barking Sands.	BO, ESA, BASH, SA	annual	610642N002 (program labor)

Reduce impacts to the federally endangered Nēnē while providing maximum flexibility for testing and training.	Supplement ongoing water quality testing to detect particulates and soluble chemicals in waters at PMRF. Testing should be conducted at least quarterly.	ESA, SA	annual	610642N002 (program labor)
Reduce impacts to the federally endangered Nēnē while providing maximum flexibility for testing and training.	Continue to explore and implement strategies to reduce risk of vehicle strikes, including additional vehicle calming measures, evaluate efficacy of permanent, temporary and marquee signs, and explore new tools to reduce vehicle strikes.	ESA, SA	annual	610642N002 (program labor)
Obtain life history information to inform adaptive management strategies that will provide a conservation benefit to federally endangered Nēnē.	Continue to communicate and share data with USDA-WS and DOFAW regularly.	SA	annual	610642N002 (program labor)
Obtain life history information to inform adaptive management strategies that will provide a conservation benefit to federally endangered Nēnē.	Collaborate with DOFAW to have all nēnē that hatch at PMRF banded and pursue permission and permits for PMRF natural resources staff to band birds if allowable.	BASH, ESA, SA	annual	610642N002 (program labor)
Obtain life history information to inform adaptive management strategies that will provide a conservation benefit to federally endangered Nēnē.	Implement priority management actions identified in the PMRF Nēnē Management Plan. Work with partners to identify potential opportunities to collaborate on off-installation conservation efforts or research opportunites to inform Nēnē management at PMRF and ensure a holistic approach that aligns with regional priorities for Nēnē protection and recovery (PMRF Biological Opinion, 2014).	ESA, BASH, SA	annual	610642N002 (program labor)
Hawaiian Hoary Bat Management				
Reduce impacts to the federally endangered Hawaiian hoary bat while providing maximum flexibility for training and operations.	Continue to avoid and minimize effects of base infrastructure, operations, and maintenance on Hawaiian hoary bats, by ensuring that trimming or removal of woody plants greater than 15 ft (5 m) tall is conducted outside of the Hawaiian hoary bat pupping season of 1 June to 15 September to avoid impacting bat pups.	BO, ESA, Bat MOU, SA	annual	610642N002 (program labor)

Reduce impacts to the federally endangered Hawaiian hoary bat while providing maximum flexibility for training and operations.	Conduct follow-up acoustic surveys for Hawaiian hoary bats every 5 years. If bat roosting and pupping sites are of interest for management of the species, then a mist netting and tracking study could be performed if warranted.	BO, ESA, Bat MOU, SA	annual	610642N002 (program labor)
Reduce impacts to the federally endangered Hawaiian hoary bat while providing maximum flexibility for training and operations.	Work with USFWS to develop and implement a standard operating procedure for bat roosting surveys if base operations warrant the need to remove and trim trees greater than 15 ft. (5 m) tall during the Hawaiian hoary bat pupping season.	ESA, SA, BAT MOU, Infrastructure	annual	610642N002 (program labor)
Migratory Bird Management				
Maintain and protect nesting and foraging habitats of native bird species protected by the MBTA at PMRF when consistent with BASH and other mission constraints and discourage non-native MBTA species presence at PMRF.	Continue to incorporate monitoring of shorebirds, Cattle Egrets, and Black-crowned Night Herons at wetland sites, and observations of Barn Owls, to inform control measures for non-native species and protective measures for native species. Conduct Pueo surveys in high-quality habitat.	MBTA, SA, ESA, Infrastructure	annual	6106411R04 6106419R01
Maintain and protect nesting and foraging habitats of native bird species protected by the MBTA at PMRF when consistent with BASH and other mission constraints and discourage non-native MBTA species presence at PMRF.	Keep track of any newly established non-native songbird species at PMRF and their numbers by participating in the annual Audubon Christmas Bird Count.	MBTA, BASH, SA	annual	6106411R04
Maintain and protect nesting and foraging habitats of native bird species protected by the MBTA at PMRF when consistent with BASH and other mission constraints and discourage non-native MBTA species presence at PMRF.	Continue to advise development projects at PMRF that have potential to negatively impact native MBTA species habitat on how to avoid impacts.	MBTA, SA	annual	6106411R04 (program labor)

Maintain and protect nesting and foraging habitats of native bird species protected by the MBTA at PMRF when consistent with BASH and other mission constraints and discourage non-native MBTA species presence at PMRF.	Advise development projects at PMRF on how to avoid creating habitat and foraging availability for non-native MBTA species at PMRF especially near the PMRF airfield.	BASH	annual	(program labor)
Terrestrial Invertebrate and Pollinator Management				
Monitor and maintain biodiversity of native terrestrial invertebrate and pollinator populations at PMRF.	Conduct species inventory at additional PMRF sites, and conduct monitoring for native invertebrate species. Consider coordinating with USFWS entomologists to identify priority species and provide expertise and training to natural resources staff.	SA, ESA, Pollinator MOU, CHE	Every 5 years	6106411R21 6106412003
Monitor and maintain biodiversity of native terrestrial invertebrate and pollinator populations at PMRF.	Coordinate all use of pesticides by natural resources staff with the NAVFAC PAC PMC and ensure that all applicators have received appropriate certifications.	State and Federal Laws and Requirements, Pollinator MOU	annual	(program labor)
Monitor and maintain biodiversity of native terrestrial invertebrate and pollinator populations at PMRF.	Ensure that treatments will not have negative effects on protected species.	SA, ESA, Pollinator MOU	annual	6106411R21 (program labor)
Monitor and maintain biodiversity of native terrestrial invertebrate and pollinator populations at PMRF.	Prohibit the use of neonicotinoids at PMRF sites.	SA, ESA, Pollinator MOU	annual	6106411R21 (program labor)
Monitor and maintain biodiversity of native terrestrial invertebrate and pollinator populations at PMRF.	Ensure that plant communities found to support native terrestrial invertebrate species are protected, enhanced, and that construction or removal projects have minimal effects on these populations.	SA, Pollinator MOU, ESA	annual	6106411R08 610641N00161 06411R22 (program labor)
Data Collection and Database and Records Management				

Implement measures to ensure that natural resources data is collected in a consistent manner, that data is easily shared with internal and external partners and streamline data inputting methods with the goal of decreasing errors and increasing efficiency.	Ensure that natural resources staff follow established standardized monitoring and surveying procedures.	BO, ESA, SA, BASH, MBTA	annual	all
Implement measures to ensure that natural resources data is collected in a consistent manner, that data is easily shared with internal and external partners and streamline data inputting methods with the goal of decreasing errors and increasing efficiency.	Continue to require GIS deliverables for all contractors, including in-house projects that follow appropriate data collection standards and ensure that all geospatial data is incorporated into the NAVFAC GeoReadiness Repository and that it complies with the Navy Data Model (NDM) adaptation of the Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) for GIS database management.	BO, ESA, SA, BASH, MBTA	annual	all
Implement measures to ensure that natural resources data is collected in a consistent manner, that data is easily shared with internal and external partners and streamline data inputting methods with the goal of decreasing errors and increasing efficiency.	Consider acquiring tablets or Trimble units with excel/GIS uploading capabilities that natural resources staff can utilize for data collection in the field.	BO, ESA, SA, BASH, MBTA	annual	610642N00261 06419R01
Implement measures to ensure that natural resources data is collected in a consistent manner, that data is easily shared with internal and external partners and streamline data inputting methods with the goal of decreasing errors and increasing efficiency.	Acquire the ability to upload GPS data directly to government computers.	BO, ESA, SA, BASH, MBTA	annual	(program labor)
Implement measures to ensure that natural resources data is collected in a consistent manner, that data is easily shared with internal and external partners and streamline data inputting	Coordinate data sharing with natural resources partner agencies USFWS, DLNR and NOAA; coordinate common data collection formatting as possible.	SA	annual	(program labor)

methods with the goal of decreasing errors and increasing efficiency.				
Outdoor Recreation				
Provide military personnel, their dependents, and the public, opportunities to participate in outdoor recreation activities that capitalize on natural resources. These activities, however, should be controlled and monitored when they interfere with natural resource management objectives and goals.	Continue to provide public opportunities for natural resource related outdoor recreation where it does not conflict with public health and safety, the military mission, or security.	SA, ESA	annual	(program labor)
Provide military personnel, their dependents, and the public, opportunities to participate in outdoor recreation activities that capitalize on natural resources. These activities, however, should be controlled and monitored when they interfere with natural resource management objectives and goals.	Ensure that the degree of access allowed for outdoor recreation is consistent with conservation of natural resources.	SA, ESA	annual	(program labor)
Provide military personnel, their dependents, and the public, opportunities to participate in outdoor recreation activities that capitalize on natural resources. These activities, however, should be controlled and monitored when they interfere with natural resource management objectives and goals.	Continue to promote awareness among recreational users of the importance of resource stewardship and promote a sense of pride in the natural environment of PMRF.	SA	annual	(program labor)
Provide military personnel, their dependents, and the public,	Provide PMRF Recreation Pass Program applicants with information on pertinent natural resources information as part of the application process.	SA	annual	(program labor)

opportunities to participate in outdoor recreation activities that capitalize on natural resources. These activities, however, should be controlled and monitored when they interfere with natural resource management objectives and goals.				
Provide military personnel, their dependents, and the public, opportunities to participate in outdoor recreation activities that capitalize on natural resources. These activities, however, should be controlled and monitored when they interfere with natural resource management objectives and goals.	Continue to restore and enhance natural and cultural resource assets at PMRF for public benefit and enjoyment.	SA	annual	(program labor)
Provide military personnel, their dependents, and the public, opportunities to participate in outdoor recreation activities that capitalize on natural resources. These activities, however, should be controlled and monitored when they interfere with natural resource management objectives and goals.	Develop a Natural Resources Information Center to include brochures and other materials promoting self-guided nature walks and bird watching opportunities on base and in the surrounding areas. Information on threats to native Hawaiian ecosystems and threatened and endangered species should be included, with particular emphasis on the introduction and spread of alien plant species and the negative effects of off-road vehicles in sensitive environments and measures that can be taken to avoid such impacts.	SA, ESA	annual	(program labor)
Natural Resources Awareness, Education, and Training				
Promote natural resources, environmental, and cultural stewardship and awareness by providing all personnel on installation training and education related to the PMRF natural resources program and related protocols, laws, and policies.	Continue to present natural resources concerns and activities at indoctrination presentations or other means prior to personnel conducting activities.	ESA, SA	quarterly	610642N002 (program labor)

Promote natural resources, environmental, and cultural stewardship and awareness by providing all personnel on installation training and education related to the PMRF natural resources program and related protocols, laws, and policies.	Continue to implement trainings, educational materials, and presentations for security and other appropriate personnel on the proper response to wildlife related observations, and avoidance of driving on coastal strand vegetation and the culturally significant areas of base such as Nohili Dunes.	ESA, CH, MBTA, SA	quarterly	610642N002 (program labor)
Promote natural resources, environmental, and cultural stewardship and awareness by providing all personnel on installation training and education related to the PMRF natural resources program and related protocols, laws, and policies.	Ensure that standard reporting and response protocols for wildlife related observations are included in all security personnel vehicles.	ESA, MBTA, SA	quarterly	610642N002 (program labor)
Promote natural resources, environmental, and cultural stewardship and awareness by providing all personnel on installation training and education related to the PMRF natural resources program and related protocols, laws, and policies.	Initiate a bi-annual natural resources newsletter about issues of concern as well as good news stories sent out through email, bulletin board, and social media in coordination with the PMRF Public Affairs Office.	ESA, CH, MBTA, SA	bi-annual	610642N002 (program labor)
Promote natural resources, environmental, and cultural stewardship and awareness by providing all personnel on installation training and education related to the PMRF natural resources program and related protocols, laws, and policies.	Provide the Public Affairs Office with flyers to send out by email and for posting on bulletin boards around base regarding seasonally appropriate natural resources issues.	ESA, CH, MBTA, SA	quarterly	610642N002 (program labor)
Promote natural resources, environmental, and cultural stewardship and awareness by providing all personnel on installation training and education related to the PMRF natural resources program and related protocols, laws, and policies.	Include natural resources information in Welcome Aboard packages for incoming Navy personnel.	ESA, CH, MBTA, SA	annual	610642N002 (program labor)

Provide technical support for events that foster understanding and awareness of the environment through educational conservation programs and increase visitor and resident awareness of the PMRF natural resources program and related protocols, laws, and policies.	Coordinate and participate in volunteer events, educational programs, and natural resources related site visits from local schools.	SA	annual	610642N002 (program labor)
Provide technical support for events that foster understanding and awareness of the environment through educational conservation programs and increase visitor and resident awareness of the PMRF natural resources program and related protocols, laws, and policies.	Continue to coordinate with MWR to place natural resources related information in beach cottages, implement informational signage, and consider creating a permanent natural resources display near the beach cottages, Majors/ Waiapua'a Bay, and the MWR visitor check-in building.	BO, ESA, MBTA, SA	annual	610642N002 (program labor)
Provide technical support for events that foster understanding and awareness of the environment through educational conservation programs and increase visitor and resident awareness of the PMRF natural resources program and related protocols, laws, and policies.	Continue to work with base personnel on signage and other outreach and enforcement efforts to deter illegal feeding of animals as well as misuse of recreational areas.	BO, ESA, MBTA, SA	annual	610642N002 (program labor)
Barking Sands Natural Resources Management				
Laysan Albatross Management				
Minimize impacts to Laysan Albatross while providing maximum flexibility for testing and training at PMRF and supporting regional Laysan Albatross conservation measures.	Continue the PMRF Laysan Albatross Egg Swap program.	MBTA, BASH, SA	annual	6106411R04 (program labor)

Minimize impacts to Laysan Albatross while providing maximum flexibility for testing and training at PMRF and supporting regional Laysan Albatross conservation measures.	Work with partners to ensure that as many albatross eggs as possible stay on Kaua‘i and find new suitable egg relocation locations.	MBTA, BASH, SA	annual	6106411R04 (program labor)
Minimize impacts to Laysan Albatross while providing maximum flexibility for testing and training at PMRF and supporting regional Laysan Albatross conservation measures.	Continue to translocate albatross to the north shore of Kaua‘i from January-April.	MBTA, BASH, SA	annual	6106411R04 (program labor)
Minimize impacts to Laysan Albatross while providing maximum flexibility for testing and training at PMRF and supporting regional Laysan Albatross conservation measures.	Coordinate with DOFAW on potential new albatross release sites.	MBTA, BASH, SA	annual	6106411R04 (program labor)
Minimize impacts to Laysan Albatross while providing maximum flexibility for testing and training at PMRF and supporting regional Laysan Albatross conservation measures.	Closely monitor re-sights of translocated albatross by working with partners on the north shore of Kaua‘i to enter data into the Airtable app database.	MBTA, BASH, SA	annual	6106411R04 (program labor)
Minimize impacts to Laysan Albatross while providing maximum flexibility for testing and training at PMRF and supporting regional Laysan Albatross conservation measures.	Use data analysis to assess the effectiveness of albatross translocations based on location of translocation, time of year, and whether or not the albatross is a known breeder, sub-adult, or new bird to PMRF.	MBTA, BASH, SA	annual	6106411R04 (program labor)
Minimize impacts to Laysan Albatross while providing maximum flexibility for testing and training at PMRF and supporting regional Laysan Albatross conservation measures.	Support research on the PMRF albatross populations that increases the understanding of their behavior as it relates to the PMRF airfield.	MBTA, BASH, SA	annual	6106411R04 (program labor)

Minimize impacts to Laysan Albatross while providing maximum flexibility for testing and training at PMRF and supporting regional Laysan Albatross conservation measures.	Continue base-wide predator control to protect MBTA-listed species including Laysan albatross; monitor for pigs, dogs, and cats in known breeding areas prior to the albatross breeding season and increase control efforts as needed.	MBTA, SA	annual	6106412036 (program labor)
Wedge-tailed Shearwater Management				
Manage, protect, and enhance Wedge-tailed Shearwater nesting colonies to ensure stable populations at appropriate nesting colonies on base while supporting maximum flexibility for testing and training at PMRF.	Enhance Wedge-tailed Shearwater habitat in areas far from the PMRF airfield and human presence and develop deterrant measures for burrows in areas of human traffic and near the airfield.	MBTA, BASH, SA	annual	6106411R04 (program labor)
Manage, protect, and enhance Wedge-tailed Shearwater nesting colonies to ensure stable populations at appropriate nesting colonies on base while supporting maximum flexibility for testing and training at PMRF.	Research and work with facilities and MWR to implement methods for discouraging Wedge-tailed Shearwater burrowing in the immediate vicinity of the PMRF Beach Cottages.	MBTA, BASH, SA	annual	6106411R04 (program labor)
Manage, protect, and enhance Wedge-tailed Shearwater nesting colonies to ensure stable populations at appropriate nesting colonies on base while supporting maximum flexibility for testing and training at PMRF.	Continue to implement protective measures that prevent the crushing of burrows in the beach cottages area (e.g., signage, temporary rope fencing, wooden burrow tents, outreach materials in cottages).	MBTA, SA	annual	6106411R04 (program labor)
Improve understanding of Wedge-tailed Shearwater population dynamics at Barking Sands to guide future adaptive management decisions and support regional conservation of shearwaters species.	Conduct annual Wedge-tailed Shearwater population surveys in the Kinikini Ditch, beach cottages, and Nohili Dune areas.	MBTA, BASH, SA	annual	6106411R04 (program labor)
Improve understanding of Wedge-tailed Shearwater population dynamics at Barking Sands to guide future adaptive management decisions	Work with partners to collect additional data that supports adaptive management on PMRF and regional conservation objectives for shearwater species.	MBTA, BASH, SA	annual	6106411R04 (program labor)

and support regional conservation of shearwaters species.				
Wetland and Waterbird Management				
Decrease negative interactions between Hawaiian waterbirds and PMRF operations by managing wetlands and waterbirds appropriately in order to minimize risks to waterbird and human safety.	Continue to coordinate closely with Facilities Maintenance regarding restrictions on vegetation removal practices within a 100-foot radius of waterbirds or their nests.	ESA, SA	annual	610642N002 6106411R09 (program labor)
Decrease negative interactions between Hawaiian waterbirds and PMRF operations by managing wetlands and waterbirds appropriately in order to minimize risks to waterbird and human safety.	Discourage waterbird presence and nesting at the oxidation pond complex by maintaining vegetation at a height of less than 6 inches and by funding the installation of exclusionary measures.	ESA, SA	annual	610642N002 6106411R09 (program labor)
Decrease negative interactions between Hawaiian waterbirds and PMRF operations by managing wetlands and waterbirds appropriately in order to minimize risks to waterbird and human safety.	Continue to coordinate with Facilities Maintenance to obtain environmental data on the oxidation pond regularly to better inform causes of avian botulism outbreaks and identify high risk conditions that require management actions.	ESA, SA	annual	610642N002 6106411R09 (program labor)
Decrease negative interactions between Hawaiian waterbirds and PMRF operations by managing wetlands and waterbirds appropriately in order to minimize risks to waterbird and human safety.	Coordinate with Public Works to develop oxidation pond flushing protocols in response to avian botulism outbreaks or high-risk conditions.	ESA, SA	annual	610642N002 6106411R09 (program labor)
Decrease negative interactions between Hawaiian waterbirds and PMRF operations by managing wetlands and waterbirds appropriately in order to minimize risks to waterbird and human safety.	Coordinate with Facilities Maintenance on all oxidation pond construction and restoration plans.	ESA, SA	annual	610642N002 6106411R09 (program labor)

Decrease negative interactions between Hawaiian waterbirds and PMRF operations by managing wetlands and waterbirds appropriately in order to minimize risks to waterbird and human safety.	Supplement ongoing water quality testing to detect particulates and soluble chemicals in waters at PMRF. Testing should be conducted at least quarterly.	ESA, SA	annual	610642N002 6106411R09 (program labor)
Decrease negative interactions between Hawaiian waterbirds and PMRF operations by managing wetlands and waterbirds appropriately in order to minimize risks to waterbird and human safety.	Replace and improve waterbird crossing signage at PMRF as needed to reduce risk of vehicle strikes (PMRF Biological Opinion, 2014), evaluate efficacy of signs, and explore new tools to reduce vehicle strikes.	BO, ESA, SA	annual	610642N002 6106411R09 (program labor)
Improve understanding of Hawaiian waterbird population dynamics at Barking Sands to guide future adaptive management decisions.	Continue to conduct regular monitoring for Hawaiian waterbird species at Barking Sands.	BO, ESA, SA	annual	610642N002 6106411R09 (program labor)
Improve understanding of Hawaiian waterbird population dynamics at Barking Sands to guide future adaptive management decisions.	Consider implementing a waterbird banding/telemetry program to track movement, monitor nest-site fidelity, and inform management on the base.	ESA, SA	annual	610642N002 6106411R09 (program labor)
Marine Mammal and Sea Turtle Management				
Hawaiian Monk Seal Management				
Maintain and enhance populations of Hawaiian monk seals to the greatest extent practicable.	Continue to ensure that Security reports sightings of monk seals during daily patrols at PMRF beaches and erects signage and barricades if observed where people frequent.	ESA, BO, MMPA, SA	annual	610642N002 (program labor)
Maintain and enhance populations of Hawaiian monk seals to the greatest extent practicable.	Continue to report observations of hauled-out Hawaiian monk seals to NOAA as soon as possible and provide high quality photos to assess seal health, ID, and aid in population abundance monitoring.	ESA, BO, MMPA, SA	annual	610642N002 (program labor)

Maintain and enhance populations of Hawaiian monk seals to the greatest extent practicable.	Collaborate with NOAA to implement Hawaiian Monk Seal recovery objectives when feasible.	ESA, BO, MMPA, SA	annual	610642N002 (program labor)
Maintain and enhance populations of Hawaiian monk seals to the greatest extent practicable.	Continue base-wide predator control to remove non-native predators, including feral cats and collaborate with partners on studies regarding toxoplasmosis at PMRF to inform these efforts; conduct outreach about the disease and its effects on wildlife and human health.	ESA, BO, MMPA, SA	annual	610642N002 6106412036 (program labor)
Maintain and enhance populations of Hawaiian monk seals to the greatest extent practicable.	Continue to monitor for, and remove, marine debris as part of regular monk seal surveys at beaches frequently used by hauled out monk seals.	ESA, BO, MMPA, SA	annual	610642N002 6106412036 (program labor)
Maintain and enhance populations of Hawaiian monk seals to the greatest extent practicable.	Continue to develop and install signage and implement trainings, educational materials, and presentations for security, other appropriate personnel, and the public on monk seals and the proper response to wildlife related observations.	ESA, BO, MMPA, SA	annual	610642N002 6106412036 (program labor)
Maintain and enhance populations of Hawaiian monk seals to the greatest extent practicable.	Continue surveys and measuring of nearshore water quality parameters at six sites at Barking Sands (each with three sampling points) for habitat conservation and protection purposes.	ESA, BO, MMPA, SA	annual	610642N002 6106412036 (program labor)
Improve understanding of population dynamics to guide future adaptive management decisions	Conduct regular surveys approximately five times per week of beaches near the Nohili Ditch outfall and Kuaki‘i (Diver’s Landing) for monk seal presence, and all other beaches approximately twice per week.	ESA, BO, MMPA, SA	annual	610642N002 (program labor)
Sea Turtle Management				
Maintain, enhance, and improve understanding of sea turtle populations at Barking Sands.	Continue to ensure daily patrols of PMRF’s beaches for sea turtles to collect observational data and check for stranded, injured, or entangled turtles are conducted by partnering with Security.	ESA, BO, CH, SA	annual	610642N002 (program labor)

Maintain, enhance, and improve understanding of sea turtle populations at Barking Sands.	Conduct surveys by biologists approximately five times per week of beaches near the Nohili Ditch outfall and Kuaki'i (Diver's Landing) for sea turtle presence, and ensure that marine surveys in nearshore areas quantify sea turtles and potential foraging or resting habitat.	ESA, BO, CH, SA	annual	610642N002 (program labor)
Maintain, enhance, and improve understanding of sea turtle populations at Barking Sands.	Continue to survey beaches for sea turtle nesting activity during the nesting season, protect all nests observed with ropes and signage, mitigate light attraction issues on beaches, and coordinate with DAR to excavate nests.	ESA, BO, CH, SA	annual	610642N002 (program labor)
Maintain, enhance, and improve understanding of sea turtle populations at Barking Sands.	Continue to encourage good communication between Security and natural resources regarding sea turtle activity on PMRF beaches to reduce negative impacts to the species from Security beach patrol vehicles.	ESA, BO, CH, SA	annual	610642N002 (program labor)
Maintain, enhance, and improve understanding of sea turtle populations at Barking Sands.	Develop and use USFWS-approved outreach, educational materials, and signage with the objective to educate and provide information to residents, recreational users, visitors, and staff about proper procedures and acceptable activities within sea turtle habitat and how to act when coming in contact with sea turtles.	ESA, BO, CH, SA	annual	610642N002 (program labor)
Maintain, enhance, and improve understanding of sea turtle populations at Barking Sands.	Continue to implement surveys to ensure no sea turtles are in affected areas during training exercises or in-water work.	ESA, BO, CH, SA	annual	610642N002 (program labor)
Maintain, enhance, and improve understanding of sea turtle populations at Barking Sands.	An interagency agreement was listed in fiscal year (FY) 23 to allow the Navy to partner with the NMFS Pacific Islands Fisheries Science Center (PIFSC) to deploy SPLASH tage (GPS and Argos) on sea turtles, and will be pursued at PMRF.	ESA, BO, CH, SA	annual	610642N002 (program labor)
Maintain, enhance, and improve understanding of sea turtle populations at Barking Sands.	Supplement ongoing water quality testing to detect particulates and soluble chemicals in waters at PMRF. Testing should be conducted at least quarterly.	ESA, BO, CH, SA	annual	610642N002 (program labor)

Whale, Dolphin, and Porpoise Management				
Protect and monitor populations of whales, dolphins, and porpoises adjacent to Barking Sands.	Continue to report all observations of marine mammal strandings or deaths to NMFS and assist in response efforts.	ESA, MMPA, CH, SA	annual	610642N002 (program labor)
Protect and monitor populations of whales, dolphins, and porpoises adjacent to Barking Sands.	Improve coordination and communication regarding marine mammal strandings and other observations of note with NAVFAC PAC and Commander, United States Pacific Fleet (COMPACFLT).	ESA, MMPA, CH, SA	annual	610642N002 (program labor)
Protect and monitor populations of whales, dolphins, and porpoises adjacent to Barking Sands.	Implement and collaborate with partners on studies regarding toxoplasmosis at PMRF to inform predator control efforts and conduct outreach about the disease and its effects on wildlife and human health.	ESA, MMPA, CH, SA	annual	610642N002 6106412036 (program labor)
Protect and monitor populations of whales, dolphins, and porpoises adjacent to Barking Sands.	PMRF will cooperate with the Agribusiness Development Corporation (ADC) to ensure compliance with the Clean Water Act and other environmental regulatory requirements where there is a nexus with federal monies or property.	ESA, MMPA, SA	annual	610642N003 (program labor)
Marine Nearshore Management				
Employ a systematic approach to managing coastal and near-shore resources, using a process that includes inventory, monitoring, modeling, management, assessment, and evaluation.	Establish a monitoring program for the nearshore environment of PMRF to inform future management decisions and monitor changes overtime.	SA, EO 13089, ESA	Every 5 years	610642N003 (program labor)
Employ a systematic approach to managing coastal and near-shore resources, using a process that includes inventory, monitoring, modeling, management, assessment, and evaluation.	Partner with DLNR DAR to incorporate regular monitoring site(s) in PMRF's nearshore waters into the State's regular monitoring schedule, as feasible.	SA, EO 13089, ESA	annual	(program labor)
***Panicum niihauense* Critical Habitat Management**				

Provide conservation benefit to Ni‘ihau panicgrass designated critical habitat area under Section 202(a)(3) of the Sikes Act.	Work to improve protection, habitat and/or consider out-planting Ni‘ihau panicgrass. Protections will be aimed at preventing unauthorized off-road vehicle use and invasive plant removal, and to demonstrate benefit to the species.	CH, ESA, SA,	annual	6106411R08 610641N001 (program labor)
Provide conservation benefit to Ni‘ihau panicgrass designated critical habitat area under Section 202(a)(3) of the Sikes Act.	Out-plant native species and remove invasive species in areas with suitable Ni‘ihau panicgrass habitat and ensure an irrigation system is in place until plants become well established.	CH, EO 13751, ESA, SA	annual	6106411R08 610641N001
Provide conservation benefit to Ni‘ihau panicgrass designated critical habitat area under Section 202(a)(3) of the Sikes Act.	Consider undergoing the approval process to out-plant the endangered Ni‘ihau panicgrass in the effort to remove or reduce amount of PMRF property designated as critical habitat for the species. Coordinate with Federal and State partners to secure material for out-planting if pursued.	CH, ESA, SA	annual	6106411R08 6106411R12 (program labor)
Mākaha Ridge Tracking Station Natural Resource Management				
Dwarf Ili’au and Hawai‘i Scaleseed Management				
Assess current populations of dwarf ili’au and Hawai‘i scaleseed to monitor population health.	Implement erosion control efforts that directly benefit areas where protected species are present.	ESA, SA	annual	6106411R18 6106411R19
Assess current populations of dwarf ili’au and Hawai‘i scaleseed to monitor population health.	Conduct a reassessment of the status and condition of listed plant species on the cliffsides of Mākaha Ridge Tracking Station populations every five years and collaborate with partners to grant them access for further research and conservation efforts.	ESA, SA	Every ten years	6106411R18
Kōke‘e Sites Natural Resource Management				
Hawaiian Picture-wing Fly				
Provide conservation benefits to federally endangered Hawaiian picture-wing flies and inform management decisions.	Conduct periodic surveys every five years to assess presence/absence of endangered Hawaiian picture-wing fly species at and directly adjacent to PMRF Koke‘e sites.	ESA, CH, SA	Every five years	6106411R21

Provide conservation benefits to federally endangered Hawaiian picture-wing flies and inform management decisions.	Conduct invasive plant removals annually in areas near known Hawaiian picture-wing fly habitat to promote native tree health and propagation and reduce introductions of invasive species into adjacent habitat due to Navy operations.	ESA, SA, EO 13751	annual	6106411R22
Kamokala Ridge Natural Resources Management				
Invasive and Nuisance Animal Management				
Ensure sustainable use of Navy infrastructure at Kamokala Ridge.	Work with the PMRF Archery Club to control ungulate populations at the Kamokala Ridge site by implementing trapping and baiting stations if the animals become a nuisance to Navy operations or pose a risk to protected wildlife.	ESA, SA, EO 13751	annual	6106412036
Ensure sustainable use of Navy infrastructure at Kamokala Ridge.	Conduct observations to identify feral cat use at Kamokala Ridge and consider expanding cat trapping if use is consistent or becomes a nuisance.	ESA, SA, EO 13751	annual	6106412036
Port Allen Natural Resource Management				
Endangered Seabird Management				
Minimize direct and indirect impacts to federally listed, endangered Hawaiian seabird species while providing maximum flexibility for training and operations.	Coordinate with facilities owner and USFWS to address lighting issues and continue to implement the Dark Skies program to the extent possible at the facility.	BO, ESA, MBTA, SA	annual	6106410R01 (program labor)
Minimize direct and indirect impacts to federally listed, endangered Hawaiian seabird species while providing maximum flexibility for training and operations.	Train staff to recognize, respond to, and report any circling or downed seabirds seen at the facility.	BO, ESA, MBTA, SA	annual	6106410R01 (program labor)
Kaʻula Island Natural Resource Management				

Special Status Species Management				
Maintain and enhance populations of special status species on Ka‘ula Island.	Continue implementing all military training SOPS.	ESA, MBTA, MMPA, SA	annual	(program labor)
Improve understanding of special status species population dynamics to guide future adaptive management decisions.	Conduct aerial seabird surveys of Ka‘ula Island as needed for management planning to inform species presence, location, and numbers.	ESA, MBTA, MMPA, SA	annual	(program labor)
Improve understanding of special status species population dynamics to guide future adaptive management decisions.	Conduct base-line flora surveys; conduct land-based updates to floral and fauna surveys on Ka‘ula Island if access is safe and allowable.	ESA, MBTA, MMPA, SA	annual	(program labor)
Improve understanding of special status species population dynamics to guide future adaptive management decisions.	Partner with DOFAW and other partners to coordinate barn owl and other predator control efforts on Ka‘ula Island if access is safe and allowable and control methods are practicable.	ESA, MBTA, MMPA, SA	annual	(program labor)
Improve understanding of special status species population dynamics to guide future adaptive management decisions.	Assess population of Ihi (Hairy Purslane) on Ka‘ula Island.	ESA	Every 10 years	6106412003
Mauna Kapu Site Natural Resource Management				
Protection of State and Federally Protected Species				
Assess the occurrence of wildlife populations utilizing the facility to better understand and manage for all wildlife species.	Conduct base-line flora and fauna surveys.	BO, ESA, MBTA, MMPA, SA	Every 5 years	6106412003
Ni‘ihau Natural Resource Management				

Disturbance of Protected Species due to Military Training Exercises				
Monitor protected species utlilizing Ni‘ihau to help inform operations and management of wildlife and provide conservation benefits to the species and its habitat under Section 202(a)(3) of the Sikes Act.	Continue to conduct twice-yearly surveys through partnership with NOAA Fisheries for Hawaiian Monk Seals on Ni‘ihau.	BO, ESA, MMPA, SA	annual	6106414R50
Monitor protected species utlilizing Ni‘ihau to help inform operations and management of wildlife and provide conservation benefits to the species and its habitat under Section 202(a)(3) of the Sikes Act.	If proposed Navy operations have the potential to impact sea turtles or habitat, conduct surveys for listed sea turtles and nesting activity on Ni‘ihau to understand habitat use and trends.	ESA, MMPA, SA	annual	6106414R50 6106411R09 610642N002
Monitor protected species utlilizing Ni‘ihau to help inform operations and management of wildlife and provide conservation benefits to the species and its habitat under Section 202(a)(3) of the Sikes Act.	If proposed Navy operations have the potential to impact waterbirds at Ni‘ihau, conduct surveys to understand habitat use and trends.	ESA, MMPA, SA	annual	6106414R50 6106411R09 610642N002
Monitor protected species utlilizing Ni‘ihau to help inform operations and management of wildlife and provide conservation benefits to the species and its habitat under Section 202(a)(3) of the Sikes Act.	Continue to adhere to management strategies implemented by Ni‘ihau Ranch on Ni‘ihau, including restricted access, feral animal control, and not allowing dogs or ATVs on the island.	ESA, MMPA, SA	annual	6106414R50 6106411R09 610642N002

Key Drivers:

BASH –Bird/Wildlife Aircraft Strike Hazard

BO –Biological Opinion on Base-wide Infrastructure, Operations, and Maintenance

ESA – Endangered Species Act

CH – Critical Habitat

CHE – Critical Habitat Exemption

EO 13751 – Safeguarding the Nation from the Impacts of Invasive Species

EO 13089 – Coral Reef Protection

MBTA – Migratory Bird Treaty Act

MMPA – Marine Mammal Protection Act

Tripartite Agreement – MOU between DoD and USFWS and the Association of Fish and Wildlife Agencies for a Cooperative Integrated Natural Resources Management Program on Military Installations Pollinator MOU – MOU between DoD and the Pollinator Partnership

Bat MOU – MOU between DoD and Bat Conservation International

OPNAV M-5090.1 – Environmental Readiness Program Manual

SA – Sikes Act

APPENDIX E – PROTECTED SPECIES STANDARD OPERATING PROCEDURES

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DEPARTMENT OF THE NAVY

PACIFIC MISSILE RANGE FACILITY

P.O. Box 128

KEKAHA, HAWAII 96752-0128

From: Commanding Officer, Pacific Missile Range Facility

Subj: DARK SKIES PROGRAM DURING SHEARWATER FLEDGLING FALLOUT SEASON: 15 SEPTEMBER THROUGH 15 DECEMBER 2023

Encl: (1) 2023 Fledging Season AM Event and PM Event Calendars

(2) 2023 Dark Skies Night Operations Waiver Request

(3) PMRF Dark Skies Program Brochure

1. Purpose. To announce the arrival of Shearwater Fledgling Fallout Season at the Pacific Missile Range Facility (PMRF) and give guidance for measures to be implemented to reduce/eliminate risk to protected seabirds during this period.

2. Dates. Shearwater fledging season runs from 15 September through 15 December 2023. The most critical times to avoid use of exterior lights at PMRF are during the dark moon phases of the fledging season. In 2023, the highest risk periods occur 5-25 October and 2-21 November. Any nights with cloudy, misty conditions are also considered critical. Enclosure (1) may be used to inform planning for the 2023 shearwater fledging season.

3. Policy

a. All exterior lights will be turned off between 15 September and 15 December 2023 at PMRF (including Kokee, Makaha Ridge, Port Allen, and Kamokala facilities) unless required for safety or security. Any night lighting purported to be necessary to meet operational requirements during this period except as required by regulation, including motion sensing lighting, will require prior approval by the Natural Resources Manager/Installation Environmental Program Director, Public Works Officer, and Command on a case by case basis. Exceptions will require the activity to identify a Biological Monitor for the lighting event. Depending on the nature of the lighting, this

person may need to act as a monitor for seabird attraction for the duration of the event. If a protected seabird is attracted to the lights, the monitor will direct the lights to be turned off temporarily to allow the bird to fly safely away from the area. The activity will coordinate with Natural Resources ahead of time to ensure that appropriate training for biological monitors is completed prior to the event. Organizations may apply for a standing waiver if the activity is season-long and will continue to take place year after year. Project managers with standing waivers from prior years will annually verify with Natural Resources that personnel designated on the waiver and the nature of the operations covered by the waiver have remained unchanged. Updates to the standing waiver may need to be routed through the chain of command for approval.

b. All operations requiring night lighting at PMRF shall coordinate with the PMRF Natural Resources Manager, Brooke McFarland, by emailing brooke.a.mcfarland.civ@us.navy.mil or calling (808) 335-4017 to implement mitigation measures during the fledging season. The Installation Environmental Program Director, Jessica Hallman Behnke, is the designated secondary contact for coordination needs and can be reached by email at jessica.l.behnke.civ@us.navy.mil or by calling (808) 335-4064.

c. Requests to use exterior lighting at night during this period shall be made using enclosure (2), to be filled out completely by the Project Manager or other appropriate agent, and submitted to the Natural Resources Manager by email. All waiver requests will be approved/disapproved by the Executive Officer.

d. Portable light carts used for Force Protection should be equipped with two green and two white lights; due to their lower intensity; only the green lights are used during lower Force Protection Conditions (FPCON) status, while white lights are available for higher FPCON status. Lamps should be oriented in the full cut off position and facing directly downward.

e. Interior lighting that escapes from buildings through open bay doors will be considered the same as exterior lighting. Bay doors of buildings with bright interior lights such as the hangar will be kept closed at all times during the Dark Skies season except as approved by the command. When working in a building at night, please pull blinds and curtains to reduce the amount of light escaping into the outdoor environment and contributing to light pollution.

f. Waivers must be submitted for all motion sensor lights located on buildings and in parking lots. All motion sensors must have automatic timer mechanisms that turn off automatically after 120 seconds maximum. Motion sensor lights approved by the command through the waiver process must be inspected weekly by the designated Biological Monitor(s) to ensure lights are switching off in a timely manner.

g. Downed shearwaters should be immediately reported to the PMRF Natural Resources Hotline at (808) 208-4416. For more information refer to enclosure (3).

4. Safety. No measure taken during Dark Skies operations is worth serious injury to personnel on board PMRF. We will accept some risk for minor hazards like tripping in an unlit parking lot. We ask everyone to do their part to not only take action to mitigate risks (e.g., request waivers in critical areas, utilize head lamps, carry flashlights or use flashlight mode on cell phones as personal protective equipment), but also immediately bring an unmitigated serious hazard to the attention of Command Duty Officer (808) 651-3471. All government employees, contractors, and visitors to the base should plan their activities on the base with the Dark Skies Program requirements in mind and take any precautions that may be necessary to ensure safe passage to and from office buildings, work sites, and recreational areas. It is recommended that employees working during non-daylight hours during the Dark Skies season carry a working flash light or head lamp. PMRF Public Works Office will provide flashlights on a loaner basis for individuals who do not possess one. Should you have any question regarding this, please contact the Natural Resources Manager at (808) 335-4017.

5. Records Management. Records created as a result of this notice, regardless of media or format, must be managed per Secretary of the Navy Manual 5210.1 of September 2019.

6. Cancellation Contingency. This notice will be cancelled 31 December 2023 or upon completion of Dark Skies Program.

STEVENSON.BRETT.ASHLEY.1158727311 Digitally signed by STEVENSON.BRETT.ASHLEY.1158727311 Date: 2023.08.17 17:00:44 -10'00'

B. A. STEVENSON

PMRF Dark Skies Lighting Waiver Request

Organization seeking waiver:	
Supervisor/POC:	
Supervisor/POC phone:	
Supervisor/POC email:	
Designated Biological Monitor(s):	
Biological Monitor phone:	
Biological Monitor email:	
Date(s) and time period(s) for which waiver is requested:	
Describe proposed operation including start and stop times and details on requested lighting:	
Explain why this operation cannot be performed without the use of exterior lighting:	
Description of alternatives considered:	
ENVIRONMENTAL/ RAC COMMENTS:	
XO Approval:	

Enclosure 1

DARK SKIES PROGRAM- FIELD PROGRAM

The INRMP Implementation Field Biology Program is responsible for several components of the Dark Skies season to ensure safety of seabirds and the Navy's mission. There is some pre-season work that is described below. All team members, regardless of position, are expected to participate in all aspects of the Dark Skies Program. In addition, it is expected that everyone can accurately identify all three key seabird species (Newell's Shearwater, Hawaiian Petrel, and Band-rumped Storm Petrel).

Preseason activities:

-Assist the NR manager with Waivers, Department Heads Presentation, and comprehensive light list (by early September)

-Prepare lighting covers for the Major's Bay Bike Path, ensure they are approved by PWD. By Sept 15 all covers must be on.

-Communicate with Hunt housing and MWR regarding Dark Skies in early August.

-Purchase 36+ Bird Carriers (cardboard or plastic Flute Board), 50+ towels for bird carriers; Ziploc bags; 300 NESH stickers

-PRESEASON Lighting Survey. One-two weeks prior to Dark Skies to familiarize yourself and verify light numbers/ location/ description.

Shenanigans Downed Bird Walk Through

These walkthroughs need to happen Monday through Friday at least half an hour to an hour before dawn (refer to Sunset and Sunrise Calendar). We want to do this early before a bird could take off at dawn so that we aren't documenting missing any injuries, etc. They take approximately 20-30 minutes to do a walkthrough of the area. You will need to have a headlamp, bird box, towels, camera (cell phone works), field notebook, etc. You can do this in your personal car as long as you have all of the equipment, supplies.

For the walk through, walk the perimeter of the Shenanigans lawn, around the structures (Shenanigans, the dumpster, etc), and under any bushes need to be searched for downed birds. If one is found, call the SOS hotline, Call the NR manager, and text the PCSU/PMRF Project Coordinator. You need to make sure that you are adequately searching in and around the bushes in the area, under the building, etc. Birds tend to hide when they fall out.

The person who does the Shenanigans walkthrough is also responsible for checking the Save Our Shearwaters Aid station at Pass and ID and communicating to them if any birds were placed in the box. It is recommended to do this before doing the Shenanigans walkthrough so that you don't have to go in and out through the gate.

The PCSU Project Coordinator will do the Shenanigans walk through with you for a quick training.



Dark Skies Lighting Survey Overview

Surveys are performed once a week from September 15th to December 15th at Barking Sands, Kokee Site C and Makaha Ridge. During Dark Skies, there should be minimal lights on from dusk till dawn. The objective of the survey is to (1) look for any lights that are left on and do not have a waiver (2) make sure motion sensor lights are not on longer than 120 seconds and (3) look for any down seabirds.

Before starting these surveys, you must call Dispatch (808-335-4523) and let them know that you will be surveying the base for lights as well as what vehicle you are in. Before going North of the Hanagar you must call ICC (808-335-4258).

During these surveys, pay extra attention to nene resting in and around the roadways as to avoid injuring a nene.

<u>Kokee/Makaha</u>

If the Kokee and Makaha surveys are done in the morning, we are able to pair a downed seabird survey with the lighting surveys. It is preferred to do these surveys early in the morning. After the lighting surveys and downed bird survey at Kokee, a nene survey at both locations should be performed. The downed bird surveys will need to begin in October.

1. Surveys can be done 2 - 3 hours before sunrise or at night when it gets completely dark. You must ensure that you have plenty of time before sunrise if you choose an AM survey, including driving time.

2. Read over waivers and make note of what buildings have a waiver for lights and where the lights are located

3. Drive up/walk around buildings, making sure to set off motion lights.

4. Wait and see if motion lights turn off after 120 sec

5. Make sure to write down any violations (lights on, motion lights over 120 seconds, etc)

6. Look around buildings, towers, and guylines (kokee only) for down seabirds.

Barking Sands

1. Surveys can be performed in the morning (2 ½-3 hours before sunrise) or at night approximately an hour to an hour and half after sunset (when it is completely dark).

2. Make sure to read over waivers so you know what buildings can have lights on

3. Cover all base from SouthGate to North Launch, and especially housing and the rental cottages

4. Be sure to drive up to buildings and walk around to make sure all lights are in compliance or they have a waiver

5. Write down any findings that are in violation or you have a question about.

The Hangar doors are only permitted to be open for 5 minutes at a time. These lights in particular act as a giant beacon for seabirds. If we know that there are night operations, we will occasionally need to do a morning walkthrough of the Hanagar and Spotlight area (near the memorial) in addition to the daily Shenanigans walkthroughs.

Just be thorough with your surveys. The more you do, the smoother it will go and the quicker you will get.

AIRFIELD NĒNĒ NEST RESPONSE PROTOCOL PACIFIC MISSILE RANGE FACILITY

I. Overview

The Hawaiian Goose, or nēnē, (*Branta sandvicensis*) is federally protected under the Endangered Species Act and also presents a significant Bird Aircraft Strike Hazard (BASH) risk. Geese are of special safety concern to pilots as large birds with low, slow flight patterns, and are conversely at high risk themselves of being struck on an airfield. Additionally, females tend to return to their natal fledging ground to nest themselves, and so, if even one nest hatches from an area, more can follow in the area in future years. This makes preventing nēnē presence on the airfield of the highest priority. As per the 2014 Pacific Missile Range Facility (PMRF) Biological Opinion, PMRF's Bird Discovery and Dispersal Team (BDDT) is permitted to haze nēnē at the facility. However, despite best available hazing practices, USDA-Wildlife Services (WS) discovered an active nēnē nest in FY16 just south of the runway, and another nest in the area in FY17 by a different pair (Figure 1). The installation recognizes that the best strategy for preventing nesting within the PMRF airfield involves removing vegetation that provides nesting habitat and consistently hazing nēnē from the area. However, if a nēnē nest is discovered that poses a clear and present danger to human lives despite following best management practices, PMRF Natural Resources (NR), USDA Wildlife Services (WS), and PMRF Air Operations will comply with the following Nēnē Airfield Nesting Response Protocol. This protocol outlines a timeline for appropriate notification channels, instructions to document and destroy the nest, and guidance for discouraging re-nesting attempts.

II. Standard hazing protocol

Air Ops and USDA-WS staff currently haze nēnē using non-lethal techniques including vehicle horn blowing, human vocalizations, hand clapping, foot stomping, and/or use of flashing vehicle lights. The BDDT actively hazes during published hours of airfield operation: M-F 0700-1800, excluding federal holidays. On any given work day, USDA personnel drive a circuit covering the airfield and immediate surrounding area, hazing any nēnē observed. Each area on the circuit is visited approximately every 60-90 minutes during published airfield operational hours.

III. Nene Nest Exclusion Zone

A nest will be considered a clear and present danger to human lives when laid within the delineated Nene Nest Exclusion Zone to include the lateral clear zones (CZ's) of the taxiway and runway a (Figure 2). An airfield's CZ is designated as that area where an aircraft accident is most likely to occur; as such, the area is maintained in a manner which provides the pilots with the safest possible conditions. At PMRF Barking Sands, the lateral CZ extends to 750 ft on either side of the runway centerline, 150 ft on either side of the taxiway's centerlines, and 100 ft from the edge of aircraft parking aprons. Airfield Nēnē Nest Response Protocol Pacific Missile Range Facility

IV. Protocol upon seeing a nēnē pair for three consecutive days in the Nene Nest Exclusion Zone1

Protocol initiation will be considered prior to the three day bench mark if the weekend or holidays would factor into those initial three days, e.g., if a pair is repeatedly observed on Thursday and Friday, CDO's may monitor and haze the pair over the weekend if deemed necessary.

1) Notification of pair's presence on airfield and initiation of this protocol (within 24 hours)

a) Report pair to USDA-WS Kauai District Supervisor and PMRF NR Manager
b) NR Manager: Notify the following people of pair and initiation of this protocol
    i) USFWS: Lead for PMRF Base-wide Consultation
    ii) DOFAW: Kauai Wildlife Manager and Nēnē Biologist
    iii) PMRF Executive Officer
    iv) PMRF Public Works Officer
    v) PMRF Field Biologists
c) USDA-WS Kauai District Supervisor: Notify the following people
    i) PMRF Airfield Manager
    ii) PMRF Airfield Operations Officer
    iii) USDA-WS PMRF Biologist
    iv) USDA-WS PMRF Technicians

2) COA (Course of Action)

a) USDA-WS: Organize site meeting within 48 hours
    i) Include USDA and NR personnel, and Airfield Manager
    ii) Identify potential nesting areas in proximity to observations of the pair
    iii) Produce and implement an action plan to remove all proximate nesting vegetation or erect a physical barrier ASAP
        (1) Action plan should include coordination with Airfield Manager and Public Works
        (2) Preferred option is vegetation removal. If vegetation cannot be removed immediately, temporary fencing may act as a deterrent, preventing them from walking into nesting vegetation from the airfield.
        (3) Prior to any vegetation removal, thoroughly search the area for active nests
b) Airfield Operations Officer
    i) Notify Command Duty Officers to enact hazing protocol in area of concern
        (1) M-F: Haze at Dusk
        (2) Sa-Su, Holidays: Haze over weekends every 1.5-2 hours

V. Protocol upon finding a nest within the Nene Nest Exclusion Zone

1) Immediate Notification of nest discovery and initiation of this protocol (within 2 hours)

a) Report nest to USDA-WS Kauai District Supervisor and PMRF NR Manager
b) NR Manager: Notify the following people
    i) USFWS: Lead for PMRF Base-wide Consultation
    ii) DOFAW: Kauai Wildlife Manager and Nēnē Biologist
    iii) PMRF Public Works Officer
    iv) Navy Region Hawaii Natural Resources Manager
    v) PMRF Field Biologists
c) USDA-WS Kauai District Supervisor: Notify the following people
    i) PMRF Airfield Manager

ii) PMRF Airfield Operations Officer
iii) USDA-WS Hawaii State Director
iv) USDA-WS PMRF Biologist
v) USDA-WS PMRF Technicians

d) Airfield Operations Officer: Notify the following people
i) PMRF Executive Officer (XO)
ii) PMRF Command Duty Officer (CDO)

2) Course of Action (COA)

a) NR: Initiate conversations with USFWS and DOFAW to first determine if the eggs will be translocated or destroyed, and second to identify potential foster nests
b) USDA-WS: Continue to actively haze adults away from airfield
i) Check area during routine wildlife checks approximately every 60-90 minutes
ii) Ensure neither parent is attending and that the female is not incubating the nest
iii) Record each time adults are observed and their behavior
iv) Ensure CDO's continue hazing efforts
(1) M-F: Haze at Dusk
(2) Sa-Su, Holidays: During daylight, haze every 1.5-2 hours
c) USDA-WS: Identify an action plan to remove all proximate vegetation if it has not yet been removed. Vegetation up to 1m of the nest should be removed if possible.
i) Action plan should include coordination with Airfield Manager and Public Works
ii) Document date and time of vegetation removal and take before and after photos
d) USDA-WS: If fencing was erected, remove the barrier; it could be an entanglement risk or prevent nesting adults from escaping predators.
i) Coordinate removal with Airfield Manager.
e) USDA-WS: Hang mylar deterrent tape over nest to discourage nēnē from accessing nest within 8 hours of initial nest observation
i) Document mylar placement with photographs, time, and personnel involved.
f) USDA-WS: Determine if the nesting pair has finished laying eggs
i) Geese often immediately re-nest if a nest is destroyed before the female is finished laying eggs
ii) A nesting pair will generally lay one egg every 24 hours until finished
iii) If the number of eggs has been constant for more than 24 hours, it is assumed that the female is done laying
iv) Nēnē clutch size range: 1-6 eggs; Mean: 3 eggs
g) NR: Remove eggs and destroy nest once the female has finished laying within 24 hours
i) NR Manager: Notify DOFAW, USFWS, USDA-WS, and Airfield Manager prior to nest destruction
ii) Photograph and GPS the nest if it has not already been done
iii) Collect eggs
iv) Destroy nest in a way that looks as if the eggs were scavenged
v) If available and permitted by USFWS and DOFAW, translocate eggs

vi) If no secondary location for egg placement is available, bury the eggs at least 200m away from the nest; hole should be at least 18 in. deep
vii) Document nest destruction process with times, personnel involved, and photographs
viii) NR Manager: Confirm nest destruction within 24 hours
(1) USFWS: Lead for PMRF Base-wide Consultation
(2) DOFAW: Kauai Wildlife Manager and Nēnē Biologist
(3) USDA-WS: Kauai District Supervisor
(4) Airfield Manager
(5) Airfield Operations Officer
(6) Public Works Officer
(7) Navy Region Hawaii Natural Resources Manager

h) NR and USDA-WS: Nest destruction follow-up actions
i) NR: Coordinate with Public Works to remove nesting vegetation in area if it has not already been completed
(1) Wait 48 hours after nest destruction to allow parents to see depredated nest
(2) Coordinate vegetation removal with Airfield Manager and USDA-WS
ii) USDA-WS: Remove all deterrent barriers from airfield
(1) Remove all mylar tape after the pair has been absent from the area for seven consecutive days
(2) If fencing is erected, take down once the vegetation has been removed or after the pair has been absent from the area for seven consecutive days if it has not already been deconstructed
(3) Coordinate removal with Airfield Manager
iii) USDA-WS: Continue to actively haze adults away from airfield to prevent re-nesting attempts
(1) USDA-WS: Check area during routine wildlife checks approximately every 60-90 minutes during published hours of airfield operation
(2) Ensure CDO's continue hazing efforts when airfield is closed
(a) M-F: Haze at Dusk
(b) Sa-Su, Holidays: During daylight, haze every 1.5-2 hours
(3) Record each time adults are observed and their behavior

3) Prepare formal report within thirty days for partners

a) NR: Collaborate with USDA to assemble the below information and write formal report
i) Parent band information
ii) First observation of the pair in the area
iii) Hazing efforts prior to nesting
iv) First observation of nest
v) Notification dates/times of all appropriate partner agencies
vi) Date/time fence erected (include photo documentation)
vii) Date/time mylar deterrent tape hung (include photo documentation)
viii) Last egg lay date

ix) Clutch size at time of egg removal
x) Date, time, and description of nest destruction (include photo documentation)
xi) Hazing efforts following nesting attempt
xii) All documented sightings of the pair prior to and post nest destruction
xiii) Strategies to discourage the nēnē pair from re-nesting in the area during the current season and in future years

b) NR: Submit formal report for internal review to following personnel
   i) NR Field Biologists
   ii) NR Manager
   iii) USDA-WS Biologist
   iv) USDA-WS Kauai District Supervisor
c) NR Manager: Send formal, final report to the following personnel within 30 days of nest destruction
   i) USFWS: Lead for PMRF Base-wide Consultation
   ii) DOFAW: Kauai Wildlife Manager and Nēnē Biologist
   iii) USDA-WS: Kauai District Supervisor
   iv) Airfield Manager
   v) Airfield Operations Officer
   vi) Public Works Officer
   vii) Navy Region Hawaii Natural Resources Manager
d) USDA-WS Kauai District Supervisor: Send formal report to following personnel within 30 days of nest destruction
   i) USDA-WS Hawaii State Director



Figure 1. Nēnē nest locations along Kini Kini Ditch in FY16 and 17. Airfield Nēnē Nest Response Protocol



Figure 2. Nene Nest Exclusion Zone. Area of PMRF to exclude all nene nesting, generated from the lateral clear zones for the runway and taxiway

Pacific Missile Range Facility

Hawaiian Geese Family Hazing

Standard Operating Procedures

Background

There has been an increase in the population of Hawaiian Geese (nēnē) on Barking Sands Pacific Missile Range Facility which increases the BASH concerns for our Navy pilots. To avoid these hazards, both the PMRF Environmental Department and USDA requests the ability to haze nēnē adults and their goslings from roads and the Barking Sands Airfield.

Nēnē goslings are flightless for about 10 to 14 weeks after hatching (FWS Pacific). This limits the methods that are used for hazing. Hazing in this SOP will be defined as (gentle walking). from now on.

Procedure

The attached map is the nēnē exclusion zone shown in Figure 2. Hazing of nēnē with goslings will be only allowed on the airfield or where there is hazard to the wildlife (i.e. roads). Any nēnē family with goslings on the airfield will be reported to USDA biologist and/or USDA technician. No other personnel should try to haze, approach, and/or assess the situation without consulting USDA. The exception being PMRF Environmental Staff (EV), EV will inform USDA prior to hazing only on the airfield so documentation on USDA databases can be inputted. If hazing occurs in other areas besides the airfield, USDA does not need to be informed immediately; data collected will be inputted to the hazing databases at the beginning of each month.

USDA/EV will notify tower of the hazing operations, number of individuals, and area of airfield the family is located. USDA/EV will stay 25ft away when observing them in a vehicle prior to hazing. No hazing of adults and goslings should be done in a vehicle to avoid any injury to wildlife. Personnel will step out of the vehicle and walk the family off the airfield or area of hazard. No aggressive chasing of adults with goslings will be allowed. Slowly walking towards the family will be the method used. This will try to discourage separation of adults from goslings, as well as any confusion that might cause injury to the birds.

If a gosling is lagging behind, cease walking and do not continue until the family is reunited. If needed, take steps back to encourage the family to reunite. If a gosling does get separated, USDA/EV will keep an eye on the gosling as well as the family as best they can and call for back up. If needed, EV staff will notify their supervisor, USFWS and the state nēnē biologist about a separation or abandonment event.

Attached is a reference guide to ageing plumage. Please reference the guide if there are questions on the age of individuals to be hazed.

Contact Information

Natural Resources/EV

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PMRF Natural Resources Manager

Barking Sands, Kaua'i

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NR Hotline: (808) 208-4416

Jessi Hallman Behnke

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PMRF, Barking Sands, HI

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References

Hunter J. M 1995. A key to ageing goslings of the Hawaiian Goose *Branta sandvicensis*. Wildfowl 46:55-58. www.theFWS.gov.

Figure 1. Key for ageing Nene goslings in the wild

	Stage	Age (weeks) Slimbridge	Age (weeks) Hawaii	
	1	0–1	0–1	Small, round and downy, short legs. Breast and belly held almost parallel with ground.
	2	1–3	1–4	Downy. No contour feathering. Upright posture: breast and belly held at about 45° to ground.
	3	3–5	4–6	Downy. Beginning to feather on belly and wing coverts.
	4	5–7	6–8	Feathering on belly, flanks and wing coverts. Tail feathers just showing. Beginning to darken on face between eye and chin.
	5	7–8	8–10	Well feathered on belly, flanks and wing coverts. Tail 2.5 – 5.0 cm long. Head and neck darkening and losing down.' Some down on back of neck and rump.
	6	8-11	10-12	Pre-fledging. Appearance of grey adult. Little or no down. Dark head and cheek becoming defined. Primary feathers almost reaching base of tail.
	7	9–16	11–18	Fledged. Primaries at full length. Well defined dark head and cheek. Neck dull grey.
	8	17–20+	19–23+	Looks almost identical to adult. Neck turning buff/gold, distinctive black ring forming between buff of neck and grey of chest.

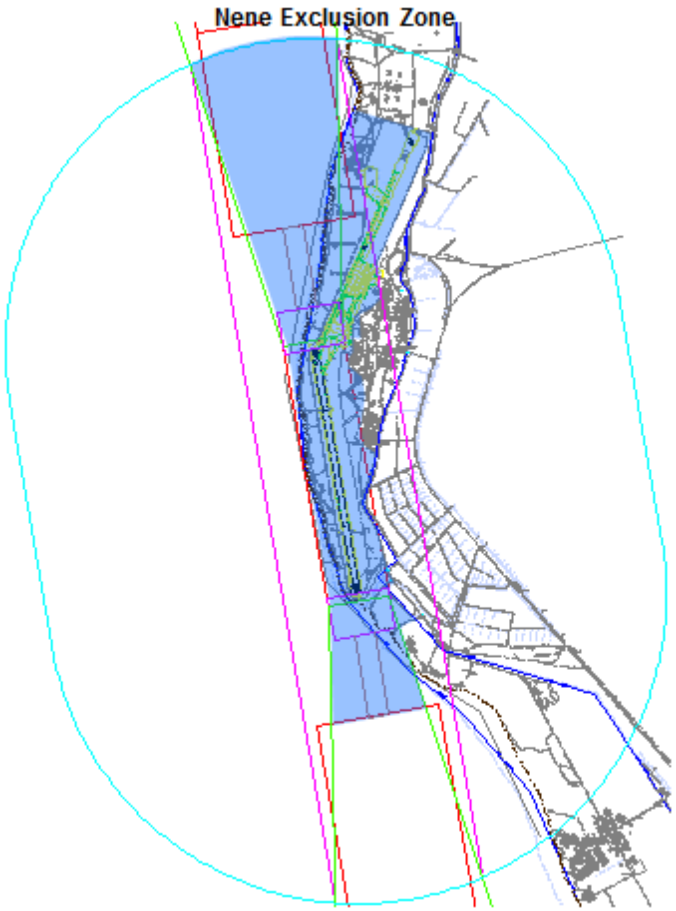


Figure 2

PMRF OXIDATION POND VEGETATION REMOVAL GUIDELINES

PMRF Natural Resources

1.0 Overview

The following guidelines were developed by PMRF biologists after consideration of the Endangered Species Act (, known breeding biology, observations collected from standardized monitoring, and informal consultation with the US Fish and Wildlife Service (USFWS) regarding species of concern. Compliance with restrictions below is required for compliance with the Endangered Species Act. The measures below are meant to avoid take under the Endangered Species Act. Oxidation pond maintenance is not currently covered by the incidental take license. Any take is a violation of the Endangered Species Act and can result in the USFWS initiating enforcement action for unauthorized take. Responsibility for compliance ultimately resides with the PMRF Commanding Officer.

Consult PMRF biologists before all vegetation removal at the Oxidation Pond compound at least one week prior. PMRF biologists will search for nests and flag nests and buffer areas to be avoided within two days. Each vegetation removal even will be taken on a case by case basis and can be affected by the breeding behavior of species of concern. Coordinate with the biologists to be on site immediately prior to actual removal of vegetation. Biologists will search for new nests and flush birds from brush. Additional maintenance of vegetation may be necessary and allowable contingent on nesting species of concern.

All observations of endangered species nests and chicks should be reported to PMRF biologists as soon as possible. All observations are reported to USFWS within 24 hours as per the 2014 PMRF Biological Opinion.

2.0 Oxidation Pond Vegetation Clearing Timeline

Early March: Perimeter of oxidation pond.

April/May: Entire Compound.

Early August: Entire compound, including perimeter pond vegetation.

3.0 Vegetation Clearing Guidelines

3.1 Hawaiian Coot and Hawaiian Stilt

Nest: No vegetation clearing withing a **100 foot buffer** of any nest until chicks have reached fledging age = **3 months after laying of egg** or **2 months after eggs have hatched.**

Chicks: If coot or stilt chicks are observed, a 100 foot buffer will be allotted around the area they are known to congregate and remain until the chicks fledge.

Hawaiian Monk Seal and Sea Turtle General Monitoring SOP

Natural Resources Program

Pacific Missile Range Facility

Kaua‘i Monk Seal Hotline: (808) 651-7668, kauaiseals@gmail.com

National Marine Fisheries Service (NMFS): (808) 938-5730

Species Overview

Hawaiian Monk Seal, *Neomonachus schauinslandi,* Ilio-holo-i-ka-uaua

- **Pupping Season:** Can pup year-round but primarily February-July, peak occurs April-June. Females nurse for 5-6 weeks. For females that give birth consecutively year after year, they pup a little later each year.
- **Lifespan:** 25-30 years
- **Male vs. Female:** females have 4 nipples on belly, males have penile opening and groove
- **Diet:** small, bottom dwelling fish, squid, octopus, eels, and crustaceans
- **Identifying Marks:** Biologists place flipper tags and/or dorsal bleach marks to mark individuals. Bleach marks are only temporary as monk seals molt their fur each year. However, many monk seals have marks such as line scars, small circle-shaped scars from cookie cutter sharks, or larger scars that can be caused by shark attacks, boat propellers or entanglement. These scars are useful for identifying individual monk seals.
- **Species Status:** Endangered, 1,400 individuals. Federally protected under the Endangered Species Act and the Marine Mammal Protection Act.

Green Sea Turtle,* *Chelonia mydas,* honu

- **Description:** Olive brown to black on top with light yellow underside; rounder head than hawksbill; non-overlapping scutes on carapace; 1 pair of prefrontal scales between eyes
- **Adult Size:** Carapace length: up to 40 inches; Weight: 200-500 lbs.
- **Identifying Marks:** Some turtles may be marked on their shell with a unique number combination or tagged on a flipper.
- **Species Status:** Central North Pacific distinct population unit listed as threatened and protected under the Endangered Species Act**.**

Hawksbill Sea Turtle,* *Eretmochelys imbricata,* honu’ea

- **Description:** Dark to golden brown, with streaks of orange, red, and/or black on top with lighter, yellow underside; head elongated with beak-like mouth; overlapping scutes on carapace; 2 pairs of prefrontal scales between eyes.
- **Adult Size:** 100-150 lbs.
- **Identifying Marks:** Some turtles may be marked on their shell with a unique number combination or tagged on a flipper.
- **Species Status:** Endangered**.** Federally protected under the Endangered Species Act.

**For more information see “Sea Turtle Nesting SOP”*

Hawaiian Monk Seal and Sea Turtle General Monitoring SOP

Natural Resources Program

Pacific Missile Range Facility

Introduction

Hawaiian monk seals and green sea turtles frequently use Pacific Missile Range Facility's (PMRF) beaches for resting or "hauling out." As federally protected species, this presents a valuable opportunity for biological monitors to inspect these hauled out individuals, checking for injuries or ailments that should be treated, or identifying a specific individual in the population.

Green sea turtles are commonly found hauled out at Turtle Cove (AKA Nohili Ditch Outfall). Favorable sea turtle foraging habitat in this area was identified by the 2010 PMRF INRMP marine nearshore surveys and the cove provides a safe place for turtles and monk seals to rest.

Adult sea turtles are most often injured by boat propeller collisions or entanglement issues. Although less common around Kaua'i, sea turtles may also be afflicted with life-threatening, tumor-like growths. These tumors, caused by the disease fibropapillomatosis, can grow over the eyes and nose obstructing vision and ability to breathe, or grow so large that they become an impediment to movement. There are two known instances of observed sea turtle injuries or strandings at PMRF. In 2009, a green sea turtle was observed by USDA at Turtle Cove with a boat propeller injury. The turtle was medivaced to Oahu for treatment, then showed up two months later in the same spot, healthy and healed. There are a few documented instances of a turtle strandings at the cove –The turtles can be found crawling along the wall and unable to find their way back to the ocean.

Hawaiian monk seals can become injured by collisions with boats, sharks, and entanglement with marine debris – especially swallowing fishing hooks and line. No major Hawaiian monk seal injuries or entanglements have been observed at PMRF, though a fish hook was removed once from the lip of a monk seal basking at Majors Bay. PMRF documented a pupping event in 1999 "beach side" of the runway across from the 2,000 ft. marker at the south end. Reporting Hawaiian monk seal sightings to the Kaua'i NOAA Fisheries monk seal hotline provides valuable information to biologists working for the recovery of the species. In some instances, biologists may want to tag or apply a bleach mark to a seal or even attach a "critter cam" to the animal to see where it goes. In addition, taking photos of the animal from all angles and observing it closely can inform if the seal is healthy and help NOAA biologists identify the individual.

NR Biologist: Turtle Cove and Diver's Landing Monitoring

1) **Frequency:** Daily as PMRF activity allows. Keep a log of days you are unable to survey in your field notebook. Keep PCSU/Program Coordinator and the Natural Resources Manager informed if you are not able to get into an area for more than 2 days in a row.
2) **Survey Method:**
   a) **Turtle Cove:**
      i) **Safety Protocol:** Call Security Dispatch and the ICC before heading out to the launch area and turtle cove to ensure that no operations are occurring in the area and that ARDEL is not radiating anywhere other than zones 1 and 2 (5 degrees above horizon is safe). Do not go over the dune south of the turtle cove area as this is within ARDEL's daily radiation operations (zone 1). Refer to the "AN/SPY-6 Radiation Cut Out Zones" map for more information.
      ii) **Survey Protocol:** After ensuring the area is safe, park on north side of turtle cove and walk to the edge of dune.
         (1) Scan the cove area and water with binoculars for seals or turtles and tracks.

(2) If no animals are observed, record date, any tracks observed, and time and location of observation.
(3) If a turtle is observed, proceed down to the beach and follow the "Sea Turtle Sighting Protocol" outlined below. If a monk seal is observed follow the "Hawaiian Monk Seal Sighting Protocol" below.

b) Diver's Landing:
i) Safety Protocol: The ARDEL facility is north of this area, do not proceed past any large triangular signs as these mark the areas of hazards. If you have any concerns with safety due to signs or operations, call Security Dispatch and ICC to confirm safety of the area.
ii) Survey Protocol:
(1) Park at the top of the dune, step out of vehicle, and scan to the left and right carefully with binoculars for seals in the water or on the beach and tracks on the sand.
(2) If no animals are observed, record date, any tracks observed, and time and location of observation.
(3) If a monk seal is observed follow the "Hawaiian Monk Seal Sighting Protocol" below.

3) Data Management:
a) Input all monitoring data into PMRF NR database daily as able (at a minimum weekly).

<u>Hawaiian Monk Seal Sighting Protocol</u>

1) Patrols for Hawaiian Monk Seals:
a) Patrols are conducted daily by PMRF Security at the majority of PMRF beaches.
i) Security reports all monk seal sightings to the PMRF Natural Resources cell phone at (808) 208-4416 and erects "Do Not Disturb" signs within the seal's vicinity if seal is in a public area.
ii) PMRF Natural Resources (NR) Personnel respond to all sightings to take data M-F during work hours
b) Daily surveys of Turtle Cove and the Diver's Landing area are conducted by PMRF NR for monk seals as able (see above). If monk seals are observed in a public area, NR personnel will report to Security Dispatch so they can erect signage.

2) NR Biologist: Response to Hawaiian Monk Seal Sightings

- ***Note: All Hawaiian monk seal sightings should be reported to the Kaua`i Monk Seal Hotline ASAP and photos sent by email. See below for more information.***

a) Safety Protocol: Goals = ensure safety of observer from seal attacks and ensure the seal does not become distressed by observer and retreat into the ocean.
i) Before approaching seal, inspect from a distance to determine the seal's level of awareness. Always approach a seal quietly, preferably down-wind of the animal, while focusing on the eyes of the animals to continually determine awareness.
ii) If the seal is unmoving and eyes closed, you are likely able to get within a safe distance of 10 ft. if necessary to get good photos.
iii) If the seal is in any way moving or if the eyes are open, proceed with great caution, do not get within 30 ft. of the animal, and approach outside of the animal's field of view to get the best photos possible. If the seal does make eye contact, immediately stop moving and crouch down until the seal looks away. If the seal becomes noticeably distressed, abort the survey and quickly walk back to your vehicle.

b) Survey Protocol: Collect data on seal(s) when safely within range.
i) Look for any injuries, open wounds, entanglement, or fishing lines coming out of mouth.
ii) If seal's belly is visible, look for nipples or penile opening and groove to determine sex.
iii) Record any identifying characteristics such as bleach marks, tags on flippers, or scars such as circle-shaped cookie cutter shark bites, small line scars, or propeller scars and the corresponding area of the body the mark is observed.
iv) Record date, time, gps location, and general location of sighting.
v) Take close-up photos of the seal from all angles (face, both sides, and flippers), if possible

c) If seal is on a public access section of beach, such as Major's Bay, notify Security Dispatch who will post signage notifying public of seal's protected status and provide a barrier between public and the seal.

i) Security has signage to post, provided by NOAA.
ii) Give the animal a large enough barrier with the signage that the individual will not be disturbed. A 150 ft. buffer between the seal and the public is requested by NOAA.
iii) If present, educate monk seal viewers of the need to keep their distance and to keep pets leashed to avoid disturbing the seal's rest and putting themselves or their pets in danger.

3) Reporting Hawaiian Monk Seal Sightings:
a) NR Biologist: Call the Kauai Hawaiian Monk Seal Hotline at (808) 651-7668 ASAP and report all information on observation.
b) If the seal is injured or entangled, a NOAA/DAR biologist will direct the response effort; PMRF NR biologist to act as coordinator between responders and Navy.
c) All photos taken of monk seals will be emailed to NOAA/DAR at kauaiseals@gmail.com with accompanying observational information ideally the same day of observation. See Data Management.
d) All information regarding injured or dead monk seal sightings and responses will be compiled and a designated NR POC will report information to NMFS PSD, DAR and USFWS within 24 hours of incident. A call is sufficient within 24 hours, but a formal report will be prepared and sent ASAP.

4) Data Management:
a) Enter all data relating to monk seal observations into the Monk Seal or Turtle sighting spreadsheet and the "PMRF NR Reporting Log" daily. Each seal needs a new line within the database to better identify individuals. If no seals or turtles are observed, enter all fields with a "0" or "N/A" to show that the sites were checked and that no focal species were observed.
b) Photos should be uploaded to an RCUH computer and organized in a folder titled with the date and abbreviated location of the sighting (ex 14aAPR2020_MonkSeal_DL). These photos should then be uploaded to the PMRF Google Drive and stored in PMRF Photos > Monk Seals > folder titled with date and abbreviated location of sighting. The link to the folder can then be shared with NOAA/DAR. The folder may need to be cleared out regularly to avoid taking up too much space on the drive. If this is the case, a new google shared drive can be created by someone with a UH email. The drive will then need to be shared with the team and the Natural Resources Manager.

Sea Turtle Sighting Protocol

1) Patrols for Turtles:
a) Patrols are conducted daily by PMRF Security at the majority of PMRF beaches
i) Security reports all turtle sightings to the PMRF Natural Resources Duty Phone at (808) 208-4416
ii) PMRF Natural Resources (NR) Personnel responds to sightings, ensures turtle is healthy, and record date, time, GPS location, general location, species, approximate size of turtle, and any identifying marks or tags
b) Daily surveys of Turtle Cove are conducted by PMRF NR for sea turtles as able (see above).

2) NR Biologist: Response to Turtle Sightings
a) Inspect turtle from an unobtrusive distance but close enough to note any injuries, entanglements, tumors, or fishing line coming out of mouth
i) If any of the above are observed, report to the National Marine Fisheries Service (NMFS) Stranding Line at (808) 983-5730.
ii) If the turtle appears healthy, record all applicable information to sighting including if the turtle is tagged or marked in an easily visible way. If the turtle is tagged, call the Kaua'i Monk Seal Hotline to report the sighting and email the photos upon return to the office (listed under "Turtle Datasheet").
iii) If NR Biologist is not available, Security will report sighting
b) If turtle is in a place frequented by people, notify Security Dispatch. Security will erect signage providing at least a 10 foot buffer around the turtle. If present, educate those present of the need to keep their distance to avoid disturbing the turtle's rest.
c) Dead turtles will be immediately reported, and stored as directed by NMFS and DAR.

3) **Reporting Live or Dead Stranded Turtles:**
   - **a)** Collect and record detailed information of the response including date and time of all actions and personnel involved.
   - **b)** Call the Natural Resources Manager immediately. If the Natural Resources Manager is unavailable, call the PCSU/PMRF Project Coordinator.
   - **c)** Document specimen and response with photos.
   - **d)** All information will be compiled and the Natural Resources Manager will report information to NMFS PSD, DAR and USFWS within 24 hours of incident. A call is sufficient within 24 hours, but a formal report will be prepared and sent ASAP.
4) **Data Management:**
   - **a)** All data, including photos, relating to observations of healthy or injured turtles should be imputed into the PMRF NR database daily (at a minimum weekly). Include reportable incidents in the "PMRF NR Reporting Log."

Species Overview

Hawaiian Green Sea Turtle*, Chelona mydas*

- **Breeding Season:** May – September; adults lay nests May – July; nests hatch July – September.
- **Lifespan:** 60-70 years; sexual maturity at 25 - 35 years.
- **Reproductive cycle:** Every 2-3 years; females usually return to natal beach.
- **Clutches:** 3 – 6 clutches per season laid every 2-3 weeks; average clutch size = 100 eggs.
- **Incubation:** 60 days on average in Hawaii
- **Nesting Range:** 90% of Hawaiian sub-population nests on French Frigate Shoals. Almost yearly nesting has been observed at PMRF with a record 6 hatched nests in 2015.
- **Adult Size:** Carapace length: 40 in; Weight: 200-500 lbs.
- **Description:** Olive brown to black on top with light yellow underside; rounder head than hawksbill; non-overlapping scutes on carapace; 1 pair of prefrontal scales between eyes.

Hawksbill Sea Turtle, *Eretmochelys imbricata*

- **Breeding Season:** Likely same as above; more information needed.
- **Reproductive cycle:** same as above
- **Clutches:** same as above
- **Incubation:** unknown, likely similar to green sea turtle.
- **Adult Size:** 100-150 lbs.
- **Description:** Dark to golden brown, with streaks of orange, red, and/or black on top with lighter, yellow underside; head elongated with beak-like mouth; overlapping scutes on carapace; 2 pairs of prefrontal scales between eyes.

Introduction

Hawaiian green sea turtles are a distinct, threatened, population segment protected under the Endangered Species Act. Green sea turtles are known historically to extensively utilize PMRF's nearshore waters for foraging and beaches for nesting and hauling out. Observations of turtle activities at PMRF dating back to 2006 show evidence of extensive year-round use of the Nohili Ditch outflow, also called Turtle Cove, in particular. Due to lack of intensive monitoring in the past, it is unknown how long green sea turtles have been nesting at PMRF. However, potential turtle digs have been observed as far back as 2006 by USDA-WS personnel with the first confirmed and excavated nest occurring in 2010.

PMRF security forces patrol the beaches of Barking Sands by vehicle daily; therefore it is imperative that sea turtle nests be fenced as soon as possible after laying in order to prevent a nest being driven over and crushed. Educating security forces, staff, and guests as well as encouraging a consistent line of communication will assist the natural resources program in its goal to protect, conserve, and monitor sea turtle nesting events on PMRF beaches. Additionally, the presence of invasive predators at PMRF poses a threat to the survivability of sea turtle nests and hatchlings. Conducting consistent predator control, monitoring and demarcating all nests found at PMRF will help protect them, especially from vehicle and foot traffic.

NR Biologist: Pre-Nesting Season, Prior to May 1

1) Planning:

a) Check in with DLNR DAR and/or USFWS before nesting season. Ensure a permitted biologist will be available and willing to excavate nests for the season

2) Notifications and Training:

a) Ask watch commanders to give nesting season reminders during shift changes to brief staff. These occur daily at 0730, 1530, and 2330

b) Ensure binders in all security vehicles have a "Security Personnel Sea Turtle Nesting SOP"

3) Preparation:

a) Mapping Shoreline

i) Sand deposition along the shoreline varies greatly from year to year with seasonal shifts observed.

ii) From the beginning of the south boundary of the AOA to roughly the northern launch pad, map areas of sandy beaches observed along the coral embankment with GPS.

iii) This will inform what sections will need to be surveyed throughout nesting season in this area.

NR Biologist: Nesting Season Survey Methods, May 1 – July 31

1) Frequency:

a) South half: twice per week (south end of base and airfield).

b) North half: once per week (Diver's Landing, Turtle Cove, and Nohili Dunes)

2) Duration*:

a) South end (south end – Beach cottages): ~20 minutes when using the UTV,
- ~1.5 hours when walking (Fig. 1)

b) Runway and Kini Kini: 0.5 hours (Fig. 2)

c) Divers Landing, Turtle Cove (Fig. 3): ~15 Minutes

*Survey times and areas may change with shifts in sand deposition along shoreline. Conduct shoreline surveys as needed, i.e. after big swells, to re-assess potential nesting habitat.

d) Nohili (Fig. 3): You must access the north section from Red Gate. Call Security to open the gate for you at the north launch area if driving UTV. Most days, they cannot open the gate until 0900.

3) Time of Day:

It is best to conduct these surveys as close to sunrise as possible either walking or in the UTV. If the sand gets too hot, the UTV can get stuck. If walking, staff needs to survey in the morning before turtle tracks are washed or blown away by the wind as tracks going up to the high tide line are often indicative of a nest.

4) Personnel:

When driving in the UTV, it is ideal to have two people surveying to ensure safety. One person drives and the other person should be looking for turtle tracks and possible digs. If walking, just one surveyor is sufficient.

5) Materials:

a) Field notebook

b) GPS

c) Camera

d) Roll of flagging tape/pin flags

e) Binoculars

f) Plenty of water, sunscreen, hat, etc.

e) Radio if survey is within Airfield Operating Area (AOA)

g) UTV when possible and associated supplies

h) Cell Phone

6) Survey Methods:

a) Call dispatch before heading to survey start point.

i) You will need to tell them exactly what you are doing, where, and which vehicle you're driving. For example, for the South survey you would say: "Hi, this is 'name' with Natural Resources. I'm about to conduct a sea turtle nesting survey at the south end of base. I am parked by super stripey, will be starting

at the south end of the beach, walking to beach cottages, and then walking back along the road. I am driving a university truck OR I am driving "make, model, color." When driving on the beach, it is especially important to call dispatch before you do so.

ii) If the survey is within the AOA, you will also need to have constant communication with tower. After calling dispatch, park your vehicle outside of the AOA, call tower with your radio when you are at the boundary, and request permission to enter the AOA, e.g., "Tower, Environmental" (wait for response,). "Environmental requests permission to access mouth of Kinikini Ditch at south end of runway for 10 minutes" (wait for approval from tower) "Environmental Proceeding" Keep your radio on you at all times. When you are done in the area, notify tower: "Tower, Environmental" (Wait for response) "Environmental is off of the AOA." (Should hear a roger/copy in response). The airfield channel is Zone 2, Channel 1. The notch on the radio should be in position "B" for Zone 2 and the screen on the back will say "Air Ops" if radio is on correct channel.

iii) If surveying the north end, call dispatch and ICC before going north of the hangar. Notify dispatch of where you are going and what you are doing. Ask ICC if there are any operations occurring on the north end of base that may limit access.

b) Record start time and location

c) Drive the beach using the UTV or walk below the vegetation line. Pay special attention to the area mid-way between dune vegetation and high tide line looking to each side for turtle tracks as well large pits in sand. Sea turtles at PMRF have historically preferred nesting high up on the beach near the toe of dunes. When driving, avoid vegetation when possible and drive in previously established tire tracks

d) Record stop time and location

e) Enter data into the PMRF NR database, regardless of locatinga nest or not.

7) Upon Finding a Turtle Dig:

b) A female sea turtle may dig in several spots before finding an acceptable spot to deposit her eggs, meaning not all digs are true nests. It is difficult to determine whether a dig is a true nest or a false dig, however there are some clues to look for:

i) Analyze tracks left by the nesting turtle

(1) The marks left by the turtle's flippers will make an arrow in the direction she was moving (Fig. 4 and 5)

(2) If the same turtle tracks lead to multiple digs, it is likely that there are only eggs in the last dig area.

ii) A true green sea turtle nest will likely have a mound with a depression next to it and tracks leading out of the depression (Fig. 4). Do not walk within 1 meter (m) of nest site. This can compact sand and inhibit hatchlings from emerging properly.

iii) After analyzing tracks, assign I.D(s) for dig(s)

(1) When one nest is found: ID the first nest of the season as "Nest 1" and so on

(2) When multiple digs are found: I.D the first nest of the season as "Nest 1" and all of its associated digs as "Dig 1-a," "1-b," etc., beginning with the southernmost dig

c) Record date and time found, GPS coordinates of each individual dig, general location, description (i.e. false dig or probable nest), and photographs

d) Flag the dig(s) and create a temporary barrier to alert Security to steer clear of nest site

8) Reporting Turtle Dig:

a) NR Biologist to **call NR Manager and report nest ASAP**.

b) When back in office, **send email to NR manager with all applicable information*** about nest(s) and dig(s). Report time, date, location, GPS coordinates, description, and Nest I.Ds.

c) **NR Manager to forward email and report to USFWS, DLNR DAR, and NMFS within 24 hours*** of NR Biologist's initial observation.

* If for any reason an email is not able to be sent to these agencies a phone call within 24 hrs of the observation will suffice as the PMRF Biological Assessment (BA) does not specify that details of the dig need be reported within 24 hrs. See below for reporting requirements.

d) NR Biologist to **call Dispatch/Security and report nest.**

e) Enter data into PMRF sea turtle database.

9) Erect Temporary Exclusion around Nest Site ASAP:

a) Place 6 ft tall posts 3 m apart in a circle, with a 2 m radius from the mound and depression. Wrap rope around posts, tying them onto the posts to create a circular demarcation (Fig. 6). According to DAR, there have been no records of dogs disturbing turtle nests thus far, so an orange plastic mesh enclosure is unnecessary and an entanglement hazard (as of 2020).

b) Place signage indicating this is a federally protected, sensitive area, and disturbing it can lead to fines/imprisonment.

c) Document fencing effort with time, date, and photos and enter the data into the PMRF sea turtle database.

Monitoring Nests

1) Day 1-49: Check nest once a week, assuring fence is properly in place and nothing has disturbed nest.

2) Prior to Day 50: Check nest at night once to make sure no lights are visible from nest site. If problem lights are identified, arrange to have them turned off or create a lighting shield.

3) Day 50: Create a "causeway" between nest and ocean if found in area with vehicular traffic to prevent vehicles running over hatchlings and/or creating deep ruts that hatchlings could get stuck in (Fig. 7)

a) The hatchling causeway should start on either side of the nest and fan out, becoming wider closer to the water.

b) Use T-posts ~6m apart, and secure firmly in sand with a mallet.

c) Hang flagging on the t-posts to make them more visible. Place signage on the posts indicating no vehicles should pass through the "causeway". Signs can include large images of turtles to indicate from afar that there might be hatchlings making their way to the water.

d) Make the slopes of existing deep tire ruts in the causeway more gradual by either raking, or simply dragging your foot along the edge of the rut. PMRF had one hatchling in 2015 that became stuck in a tire rut and crawled down the beach, parallel to the ocean for quite a ways; it eventually had to be assisted to the water by Environmental.
e) Look for and remove potential hazards like LTK, etc

4) Day 50-75: Check nest daily, looking for signs of hatching. Hatchlings usually emerge during the night or early morning.

a) Signs of hatched nest:

i) Hatchling tracks leading away from the dig (Fig. 8).
ii) A pitted or dimpled surface covering one side of the dig
iii) An 8-12 inch diameter dimple in the mound of sand from which all the hatchlings emerged. This slight dimple is the only change to the shape of the dig.

b) Check nests in the morning when the sun is still low in the sky. If there are tracks in the sand, they will cast shadows and look more pronounced. Wind/rain can easily erase hatch signs.

c) There are often crab tracks in and around turtle digs which can look very similar to baby turtle tracks especially if wind or rain has obscured them, however, crab tracks are made up of more linear marks while baby turtles leave more rounded impressions

5) Hatch Day: Check for strayed hatchlings and tracks heading away from the water. Walk 50m in either direction of the nest looking for hatchlings.

a) Report and document hatch:

i) Field Biologist to **call NR Manager and report hatch date ASAP.**

ii) When back in office, **send email to NR manager with all applicable information*** about hatch observation. Report time, date, location, GPS coordinates, description, and Nest I.D(s).

iii) NR Manager to forward email to USFWS, DLNR DAR, and NMFS within 24 hours of hatch date.*

* If for any reason an email is not able to be sent to these agencies a phone call within 24 hrs of the observation will suffice as the BA does not specify that details of the dig need be reported within 24 hrs. See below for annual report reporting requirements.

iv) Enter data into PMRF sea turtle database.

<u>After Hatch Date</u>

1) Schedule Excavation:

a) Schedule excavation for no earlier than 72 hrs after observation of hatching. This will allow late hatchlings to properly complete the hatching and emerging process.

b) Coordinate with a permitted individual such as a DAR Sea Turtle Biologist to excavate the nest.

c) Digs are excavated to ensure no baby turtles are trapped under the surface of the sand and also to count egg shells or unhatched eggs and collect samples for DNA analysis.

2) Continue Monitoring: Monitor nest until excavation date, looking for more turtle tracks or strayed turtles.

3) Sea Turtle Nest Excavation SOP:

a) Locating eggs:

i) Look for 8-12 inch dimple in sand and carefully move the sand away with your hands. There may be turtles just under the surface, so it is important to start with hand digging.

ii) The sand should feel soft. If you are digging into packed sand it is not the correct place.

iii) The eggs will be about 3 feet below the surface and will be consolidated in a small area, no more than a foot in diameter.

b) Counting eggs:

i) Collect eggshells and unhatched eggs and put them in separate bags; the state conducts DNA analysis on unhatched eggs

ii) Count egg shells. Some may be small fragments – try to estimate how many fragments would constitute an entire shell.

c) If live hatchlings are found:

i) Set hatchlings down near the nest, facing the ocean to allow the hatchlings to make their way to the ocean unassisted. Observe their progress until they reach the water. The process of crawling on the beach to the water is an important aspect of sea turtle hatchling biology. During the crawl, turtles can essentially "warm up" before entering the ocean and imprint on their natal beach.

ii) If hatchlings crawl away from the ocean direct them as needed.

iii) If all else fails and the hatchlings are alive but do not actively crawl to ocean, bring the turtles closer and closer as needed or release directly into the water.

d) Report:

i) Field Biologist to **call NR Manager and report excavation ASAP. NR Manager to notify USFWS, DLNR DAR, and NMFS that an excavation has taken place.**

ii) When back in office, **send email to NR manager with all applicable information about excavation.** Report time, date, location, GPS coordinates, description, Nest I.D(s), and results of excavation.

iii) Enter data into PMRF sea turtle database.

Sea Turtle Nesting Data Management

1) Enter all data including survey efforts, found nests and digs, fencing efforts, monitoring efforts, and excavation results into PMRF sea turtle database on a weekly basis.

2) Name and file all sea turtle nesting related photos with appropriate nest/dig ID, date, and location code and file into PMRF sea turtle database.

BA Reporting Requirements for End of Year Annual Report

1) PMRF will submit information on all turtle response activity in their annual reports for the Biological Opinion.

The annual report will include:

a) The number of nests laid, their date and location.

b) The specific management measures implemented with respect to each nest.

c) The number of false crawls, their date and location.

d) Nest hatching success and emergence success.

e) The number of stranded turtles (alive and dead).

f) Any incidents of take (i.e., light disturbance, mortality, harassment, etc.).

g) Any other information regarding sea turtles at PMRF that may be relevant to evaluating the response of sea turtles to different management actions.

For general sea turtle monitoring, see "Hawaiian Monk Seal and Sea Turtle General Monitoring SOP."



Figure 1. Turtle Survey Routes – South



Figure 2. Turtle Survey Routes – Runway/Kinikini



Figure 3. Turtle Survey Routes – North



Figure 4. Sea turtle nest with body tracks leading out of dig. The eggs are under the mound (which is not always a pronounced mound but will be adjacent to the dig) and not under the body pit.



Figure 5. Sea turtle nesting tracks leading up to digs at high tide line (right) and then back down to ocean (left). The arrow imprints from the turtle's flippers indicate direction of travel.



Figure 6. Fenced off turtle nest at Nohili in 2020. Driftwood may be used if t-posts are unavailable. Rope is wrapped around poles demarcating the exclusion boundary and signs are erected to inform the public of the nest.



Figure 7. Example of causeway erected near hatching date to inhibit vehicle traffic from running over hatchlings that may be making their way to the ocean. This is an older example of a causeway with wire connecting the poles. Instead of stringing wire, simply attach flagging on each t-post to make them visible and erect signs.



Figure 8. Hatchling tracks leading away from nest.

Security Personnel Sea Turtle SOP

<u>Year-round Reporting Procedure for all Turtle Sightings, Tracks, and Digs/Nests:</u>

Call the **PMRF Natural Resources Duty Phone at (808) 208 - 4416** and leave a message with:

1. Your full name and phone number

2. The time, date, and location of the observation

3. Details about observation (e.g., if turtle appears injured or entangled in any way, number of turtle tracks, number of holes).

4. Please direct any onlookers to stay at least 10 ft. away from turtle to avoid disturbing it.

Sea Turtle Nesting Season SOP, May – August:

1) **Drive below the high tide line** avoiding sand dunes and beach vegetation whenever possible. Sea turtles prefer nesting at the toe of sand dunes near beach vegetation.

2) **Be alert for evidence of sea turtle nesting, especially during night patrols**

a) *How to Identify sea turtle tracks and digs:*

i) Sea turtles tracks are arrow shaped (see Figure 2)

ii) Sea turtle digs look like a crater-like hole in the sand (see Figure 1)

iii) If you observe sea turtle tracks leading up to a hole in the sand, you have likely found a turtle nest. Do not drive or walk within 10 ft. of nest site, doing so can cause the sand to cave in or compact.

b) *What to do if you find a live sea turtle at night:*

i) Stay at least 150 ft. away and slowly drive away from the area before reporting the observance. The turtle may abort her nesting attempts if disturbed.





DEPARTMENT OF THE NAVY

PACIFIC MISSILE RANGE FACILITY

P.O. Box 128

KEKAHA, HAWAII 96752-0128

PACMISRANFAC NOTICE 11015

From: Commanding Officer, Pacific Missile Range Facility

Subj: TREE CUTTING AND TRIMMING DURING ENDANGERED HAWAIIAN HOARY BAT PUPPING SEASON 1 JUNE - 15 SEPTEMBER

Encl: (1) PMRF Wildlife Seasons Chart

(2) Hawaiian Hoary Bat Fact Sheet

1. Purpose. To give guidance for allowable and prohibited vegetation maintenance activities during the endangered Hawaiian hoary bat pupping season to eliminate risk to bat pups before they are able to fly.

2. Policy. No part of any tree 15 feet or taller, with the below exceptions, is allowed to be trimmed, cut or removed during the period above, including for construction by or for tenant or customer Department of Defense commands or other federal agencies. For the purposes of this policy, trees are woody vegetation with a central trunk. Tree trimming that is routinely needed shall be scheduled to be completed outside of this period; trees that need to be trimmed for projects during the prohibited period should be maintained at a height less than 15 feet during the pupping season. This policy applies across the installation and leased properties, including Barking Sands, Makaha Ridge, Koke'e sites and Kamokala Ridge. Natural Resources must be notified of bats found on any part of the installation.

3. Dates. Hawaiian hoary bat pupping season lasts from 1 June - 15 September 2023 inclusive. Exceptions to the Policy:

a. Coconut palms. Leaves and coconuts may be removed from coconut palms 15' or taller if a visual inspection is conducted prior to trimming and there are no bats present. Coconut palms may not be cut down during the period.

b. Emergency need. In the event of an unforeseeable event leading to the immediate need for tree/tree branch removal, Natural Resources must be contacted and allowed to conduct a pre-dawn bat survey of the vegetation, as safety allows. Any trimming that

must be done without delay and without the necessary notification for a survey will be documented and reported to the Natural Resources Manager, Brooke McFarland at brooke.a.mcfarland.civ@us.navy.mil or (808) 335- 4017. All felled vegetation will remain on site until inspected by a biologist.

Subj: TREE CUTTING AND TRIMMING DURING ENDANGERED HAWAIIAN HOARY BAT PUPPING SEASON 1 JUNE - 15 SEPTEMBER

4. Safety. No measures taken during this period should result in unsafe situations for human health or property. All reasonable measures should be taken to identify trees that could become a safety hazard within the prohibited period.

5. Cancellation Contingency. This notice will be cancelled 31 December 2023 or upon completion of the Hawaiian hoary bat pupping season.

6. Records Management. Records created as a result of this notice, regardless of media or format, must be managed per Secretary of the Navy Manual 5210.1 of September 2019.

STEVENSON.BRETT.ASHLEY.1158727311 Digitally signed by STEVENSON.BRETT.ASHLEY.1158727311 Date: 2023.04.25 16:12:45 -10'00'

B. A. STEVENSON

APPENDIX F – PROTECTED SPECIES MANAGEMENT PLANS

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Nēnē Management Plan: Pacific Missile Range Facility, Barking Sands

Kauai, Hawaii



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LIST OF ACRONYMS & ABBREVIATIONS

ac	Acre(s)
AOA	Airfield Operations Area
Admin	Administration
BASH	Bird Aircraft Strike Hazard
BO	Biological Opinion
cm	Centimeter(s)
CNIC	Commander Navy Installation Command
CNRH	Commander Navy Region Hawaii
CNO	Chief of Naval Operations
DLNR	Hawaii Department of Land and Natural Resources
DoD	Department of Defense
DOFAW	Hawaii Division of Forestry and Wildlife
DoN	Department of the Navy
ESA	Endangered Species Act
etc	Et cetera (examples)
e.g.	Exemplia gratia (for example)
ft	Feet
FAA	Federal Aviation Administration
Fig(s)	Figure(s)
g	Gram(s)
GIS	Geographic Information Systems
GPS	Global Positioning System
ha	Hectare(s)
hr	Hour
HIANG	Hawaii Air National Guard
in	Inch(es)
INRMP	Integrated Natural Resources Management Plan
INST	Instruction
IR	Infrared
KISC	Kauai Invasive Species Council
km	Kilometer(s)
KPNWR	Kilauea Point National Wildlife Refuge
lbs	Pound(s)
LCDR	Lieutenant Commander
LT	Long-Term
m	Meter(s)
MBTA	Migratory Bird Treaty Act
mi	Mile(s)
mph	Miles Per Hour
NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service
NWR	National Wildlife Refuge
NWRC	USDA WS National Wildlife Research Center

OANRP	Oahu Army Natural Resources Program
Oz	Ounce(s)
PMRF	Pacific Missile Range Facility
PWO	Public Works Office
SOH	State of Hawaii
Spp	Species (plural)
ST	Short-Term
TNR	Trap Neuter Release
UAV	Unmanned Aerial Vehicle
US	United States
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WHA	Wildlife Hazard Assessment
WHMP	Wildlife Hazard Management Plan
WS	U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services
WVC	Wildlife Vehicular Collision
ZSSD	Zoological Society of San Diego

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EXECUTIVE SUMMARY

This Nēnē Management Plan (NMP) has been developed for the United States (US) Department of the Navy (DON), Commander Navy Region Hawaii (CNRH) for its Pacific Missile Range Facility (PMRF) to assist in the management of the endangered Hawaiian Goose or nēnē (Branta sandvicensis). This plan is in accordance with the DON PMRF Integrated Natural Resources Management Plan (INRMP) (Section 3.4.1.1) (CNRH, 2010) and in partial fulfillment of the US Fish and Wildlife Service (USFWS) 2014 Biological Opinion (BO) for PMRF Base-wide Infrastructure, Operations and Maintenance, Kauai.

The nēnē, as a federally endangered species as well as a Bird Aircraft Strike Hazard (BASH) risk, requires proactive management and specific conservation measures. The following management plan details species biology, threats to species conservation, species history at PMRF, and best management strategies for the species across all PMRF's sites to support mission capability as well as species recovery.

The management and monitoring actions detailed in this plan will be incorporated into the facility's INRMP, stressing the need for adaptive management based on best information available. These actions include but are not limited to the following: predator population monitoring and control, standardized nēnē population surveys, education and outreach efforts, and habitat management. The recommended management and monitoring actions are presented such that they may be implemented individually or in combination. By continuing to monitor nēnē populations, these management actions may be evaluated by their apparent effects – intended and otherwise – and can inform adaptive management strategies. This management plan is a living document that can, and should, be revised at any time as new information becomes available.

1. INTRODUCTION

PURPOSE

This NMP has been developed for the US DON, CNRH for the PMRF to assist in the management of the endangered Hawaiian Goose or nēnē (*Branta sandvicensis*). A single adult nēnē was first observed at Barking Sands by DOFAW Wildlife Manager Tom Telfer in 1987 (Banko & Elder, 1990). Observations of nēnē at PMRF have since become regular in conjunction with the species' overall population growth on Kauai.

This NMP serves two main functions: (1) it serves as a central source of nēnē natural history for the DON, specifically in relation to PMRF; and (2) it identifies management goals and recommended actions to aid in the continued recovery of the species while striving to maintain no net loss in mission capability.

This plan is meant to be an internal guidance document, and was prepared in partial fulfillment of the US Fish and Wildlife Service (USFWS) 2014 BO for PMRF Base-wide Infrastructure, Operations and Maintenance, Kauai. Compliance with the provisions of National Environmental Policy Act (NEPA) and other applicable laws, regulations, and policies is required prior to implementation of management strategies. The management actions proposed herein will be incorporated into the PMRF INRMP that is implemented under the guidance of the PMRF Natural Resources (NR) Manager. Regular monitoring and documentation will be completed concurrently with implementation of all nēnē management strategies at PMRF to evaluate effectiveness.

This NMP is to be reviewed annually by PMRF stakeholders, USFWS, and Department of Land and Natural Resources (DLNR)-Department of Fish and Wildlife (DOFAW). At that time parties will review most recent nesting and population data for PMRF, the apparent effects of implemented management strategies, and novel relevant information on nēnē biology or demography; taking all this information into account, managers will collaborate and amend the proposed strategies as needed throughout the adaptive management process.

INSTALLATION BACKGROUND

Mission & Vision

The mission and vision of PMRF, Barking Sands, Kauai is to provide integrated range service in a modern, multi- threat, multi-dimensional environment that ensures the safe conduct and evaluation of training and Test & Evaluation missions, in addition to delivering products to improve the customer's ability to achieve readiness and other national defense objectives (CNIC, 2016).

Location & Facilities

Located on the western coast of the island of Kauai, PMRF encompasses approximately 3,700 ac (1,497 ha). It is the largest multi-environment test range in the world and contains land, sea, and air zones. PMRF's Main Base is located at Barking Sands, Kauai and supports training, tactics development, and evaluation of air, surface and subsurface weapons systems for the Navy and other Department of Defense (DoD) agencies, foreign military forces, and private industry (Figure 1).

The Mana Plain, where PMRF, Barking Sands is located, was historically associated with extensive wetlands separated from the coastal beach area by a system of high sand dunes. Currently, a man-made oxidation pond, used for sewage treatment, and several irrigation ditches at Barking Sands support protected bird species, however these areas have not been delineated by the US Army Corps of Engineers and are not listed in the USFWS's wetland inventory. Kini Kini Ditch runs east to west directly south of the PMRF airfield

(Figure 2), while the Oxidation Pond is located 2 miles south of the airfield. Nēnē are most often observed at the Barking Sands facility around these manmade water sources or loafing and foraging on mowed lawns.

In addition to the Barking Sands main base, there are numerous support facilities located both on and off Kauai including those at Makaha Ridge (secondary range), Kokee (tracking radars, telemetry, communications, command and control), Kamokala Ridge (explosive storage), Milolii Ridge (reflectors), Niihau Island (radar, optics, and electronic warfare), and Kaula Island (aircraft gunnery and inert ordnance target practice) (CNRH, 2010). Of these support facilities, the Makaha Ridge Tracking Station and Kokee Sites are known to harbor nēnē and are included in this plan.

The Makaha Ridge Tracking Station sits on a Na Pali finger ridge to the north of Barking Sands, overlooking the Mana Plain. The station has a maximum elevation of about 1,850 ft (564 m), with steep slopes that surround it on the south, west, and north. Nēnē often forage and loaf in the mowed lawns around the most distal group of buildings at the station near the bottom of the ridge.

East of Makaha Ridge and higher in elevation (3,710 ft), PMRF leases five small parcels of land within the boundaries of Kokee State Park collectively referred to as the Kokee sites. The Kokee sites are fenced, and open areas within the fence line consist mainly of mowed lawns. Nēnē are not often observed at Kokee, however, the open green lawn will be a continued attractant as Kauai's nēnē population increases in size.

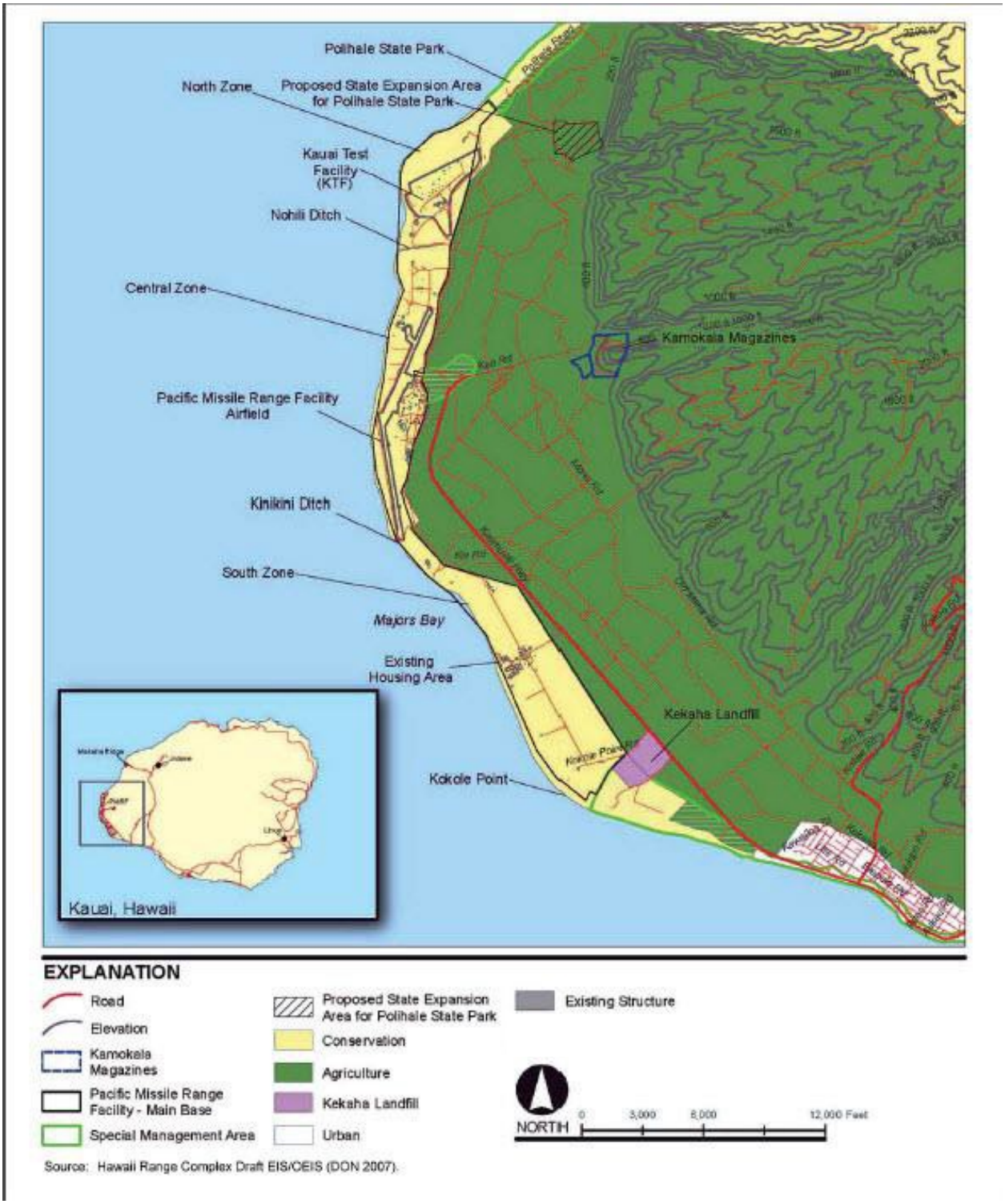


Figure 1. PMRF, Barking Sands, island of Kauai map



Figure 2. Aerial views of airfield area of PMRF with Kini Kini and Kawaiole Ditches (bottom) and agricultural lands visible (right)

2. NĒNĒ BIOLOGY AND ECOLOGY

FORAGING

Historically, seasonal changes in food availability led nēnē to migrate between the uplands in summer to forage on berries and lowlands during the winter to forage on new growth of greens (Baldwin, 1947). Browsers and grazers, nēnē today forage on the leaves, seeds, flowers and fruits of over 50 native and non-native grasses, sedges, composites, and shrubs (Banko, Black & Banko, 1999; DOFAW 2005). As opportunistic generalists, their diet is largely dependent on their surrounding habitat (Black et al, 1994; Banko et al, 1999; Woog, 2000). This adaptability has allowed nēnē to survive in marginal environments and thrive in highly altered landscapes (Black et al, 1994 & Banko et al, 1999). Nēnē are readily attracted to short growing exotic grasses and herbs found in pastures, golf courses, roadsides, and lawns (Black et al, 1994; Loepold & Hess, 2013; Baldwin, 1947; Woog & Black, 2001). These cultivated grasses when mowed, grazed, fertilized, and irrigated, provide nēnē with much needed high-protein forage – higher than that in either than berries or grass seeds.

REPRODUCTION

The vast majority of wild nēnē nest between October and March, with the production of clutches peaking between October and December; however, nēnē nesting has been documented anytime from August – April (Banko, Black & Banko, 1999; Kear & Berger, 2010). Directly prior to nesting, nēnē tend to pair off, separating from flocks and family groups. Males become aggressive toward other geese, people, and even, at times, cars that approach the pair. Nēnē mate for life and remain in close proximity to each other throughout the year, generally finding a new mate only if their current mate perishes.

Nēnē usually build nests along "veg lines" – a line of taller vegetation (herbaceous or woody) that borders an open area. Nest locations can be identified by a solitary male acting defensively near one of these veg lines; the female, along with the nest, is generally well-hidden in the taller vegetation. Additionally, a pair will regularly attend an area for 2-3 weeks prior to nesting. A nēnē clutch contains an average of 3 (1-6) large eggs laid every 24-48 hours (Banko, Black & Banko, 1999). Female nēnē incubate their eggs for 29- 31 days and are known to re-nest within 14-60 days should their first clutch fail (USFWS, 2004). Typically, all eggs in a clutch hatch within the same 24-hr period (Banko et al, 1999). Female nēnē will often return to their natal fledging sites for nesting, and commonly nest within the previous year's nest cup or in close proximity to it (Banko, 1980; Banko & Manuwal, 1982; Woog, 2000).

Nēnē incubate eggs for 30 days, and goslings remain in the nest for only 1-2 days after which broods become mobile (Banko, 1992). Until their first pre-basic molt, which occurs 11-14 weeks post-hatching, juvenile nēnē are flightless and duller in color than adults (USFWS, 2004); by 5 months of age juveniles are nearly indistinguishable from their parents with whom they will remain for about a year (Banko, Black & Banko, 1999).

MOLTING AND FLOCKING

Like most waterfowl, nēnē undergo a complete molt each year between March and June. When molting, nēnē lose and regrow all body, wing, and tail feathers. Nēnē are flightless during the 4-6 week molting period, and therefore highly vulnerable to predation; birds are accordingly extremely cautious and spend the majority of their time in thick brush or by water sources which both provide escape avenues (Leopold & Hess, 2013). Post-breeding and molting (May – August), nēnē family units will flock together and move locally within a 6 mile radius (10 km) in large groups.

DISTRIBUTION

Prior to western colonization of the Hawaiian Islands in the early 1700's, the nēnē population was approximately 25,000 birds (Baldwin, 1945). In 1949, the wild nēnē population was less than 50 individuals (Banko, 1978), when a second captive breeding program was organized for the protection of the species. Today, over 2,600 captive-bred birds have been released on Hawaii, Maui, Molokai, and Kauai (DOFAW, 2012; USFWS, 2004).

The 2015 statewide nēnē population estimate is 3,039 birds with 1,319 on the island of Kauai (Nēnē Recovery Action Group, 2016). While survival and breeding success in the wild remains low for some nēnē populations on other islands, the Kauai population nearly tripled in just over a decade: the population was estimated at only 525 birds in 2002 (USFWS, 2002). This growth has been largely attributed to the lack of an established mongoose population on Kauai, and the presence of large tracts of undeveloped low elevation grasslands throughout the island. Kauai's 2015 west-side population was estimated to be 60 individuals (DOFAW Kauai Nēnē Biologist J. Olbert, personal communication).

THREATS

Nēnē evolved with no native predators excepting perhaps the Hawaiian Short-eared Owl or Pueo (*Asio flammeus sandwichensis*) and Black–crowned Night Heron ('Auku'u, *Nycticorax nycticorax*) on goslings. The geese have very limited evolutionary adaptations – behavioral or physical – to protect against the introduced mammalian predators of the Hawaiian Islands. Predators include feral and free-ranging cats, feral and free-ranging dogs, rats, mongoose, pigs, and even humans historically. In addition to directly consuming or attacking nests, goslings, and/or adults, many of these mammals can also be disease vectors.

One of the growing threats to adult nēnē on Kauai is vehicle collisions: Over 50 adults between 2015 and 2017 were killed by vehicle collisions on the island (DOFAW, 2016). Mowed grassy areas along roadsides are often the first place to green on the west side after rains, since these grassy areas collect the water runoff from the roads. This makes these green grassy areas highly attractive to nēnē for foraging opportunities, and the birds' low slow flight patterns make them especially vulnerable to passing vehicles (DOFAW, 2016).

Nēnē may also be attracted to roadways by well-meaning people who feed the birds. However, feeding nēnē creates a serious risk for individuals: "A fed Nēnē is a dead Nēnē" as Volcano National Park on the island of Hawaii advertises to visitors. Nēnē that have been fed have a higher incidence of vehicular collision, returning to roadways and parking lots in search of food handouts (Huijser, et al., 2008).

Other anthropogenic threats include land use conflicts such as nēnē foraging around farms, golf courses, and airfields. On farms, nēnē forage on young seedlings and farmers are increasingly concerned about theeconomic impact the geese may have on their crops and their inability to haze the geese from the field due to their endangered status. Geese on golf courses are at risk of being hit by golf balls, and can be attracted to major population centers by the lush green fields. Geese in the vicinity of airports present a BASH, dangerous for birds and pilots alike.

3. NĒNĒ AT PMRF

DEMOGRAPHY

Standardized surveys have been completed at PMRF Barking Sands since July 2016 (Table 1). In eight months of data collected between July 2016 and February 2017, the average nēnē population on base was 26 individuals, with slightly more during flocking season and significantly less during molting season (Figure 3). The most variable month, by far, was July during the height of flocking season with a high of 79

individuals and a low of 0 individuals observed during a single survey. The least variable month was December during the height of breeding season (21-30 individuals).

Similar to population count, popular areas at Barking Sands also varied depending on the season. During flocking season, nēnē were most often observed in the Kini Kini Ditch area east of Nohili Rd (technically outside the property lines of Barking Sands), at Shenanigans All-Hands Club, and near Subway (Figure 4, Figure **5**). However, during nesting season, nēnē were most regularly observed at the Oxidation Pond and Hawaii Air National Guard (HIANG), both of which are common nesting locations (Figure 4, Figure **5**). From April 2016 through March 2017, 123 banded individuals were recorded at Barking Sands.

Seven surveys were completed at Makaha Ridge and Kokee Sites from July 2016 through February 2017 by PMRF staff. During these surveys, between 11 and 12 nēnē were observed on average at Makaha Ridge. DOFAW conducted 25 surveys at Makaha Ridge between January 2014 and February 2017, and similarly observed 11 birds on average at the facility (J. Olbert, 2017 personal communication). No nēnē were observed at the Kokee sites by PMRF staff.

Table 1. Number of basewide nēnē surveys completed at Barking Sands, Pacific Missile Range Facility, HI between July 2016 and February 2017

Month	# of Surveys
2016	
July	6
August	6
September	6
October	7
November	9
December	6
2017	
January	7
February	7

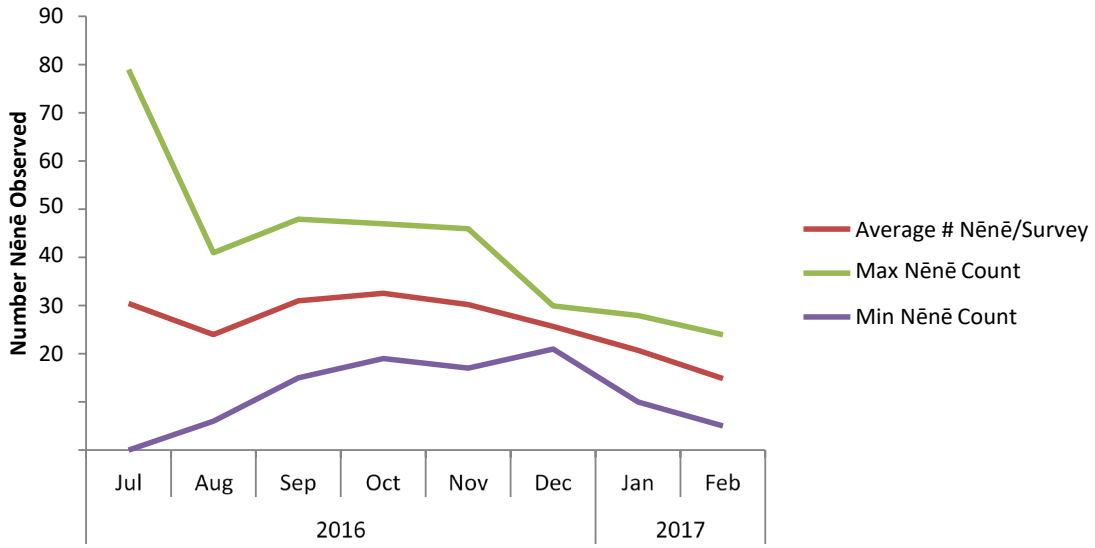


Figure 3. Number of nēnē observed at PMRF Barking Sands during basewide surveys, per month (July 2016 – February 2017)

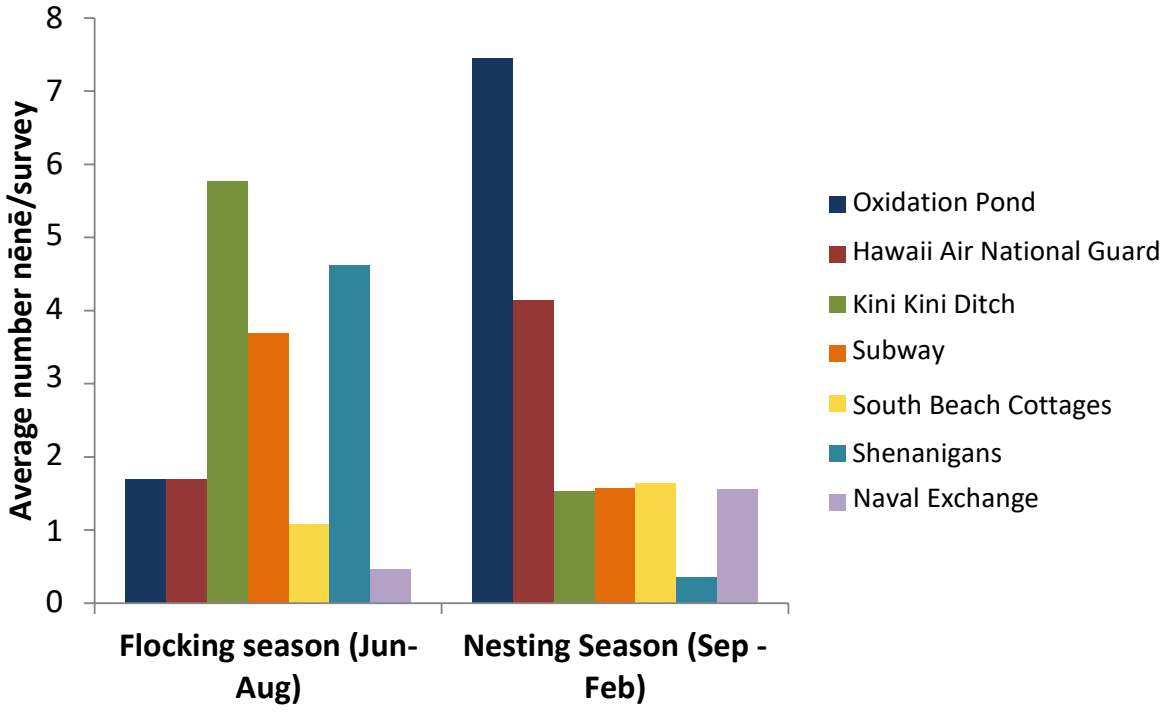


Figure 4. Average number of nēnē in the most frequented areas of PMRF Barking Sands, July 2016 – Feb 2017



Figure 5. Most frequented areas by nēnē at PMRF Barking Sands, July 2016 – Feb 2017

NESTING

The first documented nest on Barking Sands was observed in fall 2010 at Hawaii Airforce National Guard (HIANG) station. Since that time, 31 nests have been established at Barking Sands and at least 36 geese have fledged (Figure 6. Nēnē nests laid at PMRF Barking Sands. Information includes total number of nests documented in an area (yellow circle), fiscal years during which at least one nest was documented in an area, and number of pairs which have nested in the area. The two most popular nesting areas are in the vicinity of HIANG (six nests between 2010 and 2017) and the Oxidation Pond (18 nests between 2012 and 2017). Of highest threat to base operations were the two nests laid at the south end of the runway in FY16 and FY17. The nest in FY16 was predated soon after discovery and the parents abandoned the area directly after. However, the FY17 pair laid their nest less than 75m from the end of the runway, and through emergency consultation with USFWS and DOFAW, all agencies agreed the best mitigation of risk to human and nēnē lives at the time was to destroy the nest.

Makaha Ridge had six active nests in FY17, and DOFAW documented 24 nests between FY07 and FY16 at the site. All nests have been in the western most cleared area near the end of the ridge (Figure 7). No active nests have been observed at the Kokee sites.

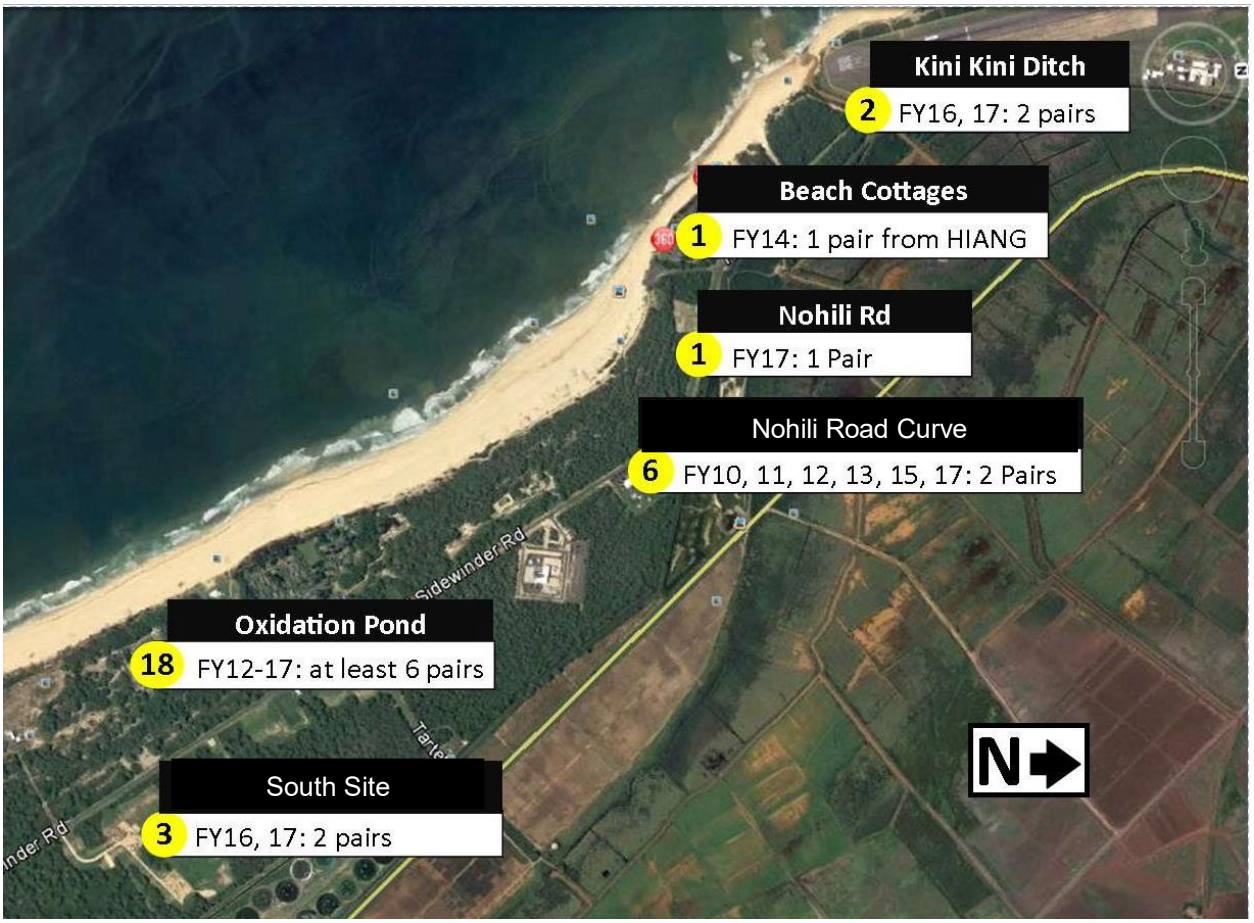


Figure 6. Nēnē nests laid at PMRF Barking Sands. Information includes total number of nests documented in an area (yellow circle), fiscal years during which at least one nest was documented in an area, and number of pairs which have nested in the area



Figure 7. Nēnē nesting area at Makaha Ridge, delineated by red circle

HAZING

United States Department of Agriculture Wildlife Services (USDA-WS) currently hazes nēnē only by foot and/or vehicle horns. The Bird Discovery and Dispersal Team (BDDT) actively hazes during published hours of airfield operations: M-F 0700-1800, excluding federal holidays. On any given day, USDA-WS personnel drive a circuit covering the airfield and immediate surrounding area, hazing any wildlife posing a danger to aircraft. Each area on base is visited approximately every 60-90 minutes during airfield operational hours.

Nēnē are most often seen on the Barking Sands airfield outside breeding season, when large groups flock together overnight (Figure 8). Monthly highs fluctuate significantly from year to year, and the most populous month on the airfield for nēnē occurred anywhere between May and October. September 2016 had a record high of 504 nēnē hazing events on the airfield – more than double the number of hazing events from any other month. A "hazing event" refers to a single individual being hazed: If a flock of 20 birds was hazed once or the same five-member family unit was hazed four times, both would qualify as 20 hazing events. Airfield population trends could be correlated with weather conditions, breeding season, and/or other variables.

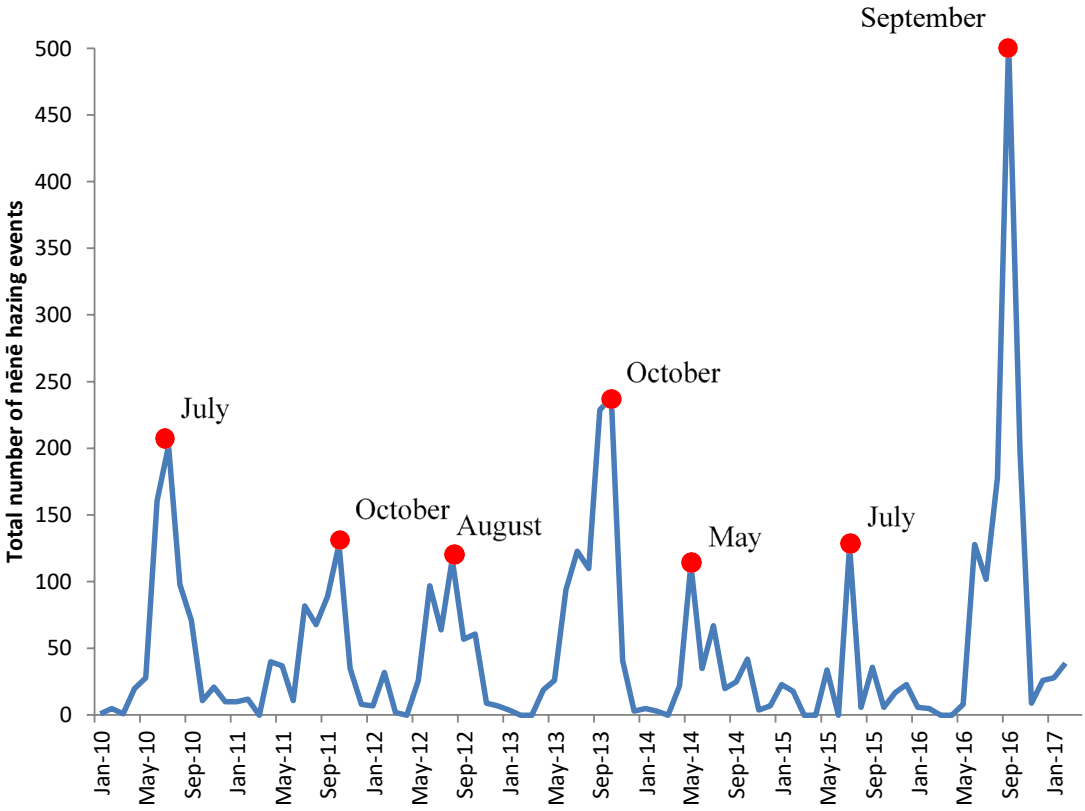


Figure 8. Total number of nēnē hazing events on the Barking Sands Airfield from January 2010 - March 2017 by USDA-WS. Red dots and corresponding labels indicate annual highs and their corresponding months.

MORTALITY INCIDENTS

Six nēnē mortality events occurred between March 2015 and March 2017 at Barking Sands: five due to vehicle collisions and one due to an enlarged liver (Figure 9). All vehicle collisions occurred on Nohili Drive in 45mph speed limit sections. Of special concern is the Hawaii Air National Guard area where four mortality events occurred within three months. Geese are attracted to this area to forage along the roadside, especially during drought events (See Nēnē Biology and Ecology: Threats section). The 2016- 17 events also coincided with breeding season when geese are especially territorial and less prone to flee from human activity. Additionally, one mortality occurred at Makaha Ridge in 2010 when a goose was struck by a truck in the same area as the nesting region (Figure 7).



Figure 9. Documented nēnē mortality events at Barking Sands, Pacific Missile Range Facility. Red icons indicate vehicle strikes along Nohili Road, and the blue icon represents the location where the adult male carcass was found with an enlarged liver.

4. NĒNĒ MANAGEMENT AT PMRF: GOALS, OBJECTIVES, AND STRATEGIES

The goals for the Navy's Installation NR Program are:

1. Integrate natural resource conservation responsibilities with military activities, installation planning and programming, and other activities as appropriate to ensure no net loss to the Navy mission.
2. Ensure sustainable multipurpose use of the resources and public access when consistent with the mission, and safety and security requirements; and
3. Interact with the surrounding community to develop positive and productive community involvement, participation, and educational opportunities.

A summary of the objectives and strategies to achieve these program goals with respect to nēnē are presented below. Target timeline for implementation is classified as either short-term (ST), starting within the next 2 years, or long-term (LT), starting up to 5 years from now. The final implementation of the strategies described is contingent upon adequate staffing and funding. Additional details explaining rationale and suggested implementation of strategies follow after the summary table.

OBJECTIVE 1 – MINIMIZE NĒNĒ BASH RISK AT PMRF VIA HABITAT MODIFICATION, HAZING, AND OTHER ACTIVE MANAGEMENT MEASURES

STRATEGY 1-1. Maintain the grass at 7-14 inches in areas under mandate of Air Traffic Control (ST & LT)

STRATEGY 1-2. Manage landscaping (off the airfield) to minimize attractiveness to nēnē. (LT)

STRATEGY 1-3. Maintain vegetation adjacent to drainage ditches near the airfield to discourage nēnē presence. (ST)

STRATEGY 1-4. Expand the current hazing toolkit to make hazing operations more effective. (ST & LT)

STRATEGY 1-5. Increase hazing efforts for nēnē to preclude them from breeding in areas adjacent to the airfield. (ST)

STRATEGY 1-6. Review and revise current Wildlife Hazard Assessment and Wildlife Hazard Management Plans in respect to nēnē. (ST)

OBJECTIVE 2 – REDUCE NĒNĒ INJURY/MORTALITY AT PMRF ASSOCIATED WITH MILITARY PRESENCE (EXCEPT AS RELATED TO BASH) TO A MAXIMUM OF TWO INCIDENTS PER YEAR BY 2020

STRATEGY 2-1. Standardize SOPs for notification and response actions when nēnē nests are observed (ST)

STRATEGY 2-2. Improve preventative measures along roads where nēnē are frequently observed, such as road signage, rumble strips, or speed bumps (ST & LT

STRATEGY 2-3. Implement training to increase awareness of presence of nēnē on base, guidelines for notification and response, rules for pets on base, nēnē biology and protected status. (ST)

OBJECTIVE 3 – DEVELOP A COMPREHENSIVE PREDATOR CONTROL PLAN TO REDUCE NĒNĒ INJURY AND MORTALITY FROM PREDATORS

STRATEGY 3-1. Identify predator population on base and prioritize areas for predator control actions. Target species include feral cats, dogs, pigs, barn owls, rats, and mongoose should they become established on the island. (ST)

STRATEGY 3-2. Integrate monitoring for predators to support evaluation of effectiveness of predator control actions (ST)

STRATEGY 3-3. Increase awareness and enforcement of Navy policy regarding feral cats through improved training and outreach (ST)

OBJECTIVE 4 – REVIEW THE NĒNĒ MANAGEMENT PLAN ANNUALLY AND IDENTIFY OPPORTUNITIES FOR IMPROVEMENT

STRATEGY 4-1. Implement standardized monitoring to track the baseline nēnē population. (ST)

STRATEGY 4-2. Review new information obtained through implementation of the management plan annually, and evaluate for overall effectiveness and efficiency of meeting stated objectives. (ST)

STRATEGY 4-3. Establish a working group with the NR staff and key stakeholders with responsibilities in the implementation of this management plan. Meet annually to review changes to mission needs, population update as identified in Strategies 4-1 and 4-2 above, and recommend changes to the plan. (ST)

OBJECTIVE 5 – IDENTIFY OPPORTUNITIES FOR MULTIPURPOSE USE AT PMRF TO PROVIDE CONSERVATION BENEFIT TO NĒNĒ

STRATEGY 5-1. Conduct studies to improve understanding of nēnē population dynamics at PMRF. Studies to start with surveys that can be implemented within the next year with existing funding. (ST)

STRATEGY 5-2. Identify additional research objectives that could be of value to nēnē management at Barking Sands, justify the expenditure within the scope of the PMRF NR program, and request funding to implement these additional studies. (LT)

OBJECTIVE 6. IMPROVE UNDERSTANDING OF HOW NĒNĒ AT PMRF INCORPORATE INTO THE REGIONAL NĒNĒ POPULATION AND IDENTIFY OPPORTUNITIES TO SUPPORT CONSERVATION OF NĒNĒ AS A SPECIES

STRATEGY 6-1. Maintain close coordination with Sikes Act Partners with nēnē programs to share data and identify opportunities to integrate the PMRF nēnē management with other nēnē conservation programs (ST)

STRATEGY 6-2. Establish and maintain partnership and open communication lines with private and public landowners surrounding PMRF (LT)

OBJECTIVE 1 – MINIMIZE NĒNĒ BASH RISK AT PMRF VIA HABITAT MODIFICATION, HAZING, AND OTHER ACTIVE MANAGEMENT MEASURES.

Birds and other wildlife in proximity to airfields are a serious threat to aviation safety. A record 13,668 wildlife strikes were reported to the Federal Aviation Administration (FAA) in 2014 alone (FAA, 2014). Naval aviators specifically have experienced over 16,550 bird strikes, which resulted in over 440 aircraft mishaps, 250 foreign object damaged engines, $372 million in damage related costs, 10 destroyed aircraft, and one fatality since 1981 (CNIC, 2011).

The 2007 Wildlife Hazard Assessment (WHA) for PMRF identified the nēnē and Laysan Albatross as special threats to aviators at the facility. Nēnē in the Aircraft Operations Area (AOA) pose a significant threat to human safety and Navy equipment due to their low and slow flight patterns, large body size, and flocking behavior. The following strategies have been developed to mitigate this risk. USDA-WS is currently working on a revised WHA; tentatively scheduled for completion in 2018. This will be a key resource for the Bash Working Group (BWG) in the preparation of the revised Wildlife Hazard Management Plan (WHMP) which describes management actions to be implemented at PMRF to minimize BASH hazards. The BWG is comprised of representatives from airfield operations, USDA- WS, public works, natural resources, public affairs, security, and mission-related operations. The PMRF NR Manager is responsible for ensuring that management actions identified in the WHMP are consistent with all applicable laws relating to natural resources, in line with the INRMP, and to initiate consultation with the USFWS through the Section 7 consultation process as needed.

One of the most permanent methods of discouraging birds and other wildlife from visiting or utilizing airfields is modifying or removing attractive habitat features (CNIC, 2010 & Washburn & Seamans, 2004). The PMRF BASH Instruction 5090.7B (2012) identifies numerous land management procedures for discouraging wildlife from using the airfield at PMRF.

STRATEGY 1-1. Maintain the grass at 7-14 inches in areas under mandate of Air Traffic Control. (ST & LT)

Grasses are highly attractive to a variety of hazardous wildlife species, and no one grass management regime will deter all species of hazardous wildlife in all situations. The 2014 BO and PMRFINST 5090.7C stipulate a 7-14” grass regime on the airfield which would likely discourage casual loafing by large flocks of nēnē. All areas of the airfield which require contact with Air Traffic Control should be maintained according to this guidance (Figure 10).

While this target grass height is less attractive to nēnē for loafing and feeding, provided it does not seed at this height, the altered landscape could attract more nesting nēnē to the area. Of 142 nests island-wide in FY17 monitored by DOFAW, 44 percent were located in grasses: buffelgrass (6-84”), California grass (12-40”), crabgrass (12”) and guinea grass (12-72”) (J. Olbert, personal communication 2017). One 2016 nēnē pair was observed nesting in just 8” buffelgrass at the Oxidation Pond. Increased hazing effort may be necessary to counteract the expansion of potential nesting habitat (discussed in further detail under Strategy 1-4). Taller grasses could also attract gamebirds who favor hiding in these taller grasses and flush when startled.

Alternative vegetation to replace grass on the airfield has been considered in the past, but no workable replacement has been identified. Per the BO recommendation, test plots of native beach morning glory (*Ipomoea pes-caprae*) and akiaki grass (*Sporobolus virginicus)* were established at the north end of the base in 2012. Without irrigation, invasive grasses and shrubs moved into the area, and the native

vegetation began to die back. This trial indicates that maintaining monoculture carpets of native vegetation could be unmanageable without irrigation or intensive landscaping.

In evaluating potential alternatives, a foraging preference study similar to the one conducted by Washburn & Seamans (2012) could be valuable. Such a study would help to determine which turf grass species are the least likely to attract nēnē, and hence are best suited for use within the AOA. Captive nēnē, such as those currently at the Honolulu Zoo, could provide an alternative to the use of wild nēnē in the execution of the study. In addition to considering attractiveness to nēnē, all vegetation would be selected with the following in mind: effects on non-target species, and adaptability to the dry, hot environment of Kauai's west-side. USDA-WS is currently working on revising the WHA and WHMP which should provide additional suggestions for potential alternatives.

Management Actions:

1. Implement grass maintenance at 7-14" on the airfield.
2. Assure mowing and landscaping efforts are coordinated with the airfield manager for minimal impact to air operations.
3. Identify and evaluate potential alternatives for vegetation on the airfield.



Figure 10. Designated areas of the airfield which require contact with Air Traffic Control. Currently mowed lawns will be maintained at 7-14 inches within the next two years. In the long-term, all trees and shrubbery in the designated area will be cleared and these areas will also be maintained at 7-14 inches.

STRATEGY 1-2. Manage landscaping (off the airfield) to minimize attractiveness to nēnē. (LT)

Per the 2014 BO the watering of lawns on the Barking Sands airfield ceased entirely in 2015, as well as the area near the Nohili Road Curve. However, certain high visibility areas in direct proximity to the airfield continue to be watered for aesthetic and financial purposes: the area around Subway, the field around the flagpole, the memorial area, the Public Works Office, and the north PMRF gate entrance. During dry times of the year, nēnē are regularly observed loafing and feeding in these areas. Again, during flocking season 2016, the

area around Subway and the flagpole, less than 500 meters from the airfield, was the second most popular spot to observe nēnē at Barking Sands (Figure 4).

Public Works (PW) will aim to modify these areas by 2025, eliminating all lawn irrigation within 5000 ft of the airfield. PW may look into xeriscaping, artificial turf grasses, or simply discontinuing watering.

Management Actions:

1. PW – develop landscaping plans eliminating the use of irrigation to maintain lawns within 5000 ft of the airfield by end of 2018, with input from BWG.
2. Eliminate all irrigation within 5000 ft of the airfield by 2025.

STRATEGY 1-3. Maintain vegetation adjacent to drainage ditches near the airfield to discourage nēnē presence. (ST)

Standing water or water flowing through drainage ditches creates habitat that provides food, cover, potential nesting areas, loafing areas and water resources for wildlife (CNIC, 2010). Nēnē, which readily utilize standing water for bathing, drinking, and predator avoidance (USFWS, 2004 & Loepold & Hess, 2013), have been observed most often within the AOA in the Kini Kini Ditch vicinity. Reducing the attractive habitat features of Kini Kini and Kawaiole Ditches will help to reduce nēnē BASH risk. The ditches are state-owned, but maintained by Agribusiness Development Corporation (ADC). The ADC is responsible for water quality from source to sea including water flowing through the installation, as well as ditch maintenance off installation. The Navy has been responsible for ditch maintenance on the installation since 2010. Coordination for real estate actions or other work pertaining to the ditches near the airfield will be reviewed to ensure consistency with base instructions and coordinated through the BASH working group to minimize BASH hazards. PMRF Instruction 5090.7B (2012) outlines that drainage ditches should be kept clear and built as steeply as possible. A minimum slope ratio of 5 to 1 should be established within both ditches and all vegetation should be cleared, and regularly maintained.

If monitoring indicates that clearing the ditches does not sufficiently minimize BASH risk, other actions may need to be considered such as netting to prevent access or construction modifications to the ditch. Any proposed changes would be coordinated with the ADC through PW to evaluate potential impacts to other environmental media and all real estate commitments are fulfilled.

Management Actions:

1. Remove vegetation from ditches near the airfield.
2. Ensure the real estate agreements identify restrictions for vegetation in the ditches.
3. Develop long term plan for ditch maintenance through airfield manager and PW.

STRATEGY 1-4. Expand the current hazing toolkit to make hazing operations at the airfield more effective. (ST & LT)

Air Ops and USDA-WS staff currently haze nēnē using non-lethal techniques including vehicle horn blowing, human vocalizations, hand clapping, foot stomping, and/or use of flashing vehicle lights. Though these techniques are immediately effective in dispersing flocks, they often return to the PMRF airfield throughout the day or in the evenings when no hazing occurs (Williamson & Ohashi, 2013). Noise-producing pyrotechnics have not been used at PMRF due to restrictions on their storage at the facility;

however, approval for storage is expected in the near future (LCDR J. Bartholomew, 2016 personal communication). As previously mentioned, the revised WHMP will describe any changes to nēnē hazing practices and will include coordination with the USFWS through the Section 7 consultation process.

Hazing effectiveness could be improved with implementation of additional hazing techniques such as auditory, visual and physical deterrents. Pyrotechnics would allow for aggressive dissuasion and, when combined with different noises and varying visual effects, could prove particularly effective in hazing nēnē and other wildlife at PMRF. Other auditory deterrents being considered include fog horns, cattle flags, and biosonic devices that produce predator calls. Visual deterrents such as high intensity lasers have successfully been used to haze geese on the mainland in conjunction with other hazing techniques (Portland International Airport, 2009). Lasers are considered humane and eco-friendly and can be deployed as automated systems or as hand-held portable devices; they are most effective in low-light conditions such as dawn or twilight (Portland International Airport, 2009). Finally, many airports around the country have had tremendous success using trained and certified dogs to haze wildlife, including geese. The most effective BASH programs use a combination of these techniques, to prevent wildlife from becoming habituated to any one method. The BASH working group will work together to identify and implement most effective practices in an adaptive fashion.

Management Actions:

1. Continue pursuing approval for use of novel auditory, visual, and physical deterrents to effectively haze nēnē.

STRATEGY 1-5. Increase hazing efforts for nēnē to preclude them from breeding in areas adjacent to the airfield. (ST)

Most current hazing efforts at PMRF are aimed at preventing nēnē presence in the AOA. USDA-WS currently hazes from the Nohili Road Curve to the area north of Nohili Ditch (Figure 12), and does not discourage nēnē nesting elsewhere at Barking Sands.

Increasing the hazing effort prior to, and during the nēnē breeding season so as to preclude nēnē from nesting in areas on the airfield is critical. Nest-preventative hazing is more involved than hazing loafing flocks, which once scared, generally disperse for the day. Once a nēnē pair has chosen an area for nesting they are difficult to effectively haze from the area before a nesting attempt is made. Pre-nesting adults must be hazed intensively multiple times a day. Any nesting pairs spotted repeatedly within 5000 ft of the airfield will be hazed intensively until the pair abandons the area or evidence of nesting is found.

In response to a 2017 pair that nested 75m from the approach end of Runway 34 despite dedicated hazing during airfield operational hours, the PMRF BASH Working Group is working to develop a protocol to better prevent nēnē from nesting near the airfield. One strategy is to clear all nesting vegetation from Kini Kini Ditch, and another is to expand hours of hazing coverage. If a pair is observed on three consecutive days exhibiting nesting behavior within the Nēnē Nest Exclusion Zone, hazing coverage will be expanded to include weekends and evenings to prevent nesting attempts, provided by the Command Duty Officer. Expanded hazing will be considered prior to the three day bench mark if the weekend or holidays would factor into those initial three days, e.g., if a pair is repeatedly observed on Thursday and Friday Command Duty Officer's (CDO) may monitor and haze the pair over the weekend if deemed necessary.

All nesting within the lateral clear zones (CZ's) of the taxiway and runway (Figure 11) will be disallowed to protect adult nēnē as well as human health and safety. If a nēnē pair nests within the exclusion zone despite best hazing practices, the nest should be removed for human and nēnē safety. The 2014 BO mandates coordination with USFWS prior to

implementation of any actions affecting a nēnē nest. In order to expedite coordination and implementation, the afore-mentioned protocol will also cover nest removal and destruction. PMRF will continue to pursue options to translocate eggs into available nests.

Management Actions:

1. Plan for expanded hazing coverage in response to nesting behavior on the airfield. Offer hazing training for all CDOs by August 2017.
2. Finalize SOP for emergency action to remove nēnē nests within the Nēnē Nest Exclusion Zone, with USFWS and DOFAW coordination by July 2017.
3. Pursue an option to translocate eggs into foster nests, if available, with USFWS and DOFAW.



Figure 11. Nēnē Nest Exclusion Zone. Area of PMRF to exclude all nēnē nesting, generated from the lateral clear zones for the runway and taxiway

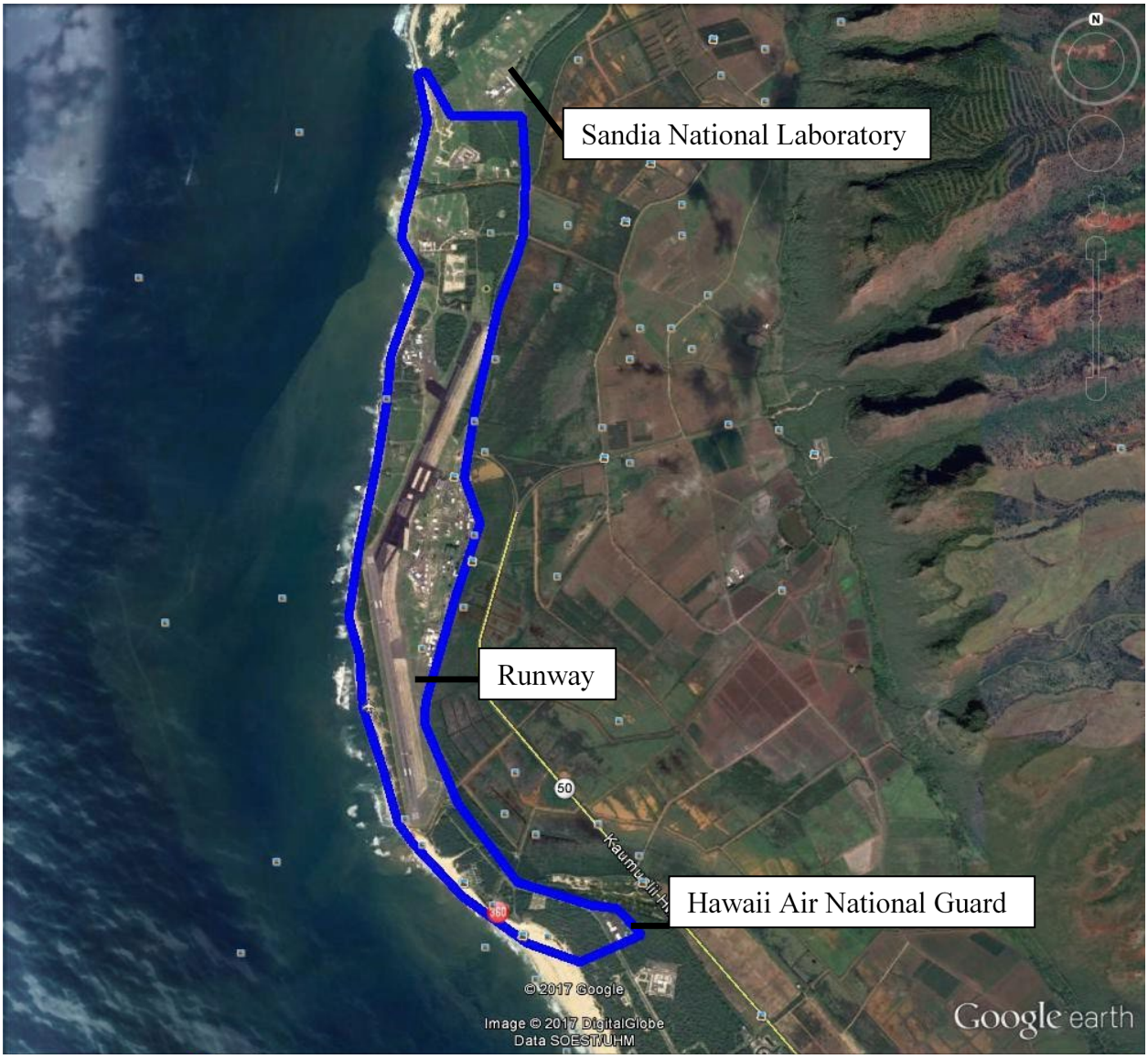


Figure 12. Area of coverage by USDA-WS for nēnē hazing at PMRF, July 2017

STRATEGY 1-6. Review and revise current Wildlife Hazard Assessment and Wildlife Hazard Management Plans in respect to nēnē. (ST)

USDA-WS prepared a WHA for the PMRF airfield in 2013, and a draft WHMP in 2016. This plan was never finalized; however, some of the actions recommended in the plan have been implemented. The management actions described under Objective 1 are meant to support BASH program goals with respect to nēnē as described in that draft. USDA-WS is currently collecting data to support informed revisions to the WHA. A revised WHA and WHMP will likely provide additional insight and actions that will modify the actions currently described above in Objective 1.

NR management is dynamic and the WHA, WHMP, and this NMP should be reviewed annually.

OBJECTIVE 2 – REDUCE NĒNĒ INJURY/MORTALITY AT PMRF ASSOCIATED WITH MILITARY PRESENCE (EXCEPT AS RELATED TO BASH) TO A MAXIMUM OF TWO INCIDENTS PER YEAR BY 2020

STRATEGY 2-1. Standardize SOPs for notification and response actions when nēnē nests are observed (ST).

The NR program established standard protocols for nest response in FY17: flag the nest, record parent bands and the date the nest was first observed, notify Facilities Manager who will then notify landscaping contractors to avoid disrupting the nesters, notify NR Manager, USFWS, and DOFAW within one business day, and set up a 25 mph zone if the nest is less than 50 m from a main road. A 25 mph zone will also be established for any areas where families are repeatedly observed. Field biologists will prepare a nesting summary notifying agency partners of all nest fates, to be included in the PMRF nēnē summary submitted by June. See Strategy 4-2.

NR Biologists will continue to train PMRF personnel to recognize nesting behavior and to notify the NR program of any perceived nesting attempts.

Management Actions:

1. Increase awareness of nēnē nesting behaviors and notification channels at PMRF, through training and outreach.

STRATEGY 2-2. Improve preventative measures along roads where nēnē are frequently observed, such as road signage, rumble strips, or speed bumps. (ST & LT)

There are currently several permanent signs at PMRF Barking Sands installed to minimize vehicular collisions with nēnē in areas where vehicle strikes have occurred (Figure 13a). However, despite signs posted in the Nohili Road Curve area, two adults and two goslings were struck in a three-month period in FY17.

The NR program will pursue other more effective preventative measures in this area as well as other problem areas that arise in the future: temporarily or permanently decreasing the speed limit; attach flags or lights to existing signage to increase visibility (Figure 13b); changing signage strategy as Yosemite National Park did in 2005, posting signs where wildlife strikes occurred to increase visitor awareness (Figure 13c); or even constructing speed bumps or rumble strips to attract driver attention and slow down traffic.

Additionally, if a nēnē family with young goslings is routinely observed along a specific section of road, fencing might be used to good effect to prevent the family from accessing the roadway. NR personnel would consult with PW, USDA-WS, USFWS, and DOFAW as needed to implement a strategy such as this.

Management Actions:

1. Increase visibility of permanent signage.
2. Pursue more permanent options to decrease speed of traffic if signage is not effective.
3. Consider temporary barriers in response to young goslings frequenting roadsides.

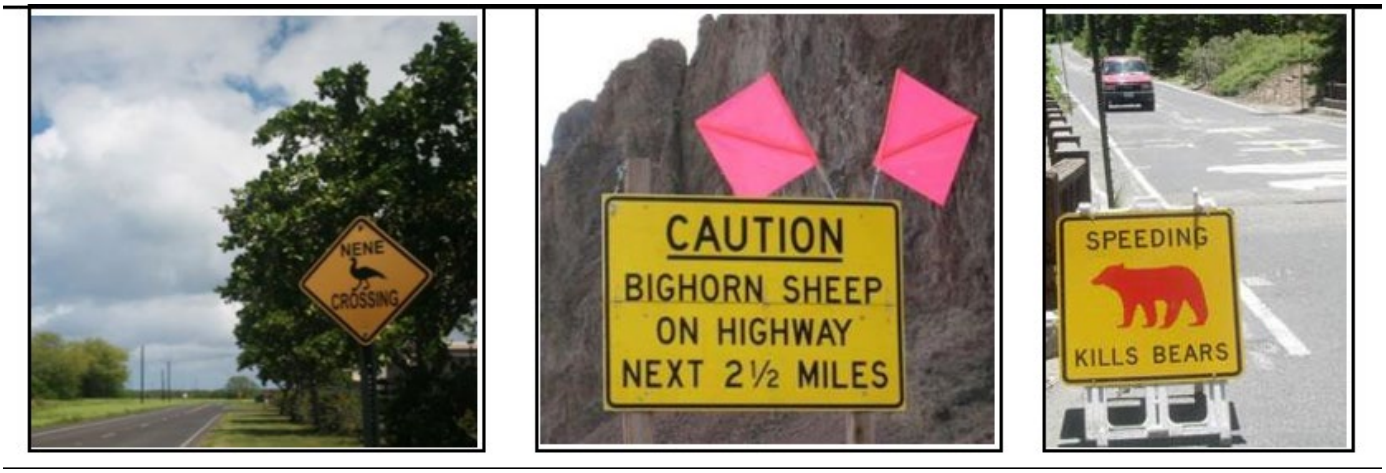


Figure 13. a) PMRF nēnē crossing sign fronting Nohili Road Curve; b) Enhanced wildlife vehicle collision sign with flagging; c) "Red Bear, Dead Bear" sign posted at Yosemite National Park marking areas where wildlife strikes occurred along the highway

STRATEGY 2-3. Implement training to increase awareness of presence of nēnē on base, guidelines for notification and response, rules for pets on base, nēnē biology and protected status. (ST)

By growing awareness of nēnē at PMRF, many of the human-nēnē conflicts at the facility could be avoided. Additionally, by offering notification channels for nesting, injured, or dead nēnē, management will be more effective at the institution.

NR Program will prepare outreach materials aimed at distributing information to all personnel at PMRF. The NR program developed basic informational sheets to be distributed to Beach Cottage visitors in FY17. The program will also develop additional programs to educate PMRF residents and employees on species biology, various nēnē behaviors, threats to species recovery (e.g., loose dogs, feeding, vehicles), and current recovery efforts.

Management Actions:

1. Develop printed materials such as printed brochures, fact sheets, or signs for widespread distribution and education.
2. Increase awareness by distributing magnets or stickers to spread a program message.
3. Develop an internet-based education approach, to include utilizing social media in cooperation with public affairs and creating a PMRF NR web page.

OBJECTIVE 3 – CONTINUE TO DEVELOP A COMPREHENSIVE PREDATOR CONTROL PLAN TO REDUCE NĒNĒ INJURY AND MORTALITY DUE RESULTING FROM PREDATORS.

STRATEGY 3-1. Identify predator population on base and prioritize areas for predator control actions. Target species include feral cats, dogs, pigs, barn owls, rats, and mongoose should they become established on the island.

(ST)

The predator control (PC) program has identified predator populations at Barking Sands, Makaha Ridge, and Kokee Sites. PC efforts are focused in areas around Migratory Bird Treaty Act (MBTA) and Endangered Species Act (ESA) species' flocking and nesting sites, including those areas that

regularly harbor nēnē. Potential predators include feral and free-ranging dogs (*Canis lupus familiaris*), feral and free-ranging cats (*Felis silvestris catus*), rats (*Rattus* spp.), and feral pigs (*Sus scrofa*). Additionally, the introduced Barn Owl (*Tyto alba*) may prey upon nēnē goslings and should be included in predator surveys. Should mongoose (*Herpestes javanicus*) be sighted or captured during predator control measures, Kauai Invasive Species Committee (KISC) will be immediately notified.

Drafted management plans pertaining to predator control at PRMF facilities will be specific, adaptive, and provide detailed protocols to ensure continuity, repeatability, and accountability.

Management Actions:

1) High priority areas have been identified for predator control where large predator populations and frequently used areas by nēnē overlap.
2) Protocols will continue to be developed to address all predator species across all PMRF sites.

STRATEGY 3-2. Integrate monitoring for predators to support evaluation of effectiveness of predator control actions. (ST)

Standardized predator population monitoring will be incorporated into the PC program. Monitoring tools may include wax bait blocks, trail cameras, chew cards, and/or tracking tunnels. Quarterly summaries will be prepared reporting population updates, trapping effort, and program plans/goals for the following quarter. This will ensure an adaptive program, consistently identifying and responding to immediate program needs.

Management Actions:

1) Use peer-reviewed methods to monitor predator populations across PMRF Barking Sands, Makaha Ridge Tracking Station, and Kokee sites.

STRATEGY 3-3. Increase awareness and enforcement of Navy policy regarding feral cats and loose dogs through improved training and outreach. (ST)

Navy policy prohibits feeding of feral cats on all Navy installations (CNO Policy Letter dated 10 JAN 2002, OPNAV M-5090.1). Feral cats pose a significant threat to nēnē and other listed species found at Barking Sands. Recent trapping efforts at PMRF have identified a large feral cat population at Barking Sands that may be in part sustained by well-meaning, yet uninformed individuals. NR and PC programs will increase outreach and education efforts to improve awareness of the CNO policy on feral animal feeding, and the impacts that such feeding has on protected species. Additionally, NR personnel will increase efforts to educate people of the danger unleashed dogs pose to native and protected wildlife. Awareness training will be targeted at military personnel, civilian employees, resident families, TDY personnel, and visitors at PMRF. Media for improving awareness may include printed brochures, fact sheets, posted signs, base newspapers, trainings, and internet notification.

NR works closely with Security Forces to train personnel on the above risks, and has developed protocols for improving reporting and enforcement efforts concerning the no feeding directive, in conjunction with Conservation Law Enforcement Program requirements for the base.

Management Actions:Explain need for Conservation Law Enforcement, and continue to secure support of Command and Security personnel at PMRF in light of continuous personnel changeover.

1) Develop educational materials and media targeted toward ill effects on wildlife as a result of feeding feral animals and failing to keep dogs on leashes.
2) Enact the established reprimand and educational protocol for individuals found feeding feral or wild animals, as well as those who let dogs run loose.

OBJECTIVE 4 – REVIEW THE NĒNĒ MANGEMENT PLAN ANNUALLY AND IDENTIFY OPPORTUNITIES FOR IMPROVEMENT.

STRATEGY 4-1. Implement standardized monitoring to track the baseline nēnē population. (ST)

Standardized basewide nēnē surveys have been conducted approximately twice a week at PMRF since July 2016. These surveys over time will allow the NR program to track individuals on base as well as seasonal and annual population fluctuations. Monitoring will also provide documented population and individual response to implemented strategies.

Management Actions:

1) Continue performing standardized basewide nēnē surveys at PMRF.
2) Compile annual reports on nesting activity and population demographics.

STRATEGY 4-2. Review new information obtained through implementation of the management plan annually, and evaluate for overall effectiveness and efficiency of meeting stated objectives. (ST)

NR will draft a report to be completed by the beginning of June each year, addressing progress in meeting each of the objectives outlined in the PMRF Nēnē Management Plan. At this time, each management strategy will be addressed as completed, in progress, or no longer the best management strategy with current data. This plan will also provide a PMRF nēnē population summary to include prior year's nesting information, as well as predator control efforts targeted at protecting nēnē. This report will be dispersed to the BASH working group as well as state and federal partner agencies.

Management Actions:

1) Compile annual report on nesting activity and population demographics in June.
2) Address status of each objective of NMP in annual report.
3) Send report to all stakeholders and schedule meeting reviewing NMP.

STRATEGY 4-3. Establish a working group with the NR staff and key stakeholders with responsibilities in the implementation of this management plan. Meet annually to review changes to mission needs, population update as identified in Strategies 4-1 and 4-2 above, and recommend changes to the plan. (ST)

After reviewing the report as outlined in Strategy 4-2, the NR program will arrange one or several working groups addressing nēnē annually to include the BASH working group and state partners. The BASH working group includes airfield, USDA-WS, NR, executive officer, and public works personnel. Suggested time for this review and editing of the plan is June/July between nesting seasons.Concerns/suggestions aired at these meetings should be documented, to be referred to in the future if needed.

If all parties agree on strategy or objective modifications, edits to the NMP will be documented and made following this meeting. Each version of the plan will be saved and archived with a date and version number attached. The most current version of the NMP will be dispersed to all stakeholders.

USFWS will submit an independent recommendation pertaining to the Navy's effectiveness in implementing the strategies outlined in this plan and compliance with BO requirements.

Management Actions:

1) Compile annual report on nesting activity and population demographics in June.
2) Address status of each strategy of NMP in annual report.
3) Send report to all stakeholders and schedule meeting reviewing NMP.

OBJECTIVE 5 – IDENTIFY OPPORTUNITIES FOR MULTIPURPOSE USE AT PMRF TO PROVIDE CONSERVATION BENEFIT TO NĒNĒ.

STRATEGY 5-1. Conduct studies to improve understanding of nēnē population dynamics at PMRF. Studies to start with surveys that can be implemented within the next two years with existing funding. (ST)

Field biologists will incorporate recording behavior into standardized surveys. For each group of nēnē, foraging, loafing, or breeding behavior will be recorded. All incidences of molting are to be noted as well.

Additionally, biologists will establish a protocol to collect data on vegetation type/structure in areas where nēnē frequent. This may be documented during the biweekly nēnē surveys, or through a separate vegetation monitoring strategy.

Finally, placing game cameras on active nests would be valuable in documenting potential nest depredation events and informing management strategies.

STRATEGY 5-2. Identify additional research objectives that could be of value to nēnē management at Barking Sands, justify the expenditure within the scope of the PMRF NR program, and request funding to implement these additional studies. (LT)

Various other studies may be of value to nēnē management at Barking Sands. These long term additional research objectives will be discussed each year at the NMP meeting. For this strategy, objectives should directly address nēnē management at PMRF and should be implemented on property. A "wish list" will be established among all stakeholders and as funding is available, NR will conduct projects addressing these research objectives.

Management Actions:

1) Schedule NMP Stakeholder meeting.
2) Compile a research objective list with input from all parties on ranking of objective priority – protection of human life and mission capability will be of highest priority to PMRF. Program funding for established future research objectives.

OBJECTIVE 6 – IMPROVE UNDERSTANDING OF HOW NĒNĒ AT PMRF INCORPORATE INTO THE REGIONAL NĒNĒ POPULATION AND IDENTIFY PARTNERING OPPORTUNITIES TO SUPPORT CONSERVATION OF NĒNĒ AS A SPECIES

STRATEGY 6-1. Maintain close coordination with Sikes Act Partners with nēnē programs to share data and identify opportunities to integrate the PMRF nēnē management with other nēnē conservation programs. (ST)

NR program will continue to notify Sikes Act Partners of any nēnē nesting or mortality incidents at Barking Sands immediately, and meet quarterly to discuss NR Program updates and status. These quarterly meetings can serve as an opportunity to update one another of research or conservation initiatives each agency is currently implementing or planning.

PMRF will contribute to regional nēnē projects as funding is available, especially those with direct implications for informed management on installation. Potential projects include, but are not limited to, tracking nēnē families with satellite tags or telemetry, contributing to an interagency diet study, and improving rehabilitation facilities.

Management Actions:

1) Continue reporting all nesting, injury, and mortality events.
2) Continue collaborating with DOFAW for standardized nēnē monitoring and banding efforts.
3) Discuss nēnē update in quarterly NR meetings, and maintain communication on upcoming island- wide or regional projects to which the Navy could contribute.

STRATEGY 6-2. Establish and maintain partnership and open communication lines with private and public landowners surrounding PMRF. (LT)

As the nēnē population grows, and surrounding land use changes, integrated landscape management will be important for protection of mission capability at PMRF. NR program should work with various agriculture and state agencies that own proximate land to the facility, in the efforts of long term and comprehensive monitoring and conservation of the population.

Management Actions:

1) Work with Community Planning Liaison Officer (CPLO) and Public Affairs Officer (PAO), with command approval, to establish a community working group. Members will discuss regional nēnē management objectives and concerns.
2) Attempt to gain access to surrounding lands to monitor region population or regional nesting data, with landowner approval, through physical access or aerial surveys with drone technology.

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APPENDIX G – GREEN SEA TURTLE MANAGEMENT

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Sea Turtle In-Water Standard Operating Procedures and Best Management Practices
Natural Resources Program
Pacific Missile Range Facility
Kaua'i, HI 2024

INTRODUCTION

Green sea turtles (*Chelonia mydas*) are known to routinely utilize coastal waters and beaches of the Pacific Missile Range Facility (PMRF) for foraging and basking, respectively. Green turtles from the Central North Pacific (CNP) distinct population segment (DPS) are observed basking on the beach and in the waters at the Nohili Ditch outfall or what is commonly referred to as the Turtle Cove area, which has a natural limestone ledge on the oceanside, rising several feet above the beach. Green turtles have also been observed basking on the beach in front of Shenanigans Restaurant and at Kuaki'i (Diver's Landing). Sightings of green turtles have been recorded during daily patrols by U.S. Department of Agriculture – Wildlife Services (USDA-WS), Security, and Natural Resources staff since 2006. Green sea turtles have consistently been documented nesting at Barking Sands in recent years with a total of twelve confirmed nests laid between 2015 and 2023. Nests have been observed on the southern coast of Barking Sands, the beach along the airfield and the Nohili Dunes area. Although no observations of Hawksbill sea turtle (*Eretmochelys imbricata*) activity have been recorded, there is a possibility for the species to nest at PMRF and/or forage in its nearshore waters.

Surveys have shown the highest densities of green turtles near the mouth of the Nohili Ditch, where the species haul out and have been observed in the nearshore at the surface and utilizing an underwater depression for resting. In-water surveys prior to 2023 consistently reported turtles using this depression: 15 turtles were observed in 1990, 4 in 2000, 2 in 2006, and 0 in 2022. The Nohili sector of the PMRF nearshore area has a reef structure and algae (*Asparagopsis taxiformis*) in that area for foraging. No green turtles were observed in the Nohili Sector during 2022 marine surveys; however, they are observed in-water and at the surface.

In-water threats to green turtles include stranding or entanglement in marine debris or fishing gear.

The nearshore waters surrounding PMRF Barking Sands, Figure 1, are designated for Navy use per:

- 33 CFR § 334.1390 – Danger Zone: Pacific Ocean off the Pacific Missile Range Facility at Barking Sands, Island of Kauai, Hawaii in which the Commanding Officer, Pacific Missile Range Facility is designated as the enforcement authority; and

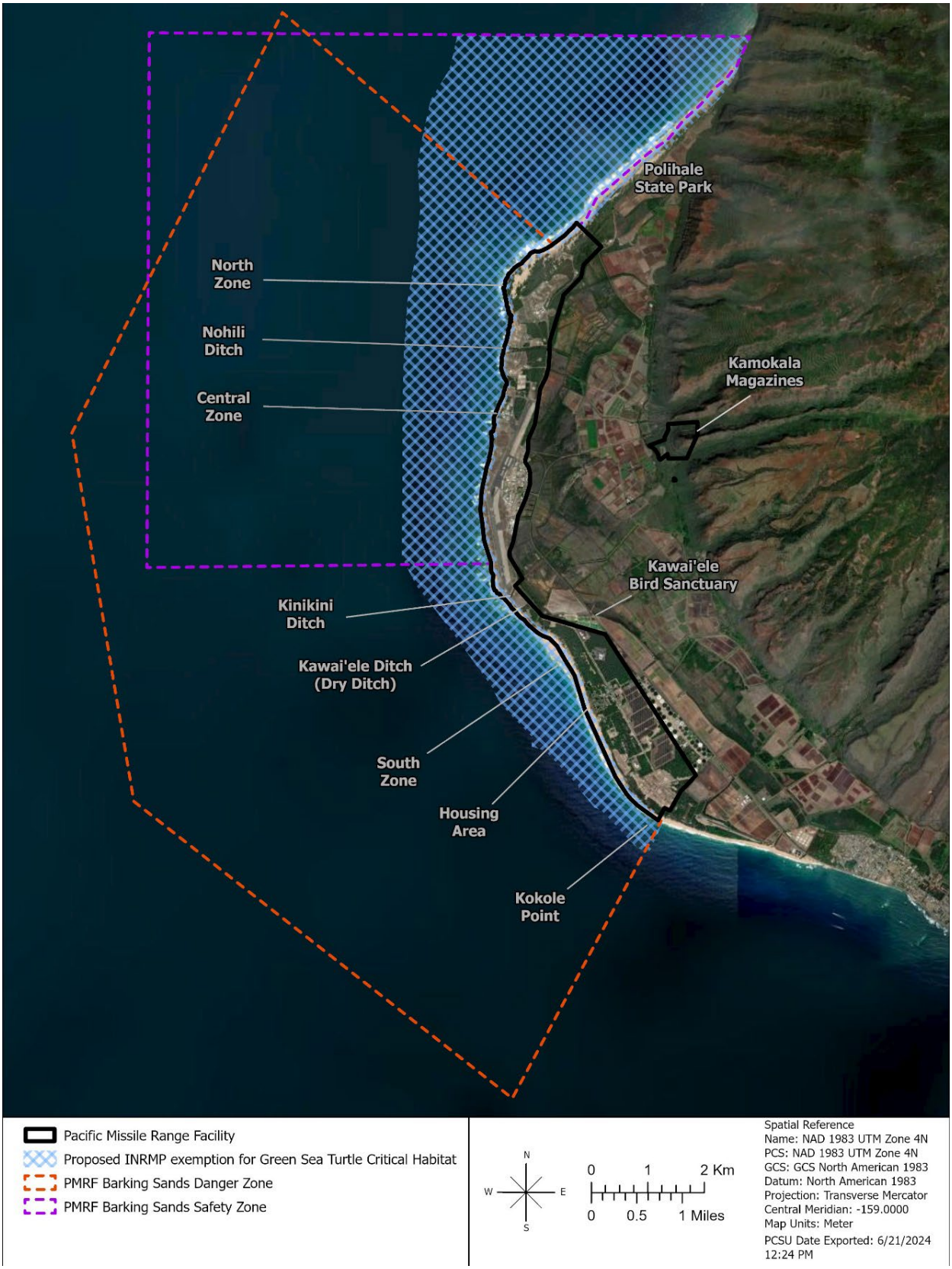

Polihale
State Park
North
Zone
Nohili
Ditch
Central
Zone
Kamokala
Magazines
Kawai'ele
Bird Sanctuary
Kinikini
Ditch
Kawai'ele Ditch
(Dry Ditch)
South
Zone
Housing
Area
Kokole
Point
Pacific Missile Range Facility
Proposed INRMP exemption for Green Sea Turtle Critical Habitat
PMRF Barking Sands Danger Zone
PMRF Barking Sands Safety Zone
N
W
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S
0
1
2 Km
0
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1 Miles
Spatial Reference
Name: NAD 1983 UTM Zone 4N
PCS: NAD 1983 UTM Zone 4N
GCS: GCS North American 1983
Datum: North American 1983
Projection: Transverse Mercator
Central Meridian: -159.0000
Map Units: Meter
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Figure 1: Nearshore Waters Surrounding PMRF

- 33 CFR § 165.1406 - Safety Zone: Pacific Missile Range Facility , Barking Sands, Island of Kauai, Hawaii in which the Coast Guard has authorization and closures of the area occur at the Navy's request.

The nearshore waters within the Danger Zone and Safety Zone are, therefore, designated for Navy use and the PMRF Integrated Natural Resources Management Plan provides a conservation benefit to green sea turtles in these areas as described below.

OBJECTIVE

To ensure a benefit to in-water green turtles, PMRF implements the following standard operating procedures (SOPs) and best management practices (BMPs) to address threats to the species and its habitat.

FISHING

The Navy limits shore fishing at Barking Sands to the Recreation Area and the Special Use Area (Figure 2). The areas accessible for fishing, surfing, recreation, and socializing extend from Shenanigans (All-Hands Club) to Kawai'ele Ditch (also known as Dry Ditch) (north of beach cottages), Monday through Friday, and into the Special Use Recreation Area (Kawai'ele Ditch [also known as Dry Ditch] to the northern windsock of the runway) on weekends and holidays, except during heightened force protection conditions or range operational periods. Fishing restrictions allow only for pole, cast net, and spear fishing. Fishing and beach access restrictions are enforced by installation security details, which patrol the beach.

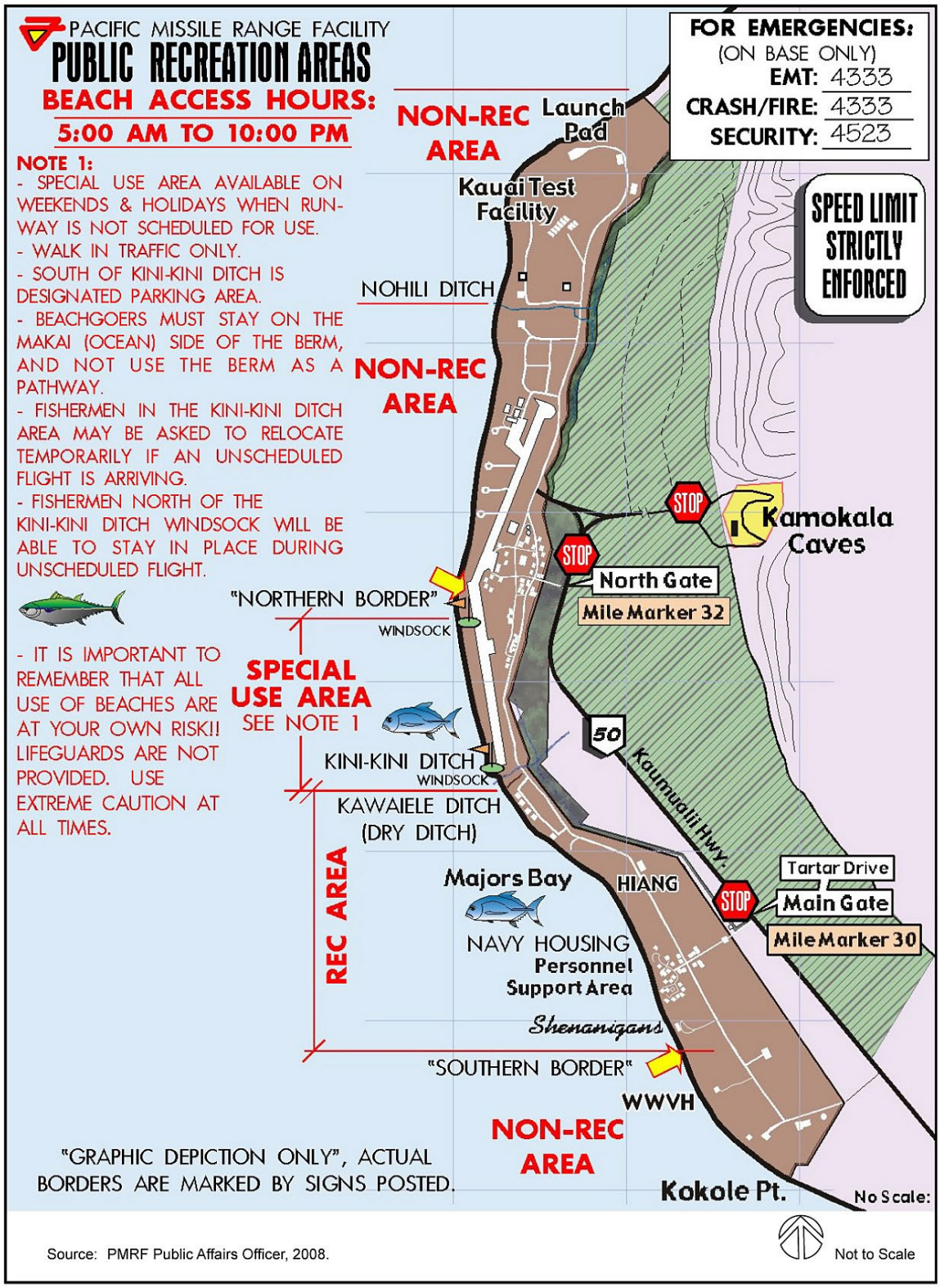


Figure 2: Barking Sands Public Recreation Areas

To address unauthorized fishing, hooking of turtles, and removal, PMRF will implement the following:

1. Instruction:
    a. Create a recreational fishing manual and maintain as a living document; include information about the presence of in-water sea turtles, coral reefs, seagrasses, and other sea turtle habitat; include information on how to dehook a sea turtle, if accidentally caught on hook and line; include information on removing all fishing gear
    b. Provide manual online; include information about the presence of in-water sea turtles, coral reefs, seagrasses, and other sea turtle habitat; include information on how to dehook a sea turtle, if accidentally caught on hook and line; include information on removing all fishing gear
    c. Provide manual during indoctrination classes for new base personnel; include information about the presence of in-water sea turtles, coral reefs, seagrasses, and other sea turtle habitat; include information on how to dehook a sea turtle, if accidentally caught on hook and line; include information on removing all fishing gear
2. Signs. Install signs around installation regarding:
    a. information about the presence of in-water sea turtles, coral reefs, and other sea turtle habitat
    b. information on who to contact if a hooked sea turtle is observed
    c. information on removing all fishing gear

MARINE DEBRIS

PMRF hosts and participates in marine debris cleanups at least twice a year and removes nets and entanglement hazards during minimum weekly beach surveys at the facility and in the surrounding community. Attendees are educated on the risks that debris poses to marine life such as ingestion and entanglement. Large nets such as cargo or trawl nets occasionally wash onshore and are removed and disposed of by Natural Resources staff to the greatest extent practicable.

SURVEYS AND MONITORING

Surveys are conducted to provide information about green turtle presence and potential in-water habitats within nearshore areas at PMRF used for resting, foraging, and reproductive purposes.

1. Daily patrols of PMRF's beaches for sea turtles to collect observational data and check for stranded, injured, or entangled turtles are conducted by partnering with Security.
2. Surveys by qualified biologists are done approximately five times per week on the beaches near the Nohili Ditch outfall and Diver's Landing for sea turtle presence and strandings, injuries or entanglements.
3. Natural Resources operates a hotline telephone line for all base personnel or members of the public to report any potentially injured animal. Injured animal response is coordinated with State and Federal Sikes Act Partners and observational data is shared during the annual Sikes Act meetings.

4. Navy Natural Resources personnel survey beaches for sea turtle nesting activity during the nesting season, protect all nests observed with ropes and signage, mitigate light attraction issues on beaches, and coordinate with the State of Hawai'i Department of Land & Natural Resources (DLNR) Division of Aquatic Resources (DAR) to excavate nests.
5. Encourage good communication and coordination between Natural Resources and PMRF military, civilian, and contractor Security personnel regarding sea turtle activity on PMRF beaches to assist with understanding the species, reduce impacts to the species from Security beach patrol vehicles, and contribute to overall natural resources compliance
6. Develop and use USFWS and/or NOAA approved outreach, educational materials, and signage with the objective to educate and provide information to residents, recreational users, visitors, and Navy personnel about proper procedures and acceptable activities within sea turtle habitat and how to act when coming in contact with sea turtles.
7. An interagency agreement was issued in FY23 to allow the Navy to partner with the NMFS Pacific Islands Fisheries Science Center (PIFSC) to deploy SPLASH tags (GPS and Argos) on sea turtles. A project to work with NMFS PIFSC to deploy tags on sea turtles off of PMRF is in development and will be a future INRMP project

NEARSHORE MANAGEMENT

Although the PMRF installation boundary ends at the high-water mark, PMRF conducts monitoring and implements proactive management to ensure conservation benefits are provided to aquatic species and habitats in waters adjacent to the installation.

The Navy also controls primary land access to water assets off Barking Sands. All persons, boats, vessels, or other craft are prohibited from entering, transiting, or remaining within, the danger zone during range operations, test and training activities, or increases in force protection that pose a hazard to the general public (33 Code of Federal Regulations [CFR] Section 334.1390). There is a no anchorage zone off Barking Sands because of the presence of underwater cables.

The nearshore environment adjacent to Barking Sands provides habitat for numerous species, including corals, macroinvertebrates, and fishes. Navy-funded surveys of the marine environment were conducted in April 2000 (Dollar and Brock 2000), August 2006 (Dollar and Brock 2007) as well as May and August, 2022 (Miller et al. 2022). These investigations involved point-to-point underwater swims at each dive site to evaluate abundance and other characteristics of marine communities. The investigations were limited to a maximum depth range of 65 ft (20 m) in the nearshore sector. The survey area was divided into four sectors separated by distinct physiographic and biotic structures as shown in Figure 3. A summary of the 2000 (Dollar and Brock 2000), 2006 surveys (Dollar and Brock 2007), and 2022 surveys (Miller et al. 2022) for coral reefs, fish, macroinvertebrates, and protected species, to include sea turtles, can be found in Chapter 3.3.6 in the INRMP. During the most recent survey effort in 2022, biological and benthic habitat surveys were conducted in the nearshore environment off PMRF to identify any substrate or species composition changes, and to record all observations of protected species, including marine mammals and green sea turtles (Miller et al. 2022).



Figure 3: Barking Sands Marine Sectors

CONSERVATION ENFORCEMENT

PMRF military, civilian, and contractor security forces are responsible for patrolling the installation. They work with PMRF Environmental in reporting any incidents observed pertaining to Barking Sands natural resources including the presence of sea turtles on the beach. They enforce beach and fishing restrictions, access restrictions to Nohili Dunes, and ensure that the public does not disturb sea turtles basking on the beach or any identified nesting areas. Annual updates will be provided to NMFS during metrics meeting.

IN-WATER TRAINING

In-water training operations are subject to Endangered Species Act (ESA) Section 7 consultations if the project may affect federally listed species. During project development, environmental planners take into consideration potential activity impacts that would disrupt sea turtle behaviors while also taking into consideration current mission requirements, long-term mission planning, and future mission flexibility. Planners aim to minimize and avoid potential impacts while ensuring mission requirements are met.

Future proposed activities will follow the section 7 process to avoid and minimize impacts to green turtles, including implementing BMPs as outlined in the 2018 Hawai‘i-Southern California Training and Testing Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS).

BMPs:

1. Implement a system of Environmental Awareness and Education, including Marine Species Awareness Training for all relevant military and civilian personnel.
2. Utilize trained lookouts, as appropriate, for the proposed activity.
3. Designate avoidance zones for specific activities before and during activities, and implement avoidance until: the animal is observed exiting the avoidance zone; the animal is thought to have exited the avoidance zone based on a determination of its course, speed, and movement relative to the stressor source; the avoidance zone has been clear from any additional sightings for a specific wait period; for mobile activities, the stressor source has transited or has been relocated.
4. Report all sea turtle observations to the appropriate regulatory agency immediately or as soon as operational security considerations allow if any of the following are, or may be, attributable to Navy activities: (1) a vessel strike of a sea turtle during training or testing, (2) a stranded, injured, or dead sea turtle during training or testing, or (3) an injured or dead sea turtle during post explosive event monitoring.
5. All testing and training must follow NEPA documentation and associated ESA consultation requirements. Further information can be found in the Hawaii-Southern California Training and Testing (HSTT) EIS 2018.

WATER QUALITY

The following water quality protections and improvements are underway and benefit habitat for the CNP DPS of green turtles:

1. Prevent and reduce the spread of biotoxins and contaminants from Navy lands including best management practices, monitoring for contamination, restoration of sediments, and spill prevention. PMRF utilizes a Spill Prevention Control and Countermeasure (SPCC) plan that includes a Spill Contingency Plan;
2. Review of Storm Water Pollution Prevention Plans (SWPPPs) for construction projects by PMRF environmental personnel ensure adequate protective measures and best management practices are in place and implemented;

3. Restoration of coastal dune habitat in the Nohili Dunes, of which 5,000 square feet of non-native plant control and native plant outplanting has been completed and an additional six acres are planned for restoration, reduces sedimentation and run-off which improves water quality for the CNP DPS of green turtles and provide ancillary benefits to their prey and forage, which also rely on these marine ecosystems;
4. Restoration of six acres of upland habitat on bare land at Makaha Ridge (currently in progress) will reduce sedimentation in the nearshore environment immediately downslope of the facility by stabilizing soil and reducing runoff through native plant outplanting and ungulate removal;
5. Vehicular access is clearly delineated and restricted to protect sensitive resources in the coastal environment, including preventing driving over green sea turtle nests;
6. Nohili outfall is closed except in emergency flooding conditions, limiting transport of upland sediment to the nearshore environment. This outfall may be reopened when future climate resilience water management solutions are implemented;
7. Climate resilience actions at Makaha Ridge in partnership with the US Army Corps of Engineers Engineering With Nature (EWN) initiative to mitigate erosion and reduce sedimentation into the nearshore environment below through revegetation and runoff reduction by the use of checkdams, green gabion flow rerouting and water capture;
8. PMRF operates two permitted wastewater treatment facilities to ensure appropriate water quality;
9. Port Allen utilizes a robust refueling SOP to ensure no adverse impact to nearshore environment during fueling evolutions.

ADDITIONAL CONSERVATION ACTIONS WITH BENEFITS TO SEA TURTLES

In addition to the restoration projects, spill prevention, and erosion prevention mentioned above occurring on installation, PMRF is actively involved with projects off-installation that provide a habitat conservation benefit to green turtles.

The DoD Readiness Environmental Protection Integration (REPI) Program is a key tool for combating encroachment that can limit or restrict military training, testing, and operations. The REPI program benefits the environment by conserving land near military installations and ranges. In FY22 and FY23, the Navy invested almost $10 Million in open floodable space climate resilience cooperative agreement with the Kekaha Agriculture Association (KAA) on behalf of the State of Hawai‘i Agribusiness Development Corporation (ADC) and a forest and watershed protection cooperative agreement with the DLNR Division of Forestry and Wildlife (DOFAW). The purpose of the projects is to mitigate climate effects and impacts of sea level rise, protect and restore native forests within the watershed, and improve water quality in the nearshore environment of West Kaua‘i.

Mānā Plain Open Floodable Space Climate Resilience Project

The objectives of the Mānā Plain open floodable space climate resilience project are to improve water quality introduced into the ocean through reducing sedimentation, maintain community and mission resilience in the face of flood events and sea level rise, ensure that the ditch system continues to function in the same manner as it has for the past 100 years by creating ~200 acres of Open Floodable Space where surface runoff will temporarily pond, and support PMRF’s mission to provide services in

a multi-dimensional environment that ensures the safe conduct of training and missions. As there are no natural streams that cross or are present in the Mānā Plain, historically the only means of evacuating water that accumulated in low-lying areas were evaporation and lateral groundwater flow through dunal and sand ridges. The development of ~35 miles of agricultural drainage ditches provided a gravity flow system to move discharge from the plain to the ocean. With current and projected sea-level rise, the Mānā Plain will become more vulnerable to event-based flooding, as gravity flow in the ditches will be constrained by tide and wave height. The increased flood risk has implications for water quality and sedimentation, and will impact PMRF airfield operations as well as reducing the amount of available agricultural land adjacent to the installation.

The Open Floodable Space project will naturally process and improve the quality of water discharged into the ocean by collecting and retaining surface runoff to allow for reduced gravity flow conditions, and therefore is expected to have benefits to the nearshore marine ecosystem at PMRF, which provides habitat for numerous species including corals, macroinvertebrates and fishes, as well as federally-listed monk seals and green turtles. Federally-designated essential fish habitat also occurs along the shoreline at Barking Sands. Additionally this project proposes to realign portions of the ditch system and the outlet at Kawai‘ele to reduce the threat of erosion to the south end of the PMRF runway and reduce Bird/Animal Aircraft Strike Hazard risk while maintaining habitat for federally-listed waterbird species in the area, prevent saltwater intrusion into the ditch system by installing tide gates at remaining outlets, and increase pumping capacity at Kawai‘ele and Nohili to ensure pumps are not overwhelmed after storms and that ambient water levels in the ditch system remain at their current elevation.

The increased flood risk has implications for water quality and sedimentation, and will impact PMRF as well as reduce the amount of available agricultural land. By creating ~200 acres of Open Floodable Space on ~400 acres of unlicensed flood-prone agricultural land adjacent to PMRF, and realigning the existing drainage ditch system and outlets, the proposed project will utilize green infrastructure to mitigate the effects of sea level rise and improve water quality. This will be achieved by creating an area where storm runoff will temporarily pond and be naturally processed before it is discharged into the ocean. Significant cumulative project benefits include eliminating fish kills and the threat erosion poses to the South end of the PMRF runway by closing Kinikini Ditch, and contributing to the regeneration of coastal wetland habitat for endemic and endangered Hawaiian water birds.

Forest and Watershed Protection Project

The objective of the forest and watershed protection project is to establish an effective ecosystem level forest enhancement and watershed restoration program, wildfire control program, as well as endangered species recovery programs. This project will benefit listed species by improving habitat conditions and reducing certain impacts such as ungulate disturbance and habitat loss. This project will benefit PMRF by managing and improving the watershed and mitigating encroachment above the installation in perpetuity. This project consists of five components:

1. Community Wildfire Fire Response. Build community readiness for wildland fires and emergencies around PMRF. Drought, unmanaged forests, and lack of wildland fire fighting infrastructure and equipment can create a dangerous situation for PMRF and the westside community. Activities in this component include:
    - Firebreak maintenance within Pu‘u Ka Pele and Na Pali Kona Forest Reserves;

- Complete compliance, permits, security fencing and initial infrastructure installations to allow for immediate relocation of firefighting equipment and supplies closer to the westside of Kauaʻi significantly shortening response time to PMRF.

2. Forest Health. Unmanaged, unhealthy forests create unbalanced ecosystems that increase wildfire risk and soil erosion. Activities include:
    - Reforesting in Puʻu Ka Pele Forest Reserve in previously burnt areas and old eucalyptus and timber plantations adjacent to PMRF Makaha to include fencing, supplies
    - Perform Wilt-resistant koa (*Acacia koa*) screening
    - Rapid Ohiʻa lehua (*Metrosideros polymorpha*) Death monitoring
3. Invasive Species Removal. Non-native invasive species alter ecosystems and create monotypic stands that lead to soil erosion and increase flood potential. Diverse native forests help to encourage water absorption and recharge the aquifers. Activities include:
    - Honopu vicinity weeding (Na Pali Kona Forest Reserve and Kuia Natural Area Reserve)
    - Alakaʻi Wilderness Preserve weeding
4. Endangered Seabird Monitoring to inform effective management practices across a large area within two Forest Reserves and a portion of State Parks (all State lands) utilizing exploratory surveys and song meter monitoring.
5. Nene Roadways Mitigation Study to identify potential mitigation solutions, acceptable to the Department of Transportation to reduce impacts of vehicular traffic to the federally listed Hawaiian Goose (*Branta sandvicensis*) on Kaumualii Highway, and nearby roads, to and from PMRF.

Specific measures of these projects include:

- Forest management (goat and invasive plant removal/control) in fenced areas will minimize erosion and sedimentation downstream in the Mānā Plain;
- Weed/invasive species control in unfenced areas will buffer the spread of weeds to fenced areas;
- Planting native plants that are more effective at capturing and storing water than invasive plants.

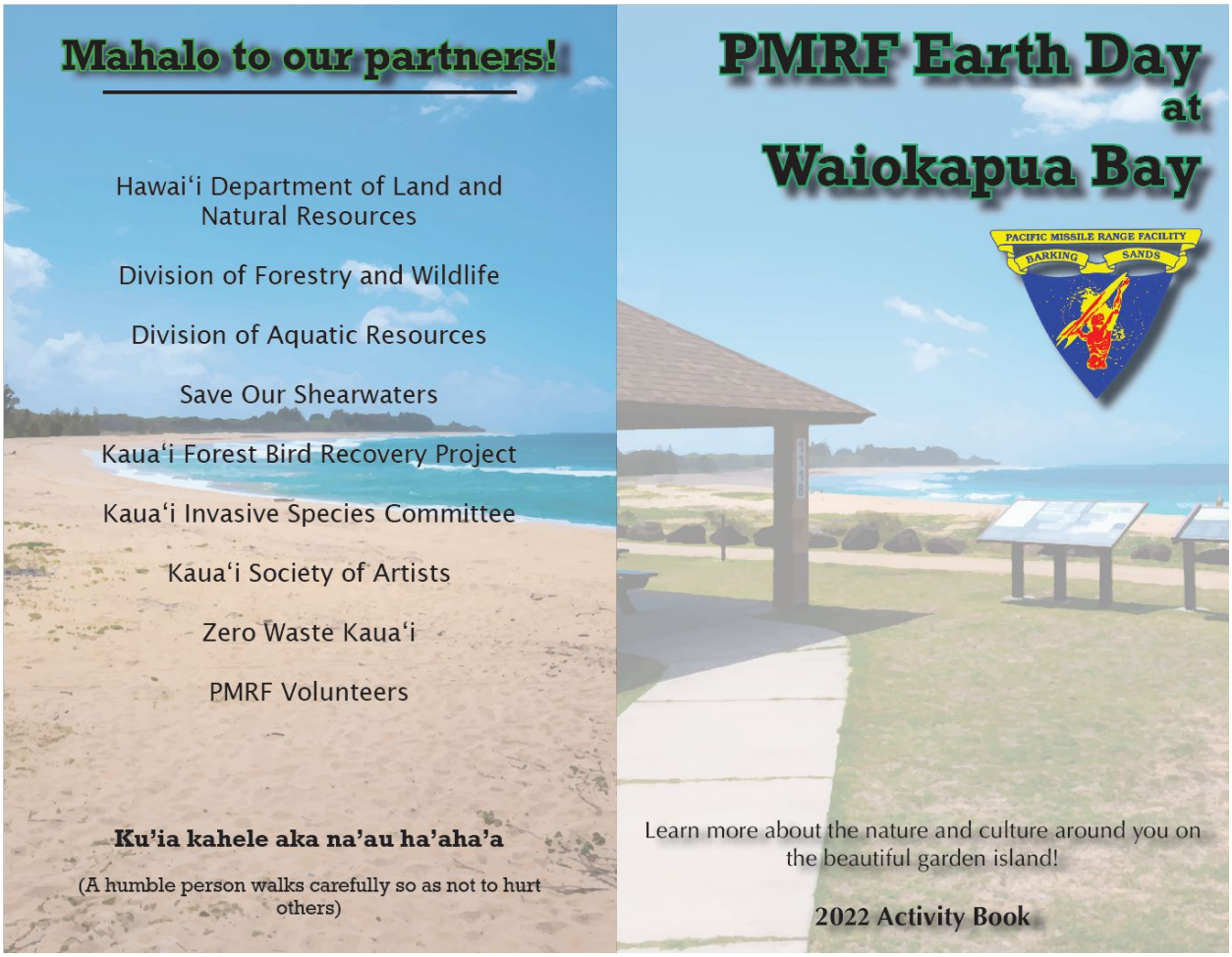
Benefits include:

- Landscape-scale Mauka to Makai approach to watershed management and climate resilience;
- Ecosystem services provided through open floodable spaces/wetlands and upland restoration will minimize flood impacts to the local community and bolster installation resiliency to climate change/ extreme weather events;
- Reduction in dredging frequency;
- Improvement to nearshore water quality (including in-water visibility) by reducing run-off; thereby enhancing habitat for marine life including green turtles and Hawaiian monk seals.

APPENDIX H – PROTECTED SPECIES OUTREACH MATERIALS

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PMRF Earth Day at Waiapua‘a (formerly Waiokapua) Bay 2022 Activity Book





Take a look around you!

Use this list to notice the beautiful nā mea kanu (plants) and holoholona (animals) around you! Mark a tally for each time you see nā mea kanu or holoholona listed below.

Hala - *Pandanus Tectorius* _____ Sightings

Ulu - *Artocarpus altilis* _____ Sightings

A`ali`i - *Dodonaea viscosa* _____ Sightings

Naupaka kahakai - *Scaevola taccada* _____ Sightings

`alae ke`oke`o - *Fulica alai* _____ Sightings

ae`o - *Himantopus mexicanus knudseni* _____ Sightings

nēnē - *Branta sandvicensis* _____ Sightings

`ua`u kani - *Puffinus Pacificus* _____ Sightings

Add your own list here:

_____ _____ Sightings

_____ _____ Sightings

_____ _____ Sightings

_____ _____ Sightings

_____ _____ Sightings

How can you help protect this beautiful island?

Here are some tips to help you and your 'Ohana be mindful every day.

Don't feed wildlife

Keep your pets on a leash

Don't step on vegetation, you never know if it's important

Don't leave trash behind at the beach

Plant indigenous species, not invasive species

Use less plastic

Use reef safe sunblock at the beach

Look for re-usable products like bags, bottles, straws

Can you think of any more tips?:

_____

_____

_____

_____

_____

_____

Holoholona hiding in plain sight!

Use these photos and facts to learn about the holoholona (animals) hiding in plain sight!



Name: `Alae ke`oke`o - Hawaiian Coot - *Fulica alai*

Did you know?: The white growth on the forehead is called a "frontal shield." Some individuals of this species can have dark red coloration at the base of their frontal shield. Have you seen one of these unique coots?



Name: Ae`o - Hawaiian Stilt - *Himantopus mexicanus knudseni*

Did you know?: Younger ae`o who are not quite ready to have a family of their own have more white feathers on their cheeks and necks than adults. Their legs are also a lighter pink color. Can you find a young ae'o or an adult with bright pink legs?

Nā mea kanu and you!

Use these photos and facts to learn about nā mea kanu (plants) in your own back yard!



Name: Hala - *Pandanus Tectorius*

Uses: Woven mats, dried seeds were used as paintbrushes

Location on base: South-west corner of Pass & ID Gate Parking Lot



Name: Ulu (Breadfruit) - *Artocarpus altilis*

Uses: Food

Location on base: Waiokapua Bay

Nā mea kanu and you!

Use these photos and facts to learn about the nā mea kanu (plants) in your own back yard!



Name: A`ali`i - *Dodonaea viscosa*

Uses: Lei making

Location on base: Kawai`ele Water Bird Sanctuary, and on base



Name: Naupaka Kahakai - *Scaevola taccada*

Uses: Erosion control, provides shade

Location on base: Kawai`ele Water Bird Sanctuary, and on base

Holoholona hiding in plain sight!

Use these photos and facts to learn about the holoholona (animals) hiding in plain sight!



Name: Nēnē - Hawaiian Goose - *Branta sandvicensis*

Did you know?: Fossil remains of 7 duck and geese-like species have been discovered in Hawai'i. Evidence suggests some of these birds were giant compared to our present day nene.



Name: `Ua`u kani - Wedge-tailed Shearwater - *Puffinus Pacificus*

Did you know?: The `ua`u kani's name sounds a lot like the sound they make in their burrows at night, a spooky oooaaaHHHHoooo call. You can even hear babies calling to their parents in a higher pitched tone between August-November!

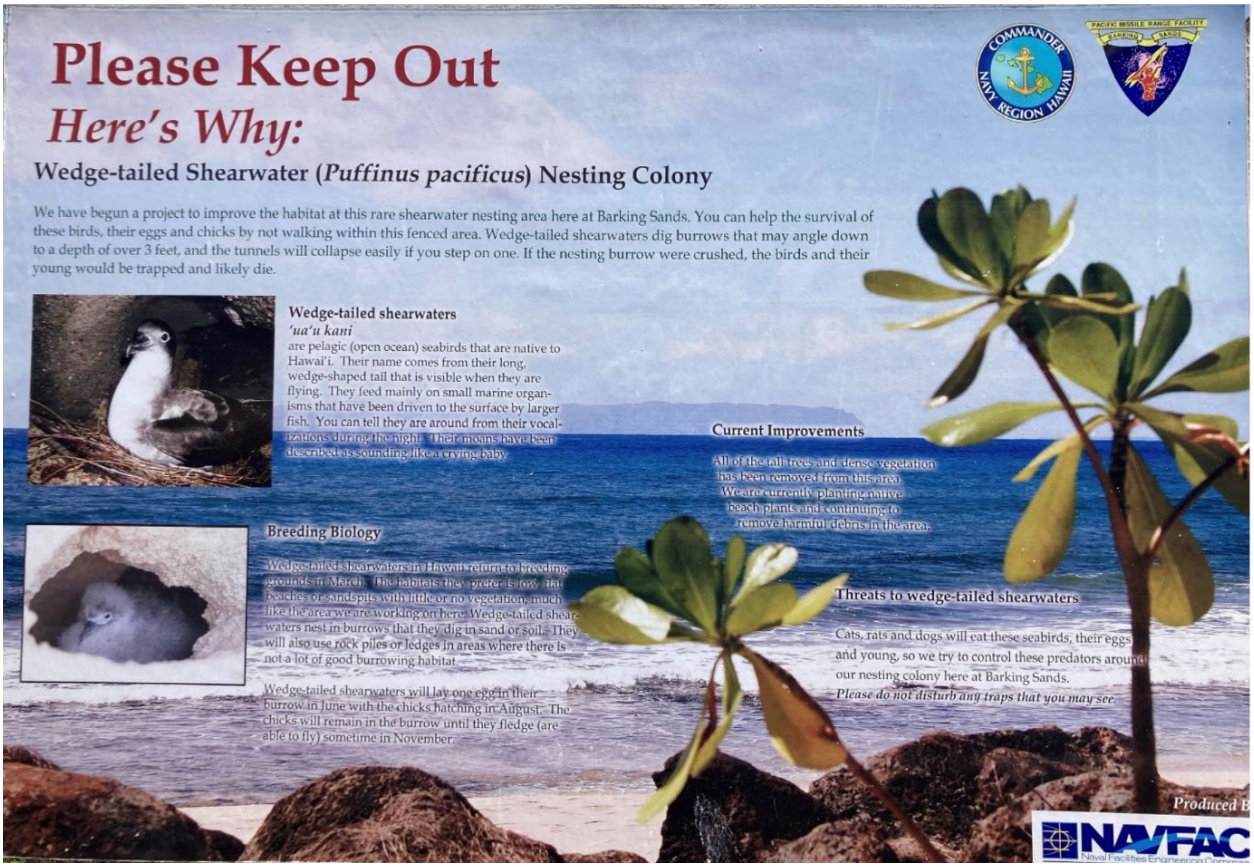
Wedge-tailed Shearwater Colony Signs



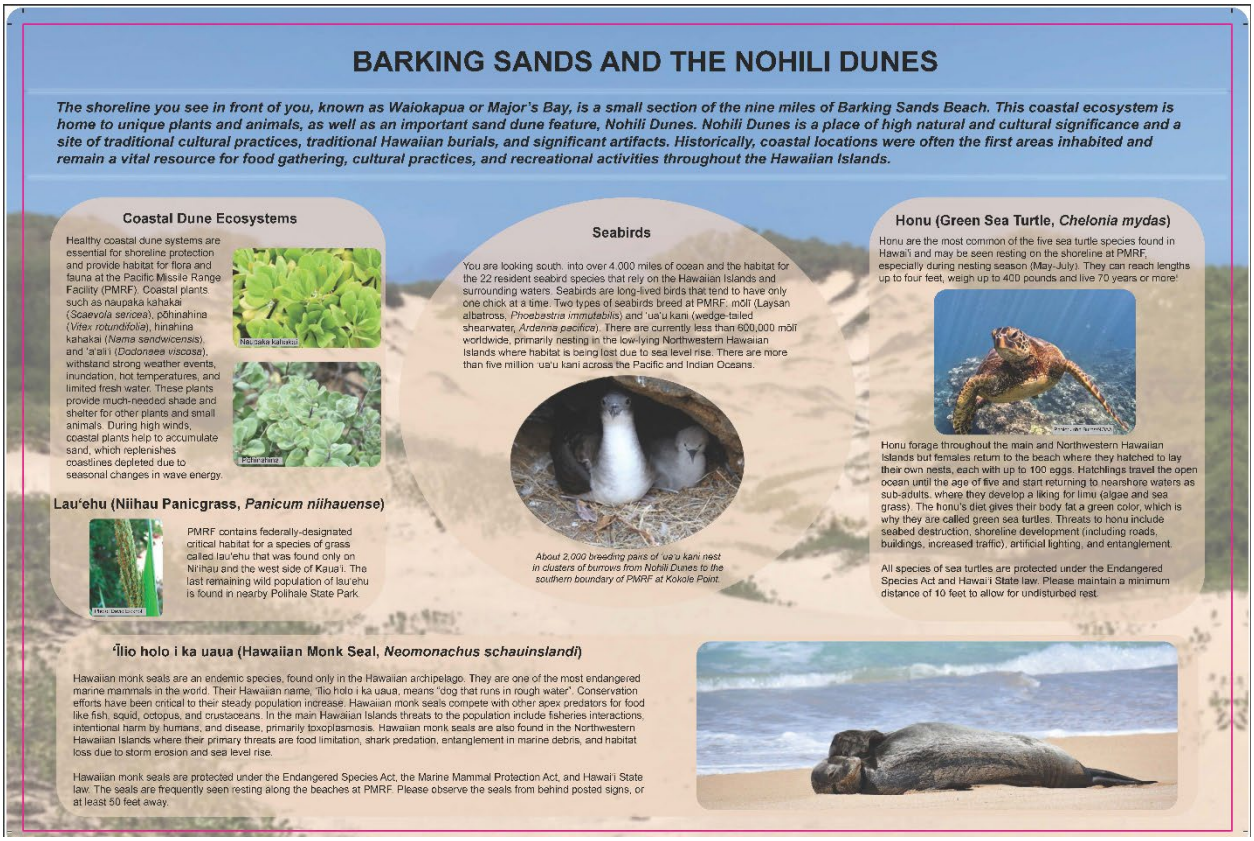
Wedge-tailed Shearwater Colony Signs



Wedge-tailed Shearwater Colony Informational Sign



Barking Sands and the Nohili Dunes Informational Sign at Waiapua'a



‘Ua‘u kani (Wedge-tailed Shearwater) Information Sign at MWR Check-In



‘Ua‘u kani

(Wedge-tailed Shearwater, *Ardenna pacifica*)

‘Ua‘u kani are native seabirds found at PMRF during their breeding season, March - December. PMRF is home to about 2,000 breeding pairs that each lay only one egg per year. Most pairs nest between the Beach Cottages and Waiokapua Bay, but some nest in the culturally significant Nohili Dunes area.

“What am I hearing outside my cottage?!”

‘Ua‘u kani are known for their loud groaning and wailing calls heard at dawn and dusk. Just before dark, they fly in over the beach, land near their burrow, and call to their mate or downy chick. ‘Ua‘u kani are burrow-nesting seabirds that dig into sand dunes, between boulders, or into the soft soil in the lawns around the cottages to make their nests. They are rarely seen during the day at PMRF because they are either in their burrows or foraging at sea. Be careful not to step near their burrow holes so as not to collapse a burrow with a chick inside.

Fishing Guides

‘Ua‘u kani commonly feed on small bait or larval fish, such as flying fish or goatfish, driven to the surface by schools of tuna or other large predatory fish. ‘Ua‘u kani catch their prey by diving and chasing fish underwater, grabbing fish while sitting on the surface, or flying low over the water and snatching fish that are just below the surface. Fisherman often look out for large flocks of foraging birds to guide them to productive fishing areas.

Threats to Seabirds

Threats to ‘ua‘u kani include predators introduced to Hawai‘i such as feral cats; disorientation by artificial lighting; habitat loss; and human disturbance. ‘Ua‘u kani and other seabirds native to Kaua‘i, including the mountain-nesting ‘a‘o (Newell’s shearwater) and ‘ua‘u (Hawaiian petrel), all spend the first few years of their lives foraging at sea. During the young birds’ first trip to the ocean they rely on the moon and stars for navigation. Whenever man-made lights overwhelm natural light sources the birds are susceptible to ‘light attraction fallout’, become disoriented, and often land. Without strong wind off the ocean or from a cliff, these birds cannot take flight and remain grounded, making them more vulnerable to injury or death.

How You Can Help

To combat the negative impacts of artificial lighting during seabird fledging season, PMRF runs a Dark Skies program from September 15 - December 15. The Dark Skies program requires that all non-essential exterior lighting at PMRF is turned off at night, including at the cottages. Visitor participation in this program is vital to its success - we thank you for your help in ensuring the safety of our native birds.

Nēnē and Other Wildlife

PMRF is home to several more species of endangered native wildlife: the honu (green sea turtle), nēnē (Hawaiian goose), and ‘Ilio holo i ka uaua (Hawaiian monk seal, translation: dog that runs in rough water) to name a few. Risks to all species include disturbance from human activities and invasive predators. Nēnē are particularly vulnerable to vehicular strikes. Please drive with attention while on base to avoid injuring any wildlife. Dogs are required to stay on a leash on PMRF property to reduce risk to wildlife.

‘Ua‘u kani pair in their burrow

Burrow cover at the Beach Cottages

‘Ua‘u kani burrow

Honu hatchling (green sea turtle, *Chelonia mydas*)

Nēnē (Hawaiian goose, *Branta sandvicensis*)

‘Ilio holo i ka uaua (Hawaiian monk seal, *Neomonachus schauinslandi*)

Please report any injured wildlife to the PMRF Natural Resources Hotline at 808-208-4416

Endangered Seabird Lighting Restrictions Sign at Majors Bay



Endangered Seabird Lighting, Dark Skies Brochure



Shearwater Fledging Season at PMRF

In the mountains of Kauai, during **September - December**, young endangered seabirds leave their nests for the first time and journey out to the ocean. This process is called "fledging" with many seabirds **taking their first flight near PMRF at night** and using the moon and starlight to navigate to sea to hunt for the first time.

Artificial light can disorient these young birds and cause them to circle lights in confusion. Eventually, they **may "fallout" in exhaustion and are typically unable to take flight again without help**. These birds are in need of immediate assistance due to their vulnerability to predators, vehicle strikes, and dehydration.

As these birds are a **federally protected endangered species**, seabird fallout can cause disruptions in PMRF operations. **To support the PMRF Dark Skies Program and protect these rare Hawaiian birds please refer to the information in this pamphlet.**



Photo Credit: "Save Our Shearwaters"

Learn More

PMRF, Natural Resources Webpage:
http://www.cnic.navy.mil/regions/cnrh/installations/pacific_missile_range_facility_barking_sands/about/resources.html

Save Our Shearwaters Project, *Kaua'i Humane Society*:
http://kauaihumane.org/programs-services/save-our-shearwaters

Kaua'i Endangered Seabird Recovery Project:
http://kauaiseabirdproject.org

PMRF Contacts

PMRF Natural Resources Hotline
(808) 208-4416

PMRF Natural Resources Manager
Office: (808) 335-7507

Installation Environmental Program Director
Office: (808) 335-4064

PMRF Dark Skies Program

Protecting PMRF Mission and Endangered Seabirds

Shearwater Fledging Season (September 15 — December 15)

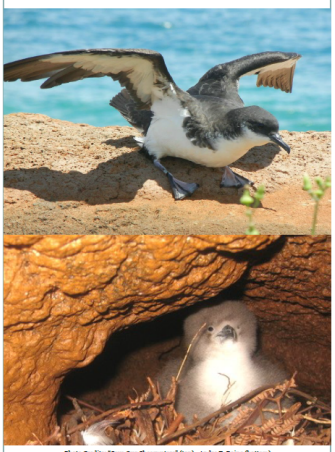


Photo Credits: "Save Our Shearwaters" (top), Andre F. Raine (bottom)

PACIFIC MISSILE RANGE FACILITY (PMRF)
KAUA'I, HI

How you can protect PMRF Mission and Endangered Seabirds:

1. SUPPORT THE PMRF DARK SKIES PROGRAM

During the hours of 1800 - 0600:

- Turn off all unnecessary outdoor lighting
- Draw curtains and blinds

2. CONTROL YOUR PETS

- It is an official PMRF Base Policy to have pets leashed and supervised at all times
- Please do not feed any wildlife or feral animals

3. BE AWARE

If you find a seabird, please refer to the enclosed guide for species of concern. Note time, location, and condition of the seabird and call the:

PMRF Natural Resources Hotline (808) 208-4416

DO NOT give food or water to the seabird and stay 20 ft. away

Seabird I.D guide
SPECIES OF CONCERN FOR FALLOUT

Newell's Shearwater / ʻAʻo



Description: Dark black back and white underneath. No white on forehead.

Hawaiian Petrel / ʻUaʻu



Description: Dark grey back and white underneath. Distinguished from the Newell's Shearwater by the white above its beak and lighter grey color.

IMPORTANT NOTE:
The above species nest in burrows in the mountains and fledglings over PMRF to the ocean. If either of these birds are seen at PMRF they are in need of immediate assistance. These birds are federally protected by the Endangered Species Act.

Photo Credits (front page and above): Jim Denny

Seabird I.D guide
Similar Looking Species found at PMRF

Wedge-tailed Shearwater / ʻUaʻu kani





Description: Grey or dark brown back gradually fading into light grey underneath.

IMPORTANT NOTE:
This species nests in burrows near the coast and is not as vulnerable to fallout. These birds are commonly seen around the PMRF Beach Cottages and Major's Bay.

Please only report this species if it appears injured or sick. This species is more common than the Newell's Shearwater and Hawaiian Petrel, however, it is federally protected by the Migratory Bird Treaty Act.

Photo Credits: The United States Fish and Wildlife Service

Nene sign



PMRF Native Bird Guide



Native Birds at PMRF

Hawaiian Goose

Nēnē



Nēnē are listed as threatened under the Endangered Species Act. They are endemic to Hawai'i, meaning they are not found anywhere else in the world. They are adapted to walking on Hawai'i's rocky lava flows by having claw like feet and less webbing than other geese. On Kaua'i, they are mainly seen on grasslands, agricultural pastures, and human modified habitat such as golf courses. They graze on grass, seeds, berries, flowers, and occasionally insects. Nēnē are the state bird of Hawai'i. Current threats to the Nēnē include introduced predators including feral cats and dogs, human disturbance (such as getting hit by cars), and habitat loss.

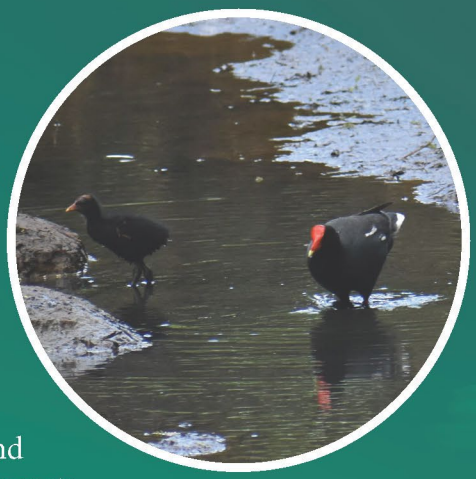
Hawaiian Coot

'Alae ke'oke'o



The Hawaiian Coot is endangered and is endemic to Hawai'i. It has a black head, grey body, and white shield on its face. Its legs and feet are greenish grey and its feet are lobed instead of webbed. They are found in wetlands where they eat seeds, leaves, insects, small crustaceans and fish. The Hawaiian Coot nests year round and constructs its nest on or near water. The Hawaiian Coot is one of the five native and endangered waterbirds in Hawai'i, all of which are facing similar threats. Habitat loss, introduced predators such as feral cats, and disease are among those threats.

Hawaiian Gallinule
ʻAlae ʻula



The Hawaiian Gallinule is endangered and is endemic to Hawaiʻi. It is similar in appearance to the Hawaiian Coot. However, Hawaiian Gallinules can be identified by their red shield and yellow legs in comparison to the Hawaiian Coot's white shield and dark colored legs. They can be found in freshwater habitats such as ponds and wetlands. Their variable diet includes insects, snails, vegetation, seeds, and algae. Nesting year-round, nests are constructed in secretive spots on water hidden in vegetation. Like the other native waterbirds, the Hawaiian Gallinule is threatened by habitat loss, introduced predators such as feral cats, and disease.





Hawaiian Duck
Koloa maoli

The Hawaiian Duck is endangered and is endemic to Hawaiʻi. This species is very secretive and easily spooked by people. They are found in wetland habitats and nest year-round. Like many ducks, they have a varied diet that includes insects, worms, algae, and seeds and leaves. Today, Kaua'i is the only island where pure forms of the Hawaiian Duck still exist. On the other Hawaiian Islands, interbreeding with introduced Mallard ducks have resulted in hybrid individuals. Other threats to the Hawaiian Duck include habitat loss, introduced predators such as feral cats, and disease.

Hawaiian Stilt
Ae'o



The Hawaiian Stilt is endangered and is endemic to Hawai'i. It is a slender waterbird with tall pink legs, white belly, and black head and back. It has a long and thin black bill, which it uses to prey on insects, worms, small crustaceans and fish. It is found in wetlands with shallow water or mudflats. Hawaiian Stilts nest between March and August in mudflats with low vegetation or in ponds. Threats to these elegant waterbirds include habitat loss, introduced predators such as feral cats, and disease.

Pacific Golden-Plover
Kōlea





The Pacific Golden-Plover breeds on tundra in western Alaska and Russia during the summer months. Many individuals spend their winters on the Hawaiian Islands where they are often seen on grasslands, tidal flats, or agricultural fields. Their diet includes mainly insects and occasionally seeds and berries. Pacific Golden-Plovers shed their feathers and grow new ones for the summer breeding season through a process called molting. They molt their feathers once again after nesting.

Hawaiian Short-eared Owl
Pueo



The Hawaiian Short-eared Owl is an endemic subspecies. These charismatic owls can be seen soaring over open fields where they hunt for small mammals and birds during the day. Little information is known about this subspecies of Short-eared Owl as they can be quite secretive in their breeding habits and difficult to observe for long periods of time. These birds are likely relatively new arrivals to the islands, appearing after Polynesian settlement.

Black-crowned Night Heron
ʻAukuʻu



Adult Black-crowned Night Herons have a black back and cap on their heads with grey wings and whiteish bellies. Juveniles are brown overall with white streaks or spots. They are common in waterways and wetlands where they forage for insects, fish, frogs, and other young waterbirds. Unlike the Black-crowned Night Herons on mainland North America, the individuals in Hawaii primarily hunt during the day instead of night. They breed between December and August, constructing large nests made of twigs in vegetation low to the ground.

Laysan Albatross

Mōlī



The Laysan Albatross is a large seabird that returns to land only to breed. It travels great distances across the ocean and breeds mainly in the Hawaiian Islands. Like many other seabirds, the Laysan Albatross returns to the same location it was born in order to breed and it lays only one egg. Eggs are laid between November and December, and chicks fledge in July. It is mostly white with black wings and tail. The oldest known Laysan Albatross is named Wisdom and she is at least 69 years old. Wisdom breeds on Midway Atoll National Wildlife Refuge in the Northwestern Hawaiian Islands.











dark morph (left), pale morph (right)

Wedge-tailed Shearwater
ʻUaʻu kani

The Wedge-tailed Shearwater is a nocturnal seabird that digs underground burrows or nests in rock crevices. Its call sounds like a series of wails and moans. This shearwater is commonly seen breeding in colonies along coastlines. Starting in March, they return to the same location they were born to breed. They lay only one egg per season, and the chicks fledge in November-December. These shearwaters fly out to sea during the day to fish and return to their burrows at night. Wedge-tailed Shearwaters have two color morphs: pale and dark. Some individuals have a lighter grey belly (pale morph) and some have a darker grey belly (dark morph).

…

PMRF Protected Wildlife Seasons Chart

Pacific Missile Range Facility
Protected Wildlife Seasons

Species Federally Protected Under: Endangered Species Act (ESA, 1973) and Migratory Bird Treaty Act (MBTA, 1918)

Federal Law	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP 1-15	SEP 15-30	OCT	NOV	DEC
ESA	Nene Breeding Season *(100 ft. Buffer Required for Nests/Chicks)*				Nene Flocking Season				Nene Breeding Season *(100 ft. Buffer Required for Nests/Chicks)*				
MBTA	Laysan Albatross Present at PMRF												Egg Laying
MBTA			Wedge-tailed Shearwater			Egg Laying, Hatching, Chick Rearing						Fledging	
ESA			Newell's Shearwater and Hawaiian Petrel Breeding							Dark Skies* ESA Seabird Fledging Season			
ESA	Hawaiian Gallinule		Breeding Season *(100 ft. Buffer Required for Nests/Chicks)*						Hawaiian Gallinule				
ESA	Hawaiian Stilt		Breeding Season *(100 ft. Buffer Required for Nests/Chicks)*						Hawaiian Stilt				
ESA	Hawaiian Coot		Breeding Season *(100 ft. Buffer Required for Nests/Chicks)*							Hawaiian Coot			
ESA	Hawaiian Duck *(100 ft. Buffer Required for Nests/Chicks) May Nest Year-round, Peak Nesting JAN-MAY*												
ESA	Green Sea Turtle **				Sea Turtle Egg Laying			Sea Turtle Nest Hatching				Green Sea Turtle**	
ESA	Hawaiian Monk Seal **			Peak Pupping			Hawaiian Monk Seal**						
ESA	Hawaiian Hoary Bat					Pupping *(Trees >15 ft. protected)*				Hawaiian Hoary Bat			
MBTA	Hawaiian Short-eared Owl / Pueo *(ground-nesting species with a potential to nest year-round at PMRF)*												

**between Sep 15 - Dec 15, all outdoor nighttime lighting requires waiver approved by PMRF Environmental and Executive Officer*

***please report monk seal and sea turtle sightings and nests to the PMRF Natural Resources Hotline*

All vegetation removal operations near waterbird habitat and nene nesting hotspots must first be searched by a PMRF biologist

Please Call to Report Injured and Deceased Wildlife and Coordinate Searches: PMRF Natural Resources Hotline at (808) 208-4416

Questions? Call: Brooke McFarland, Natural Resources Manager: (808) 335-4017 OR Jessi Behnke, Installation Environmental Program Director: (808) 335-4064

APPENDIX I – ENVIRONMENTAL ASSESSMENT FOR PMRF INRMP

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FINDING OF NO SIGNIFICANT IMPACT

FOR THE PROPOSED PACIFIC MISSILE RANGE FACILITY INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN ENVIRONMENTAL ASSESSMENT NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND, HAWAI'I PROJECT REFERENCE: CONTRACT #N62470-13-D-8017-KB01

Pursuant to Section 102(2)(c) of the National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [C.F.R.] Parts 1500–1508) implementing the procedural provisions of NEPA, the United States (U.S.) Department of the Navy (DoN or Navy) gives notice that an Environmental Assessment (EA) has been prepared. Based on this Finding of No Significant Impact (FONSI), an Environmental Impact Statement (EIS) is not required for the 2023 Integrated Natural Resources Management Plan (INRMP) for the Pacific Missile Range Facility (PMRF) Complex on the islands of Kaua'i, O'ahu, Ni'ihau, and Ka'ula, Hawai'i. The 2023 INRMP updates the 2010 INRMP for the same locations.

The DoN is aware of the November 12, 2024, decision in Marin Audubon Society v. Federal Aviation Administration, No. 23-1067 (D.C. Cir. Nov. 12, 2024). To the extent that a court may conclude that the CEQ regulations implementing NEPA are not judicially enforceable or binding on this agency action, the DoN has nonetheless elected to follow those regulations at 40 C.F.R. Parts 1500– 1508, in addition to DoN's procedures/regulations implementing NEPA at 32 C.F.R. Part 775, to meet the agency's obligations under NEPA, 42 U.S.C. §§ 4321 et seq.

PROPOSED ACTION

The Proposed Action is to adopt and implement the 2023 PMRF INRMP in Hawai'i. The EA includes an analysis of potential environmental impacts associated with the implementation of the Preferred Alternative (implementation of the 2023 PMRF INRMP) and the No Action Alternative (continuation of the 2010 INRMP).

The EA focuses on eight sites under PMRF management; no resources requiring management are to occur at the Miloli'i Ridge reflector sites on Kaua'i or the Mount Ka'ala communication site on O'ahu, which are therefore omitted from analysis. The EA further includes PMRF's monitoring and proactive management activities to provide conservation benefits to aquatic species and habitats in nearshore waters adjacent to the installations. PMRF does not own or manage submerged lands seaward of the high-water mark; however, a Safety Zone (33 C.F.R. Section 165.1406) and Danger Zone (33 C.F.R. Section 334.1390) adjacent to Barking Sands are designated for Navy use and are therefore included in the INRMP study area. The offshore underwater ranges are within open ocean areas and extend into territorial waters, which are not under the jurisdiction of PMRF or INRMP study area and, therefore, are not included in the EA; however, the Navy conducts annual marine mammal monitoring in the Hawai'i Range Complex, which includes offshore areas at PMRF. An updated Biological Opinion and Letter of

Authorization for offshore activities covered under Hawai'i-California Training and Testing EIS/Overseas EIS (OEIS) is expected by December 2025.

Documents reviewed in the preparation of this FONSI were the 2010 PMRF INRMP (which became compliant on April 11, 2014), the 2002 Final EA (prepared for the 2001 PMRF INRMP), and the 2023 PMRF INRMP.

PURPOSE AND NEED

The purpose of an INRMP is to implement an ecosystem-based conservation program that provides for conservation and rehabilitation of natural resources in a manner that is consistent with the military mission, integrates and coordinates all natural resources management activities, provides for sustainable multipurpose uses of natural resources, and provides for public access for use of natural resources subject to public safety and military security considerations. The EA has been prepared to evaluate the effects of the activities described in the 2023 PMRF INRMP.

The purpose of the Proposed Action is to implement the 2023 PMRF INRMP, which provides an approach for natural resources management on PMRF-administered lands that is consistent with the Sikes Act (as amended) as well as the most recent Department of Defense (DoD) and DoN policy and guidance regarding INRMPs. The need for the Proposed Action is to provide a comprehensive, adaptive natural resources management approach for all PMRF properties. Both the INRMP and the natural resources management programs that it supports must meet DoD and DoN policy and guidance that collectively require a plan and management approach consistent with mission support (as defined in 10 U.S.C. Section 5062).

ALTERNATIVES CONSIDERED

The DoN Environmental Readiness Program Manual (Office of the Chief of Naval Operations Manual [M]-5090.1, 2021) states that for actions associated with the implementation of an INRMP, analysis of a Proposed Action and No Action Alternatives is acceptable without considering additional alternatives.

No Action Alternative (Current Management)

Under the No Action Alternative, the Proposed Action would not occur; therefore, the objectives and practices outlined in the 2010 PMRF INRMP would remain in place. The No Action Alternative would not meet the purpose and need for the Proposed Action; however, as required by NEPA, the No Action Alternative is carried forward for analysis as it provides a baseline for measuring the environmental consequences of a Preferred Alternative. Further, the No Action Alternative would be in violation of the Sikes Act, which requires that INRMPs be revised a minimum of every 5 years.

Preferred Alternative (Proposed Action)

The Preferred Alternative includes the adoption and implementation of a revised 2023 PMRF INRMP. The INRMP identifies concerns, creates objectives, and outlines strategies to address those concerns and achieve those objectives. To evaluate impacts clearly and concisely, the EA focuses on the strategies (also called resource management actions) and analyzes the effects of implementation of those strategies. The revised INRMP would meet the goals and objectives for

management of PMRF's natural resources in a manner that would be compatible with the military uses of the property and consistent with the Sikes Act.

SUMMARY OF EFFECTS

The following summarizes the potential environmental consequences of the Preferred Alternative and No Action Alternative. The study area for the analysis of effects to resources associated with the Preferred Alternative includes the lands and waters of PMRF owned or leased by the Navy that could be affected by the proposed INRMP activities. The environmental resource areas analyzed include: the physical environment including geology and soils, and water resources; biological resources including vegetation, nuisance and invasive animals, at-risk species of bat, birds, insects, marine mammals, marine reptiles, other at-risk marine species, and coastal and nearshore biological resources; and the social and cultural environment including land use, outdoor recreation, and cultural resources. Each resource area is analyzed by facility location. Potential impacts on physical, biological, and social and cultural resources analyzed in the EA are summarized as follows.

Per CEQ guidance, several resources received only screening-level analysis in the EA because implementation of either action either would not be likely to result in any potential environmental impacts on these resources or would have negligible impacts. These resources are air quality, airspace management, noise, infrastructure, transportation, public health and safety, hazardous materials and wastes, socioeconomics, and visual resources.

Strategies for data collection, database and records management, natural resources awareness, education, and personnel training would be implemented base-wide and would benefit natural resource management across all the resource areas. The Affected Environment and Environmental Consequences section of the EA omits evaluation of these strategies because they relate primarily to implementation of all the natural resource management strategies, would have only beneficial effects, and do not pertain to a particular natural resource.

Physical Resources. Implementing the activities described in the 2023 PMRF INRMP would result in benefits to physical resources in those locations where management actions are proposed. The most current best management practices would be used when implementing these and other INRMP projects to prevent negative effects to facility location physical resources. Therefore, implementation of the Preferred Alternative would not result in significant negative impacts to physical resources. The No Action Alternative would involve PMRF continuing to operate under an outdated INRMP. This would lead to no change to the management of physical resources. Though the benefits to physical resources resulting from implementation of the Preferred Alternative would not be realized, no significant negative impacts to existing water resources would occur.

Biological Resources. Implementing the activities described in the 2023 PMRF INRMP would result in benefits to biological resources in those locations where management actions are proposed. Species surveys and monitoring would add to knowledge of species distribution and abundance, ultimately aiding conservation efforts. Control of predators (including rodents, ungulates, and feral animals) and control of invasive and non-native species would reduce mortality and competition with species that can outcompete native species for resources. Habitat improvements would benefit native terrestrial and marine flora and fauna by providing the native habitats species require. Activities that result in education and outreach to the public, law

enforcement, and recreation personnel would increase stewardship of biological resources. Additionally, the use of the most current management practices in implementing these and other INRMP projects would prevent negative effects to biological resources. No significant impact to threatened and endangered species would occur. Therefore, implementation of the Preferred Alternative would not result in significant impacts to biological resources. The No Action Alternative would involve PMRF continuing to operate under an outdated INRMP. This would lead to no change to the management of biological resources. Though the benefits to resources resulting from implementation of the Preferred Alternative would not be realized, no significant negative impacts to existing biological resources would occur.

Social and Cultural Environment. Implementing the activities described in the 2023 PMRF INRMP would result in benefits to social and cultural resources in those locations where management actions are proposed. Continued coordination among facilities planners, resource managers, and State of Hawai'i and county officials would benefit from implementation of INRMP management actions at all eight facility locations. PMRF's recreation program would ensure recreationists are well-informed, including on the importance of natural resources stewardship. Development of a Natural Resources Information Center and associated components (e.g., brochures, educational information, self-guided nature-based walks) would benefit social and cultural resources while benefiting PMRF natural resources. Therefore, implementation of the Preferred Alternative would not result in significant negative impacts to the social and cultural environment. The No Action Alternative would involve PMRF continuing to operate under an outdated INRMP. This would lead to no change to the management of the social and cultural environment. Though the benefits to resources resulting from implementation of the Preferred Alternative would not be realized, no significant negative impacts to the existing social and cultural environment would occur.

Short-term effects to biological resources are expected and require management strategies identified above to eliminate or reduce their intensity to non-target species. It was also determined that a long-term beneficial effect on all biological resources would occur due to implementation of the revised INRMP.

Cumulative Impacts. The analysis considers additive impacts from Reasonably Foreseeable Future Actions (RFFAs) that may occur later in time or farther removed in distance from the proposed action but that have a reasonably close causal relationship to the Proposed Action. This analysis includes a review of public documents prepared by federal, state, and local government agencies, management plans, land use plans, and other planning-related studies to determine potential effects from RFFAs that could combine with the potential effects of the proposed action. This analysis also includes a search of the State of Hawai'i Office of Planning and Sustainable Development EA/EIS database to determine whether analyses of any properties adjacent to the PMRF facilities were completed and published for RFFAs. However, no significant negative cumulative effects to the resource areas analyzed in the EA would be caused by implementation of the Preferred Alternative.

MITIGATION MEASURES

The analysis in the EA determined the Proposed Action would not result in significant environmental impacts. Therefore, no mitigation measures are required for the project to reach a FONSI. However, the 2023 PMRF INRMP proposes natural resources management strategies that

carry over from, and build upon, strategies in the 2010 PMRF INRMP. Because implementation of the INRMP would involve ongoing actions, the EA analysis assumes a long-term duration of the impact for all resources.

PMRF developed the INRMP to ensure consistency with the installation's military mission and to support no net loss in military mission capability for the installation lands while providing for the conservation, rehabilitation, and the sustainable multipurpose use of natural resources on PMRF. The primary purpose of the INRMP is to provide a proactive natural resources management plan that guides PMRF in achieving natural resource management goals, mission requirements, and compliance with environmental regulations and policies. The 2023 PMRF INRMP would serve as a principal information source for the preparation of future environmental analyses for proposed base actions. Management strategies are presented in Table 2, "Alternatives Comparison," of the EA.

PUBLIC OUTREACH

Formal notification and opportunity for public participation were provided during the preparation of the EA. The Navy prepared a Draft EA to inform the public of the Proposed Action and alternatives and to allow the opportunity for public review and comment.

A Notice of Availability of the 2023 PMRF INRMP and Draft EA was published in *The Garden Island* newspaper on May 16–18, 2024. The documents were made available online on the Naval Facilities Engineering Systems Command, Pacific website. Hard copies were placed in the Waimea Public Library, Līhu'e Public Library, and Kapa'a Public Library. Comments were accepted from May 16, 2024, through June 15, 2024. Comments received on the 2023 PMRF INRMP and Draft EA were analyzed and, where appropriate, changes were incorporated into the Final EA.

Public comments received on the Draft EA that were addressed in the Final EA included addressing strategies to protect marine mammals (e.g., whales and dolphins) and addressing management issues of Hawaiian monk seals (*Monachus schauinslandi*) and sea turtles (primarily green; *Chelonia mydas*) in nearshore habitats. Comments regarding marine species were addressed by the Navy's Marine Species Monitoring Program that was developed in support of Navy Training and Testing EISs/OEISs and their associated Biological Opinions and Marine Mammal Protection Act Letters of Authorization; the Navy has been conducting marine mammal monitoring in the offshore areas of the PMRF since 2008. For sea turtles, a 2023 interagency agreement will allow the Navy to partner with the National Marine Fisheries Service, Pacific Islands Fisheries Science Center, to deploy SPLASH tags (Global Positioning System and Argos) on sea turtles at PMRF; additionally, an appendix was added to the INRMP specific to sea turtle management actions at PMRF.

FINDING OF NO SIGNIFICANT IMPACT

Based on the analysis presented in the EA, which has been prepared in accordance with the requirements of NEPA and DoN policies and procedures (32 C.F.R. Part 775), and in coordination with the U.S. Fish and Wildlife Service and National Ocean and Atmospheric Administration, no significant impacts to the natural and human environments from the Proposed Action are expected. The Proposed Action includes continued implementation of the objectives and practices outlined

in the 2010 INRMP, with additional strategies proposed in the 2023 INRMP. The EA analysis concluded no significant adverse effects would occur to any of the resources from implementation of either alternative.

Conclusion

Based on review and evaluation of the information contained in the Final EA and comments received, I have determined that implementing the project will not constitute a major federal action significantly affecting the quality of the human environment within the meaning of Section 102(2)(c) of NEPA. The project is not without precedent and is not like actions that would normally require preparation of an EIS. Accordingly, preparation of an EIS for the proposed action is not required. Interested parties will be notified of the decision.

S. D. BARNETT, RADM, USN, Commander, Navy Region Hawaii
Printed Name and Affiliation

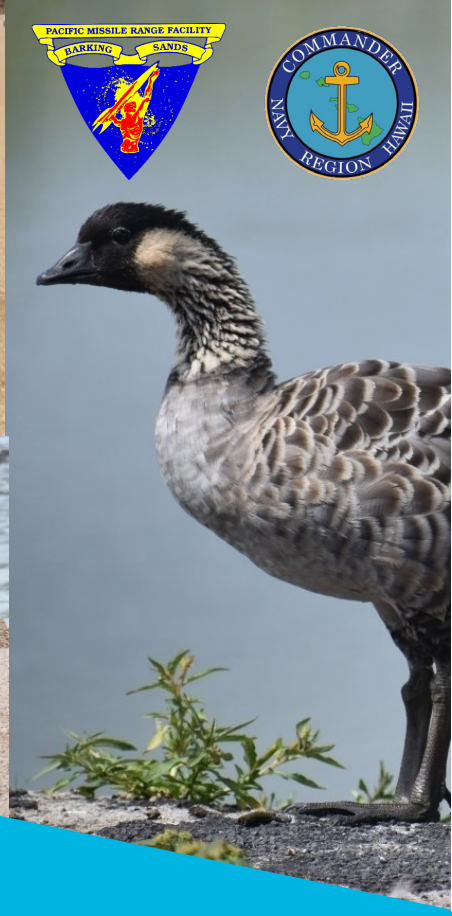
S.D.Barnett
Signature

4 MAR25
Date

Note: This FONSI and supporting references are available for public review at:

https://pacific.navfac.navy.mil/About-Us/National-Environmental-Policy-Act-NEPA-Information/



Pacific Missile Range Facility
Integrated Natural Resources Management Plan

Final Environmental Assessment

Naval Facilities Engineering Systems Command, Hawai'i
Project Reference: Contract #N62470-13-D-8017-KB01

November 2024

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Prepared for:

Naval Facilities Engineering Systems Command, Hawai‘i

Prepared by:

AECOM
1001 Bishop Street, Suite 1600
Honolulu, HI 96813
aecom.com

Prepared in association with:

NOTE ABOUT USE OF HAWAIIAN DIACRITICAL MARKINGS: This document honors the proper use and presentation of Hawaiian language including use of diacritical marks, the glottal stop and the macron (‘okina and kahakō). When Hawaiian words are used in a proper name of an agency or organization that does not utilize diacritical marks, then official titles are shown without diacritical marks. Diacritical markings may not appear in direct quotes or public comments. Elsewhere in this document, diacritical markings are used for Hawaiian terminology, proper names and place names.

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ABSTRACT

Designation:	Environmental Assessment
Title of Proposed Action:	Integrated Natural Resources Management Plan
Project Location:	Pacific Missile Range Facility, Hawai‘i
Lead Agency for the EA:	Department of the Navy
Cooperating Agency:	None
Affected Region:	Hawai‘i
Action Proponent:	Pacific Missile Range Facility
Point of Contact:	ATTN: Public Works/NR INRMP Pacific Missile Range Facility P.O. BOX 128 Kekaha, HI 96752 Email: navfachinaturalr.fct@navy.mil
Date:	November 2024

Navy Region Hawai‘i, a Command of the United States Navy (hereinafter, jointly referred to as the Navy), has prepared this Environmental Assessment in accordance with the National Environmental Policy Act, as implemented by the Council on Environmental Quality Regulations and Navy regulations for implementing the National Environmental Policy Act. The Proposed Action would implement the 2023 Integrated Natural Resources Management Plan Pacific Missile Range Facility. This Environmental Assessment evaluates the potential environmental impacts associated with one action alternative (Preferred Alternative) and a No Action Alternative.

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EXECUTIVE SUMMARY

ES.1 Proposed Action

The Proposed Action is to adopt and implement the 2023 Integrated Natural Resources Management Plan (INRMP) for the Pacific Missile Range Facility (PMRF), Kauaʻi, Hawaiʻi. The purpose of an INRMP is to implement an ecosystem-based conservation program that provides for conservation and rehabilitation of natural resources in a manner that is consistent with the military mission, integrates and coordinates all natural resources management activities, provides for sustainable multipurpose uses of natural resources, and provides for public access for use of natural resources subject to public safety and military security considerations. This Environmental Assessment (EA) has been prepared to evaluate the effects of the activities described in the 2023 PMRF INRMP.

ES.2 Purpose and Need for the Proposed Action

The purpose of the Proposed Action is to implement the 2023 PMRF INRMP, which provides an approach for natural resources management on PMRF-administered lands that is consistent with the Sikes Act (as amended) as well as the most recent Department of Defense (DoD) and Department of Navy (DoN or Navy) policy and guidance regarding INRMPs. The need for the Proposed Action is to provide a comprehensive, adaptive natural resources management approach for all PMRF properties. Both the INRMP and the natural resources management programs that it supports must meet DoD and DoN policy and guidance to conduct management of natural resources consistent with the mission (as defined in 10 United States Code Section 8062).

ES.3 Alternatives Considered

The DoN Environmental Readiness Program Manual (Office of the Chief of Naval Operations Manual [M]-5090.1, 2021) states that for actions associated with the implementation of an INRMP, analysis of a Proposed Action and No Action Alternatives is acceptable without considering additional alternatives. Therefore, no additional alternatives are carried forward in this EA.

ES.4 Summary of Environmental Resources Evaluated in the EA

Council on Environmental Quality regulations, National Environmental Policy Act (NEPA), and DoN instructions for implementing NEPA, specify that an EA should address those resource areas potentially subject to impacts. In addition, the level of analysis should be commensurate with the anticipated level of environmental impact. The environmental resource areas analyzed in the EA include: the physical environment including geology and soils, water resources, and climate change; biological resources including vegetation, nuisance and invasive animals, native, terrestrial, and marine species, and coastal and nearshore biological resources including habitat, fish and other animals, and algae; and the social and cultural environment including land use, outdoor recreation, and cultural resources. Each resource area is analyzed by each of the eight site locations: Barking Sands, Mākaha Ridge, Kōkeʻe State Park, Kamokalā Ridge Magazines, Port Allen, Kaʻula Island, Mauna Kapu, and Niʻihau Sites.

Because potential impacts were negligible or nonexistent, the following resources were not evaluated in this EA: air quality, airspace management, noise, infrastructure, transportation, public health and safety, hazardous materials and wastes, socioeconomics, environmental justice, and visual resources. The analysis in this EA addresses the natural resource management program in a programmatic context. As

management decisions are made and specific project designs are developed, further project and site-specific NEPA analysis and/or regulatory compliance may be required.

ES.5 Summary of Potential Environmental Consequences of the Action Alternatives

The following is a summary of the potential environmental consequences of the Preferred Alternative and No Action Alternative. The study area for the analysis of effects to resources associated with the Preferred Alternative includes the lands and waters of PMRF owned or leased by the Navy that could be affected by the proposed INRMP activities.

Physical Resources. Implementing the activities described in the 2023 PMRF INRMP would result in benefits to physical resources in those locations where management actions are proposed. The most current best management practices (BMP) would be used when implementing these and other INRMP projects to prevent negative effects to facility location physical resources. Therefore, implementation of the Preferred Alternative would not result in significant impacts to physical resources. The No Action Alternative would involve PMRF continuing to operate under an outdated INRMP. This would lead to no change to the management of physical resources. Though the benefits to physical resources resulting from implementation of the Preferred Alternative would not be realized, no significant impacts to existing water resources would occur.

Biological Resources. Implementing the activities described in the 2023 PMRF INRMP would result in benefits to biological resources in those locations where management actions are proposed. Species surveys and monitoring would add to knowledge of species distribution and abundance, ultimately aiding conservation efforts. Control of predators (including rodents, ungulates, and feral animals) and control of invasive and non-native species would reduce mortality and competition with species that can outcompete native species for resources. Habitat improvements would benefit native terrestrial and marine flora and fauna by providing the native habitats species require. Activities that result in education and outreach to the public, law enforcement, and recreation personnel would increase stewardship of biological resources. Additionally, the use of the most current management practices in implementing these and other INRMP projects would prevent negative effects to biological resources. There would be no significant impact on threatened and endangered species. Therefore, implementation of the Preferred Alternative would not result in significant impacts to biological resources. The No Action Alternative would involve PMRF continuing to operate under an outdated INRMP. This would lead to no change to the management of biological resources. Though the benefits to resources resulting from implementation of the Preferred Alternative would not be realized, no significant impacts to existing biological resources would occur.

Social and Cultural Environment. Implementing the activities described in the 2023 PMRF INRMP would result in benefits to social and cultural resources in those locations where management actions are proposed. Continued coordination among facilities planners, resource managers, State of Hawai‘i, and county officials would benefit implementation of INRMP management actions at all eight facility locations. PMRF’s recreation program would ensure recreationists are well informed, including education as to rules and requirements of recreating to preserve resources and the importance of natural resource stewardship. Development of a Natural Resources Information Center and associated components (e.g., brochures, educational information, self-guided nature-based walks) would benefit social and cultural resources while benefiting PMRF natural resources, this would include education of the rules and requirements for the preservation of resources and the importance of natural resource stewardship. Therefore, implementation of the Preferred Alternative would not result in significant impacts to the

social and cultural environment. The No Action Alternative would involve PMRF continuing to operate under an outdated INRMP. This would lead to no change to the management of the social and cultural environment. Though the benefits to resources resulting from implementation of the Preferred Alternative would not be realized, no significant impacts to the existing social and cultural environment would occur.

ES.6 Public Involvement

A Notice of Availability of the Draft INRMP and EA for review by the public was published in the Garden Island newspaper (May 16–18, 2024). The documents were made available on the Naval Facilities Engineering Systems Command (NAVFAC), Pacific website and hard copies were placed in the Waimea Public Library, Līhu'e Public Library, and Kapa'a Public Library. Online at:

(https://pacific.navfac.navy.mil/About-Us/National-Environmental-Policy-Act-NEPA-Information/#:~:text=Written%20comments%20on%20the%20INRMP%20and%20DEA%20may,postmarked%20by%20June%2015%2C%202024%20to%20be%20considered).

Comments were accepted from May 16, 2024, through June 15, 2024. Comments received on the 2023 PMRF INRMP and Draft EA were analyzed and, where appropriate, changes were incorporated into this EA.

Public comments received on the Draft EA that were addressed included addressing strategies to protect marine mammals (e.g., whales and dolphins) and addressing management issues of Hawaiian monk seals (*Neomonachus schauinslandi*) and sea turtles (primarily green; *Chelonia mydas*) in nearshore habitats. Comments regarding marine species were addressed by the Navy's Marine Species Monitoring Program that was developed in support of Navy Training and Testing Environmental Impact Statements (EISs)/Overseas EISs and their associated Biological Opinions and Marine Mammal Protection Act Letters of Authorization; the Navy has been conducting marine mammal monitoring in the offshore areas of the PMRF since 2008. For sea turtles, an interagency agreement was listed in 2023 to allow the Navy to partner with the National Marine Fisheries Service, Pacific Islands Fisheries Science Center, to deploy SPLASH tags (Global Positioning System and Argos) on sea turtles that will be pursued at PMRF; additionally, an appendix was added to the INRMP specific to sea turtle management actions at PMRF.

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Acronyms and Abbreviations

ac	acre
AICUZ	Air Installation Compatible Use Zone
AOA	Airfield Operations Areas
API	Agricultural Preservation Initiative
APZ	Accident potential zone
ARDEL	Advanced Radar Detection Evaluation Laboratory
AT/FP	Antiterrorism Force Protection
BASH	Bird/animal aircraft strike hazard
BMP	Best management practice
BO	Biological Opinion
BOS	Base Operations Support
CATEX	Categorical exclusion
CEQ	Council on Environmental Quality
C.F.R.	Code of Federal Regulations
CO	Carbon monoxide
COMPACFLT	Commander, United States Pacific Fleet
COTS	Crown-of-thorns
CWA	Clean Water Act
CZ	Clear zone
DAR	Division of Aquatic Resources
DLNR	Department of Land and Natural Resources
DoD	Department of Defense
DOFAW	Division of Forestry and Wildlife
DoN	Department of the Navy
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EMR	Electromagnetic radiation
EO	Executive Order
ESA	Endangered Species Act
ESQD	Explosives Safety Quantity Distance
FACSFAC	Fleet Area Control and Surveillance Facility
Fed. Reg.	Federal Register
ft	foot or feet
FY	Fiscal year
GHA	Ground Hazard Area
GHG	Greenhouse gas
ha	hectare
HAMP	Historic Asset Management Process
HAPC	Habitat area of particular concern
HAR	Hawai‘i Administrative Rule
HCTT	Hawai‘i-California Training and Testing (EIS/OEIS)
HDOA	Department of Agriculture, State of Hawai‘i
HRC	Hawai‘i Range Complex (EIS/OEIS)
HRS	Hawai‘i Revised Statutes
HSTT	Hawai‘i-Southern California Training and Testing (EIS/OEIS)

HWMO	Hawai‘i Wildfire Management Organization
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resources Management Plan
KISC	Kaua‘i Invasive Species Council
km	kilometer
km^2	square kilometer
LUC	Land Use Commission
m	meter
MBTA	Migratory Bird Treaty Act
MHI	Main Hawaiian Islands
mi	mile
MMPA	Marine Mammal Protection Act
MOU	Memorandum of Understanding
MSL	Mean sea level
MWR	Morale, Welfare and Recreation
NAAQS	National Ambient Air Quality Standards
NAVFAC	Naval Facilities Engineering Systems Command
Navy	Department of the Navy, United States
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
NWHI	Northwestern Hawaiian Islands
OEIS	Overseas Environmental Impact Statement
OPNAVINST	Office of the Chief of Naval Operations Instruction
PAC	Pacific (Region)
Pb	Lead
PMC	Pest Management Consultant
PMRF	Pacific Missile Range Facility
RDT&E	Research, development, test, and evaluation
RFFA	Reasonably Foreseeable Future Action
SLR	Sea level rise
SO_2	Sulfur dioxide
SOH	State of Hawai‘i
SOP	Standard operating procedure
SOS	Save our Shearwaters
TCP	Traditional cultural place or traditional cultural property
TMDL	Total Maximum Daily Load
U.S.	United States
U.S.C.	United States Code
UFC	Unified Facilities Criteria
USAF	United States Air Force
USDA	United States Department of Agriculture
USDA-WS	United States Department of Agriculture-Wildlife Services
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

1. Introduction

1.1 Project Background

The United States (U.S.) Department of the Navy (DoN or Navy) proposes to adopt and implement a revised Integrated Natural Resources Management Plan (INRMP) for the Pacific Missile Range Facility (PMRF) Complex in Hawai'i. The actions would take place at PMRF locations on the islands of Kaua'i, O'ahu, Ni'ihau, and Ka'ula, Hawai'i. Implementation of the INRMP would be ongoing and would coincide with existing operations at each facility.

The implementation of an INRMP is considered a major federal action requiring analysis under the National Environmental Policy Act (NEPA). This Environmental Assessment (EA) was prepared pursuant to the requirements of NEPA, as amended (42 U.S. Code [U.S.C.] 4347, Section [§] 102(2)(c)); and consistent with the implementing regulations issued by the Council on Environmental Quality (CEQ) (40 Code of Federal Regulations [C.F.R.] 1500-1508) and the Office of the Chief of Naval Operations M-5090.1, *Environmental Readiness Program Manual,* dated June 25, 2021.

The DoN is aware of the November 12, 2024, decision in Marin Audubon Society v. Federal Aviation Administration, No. 23-1067 (D.C. Cir. Nov. 12, 2024). To the extent that a court may conclude that the CEQ regulations implementing NEPA are not judicially enforceable or binding on this agency action, the DoN has nonetheless elected to follow those regulations at 40 C.F.R. Parts 1500–1508, in addition to DoN's procedures/regulations implementing NEPA at 32 C.F.R. Part 775, to meet the agency's obligations under NEPA, 42 U.S.C. §§ 4321 et seq.

1.2 Purpose and Need for the Proposed Action

The purpose of and need for the Proposed Action is to comply with the Sikes Act Improvement Act (Sikes Act) of 1997 (16 U.S.C. § 670(a) et seq.; Public Law Number 105-85, § 2901 et seq., 111 Stat. 1629, 2016 (1997), which requires the Secretary of Defense to carry out a program for the conservation and rehabilitation of natural resources on military installations. This is accomplished with the preparation and implementation of an INRMP, a comprehensive plan used to manage military installations' natural resources by providing and ensuring the sustained use of a landscape necessary to support the military mission in accordance with the best available science. The INRMP describes how current and future land use would support the military mission while managing and conserving natural resources to ensure compliance with applicable laws and regulations.

The Sikes Act of 1960, as amended (16 U.S.C. § 670(a)-(f), et seq.), states that an INRMP shall provide for "no net loss" in the capability of military installation lands to support the military mission of the installation. Therefore, mission requirements and considerations have been integrated into the INRMP for PMRF and the capability to support the mission is a natural resources priority. The Sikes Act specifically directs that INRMPs be reviewed "as to operation and effect," highlighting that the review is intended to determine whether existing INRMPs are being implemented to meet the requirements of the Sikes Act and contribute to the conservation and rehabilitation of natural resources on military installations. The Sikes Act and Department of Defense (DoD) policy requires all INRMPs to be reviewed annually by the installation in cooperation with involved parties and revised, as necessary, but at least every 5 years.

The INRMP addresses all required elements of the Sikes Act, relevant federal environmental laws, Executive Orders (EOs), and Memorandums of Understanding (MOUs), such as vegetation, wildlife, threatened and endangered species, and outdoor recreation. The INRMP provides management recommendations for natural resource actions to protect federally protected species; reduce soil and coastal erosion; protect and restore land and waterways from invasive species infestation; promote the conservation of native plant species; promote the protection of wetlands and floodplains where practicable; protect marine species; and prevent wildfire. The INRMP also includes strategies for data collection and database and records management and natural resources awareness, education, and personnel training.

1.3 Scope of Environmental Analysis

This EA includes an analysis of potential environmental impacts associated with the implementation of the Preferred Alternative (implementation of the 2023 INRMP) and the No Action Alternative (continuation of the 2010 INRMP). The environmental resource areas analyzed herein include: the physical environment including geology and soils, water resources, and climate change; including vegetation, nuisance and invasive animals, native, terrestrial and marine species, and coastal and nearshore biological resources including habitat, fish and other animals, and algae; and the social and cultural environment including land use, outdoor recreation, and cultural resources. Each resource area is analyzed by facility location.

Strategies for data collection and database and records management and natural resources awareness, education, and personnel training would be implemented base-wide and would benefit natural resource management across all the resource areas. Table 2 lists these strategies to show how implementation of the INRMP has evolved. However, the Affected Environment and Environmental Consequences section of this EA does not evaluate these strategies, as they relate primarily to implementation of all the natural resource management strategies, would have only beneficial effects, and do not pertain to a particular natural resource.

1.4 Key Documents

Analysis of other PMRF sites as part of prior studies and NEPA assessments were used in preparing this EA. Key documents are described in Appendix A and include: PMRF INRMP, Integrated Cultural Resources Management Plan (ICRMP), Hawai‘i Range Complex (HRC) Final Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS), and PMRF Master Plan.

1.5 Relevant Laws, Regulations, and Memorandums of Understanding

The Navy has prepared this EA based on federal laws, statutes, regulations, and policies pertinent to the implementation of the Proposed Action; a full list of which is provided in Appendix A.

1.6 Locations and Military Operations

The PMRF complex consists of 10 distinct sites within the County of Kaua‘i and the City and County of Honolulu (O‘ahu), State of Hawai‘i (SOH). PMRF falls under the command of Commander, Navy Region Hawai‘i. Navy Region Hawai‘i is comprised of over 23,000 acres (ac) (9,308 hectares [ha]) of land and water resources (Table 1). PMRF open ocean areas to the north, south, and west of Kaua‘i include over 1,100 square miles (mi) of instrumented underwater ranges, over 42,000 square mi of controlled airspace, and a Temporary Operating Area (TOA) covering 2.1 million square nautical miles of ocean area,

which includes Warning area 188. Most of the 2.1 million square nautical miles in the TOA falls outside of Warning Area 188; the TOA includes the entire Papahānaumokuākea Marine National Monument. This unique ocean range, combined with the highly technical instrumentation at the various base facilities can simulate a realistic environment for testing and training in the use of air, submarine, and surface weapon systems, as well as land-based weapon systems.

Table 1 The Ten Sites Comprising the PMRF Complex

Site Name	Location	Function
Barking Sands	Kauaʻi	Main Base
Mākaha Ridge	Kauaʻi	Secondary Range
Kōkeʻe State Park	Kauaʻi	Tracking Radars, Telemetry, Communications, Command, and Control Stations
Kamokalā Ridge Magazines	Kauaʻi	Explosive Storage
Miloliʻi Ridge*	Kauaʻi	Reflector Site
Port Allen	Kauaʻi	Pier and Building Facilities
Kaʻula Island	Offshore Island	Aircraft Gunnery and Inert Ordnance Target Practice
Mauna Kapu	Oʻahu	Communications and Radar
Mount Kaʻala*	Oʻahu	Communications and Radar
Niʻihau Sites	Niʻihau	Radar, Optics, and Electronic Warfare

* Not included in this EA; not included in Figure 1.

PMRF is both a Navy training range and a DoD military test range. PMRF's mission is to: *Provide integrated range service in a modern, multi-threat, multi-dimensional environment that ensures the safe conduct and evaluation of training and [testing and evaluation] T&E missions. Deliver quality products to improve customers' ability to achieve readiness and other national defense objectives* (CNIC 2022). The Navy, U.S. Air Force (USAF), Army, Marine Corps, Missile Defense Agency, allied research, development, test, and evaluation (RDT&E) programs, and other non-DoD agencies, including the Department of Energy, and commercial industry utilize PMRF.

This EA focuses on eight of the ten sites (Figure 1); no resources requiring management are to occur at the Miloliʻi Ridge reflector sites on Kauaʻi or the Mount Kaʻala communication site on Oʻahu. PMRF facilities are described in greater detail in each of their respective sections. This EA further includes PMRF's monitoring and proactive management activities to provide conservation benefits to aquatic species and habitats in nearshore waters adjacent to the sites. Although the PMRF installation boundary ends at the high-water mark and the Navy does not own submerged lands seaward of the high-water mark, a Safety Zone (33 C.F.R. Section 165.1406) and Danger Zone (33 C.F.R. Section 334.1390) adjacent to Barking Sands, and a Danger Zone adjacent to Kaʻula Island, are designated for Navy use and included in the INRMP study area. Last, the offshore underwater ranges are within open ocean areas and extend into territorial waters, which are not under the jurisdiction of PMRF or INRMP management study area, and therefore, these offshore areas are not included in this EA; however, the Navy conducts significant studies to further conservation of at-sea marine species in at-sea training and testing locations. Specifically surrounding PMRF, the Navy has ongoing annual marine mammal and sea turtle monitoring in the HRC to understand species identification and behavioral responses. The Navy's Marine Species Monitoring Program (https://www.navymarinespeciesmonitoring.us/) and Living Marine Resources Program have contributed millions of dollars to sponsor research and monitoring for over 30 years in Hawaiʻi and other training and testing locations. More information on the prior Hawaiʻi-Southern California Training and Testing (HSTT) EIS/OEIS and Marine Mammal Protection Act (MMPA) and

Endangered Species Act (ESA) authorizations can be found at https://www.nepa.navy.mil/hstt. Updated MMPA and ESA authorizations for activities covered under the Hawai‘i-California Training and Testing (HCTT) EIS/OEIS is expected by December 2025.

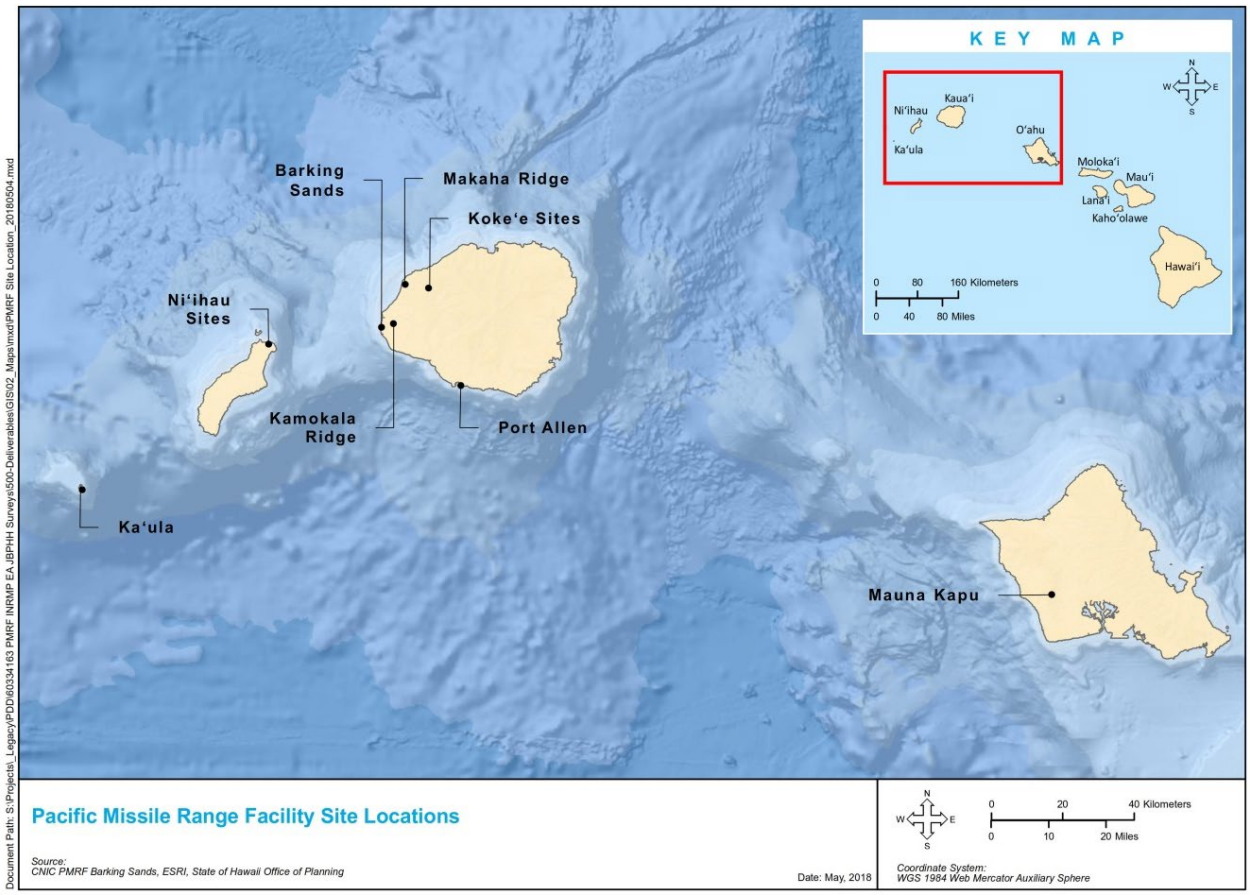


Figure 1 The Eight Sites of the PMRF Complex Addressed in this EA

2. Proposed Action and Alternatives

2.1 Proposed Action

PMRF proposes to enhance natural resources management at PMRF by implementing a revised 2023 INRMP. PMRF developed the INRMP to ensure consistency with the installation's military mission and to support "no net loss" in military mission capability for the installation lands, while providing for the conservation, rehabilitation, and the sustainable multipurpose use of natural resources on PMRF. The primary purpose of the INRMP is to provide a proactive natural resources management plan that guides PMRF in achieving natural resource management goals, mission requirements, and compliance with environmental regulations and policies (NAVFAC PAC 2022). The 2023 INRMP would serve as a principal information source for the preparation of future environmental analyses for proposed base actions.

2.2 Alternatives Considered

This EA analyzes two alternatives: the No Action Alternative and an Action Alternative (Preferred Alternative) to adopt and implement the 2023 INRMP for PMRF (Proposed Action).

2.2.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur; therefore, the objectives and practices outlined in the 2010 INRMP for PMRF would remain in place. The No Action Alternative would not meet the purpose and need for the Proposed Action; however, as required by NEPA, the No Action Alternative is carried forward for analysis as it provides a baseline for measuring the environmental consequences of a Preferred Alternative. Further, the No Action Alternative would be in violation of the Sikes Act, which requires that INRMPs be revised a minimum of every 5 years (DoN 2010).

2.2.2 Preferred Alternative: Revised INRMP Implementation (Proposed Action)

The Preferred Alternative includes the adoption and implementation of a revised 2023 INRMP for PMRF. The INRMP identifies concerns, creates objectives, and outlines strategies to address those concerns and achieve those objectives. To evaluate impacts clearly and concisely, this EA focuses on the strategies (also called resource management actions) and analyzes the effects of implementation of those strategies. The revised INRMP would meet the goals and objectives for management of PMRF's natural resources in a manner that would be compatible with the military uses of the property and consistent with the Sikes Act.

Since the affected environment at the eight sites varies so widely, as do the proposed resource management actions, the EA is organized first by location, then by resource. This organization aligns with the Revised 2023 INRMP, which provides the most utility to Natural Resource Managers. To better understand the potential changes across alternatives, a comparison table (Table 2) was developed to show, at a glance, what management actions were proposed under the 2010 INRMP at which sites, and how they are being continued, revised, or eliminated under the Preferred Alternative. The management actions from the 2010 INRMP are summarized for brevity and ease of comparison. The full text of the 2010 management actions is provided in Appendix A. The analysis discussion for each site and resource section also includes the resource management actions for the convenience of the reader.

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Table 2 Alternatives Comparison

Notes: **BS** = Barking Sands, **MR** = Mākaha Ridge, **KS** = Kōkeʻe Sites, **KR** = Kamokalā Ridge, **PA** = Port Allen, **KI** = Kaʻula Island, **MK** = Mauna Kapu, **NI** = Niʻihau Island.

Environment	Resource Category	2010 INRMP Management Actions (No Action Alternative)	BS	MR	KS	KR	PA	KI	MK	NI	2023 INRMP Management Actions (Preferred Alternative)	BS	MR	KS	KR	PA	KI	MK	NI
Physical Environment	Geology and Soils	1. Base Planning: Follow standard methods to control erosion during all new construction projects.	●	●	●	●	–	–	●	–	1. Conduct general surveys for erosion and soil compaction issues annually to prioritize restoration sites.	●	●	–	–	–	–	–	–
		1. Critical Habitat and Dune Vegetation Restoration Project: Remove invasive vegetation and restore native vegetation to improve habitat and reduce erosion. 2. Wildland Fire Control: Use open spray nozzles, when possible, to minimize erosion and destruction of cultural resources.	●	–	–	–	–	–	–	–	1. Mitigate and prevent erosion of coastal dune habitat by out-planting, establishing, and monitoring native dune building plants in areas identified as having erosion issues. 2. Implement additional security measures such as increased signage and roping off certain areas to reduce off-road vehicle presence in the Nohili Dunes area. 3. Participate in future cooperative studies assessing potential shoreline loss that threatens base infrastructure or sensitive habitats.	●	–	–	–	–	–	–	–
		1. Soil Erosion Control: Limit vehicle access to paved roads and designated paved parking areas. Limit pedestrian traffic to established walkways. Stabilize slopes with soil-stabilizing cloth and out plantings of native drought tolerant species. Install an ungulate exclusion fence around protected plants and re-planted areas. 2. Feral Goat Control: Install exclusion fencing to exclude the goats from Mākaha Ridge Tracking Station to deter the consumption of erosion-inhibiting vegetation.	–	●	–	–	–	–	–	–	1. Monitor ungulate exclusion fence for areas vulnerable to ingress monthly and regularly monitor site for ungulate presence. Remove ungulates when identified within the fenced area. 2. Maintain Mākaha Ridge ungulate exclusion fencing for erosion control. 3. Out-plant native, drought tolerant plants in areas identified as having erosion and soil compaction issues. Ensure that a regular monitoring schedule and a sufficient irrigation system are in place until plants are well established.	–	●	–	–	–	–	–	–
	Water Resources	1. Base-wide Predator Control: Continue use of cage traps and other non-chemical methods as the primary means of predator control to prevent contamination of water resources. See also INRMP Appendix D – Legal Requirements for laws and policies related to water quality and pesticide and herbicide application.	●	●	–	–	–	–	–	–	1. Coordinate all use of pesticides by natural resources staff with the Naval Facilities Engineering Systems Command (NAVFAC), Pacific (region; PAC) Pest Management Consultant (PMC) and ensure that all applicators have received appropriate certifications.	●	●	●	–	–	–	–	–
											1. Supplement ongoing water quality testing to detect particulates and soluble chemicals in waters at PMRF. Testing should be conducted at least quarterly.	●	●	–	–	–	–	–	–
		1. Marine Debris Cleanup: Continue participation in marine debris clean up events. 2. Wetlands Maintenance: Ensure proper permitting and no-net-loss of wetland acreage. Coordinate with SOH to maintain the irrigation ditch systems at Barking Sands.	●	–	–	–	–	–	–	–	1. Establish a monitoring program for the nearshore environment of PMRF to inform future management decisions and monitor changes over time. 2. Partner with Department of Land and Natural Resources (DLNR) Division of Aquatic Resources (DAR) to incorporate regular monitoring site(s) in PMRF's nearshore waters into the State's regular monitoring schedule, as feasible.	●	–	–	–	–	–	–	–
		1. Feral Goat Control: Install exclusion fencing to exclude the goats from Mākaha Ridge Tracking Station to improve coastal water quality.	–	●	–	–	–	–	–	–	1. Maintain Mākaha Ridge ungulate exclusion fencing for erosion control and to maintain water quality.	–	●	–	–	–	–	–	–
	Natural Hazards and Climate Change	1. Wildland Fire Control: Any wildland fires at all PMRF Facilities should continue to be addressed by the appropriate fire departments.	–	●	●	●	–	–	●	–	1. Coordinate with the PMRF Fire Department on developing updates to the existing Fire Management Plan.	●	●	●	●	●	●	●	●
		1. Wildland Fire Control: Clear vegetation from around the launch pads and wet the vegetation near the launch pads just prior to launch to prevent wildland fires. Provide emergency fire crews during launches to extinguish any fire and minimize its effects.	●	–	–	–	–	–	–	–	1. Remove deadfall in high-risk areas including near the Barking Sands missile launch site and the Kamokalā Ridge Magazines and replant with native, low fire risk species.	●	–	–	●	–	–	–	–
		1. Drainage Pumps and Ditch Maintenance: Continue to maintain the drainage pumps and ditches located within the 200 ac (81 ha) lease area. Continue to lease land at Barking Sands to maintain the drainage pumps and ditches to prevent flooding of the facility.	●	–	–	–	–	–	–	–	N/A.	–	–	–	–	–	–	–	–

Table 2 Alternatives Comparison (Continued)

Environment	Resource Category	2010 INRMP Management Actions (No Action Alternative)	BS	MR	KS	KR	PA	KI	MK	NI	2023 INRMP Management Actions (Preferred Alternative)	BS	MR	KS	KR	PA	KI	MK	NI
Biological Environment: Vegetation	Invasive Plant Management	1. Invasive Species Prevention and Control: Continue all invasive species prevention and control actions. Continue to work with Kaua'i Invasive Species Council (KISC) and other stakeholders on a coordinated approach to alien plant species control for Barking Sands. Continue preventive measures to avoid the introduction of alien species and inadvertent destruction of the environment via cargo on inbound aircraft. 2. Develop a Biosecurity Program: Prohibit living plant materials from being brought to Hawai'i from outside the State. Pressure-wash all Navy and contractor vehicles coming to Hawai'i on the mainland or point of origin to minimize the amount of seeds or propagules of non-native species being transported. Inspect all construction materials including sand, gravel, aggregate, or road base and certify that such materials are weed free prior to transport. Monitor to detect, assess, and eliminate non-native species on a regular basis. Continue efforts to establish native vegetation in areas where non-native vegetation is present.	●	–	–	–	–	–	–	–	1. Include biosecurity requirements and provisions in Base Operating Support (BOS) and construction contracts to reduce the risk of introduction of invasive species and plant diseases. 2. Ensure that species identified as invasive in Hawai'i , including those on the Plant Pono "Black Liste", are not utilized for landscaping or erosion control projects by developing a Landscaping Guide to include in all base contracts, integrate into the installation appearance plan, and provide to project managers that specifies an approval process for species selection. 3. Ensure early detection and a rapid response to invasive plant species through a minimum of annual surveys at all high-risk and sensitive areas. 4. Conduct removal of invasive plant species in sensitive areas, monitor for re-growth, and restore using out-plantings, if necessary, with a target of 80% reduction in invasive species within the areas of concern. 5. Decrease driving on dune vegetation, which can further increase the spread of invasive species into native habitats; continue to prohibit driving in designated Ni'ihau panicgrass (*Panicum niihauense*) critical habitat and culturally sensitive areas. 6. Strive to find new opportunities to collaborate with partners on removing invasive and exotic vegetation and planting opportunities. 7. Ensure that post planting care, including irrigation, invasive plant/weed control, and long-term monitoring and maintenance is implemented for all native plant restoration projects.	●	●	●	●	–	–	–	–
		1. Critical Habitat and Dune Vegetation Restoration Project: Continue to eradicate and control long-thorn kiawe (*Prosopis juniflora*).	●	–	–	–	–	–	–	–	1. Conduct removal of invasive plant species in sensitive areas, monitor for re-growth, and restore using out-plantings, if necessary, with a target of 80% reduction in invasive species within the areas of concern.	●	–	–	–	–	–	–	–
		1. Melastome Eradication: Provide KISC, Navy or SOH biologists access to a small patch of Asian melastome (*Melastoma candidum*) found near the roadside at Kōke'e Site D in order to eradicate this population.	–	–	●	–	–	–	–	–	1. Conduct invasive plant removals annually in areas near known Hawaiian picture-wing fly (*Drosophila sharpi* and *Drosophila musaphilia*) habitat to promote native tree health and propagation and reduce introductions of invasive species into adjacent habitat due to Navy operations.	–	–	●	–	–	–	–	–
	Native Plant Management	1. Landscape Design: Use native plants whenever possible and use sterile soil to prevent the introduction of weeds. Plant a variety of native trees, shrubs, and ground covers. Continue to evaluate all future landscape design and installation projects for the potential to include habitat restoration and the use of native plants whenever possible. 2. Protection of Natural Resources in Undeveloped Areas. Review construction and maintenance projects to ensure contractors are aware of guidelines to avoid impacting sensitive vegetation.	●	●	●	●	–	–	●	–	1. Update baseline floral surveys to improve understanding of plant community at PMRF. 2. Ensure and assist in the selection of locally sourced, non-invasive, and preferably native species, with a minimum of 50 percent native species for all new landscape planting projects by 2022 and 100 percent by 2028 while adhering to bird/animal aircraft strike hazard (BASH) requirements. 3. Ensure that post planting care, including irrigation, invasive plant/weed control, and long-term monitoring and maintenance is implemented for all native plant restoration projects. 4. Identify suitable locations for planting native Hawaiian plants, particularly those that benefit native pollinators in support of national pollinator objectives. 5. Strive to find new opportunities to collaborate with partners on removing invasive and exotic vegetation and planting opportunities. 6. The PMRF IEPD and NRM should continue to be the points of contact to provide relevant information on issues with potential to affect wildlife and native habitat, such as military operations and training, and tower and other construction and repair projects.	●	●	●	●	●	–	●	●
		1. Native Plant Restoration: The 2009 Feral Ungulate Management Plan calls for revegetation of selected eroded areas within the facility with native species expected to be found in and around Mākaha Ridge Tracking Station.	–	●	–	–	–	–	–	–	1. Out-plant native, drought tolerant plants in areas identified as having erosion and soil compaction issues. Ensure that a regular monitoring schedule and a sufficient irrigation system are in place until plants are well established.	–	●	–	–	–	–	–	–
		1. Native Plant Habitat Improvement: Conduct invasive vegetation removal, particularly in areas around existing native vegetation.	–	–	●	●	–	–	–	–	1. Conduct invasive plant removals annually in areas near known Hawaiian picture-wing fly habitat to promote native tree health and propagation and reduce introductions of invasive species into adjacent habitat due to Navy operations.	–	–	●	–	–	–	–	–

Table 2 Alternatives Comparison (Continued)

Environment	Resource Category	2010 INRMP Management Actions (No Action Alternative)	BS	MR	KS	KR	PA	KI	MK	NI	2023 INRMP Management Actions (Preferred Alternative)	BS	MR	KS	KR	PA	KI	MK	NI
Biological Environment: Vegetation (Continued)	Native Plant Management (Continued)	1. Native Medicinal Plant Garden Development/Maintenance: Continue to maintain the native medicinal plant garden/display in the grassy area adjacent to the new Pass and Identification building at the Tartar Drive Gate (Main Gate). 2. Plant Nursery Development: Establish a plant nursery at Barking Sands to propagate native plants for landscaping and habitat restoration in cooperation with The National Tropical Botanical Garden. 3. Critical Habitat and Dune Vegetation Restoration Project: Conduct on-site dune vegetation restoration at Barking Sands through removal of long-thorn kiawe, koa haole (*Leucaena leucocephala*), and other invasive vegetation including buffelgrass (*Cenchrus ciliaris*), crown flower (*Calotropis gigantea*), and golden-crown beard (*Verbesina encelioides*). 4. Beach and Dune Access Restrictions: Continue to avoid disturbing dune areas to maintain native vegetation, including *Nama sandwicense*. Monitor for excessive traffic at areas adjacent to the beach cottages and other high-use recreational areas and, if necessary, cord off those areas to re-establish vegetation. Continue to prohibit off-road vehicle usage on the beach, and minimize usage by security personnel, to allow for reestablishment of native dune vegetation such as beach morning glory (*Ipomoea pes-caprae*), pōhinahina (*Vitex rotundafolia*), and pa'u o hi'iaka (*Jacquemontia ovalifolia*).	●	–	–	–	–	–	–	–	1. Mitigate and prevent erosion of coastal dune habitat by out-planting, establishing and monitoring native dune building plants in areas identified as having erosion issues.	●	–	–	–	–	–	–	–
		1. Botanical Surveys and Mapping Initiate: Initiate botanical surveys, create vegetation maps, and report the status of any protected species at the Mauna Kapu Facility in preparation for the next INRMP.	–	–	–	–	–	–	●	–	1. Conduct baseline flora surveys.	–	–	–	–	–	●	●	–
		1. N/A: The Navy has not been able to conduct floral surveys due to safety concerns and land ownership concerns.						●			1. Conduct land-based updates to floral surveys on Ka'ula Island if access is safe and allowable.	–	–	–	–	–	●	–	–
	Ni'ihau Panicgrass	N/A.	–	–	–	–	–	–	–	–	1. Work to improve protection, habitat and/or consider out-planting Ni'ihau panicgrass. Protections will be aimed at preventing unauthorized off-road vehicle use and invasive plant removal, and to demonstrate benefit to the species. 2. Out-plant native species and remove invasive species in areas with suitable Ni'ihau panicgrass habitat and ensure an irrigation system is in place until plants become well established. 3. Consider undergoing the approval process to out-plant the endangered Ni'ihau panicgrass in the effort to remove or reduce amount of PMRF property designated as critical habitat for the species. Coordinate with Federal and State partners to secure material for out-planting if pursued.	●	–	–	–	–	–	–	–
	Dwarf Iliau and Hawai'i Scaleseed; Other Listed Plant Species[1]	1. Protected Species Monitoring and Reporting: Conduct annual monitoring and status of protected species (dwarf iliau [*Wilkesia hobdyi*] and Hawai'i scaleseed [*Spermolepis hawaiiensis*]). 2. Botanical Surveys and Mapping: Update the status of protected species (dwarf iliau and Hawai'i scaleseed) in preparation for the next INRMP.	–	●	–	–	–	–	–	–	1. Implement erosion control efforts that directly benefit areas where protected species are present. 2. Conduct a reassessment of the status and condition of listed plant species on the cliffsides of Mākaha Ridge Tracking Station populations every five years and collaborate with partners to grant them access for further research and conservation efforts.	–	●	–	–	–	–	–	–
Biological Environment: Invasive Animals	Nuisance and Invasive Animal Management	1. Base-wide Predator Control: Continue base-wide predator control (dogs, cats, owls, rodents, barn owls, and cattle egrets) to protect both native and endangered species. 2. Invasive Species Prevention and Control: Continue all invasive species prevention and control actions. Continue to work with KISC and other stakeholders on a coordinated approach to alien plant species control for Barking Sands. Continue preventive measures to avoid the introduction of alien species and inadvertent destruction of the environment via cargo on inbound aircraft. 3. Develop a Biosecurity Program: Prohibit eggs and invertebrates (insects, snails and slugs) from being brought to Hawai'i from outside the State. Pressure wash all Navy and contractor vehicles coming to Hawai'i on the mainland or point of origin to minimize the amount of eggs or invertebrates of non-native species being transported. Inspect all construction materials including sand, gravel, aggregate, or road base and certify that such materials are invertebrate free prior to transport. Monitor to detect, assess, and eliminate non-native species on a regular basis.	●	–	–	–	–	–	–	–	1. Continue to fund control measures for non-native predator species at Barking Sands, Mākaha Ridge Tracking Station, and Kōke'e Site C (PMRF Biological Opinion [BO], 2014). 2. Develop a PMRF Biosecurity Plan and include those requirements and provisions in BOS and construction contracts to ensure invasive ants, frogs, and other non-native wildlife are not introduced via equipment or landscaping efforts. 3. Increase outreach to base personnel on reporting and early detection for invasive species not yet established at PMRF. Ensure all observations or reports of high-risk invasive species are communicated to KISC and to all other appropriate contacts. 4. Conduct surveys to improve baseline knowledge of populations of invasive animals at PMRF. 5. Work with partner organizations to identify sources of feral cats and dogs off base to reduce the population of these non-native predators.	●	●	●	–	–	–	–	–

Table 2 Alternatives Comparison (Continued)

Environment	Resource Category	2010 INRMP Management Actions (No Action Alternative)	BS	MR	KS	KR	PA	KI	MK	NI	2023 INRMP Management Actions (Preferred Alternative)	BS	MR	KS	KR	PA	KI	MK	NI
Biological Environment: Invasive Animals (Continued)	Nuisance and Invasive Animal Management (Continued)	(Continued from above)	●	–	–	–	–	–	–	–	6. Consider partnering with the DLNR Division of Forestry and Wildlife (DOFAW) to do auditory predator deterrent studies on base and utilize the technology at PMRF if proven to be effective against predators. 7. Conduct ant surveys to assess presence of invasive ants including the little fire ants (*Wasmannia auropunctata*) at the Nohili Dune's wedge-tailed shearwater (*Ardenna pacifica*) colony. If little fire ants are detected, report to KISC and implement active control by using granular bait after fledglings have left the area. 8. Increase outreach about the hazards of feeding feral/invasive species with all personnel on PMRF and assist in the enforcement of such policies by practicing good communication with Security. 9. Continue to partner with the Hawai'i Department of Agriculture to ensure coconut rhinoceros beetle traps are checked and maintained at PMRF.	●	●	●	–	–	–	–	–
		1. Feral Goat Control: Install exclusion fencing to exclude the goats from Mākaha Ridge Tracking Station. 2. Trial Goat Hunting: Institute a trial goat hunting program with the Barking Sand Archery Club or other organization in coordination with DOFAW to reduce the presence of goats at the Mākaha Ridge Tracking Station.	–	●	–	–	–	–	–	–	1. Work with the PMRF Archery Club to control ungulate populations at the Kamokalā Ridge site by implementing trapping and baiting stations if the animals become a nuisance to Navy operations or pose a risk to protected species. 2. Conduct observations to identify feral cat presence at Kamokalā Ridge and consider expanding cat trapping if presence is consistent or becomes a nuisance.	–	–	–	●	–	–	–	–
		N/A.	–	–	–	–	–	–	–	–	1. Partner with DOFAW and other partners to coordinate barn owl and other predator control efforts on Ka'ula Island if access is safe and allowable and control methods are practicable.	–	–	–	–	–	●	–	–
Biological Environment: Bats	Hawaiian Hoary Bat Management	1. Hawaiian Hoary Bats (*Lasiurus cinereus semotus*): Prior to the operation of radar units at Barking Sands at nighttime, personnel will visually survey for bats in the area of impact using Anabat, or closed-circuit television cameras. 2. Hawaiian Hoary Bats: Evaluate the distribution and abundance surveys currently being conducted at the Kōke'e Sites, and if bats are detected, perform surveys on a routine periodic basis. 3. Protected Species Monitoring and Reporting-Hawaiian Hoary Bats Surveys: If Hawaiian hoary bats are observed up at Mākaha Ridge Tracking Station, evaluate the results to determine if regular monitoring is required.	●	●	●	–	–	–	–	–	1. Continue to avoid and minimize effects of base infrastructure, operations, and maintenance on Hawaiian hoary bats, by ensuring that trimming or removal of woody plants greater than 15 feet (ft) (5 meters [m]) tall is conducted outside of the Hawaiian hoary bat pupping season of 1 June to 15 September to avoid impacting bat pups (PMRF BO, 2014). 2. Conduct follow-up acoustic surveys for Hawaiian hoary bats every 5 years. If bat roosting and pupping sites are of interest for management of the species, then a mist netting and tracking study could be performed if warranted (PMRF BO, 2014). 3. Work with U.S. Fish and Wildlife Service (USFWS) to develop and implement a standard operating procedure (SOP) for bat roosting surveys if base operations warrant the need to remove and trim trees greater than 15 ft (5 m) tall during the Hawaiian hoary bat pupping season (PMRF BO, 2014).	●	●	●	●	–	–	–	–
Biological Environment: Birds	Endangered Seabird Management	1. Nocturnal Seabird Fallout Monitoring and Management: Consult with USFWS regarding fallout minimization and mitigation. 2. Use of Green Lights and Light Shielding to Protect Seabirds: Install and operate green bulbs, when plausible. Where green lights are not feasible, include shielding of white lights, install motion sensor lights, and determine areas where lights may be safely turned off.	●	●	●	–	–	–	–	–	1. Continue to promote base-wide awareness and implementation of the PMRF Dark Skies Program (PMRF BO, 2018) through early annual trainings. 2. Continue to improve the Dark Skies Program lighting waiver system and grant standing waivers where applicable to stream-line the waiver process. 3. Continue Dark Skies implementation in areas adjacent to colonial nesting grounds at high elevation nesting sites during critical fledging timeframes. 4. Conduct systematic ground searches for fallen out seabirds after high-risk night operations. 5. Incorporate results of radar studies into future programs. Consider conducting additional radar studies at the Mākaha Ridge and Kōke'e sites. 6. Pursue avenues to provide funding to Save Our Shearwaters (SOS) to assist with seabird rehabilitation costs. 7. Continue to host a SOS shearwater aid station at PMRF and monitor station during business days with SOS monitoring on weekends and holidays (PMRF BO, 2014).	●	●	●	–	–	–	–	–

Table 2 Alternatives Comparison (Continued)

Environment	Resource Category	2010 INRMP Management Actions (No Action Alternative)	BS	MR	KS	KR	PA	KI	MK	NI	2023 INRMP Management Actions (Preferred Alternative)	BS	MR	KS	KR	PA	KI	MK	NI
Biological Environment: Birds (Continued)	Endangered Seabird Management (Continued)	(Continued from above)	●	●	●	–	–	–	–	–	8. Advise various tenants on base on appropriate safety lighting that is less attractive to endangered seabirds (i.e., motion sensing lights that go off after a set time period, shielded lights, facing light away from the coast, lower lumen, and lower to the ground). 9. Provide a 10-year calendar to mission planners with high-risk dates for endangered seabird fallout clearly depicted. 10. Develop a Wildlife Friendly Lighting Guide for installation personnel and tenants to assist in planning for lighting needs.	●	●	●	–	–	–	–	–
											1. Continue to fund and implement surveys to assess mortality from tower strikes at Kōkeʻe Site C to include scavenger trials, searcher efficiency trials, and carcass searches in accordance with USFWS communication tower monitoring protocols (PMRF BO, 2018). 2. Continue to fund and implement acoustic and visual monitoring programs of communication towers at Kōkeʻe Site C for seabird strikes to inform management and provide data to be used in the re-evaluation of the Newell's shearwater (*Puffinus auricularis newelli*) portion of the PMRF Base-wide BO. 3. Minimize the potential for death or injury of Newell's shearwater due to collisions with PMRF communication towers located at Kōkeʻe Site C (PMRF BO, 2018).	–	–	●	–	–	–	–	–
											1. Coordinate with facilities owner and USFWS to address lighting issues and continue to implement the Dark Skies program to the extent possible at the facility. 2. Train staff to recognize, respond and report to any circling or downed seabirds seen at the facility.	–	–	–	–	●	–	–	–
		1. Fauna Surveys Update/Initiate. Update fauna surveys and mapping, including protected bird species, in preparation for subsequent INRMP updates. Continue to coordinate with DOFAW to collect population-monitoring data for protected species.	●	●	●	●	–	–	●	–	1. Conduct baseline fauna surveys.	–	–	–	–	–	●	●	–
											1. Conduct aerial seabird surveys of Kaʻula Island as needed for management planning to inform species presence, location and numbers. 2. Conduct land-based updates to faunal surveys on Kaʻula Island if access is safe and allowable.	–	–	–	–	–	●	–	–
	Laysan Albatross Management	1. Base-wide Predator Control: Continue base-wide predator control (dogs, cats, owls, rodents, barn owls, and cattle egrets) to protect Migratory Bird Treaty Act (MBTA)-protected Laysan albatross (*Phoebastria immutabilis*) on the installation. 2. Bird Aircraft Strike Hazard: Continue hazing program under the United States Department of Agriculture-Wildlife Services (USDA-WS) permit. Capture and relocate Laysan albatross found at Barking Sands to off-base locations. Continue the egg translocation at Barking Sands by removing Laysan albatross nests and placing them in incubators to be translocated to foster nests at KPNRW and on private lands. Adopt similar policies for black-footed albatross to that of Laysan albatross to balance protection of the species with BASH requirements, if nesting shall occur in the area.	●	–	–	–	–	–	–	–	1. Continue the PMRF Laysan Albatross Egg Swap program. 2. Work with partners to ensure that as many albatross eggs as possible stay on Kaua'i and find new suitable egg relocation locations. 3. Continue to translocate albatross to the north shore of Kaua'i from January-April. 4. Coordinate with DOFAW on potential new albatross release sites. 5. Closely monitor re-sights of translocated albatross by working with partners on the north shore of Kaua'i to enter data into the Airtable app database. 6. Use data analysis to assess the effectiveness of albatross translocations based on location of translocation, time of year, and whether or not the albatross is a known breeder, sub-adult, or new bird to PMRF. 7. Support research on PMRF albatross populations that increases the understanding of their behavior as it relates to the PMRF airfield. 8. Continue base-wide predator control to protect MBTA-listed species including Laysan albatross; monitor for pigs, dogs, and cats in known breeding areas prior to the albatross breeding season and increase control efforts as needed.	●	–	–	–	–	–	–	–

Table 2 Alternatives Comparison (Continued)

Environment	Resource Category	2010 INRMP Management Actions (No Action Alternative)	BS	MR	KS	KR	PA	KI	MK	NI	2023 INRMP Management Actions (Preferred Alternative)	BS	MR	KS	KR	PA	KI	MK	NI
Biological Environment: Birds (Continued)	Wedge-tailed Shearwater Management	1. Enhance and Improve Beach Cottages Shearwater Colony: Maintain and enhance the shearwater colony. Continue to have USDA-WS remove barn owls and haze the pueo (*Asio flammeus sandwichensis*) from the area. Provide additional educational material to guests staying at the beach cottages. Consider blocking off the road behind the fenced area to vehicle traffic during the night while the birds are in residence. Consider installing a few boardwalks from the grassy area down to the beach flats. Consider installing a viewing boardwalk on the beach side of the fenced area to reduce burrow crushing. To control shearwater burrowing under beach cottages, sidewalks, and other infrastructure, unoccupied problem burrows should be crushed as soon as possible when observed. Burrows can legally be crushed anytime between burrow initiation (usually around March when the birds arrive to the colony) and when eggs are laid (during the 1st or 2nd week of June). Remove kiawe in undeveloped areas adjacent to the colony to provide additional nesting habitat. 2. Invasive Species Prevention and Control: Exclude wedge-tailed shearwater burrowing areas from any weeding or planting activities during the nesting season. 3. SOS Support and Shearwater Banding: Continue to coordinate with the Kaua'i Humane Society's SOS program along with coordinating with USFWS and DOFAW to conduct shearwater banding training at the wedge-tailed shearwater colony at Barking Sands Beach Cottages.	●	–	–	–	–	–	–	–	1. Enhance wedge-tailed shearwater habitat in areas far from the PMRF airfield and human presence and develop deterrent measures for burrows in areas of human traffic and near the airfield. 2. Research and work with facilities and Morale, Welfare and Recreation (MWR) to implement methods for discouraging wedge-tailed shearwater from burrowing in the immediate vicinity of the PMRF beach cottages. 3. Continue to implement protective measures that prevent the crushing of burrows in the beach cottages area (e.g., signage, temporary rope fencing, wooden burrow tents, outreach materials in cottages). 4. Conduct annual wedge-tailed shearwater population surveys in the Kinikini Ditch, beach cottages, and Nohili Dunes areas. 5. Work with partners to collect additional data that supports adaptive management on PMRF and regional conservation objectives for shearwater species. 6. Conduct ant surveys to assess presence of invasive ants including the little fire ants at the Nohili Dune's wedge-tailed shearwater colony. If little fire ants are detected, report to KISC and implement active control by using granular bait after fledglings have left the area. 7. Continue to host a SOS aid station at PMRF and monitor station during business days with SOS monitoring on weekends and holidays (PMRF BO, 2014).	●	–	–	–	–	–	–	–
	Endangered Hawaiian Waterbird Management	1. Base-wide Predator Control: Continue base-wide predator control (dogs, cats, owls, rodents, barn owls, and cattle egrets) to protect Hawaiian waterbirds within the vicinity of the ditches and oxidation ponds. 2. Waterbird Species: Initiate formal Navy participation in the State-wide waterbird counts that occur at the Barking Sands oxidation ponds in January and August. 3. Invasive Species Prevention and Control: Avoid completely clearing wetland areas (excluding the ditches) of vegetation, as dense growth provides important habitat for endangered, endemic waterbirds. 4. Oxidation Pond Improvements: Develop a plan for improvements to the oxidation ponds at Barking Sands to enhance waterbird habitat. 5. Wetlands Maintenance: Ensure proper permitting and no-net-loss of wetland acreage. 6. Kawai'ele Wetlands Waterbird Sanctuary: Continue to be involved with DLNR in the planning process for the restoration of the Kawai'ele wetland which is part of the Kawai'ele Wildlife Sanctuary located immediately east of Barking Sands. Enlist volunteers to help support wetland restoration.	●	–	–	–	–	–	–	–	1. Continue to coordinate closely with Facilities Maintenance regarding restrictions on vegetation removal practices within a 100-ft (30.5 m) radius of waterbirds or their nests. 2. Discourage waterbird presence and nesting at the oxidation pond complex by maintaining vegetation at a height of less than 6 inches and by funding the installation of exclusionary measures. 3. Continue to coordinate with Facilities Maintenance to obtain environmental data on the oxidation pond regularly to better inform causes of avian botulism outbreaks and identify high risk conditions that require management actions. 4. Coordinate with Public Works to develop oxidation pond flushing protocols in response to avian botulism outbreaks or high-risk conditions. 5. Coordinate with Facilities Maintenance on all oxidation pond complex construction and restoration plans. 6. Supplement ongoing water quality testing to detect particulates and soluble chemicals in waters at PMRF. Testing should be conducted at least quarterly. 7. Replace and improve waterbird crossing signage at PMRF as needed to reduce risk of vehicle strikes (PMRF BO, 2014), evaluate efficacy of signs, and explore new tools to reduce vehicle strikes. 8. Continue to conduct regular monitoring for Hawaiian waterbird species at Barking Sands to effectively detect and reduce impacts to nests (PMRF BO, 2014). 9. Consider implementing a waterbird banding/telemetry program to track movement, monitor nest-site fidelity, and inform management on the base.	●	–	–	–	–	–	–	–
											1. If proposed Navy operations have the potential to impact waterbirds at Ni'ihau, conduct surveys to understand habitat use and trends.	–	–	–	–	–	–	–	●

Table 2 Alternatives Comparison (Continued)

Environment	Resource Category	2010 INRMP Management Actions (No Action Alternative)	BS	MR	KS	KR	PA	KI	MK	NI	2023 INRMP Management Actions (Preferred Alternative)	BS	MR	KS	KR	PA	KI	MK	NI
Biological Environment: Birds (Continued)	Nēnē Management	1. Base-wide Predator Control: Continue base-wide predator control (dogs, cats, owls, rodents, barn owls, and cattle egrets) to protect endangered Hawaiian geese (nēnē; Branta sandvicensis) while on the installation. 2. Natural Resources Signs: Continue to install, maintain, and update, as necessary, natural resources signs at the facility. PMRF and NAVFAC PAC Natural Resources staffs have prepared signs indicating appropriate behavior to protect and preserve threatened and endangered species and other protected species. The signs should be placed where such interactions are most likely, such as green turtle habitat at Nohili Ditch and areas of frequent Hawaiian monk seal (Neomonachus schauinslandi) activity at Barking Sands or Hawaiian goose activity.	●	–	–	–	–	–	–	–	1. Collaborate with USFWS, PMRF Air Ops, and DOFAW to continue to revise action plans for nēnē that attempt to or successfully nest on the airfield to facilitate rapid response, based on past observations and new knowledge. 2. Coordinate with USFWS, DOFAW, PMRF Air Ops, and PMRF Public Works to annually review and update the PMRF Nēnē Management Plan (PMRF BO, 2014). 3. Work with PMRF Air Ops and USDA-WS to insure nēnē hazing efforts are increased prior to and during the breeding season with the possibility of including weekends especially if a nēnē pair has been regularly observed on or near the airfield. 4. Continue to conduct regularly standardized surveys of nēnē at PMRF Barking Sands, Mākaha Ridge, and Kōke'e sites to improve detection of nēnē nests, determine habitat types that attract the species, and to update management (PMRF BO, 2014). 5. Continue to communicate with facilities maintenance personnel about nēnē nest locations and collaborate with them to develop effective protective measures for the species and ensure that no vegetation removal or other persistent disturbances occur within 100 ft (30.5 m) of nest sites and goslings to reduce risk of take. 6. Support regular outreach to base visitors and personnel on the importance of not providing food and water to nēnē (PMRF BO, 2014), and develop outreach material aimed at increasing awareness of the species. 7. For all new construction at Barking Sands, including construction for tenant or customer DoD commands or other federal agencies, concrete, asphalt, gravel, xeriscaping, or native vegetation, rather than lawn, will be installed in open areas surrounding buildings and parking areas to decrease attraction of nēnē (PMRF BO, 2014). 8. Fund habitat modification that discourages nēnē presence near roadways, the airfield, and construction sites at Barking Sands. 9. Supplement ongoing water quality testing to detect particulates and soluble chemicals in waters at PMRF. Testing should be conducted at least quarterly. 10. Continue to explore and implement strategies to reduce risk of vehicle strikes, including additional vehicle calming measures, evaluate efficacy of permanent, temporary and marquee signs, and explore new tools to reduce vehicle strikes. 11. Continue to communicate and share data with USDA-WS and DOFAW regularly. 12. Collaborate with DOFAW to have all nēnē that hatch at PMRF banded and pursue permission and permits for PMRF natural resources staff to band birds if allowable. 13. Implement priority management actions identified in the PMRF Nēnē Management Plan. Work with partners to identify potential opportunities to collaborate on off-installation conservation efforts or research opportunities to inform nēnē management at PMRF and ensure a holistic approach that aligns with regional priorities for nēnē protection and recovery (PMRF BO, 2014).	●	●	●	–	–	–	–	–
		1. Predator Control: Update funding annually to protect nēnē if it is determined that predators are affecting nēnē nests at the Mākaha Ridge Tracking station.	–	●	–	–	–	–	–	–									

Table 2 Alternatives Comparison (Continued)

Environment	Resource Category	2010 INRMP Management Actions (No Action Alternative)	BS	MR	KS	KR	PA	KI	MK	NI	2023 INRMP Management Actions (Preferred Alternative)	BS	MR	KS	KR	PA	KI	MK	NI
Biological Environment: Birds (Continued)	Migratory Bird Management	1. Bird Aircraft Strike Hazard: Continue hazing program under the USDA-WS permit. 2. Protection of Wildlife from Potential Electromagnetic Radiation (EMR) Impacts: Follow SOP requirements that ensure existing radars do not radiate lower than at least 4 to 6 degrees above horizontal to preclude EMR impacts on wildlife.	●	–	–	–	–	–	–	–	1. Continue to incorporate monitoring of shorebirds, cattle egrets, and black-crowned night herons (*Nycticorax nycticorax*) at wetland sites, and observations of barn owls, to inform control measures for non-native species and protective measures for native species. Conduct pueo surveys in high-quality habitat. 2. Keep track of any newly established non-native songbird species at PMRF and their numbers by participating in the annual Audubon Christmas Bird Count. 3. Continue to advise development projects at PMRF that have potential to negatively impact native MBTA species habitat on how to avoid impacts. 4. Advise development projects at PMRF on how to avoid creating habitat and foraging availability for non-native MBTA species at PMRF especially near the PMRF airfield. 5. Continue to promote base-wide awareness and implementation of the PMRF Dark Skies Program (PMRF BO, 2018) through early annual trainings.	●	●	●	●	–	–	–	–
		1. Fauna Surveys Update/Initiate. Update fauna surveys and mapping, including protected bird species, in preparation for subsequent INRMP updates.	●	●	●	●		●	●											
		1. Nocturnal Seabird Fallout Monitoring and Management: Consult with USFWS regarding fallout minimization and mitigation. 2. Use of Green Lights and Light Shielding to Protect Seabirds: Install and operate green bulbs, when plausible. Where green lights are not feasible, include shielding of white lights, install motion sensor lights, and determine areas where lights may be safely turned off.	●	●	●	–	–	–	–	–										
		N/A.	–	–	–	–	–	–	–	–	1. Coordinate with facilities owner and USFWS to address lighting issues and continue to implement the Dark Skies program to the extent possible at the facility. 2. Train staff to recognize, respond to, and report any circling or downed seabirds seen at the facility.	–	–	–	–	●	–	–	–
		N/A.	–	–	–	–	–	–	–	–	1. Continue implementing all military training SOPs.	●	●	●	–	–	●	–	–
		1. MBTA Compliance: Continue to limit inert ordnance target training on the predetermined area (~9 percent of the land area) at the southern tip of Ka'ula Island.	–	–	–	–	–	●	–	–	1. Conduct aerial seabird surveys of Ka'ula Island as needed for management planning to inform species presence, location, and numbers.	–	–	–	–	–	●	–	–
Biological Environment: Insects	Native Insects and Protected Pollinators Management	1. Landscape Design: Continue to utilize sterile soil to prevent the introduction of pests such as nematodes and weeds. 2. Landscape Design: Use native plants whenever possible and use sterile soil to prevent the introduction of weeds. Plant a variety of native trees, shrubs, and ground covers. Continue to evaluate all future landscape design and installation projects for the potential to include habitat restoration and the use of native plants whenever possible. 3. Base-wide Predator Control: Continue use of cage traps and other non-chemical methods as the primary means of predator control to prevent adverse effects to pollinators. See also INRMP Appendix D – Legal Requirements for laws and policies related to pesticide and herbicide application.	●	●	●	●	–	–	●	–	1. Conduct species inventory at additional PMRF sites, and conduct monitoring for native invertebrate species. Consider coordinating with USFWS entomologists to identify priority species and provide expertise and training to natural resources staff. 2. Coordinate all use of pesticides by natural resources staff with the NAVFAC PAC PMC and ensure that all applicators have received appropriate certifications. 3. Ensure that treatments will not have negative effects on protected species. 4. Prohibit the use of neonicotinoids at PMRF sites. 5. Ensure that plant communities found to support native terrestrial invertebrate species are protected, enhanced, and that construction or removal projects have minimal effects on these populations.	●	●	●	●	–	–	●	–
	Hawaiian Picture-wing Fly	1. Hawaiian Picture-Wing Fly: Perform surveys for the recently listed *Drosophila sharpi*. When these surveys occur, *Drosophila musaphilia* should also be included.	–	–	●	–	–	–	–	–	1. Conduct periodic surveys every 5 years to assess presence/absence of endangered Hawaiian picture-wing fly species at and directly adjacent to PMRF Kōke'e sites. 2. Conduct invasive plant removals in areas near known Hawaiian picture-wing fly habitat to promote native tree health and propagation and reduce introductions of invasive species into adjacent habitat due to Navy operations.	–	–	●	–	–	–	–	–

Table 2 Alternatives Comparison (Continued)

Environment	Resource Category	2010 INRMP Management Actions (No Action Alternative)	BS	MR	KS	KR	PA	KI	MK	NI	2023 INRMP Management Actions (Preferred Alternative)	BS	MR	KS	KR	PA	KI	MK	NI
Environment: Marine Mammals and Reptiles	Hawaiian Monk Seal Management	1. Base-wide Predator Control: Continue base-wide predator control (dogs, cats, owls, rodents, barn owls, and cattle egrets) to protect endangered Hawaiian monk seals. 2. Hawaiian Monk Seal Protection: Continue to employ several SOPs to protect, record and report monk seals to DAR that haul out on the beach or are observed injured or struggling. Continue to restrict recreational shore fishing to designated areas to reduce monk seal entanglement. Continue to restrict dogs off leashes along the beach to limit the potential for seal-dog interactions. Continue to ensure training activities do not affect hauled-out seals at PMRF beaches. Continue to prohibit vessel landing on Ka'ula Island due to UXO concerns. 3. Fishing Survey: Monitor level of fishing activity and ecosystem health, as it relates to fish stock abundance, monk-seal hookings, and marine debris, through surveys investigating level of fishing activity. 4. Natural Resources Signs: Place signage in areas of frequent Hawaiian monk seal activity at Barking Sands. 5. Hawaiian Monk Seal Protection: Continue to maintain training and contacts with National Oceanic and Atmospheric Administration's (NOAA's) Marine Mammal Stranding Network and execute a quick response to any monk seal beaching or entanglement events on PMRF beaches or nearshore waters.	●	–	–	–	–	–	–	–	1. Continue to ensure that Security reports sightings of monk seals during daily patrols at PMRF beaches and erects signage and barricades if observed where people frequent. 2. Continue to report observations of hauled-out Hawaiian monk seals to NOAA as soon as possible and provide high quality photos to assess seal health, ID, and aid in population abundance monitoring. 3. Collaborate with NOAA to implement Hawaiian monk seal recovery objectives when feasible. 4. Continue base-wide predator control to remove non-native predators, including feral cats and collaborate with partners on studies regarding toxoplasmosis at PMRF to inform these efforts; conduct outreach about the disease and its effects on wildlife and human health. 5. Continue to monitor for, and remove, marine debris as part of regular monk seal surveys at beaches frequently used by hauled out monk seals. 6. Continue to develop and install signage and implement trainings, educational materials, and presentations for security, other appropriate personnel, and the public on monk seals and the proper response to wildlife related observations. 7. Continue surveys and measuring of nearshore water quality parameters at six sites at Barking Sands (each with three sampling points) for habitat conservation and protection purposes. 8. Conduct regular surveys approximately five times per week of beaches near the Nohili Ditch outfall and Diver's Landing for monk seal presence, and all other beaches approximately twice per week.	●	–	–	–	–	–	–	–
		1. Monk Seal Monitoring: Identify and monitor individual monk seals to establish tracking trends such as abundance, survival, birth rate and movements between islands. Support a photography and data collection program to document where and when monk seals are observed. Train Ni'ihau residents on monk seal monitoring, photography, and data collection at a location determined by Ni'ihau Ranch.	–	–	–	–	–	–	–	●	1. Continue to conduct twice-yearly surveys through partnership with NOAA Fisheries for Hawaiian monk seals on Ni'ihau. 2. Continue to adhere to management strategies implemented by Ni'ihau Ranch on Ni'ihau, including restricted access, feral animal control, and not allowing dogs or ATVs on the island.	–	–	–	–	–	–	–	●
		1. Hawaiian Monk Seal Protection: Prohibit vessel landing on Ka'ula Island due to UXO concerns. Limit fishing at Ka'ula Island to maintain a marine environment with ample fish biomass and reduced stray fishing lines and nets, providing a benefit to the seals. Continue to check in all sorties to the Fleet Area Control and Surveillance Facility (FACSFAC) to ensure the absence of a monk seals within the drop zone.	–	–	–	–	–	●	–	–	1. Continue implementing all military training SOPs with regards to marine mammal interactions.	●	–	–	–	●	●	–	–
	Whale and Dolphin Management	1. Humpback Whales and other Cetaceans: Continue to participate in the NOAA Ocean Count on the last Saturday of December, January and February of each year.	●	–	–	–	–	–	–	–	1. Continue to report all observations of marine mammal strandings or deaths to National Marine Fisheries Service (NMFS) and assist in response efforts. 2. Improve coordination and communication regarding marine mammal strandings and other observations of note with NAVFAC PAC and Commander, United States Pacific Fleet (COMPACFLT).	●	–	–	–	–	●	–	●
											1. Implement and collaborate with partners on studies regarding toxoplasmosis at PMRF to inform predator control efforts and conduct outreach about the disease and its effects on wildlife and human health. 2. PMRF will cooperate with the Agribusiness Development Corporation (ADC) to ensure compliance with the Clean Water Act (CWA) and other environmental regulatory requirements where there is a nexus with federal monies or property.	●	–	–	–	–	–	–	–

Table 2 Alternatives Comparison (Continued)

Environment	Resource Category	2010 INRMP Management Actions (No Action Alternative)	BS	MR	KS	KR	PA	KI	MK	NI	2023 INRMP Management Actions (Preferred Alternative)	BS	MR	KS	KR	PA	KI	MK	NI
Biological Environment: Marine Mammals and Reptiles (Continued)	Sea Turtle Management	1. Sea Turtle Management: Continue logbook of sea turtle (most likely green turtles; *Chelonia mydas*) observations including sightings, tracks, and nesting events. Continue to protect, monitor, and record any sea turtle nests. Continue SOPs which require that beaches are surveyed one hour prior to beach landing exercises, and if sea turtles are present, then delay training until the animal(s) voluntarily leave the area. 2. Natural Resources Signs: Continue to install, maintain, and update, as necessary, green turtle habitat signs at the facility.	●	–	–	–	–	–	–	–	1. Continue to ensure daily patrols of PMRF's beaches for sea turtles to collect observational data and check for stranded, injured, or entangled turtles are conducted by partnering with Security. 2. Conduct surveys by biologists approximately five times per week of beaches near the Nohili Ditch outfall and Diver's Landing for sea turtle presence and ensure that marine surveys in nearshore areas quantify sea turtles and potential foraging or resting habitat. 3. Continue to survey beaches for sea turtle nesting activity during the nesting season, protect all nests observed with ropes and signage, mitigate light attraction issues on beaches, and coordinate with DAR to excavate nests. 4. Continue to encourage good communication between Security and natural resources regarding sea turtle activity on PMRF beaches to reduce negative impacts to the species from Security beach patrol vehicles. 5. Develop and use USFWS-approved outreach, educational materials, and signage with the objective to educate and provide information to residents, recreational users, visitors, and staff about proper procedures and acceptable activities within sea turtle habitat and how to act when coming in contact with sea turtles. 6. Continue to implement surveys to ensure no sea turtles are in affected areas during training exercises or in-water work. 7. An interagency agreement was established in fiscal year (FY) 23 to allow the Navy to partner with the NMFS Pacific Islands Fisheries Science Center (PIFSC) to deploy SPLASH tags (GPS and Argos) on sea turtles and will be pursued at PMRF. 8. An appendix was added to the INRMP specific to sea turtle management actions at PMRF. 9. Supplement ongoing water quality testing to detect particulates and soluble chemicals in waters at PMRF. Testing should be conducted at least quarterly.	●	–	–	–	–	–	–	–
		N/A.	–	–	–	–	–	–	–	–	1. Continue implementing all military training SOPs with regards to sea turtle interactions.	●	–	–	–	●	●	–	–
		1. Sea Turtle Monitoring: Support a program to document where and when sea turtles are observed on land, as well as in sea turtle nests. Train Niʻihau residents on sea turtle monitoring and sea turtle nest data collection at a location determined by Niʻihau Ranch.	–	–	–	–	–	–	–	●	1. If proposed Navy operations have the potential to impact sea turtles or habitat, conduct surveys for listed sea turtles and nesting activity on Niʻihau to understand habitat use and trends. 2. Establish a monitoring program for the nearshore environment of PMRF to inform future management decisions and monitor changes over time. 3. Partner with DLNR DAR to incorporate regular monitoring site(s) in PMRF's nearshore waters into the State's regular monitoring schedule, as feasible.	–	–	–	–	–	–	–	●
Biological Environment: Coastal and Nearshore Resources	Fish, Essential Fish Habitat, and Corals	1. Marine Resources and Fisheries Survey Update: Fund a follow-on survey to the 2006 marine resources and fisheries survey of the coastal/marine environment at Barking Sands. 2. Fishing Survey: Level of fishing activity and ecosystem health, as it relates to fish stock abundance, monk-seal hookings, and marine debris, should be monitored through surveys investigating level of fishing activity. A fee for fishing-gear rental and for fishing access to base should be instituted to cover costs.	●	–	–	–	–	–	–	–	1. Establish a monitoring program for the nearshore environment of PMRF to inform future management decisions and monitor changes over time. 2. Partner with DLNR DAR to incorporate regular monitoring site(s) in PMRF's nearshore waters into the State's regular monitoring schedule, as feasible.	●	–	–	–	–	–	–	–

Table 2 Alternatives Comparison (Continued)

Environment	Resource Category	2010 INRMP Management Actions (No Action Alternative)	BS	MR	KS	KR	PA	KI	MK	NI	2023 INRMP Management Actions (Preferred Alternative)	BS	MR	KS	KR	PA	KI	MK	NI
Social and Cultural Environment	Land Management	1. Base Planning: A routine procedure should continue to be implemented to assure coordination among facilities planners, resource managers, SOH, and county officials. Continue to utilize the PMRF Environmental Coordinator as the point of contact to provide relevant information on issues with potential to affect wildlife and native habitat, such as military operations and training, and tower and other construction and repair projects. 2. Protection of Natural Resources in Undeveloped Areas: Review construction and maintenance projects at PMRF to ensure contractors are aware of guidelines to avoid impacting sensitive vegetation.	●	●	●	●	–	–	●	–	1. Continue to implement coordination among facilities planners, NAVFAC and COMPACFLT resource managers, FACSFAC and Data Collection and Scheduling Tool (DCAST) managers, SOH, and county officials. 2. The PMRF IEPD and NRM should continue to be the points of contact to provide relevant information on issues with potential to affect wildlife and native habitat, such as military operations and training, and tower and other construction and repair projects.	●	●	●	●	●	●	●	●
		3. Base Planning: Continue to follow standard methods to control erosion for all new construction projects. The proposed Maritime Directed Energy Test Center at Barking Sands should be sited to avoid protected species and their habitat.	●	–	–	–	–	–	–	–									
		1. Base Planning: Site the FORCEnet integration laboratory in a previously disturbed area. Avoid periods of bird fallout and, if that is not practicable, the Navy should conduct monitoring for seabird fallout near the FORCEnet integration laboratory portable trailer activities and antennas as appropriate.	–	●	●	–	–	–	–	–									
		1. Base Planning: Review locations and plans for any new equipment towers to minimize effects on protected species and their habitat.	●	●	–	–	–	–	–	–									
	Outdoor Recreation	1. Fishing, Surfing, Windsurfing, and Beach Activities: Continue to provide beach access through Barking Sands for surfing and boating to PMRF employees, active duty, reserve, and retired military and dependents, as well as any U.S. citizen who possess a valid annual PMRF Recreation Pass. 2. Dissemination of Pertinent Natural Resources Information to Recreation Pass Program Applicants: Provide PMRF Recreation Pass Program applicants with information on invasive species, aquatic hitchhikers, and other pertinent natural resources information as part of the application process. 3. Beach and Dune Access Restrictions: Continue all beach and dune access restrictions. Monitor for excessive traffic at areas adjacent to the beach cottages and other high-use recreational areas and temporarily cord off areas to re-establish the vegetation, if necessary.	●	–	–	–	–	–	–	–	1. Continue to provide public opportunities for natural resource related outdoor recreation where it does not conflict with public health and safety, the military mission, or security. 2. Ensure that the degree of access allowed for outdoor recreation is consistent with conservation of natural resources. 3. Continue to promote awareness among recreational users of the importance of resource stewardship and promote a sense of pride in the natural environment of PMRF. 4. Provide PMRF Recreation Pass Program applicants with information on pertinent natural resources information as part of the application process. 5. Continue to restore and enhance natural and cultural resource assets at PMRF for public benefit and enjoyment. 6. Develop a Natural Resources Information Center to include brochures and other materials promoting self-guided nature walks and bird watching opportunities on base and in the surrounding areas. Information on threats to native Hawaiian ecosystems and threatened and endangered species should be included, with particular emphasis on the introduction and spread of alien plant species and the negative effects of off-road vehicles in sensitive environments and measures that can be taken to avoid such impacts.	●	–	–	–	–	–	–	–
		1. Trial Goat Hunting. Institute a trial goat hunting program with the Barking Sand Archery Club or other organization in coordination with the DLNR DOFAW to reduce the presence of goats at the Mākaha Ridge Tracking Station.	–	●	–	–	–	–	–	–	1. Work with the PMRF Archery Club to control ungulate populations at the Kamokalā Ridge site by implementing trapping and baiting stations if the animals become a nuisance to Navy operations or pose a risk to protected species.	–	–	–	●	–	–	–	–
Other Management Actions	Data Collection and Database and Records Management	1. Integrate Natural Resources Survey Data in GIS Database: Continue to manage, integrate, access and report natural resources GIS data into PMRF GIS database. 2. Fauna Surveys Update/Initiate: continue to coordinate with DLNR-DOFAW to collect population-monitoring data for protected species. Population monitoring data should continue to be evaluated for any necessary changes or improvements in management actions. 3. Botanical Surveys and Mapping: Provide a 5-year update of botanical survey data. 4. INRMP Annual and 5-year Updates. Continue to update Navy metrics builder, meet with INRMP Working Group Members, and update document as required.	●	●	●	●	–	–	●	–	1. Ensure that natural resources staff follow established standardized monitoring and surveying procedures. 2. Continue to require GIS deliverables for all contractors, including in-house projects that follow appropriate data collection standards and ensure that all geospatial data is incorporated into the NAVFAC GeoReadiness Repository and that it complies with the Navy Data Model (NDM) adaptation of the Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) for GIS database management. 3. Consider acquiring tablets or Trimble units with excel/GIS uploading capabilities that natural resources staff can utilize for data collection in the field. 4. Acquire the ability to upload GPS data directly to government computers. 5. Coordinate data sharing with natural resources partner agencies USFWS, DLNR and NOAA; coordinate common data collection formatting as possible.	●	●	●	●	●	●	●	●

Table 2 Alternatives Comparison (Continued)

Environment	Resource Category	2010 INRMP Management Actions (No Action Alternative)	BS	MR	KS	KR	PA	KI	MK	NI	2023 INRMP Management Actions (Preferred Alternative)	BS	MR	KS	KR	PA	KI	MK	NI
Other Management Actions (Continued)	Natural Resources Awareness, Education, and Training	1. Natural Resources Information Center: Continue to distribute natural resources information to reporting personnel, residents, and base visitors through a variety of printed materials and venues. Continue to provide natural resource information brochures to the Personnel Support Center for inclusion in "Welcome Aboard" packages given to all Navy personnel and family members. 2. Educational Outreach Partnership: Consider an educational outreach partnership between NOAA, west side kupuna, and PMRF staff, to develop a combined natural resource and cultural resource program focused on the beachfront in a recovering and remote location on Barking Sands. 3. Enhance and Improve Beach Cottages Shearwater Colony: Provide additional educational material to guests staying at the beach cottages. 4. Natural Resources Signs: Continue to install, maintain, and update, as necessary, natural resources signs at the facility.	●	–	–	–	–	–	–	–	1. Continue to present natural resources concerns and activities at quarterly indoctrination presentations or other means prior to personnel conducting activities. 2. Continue to implement trainings, educational materials, and presentations for security and other appropriate personnel on the proper response to wildlife related observations, and avoidance of driving on coastal strand vegetation and the culturally significant areas of base such as Nohili Dunes. 3. Ensure that standard reporting and response protocols for wildlife related observations are included in all security personnel vehicles.	●	●	●	●	●	●	●	●
											1. Initiate a bi-annual natural resources newsletter about issues of concern as well as good news stories sent out through email, bulletin board, and social media, in coordination with the PMRF Public Affairs Office. 2. Provide the Public Affairs Office with flyers to send out by email and for posting on bulletin boards around base regarding seasonally appropriate natural resources issues. 3. Include natural resources information in Welcome Aboard packages for incoming Navy personnel. 4. Coordinate and participate in volunteer events, educational programs, and natural resources related site visits from local schools. 5. Continue to coordinate with MWR to place natural resources related information in beach cottages, implement informational signage, and consider creating permanent natural resources displays near the beach cottages, Majors/Waiapua'a Bay and the MWR visitor check-in building. 6. Continue to work with base personnel on signage and other outreach and enforcement efforts to deter illegal feeding of animals as well as misuse of recreational areas.	●	●	●	●	●	–	–	–
		5. Law Enforcement: Continue to use existing law enforcement at its installations. Any incidents related to natural resources should continue to be reported to the PMRF Environmental Coordinator.	●	●	●	●	–	–	●	–	1. During daily security patrols, Security Forces shall report particular sightings of note of rare, threatened, or endangered species that may occur on base or in the nearshore environment. 2. Security forces provide a single point of contact for environmental emergencies such as injured bird response, which in turn shall conduct proper notifications to Environmental staff. 3. Security Forces shall enforce beach restrictions to protect special status species 4. PMRF's designated game warden shall oversee the PMRF Archery Club and coordinate hunts with PMRF Command and DOFAW.	●	●	●	●	●	–	–	–

Notes: **BS** = Barking Sands, **MR** = Mākaha Ridge, **KS** = Kōke'e Sites, **KR** = Kamokalā Ridge, **PA** = Port Allen, **KI** = Ka'ula Island, **MK** = Mauna Kapu, **NI** = Ni'ihau Island.

2.3 Summary of Impacts

Table 3 provides a summary of impacts by location and resource. Please refer to each respective location and resource for the full impact analysis. The methodology used to determine the level of impact is described in Section 3.2.

Table 3 Summary of Impacts

Environment	Resource Category	Barking Sands No Action	Barking Sands Preferred	Mākaha Ridge No Action	Mākaha Ridge Preferred	Kōkeʻe Sites No Action	Kōkeʻe Sites Preferred	Kamokalā Ridge No Action	Kamokalā Ridge Preferred	Port Allen No Action	Port Allen Preferred	Kaʻula Island No Action	Kaʻula Island Preferred	Mauna Kapu No Action	Mauna Kapu Preferred	Niʻihau Island No Action	Niʻihau Island Preferred
Physical	Geology and Soils	BEN	BEN	BEN	BEN	NONE	NONE	NONE	NONE	—	—	—	—	—	—	—	—
	Water Resources	BEN	BEN	BEN	BEN	NONE	NONE	NONE	NONE	—	—	—	—	—	—	—	—
	Natural Hazards	BEN	BEN	—	—	—	—	NONE	BEN	—	—	—	—	—	—	—	—
	Climate Change	BEN	BEN	—	—	—	—	—	—	—	—	NONE	NONE	—	—	NONE	NONE
Biological	Vegetation	BEN	BEN	BEN	BEN	BEN	BEN	BEN	BEN	—	—	—	—	—	—	—	—
	Nuisance and Invasive Animals	BEN	BEN	BEN	BEN	NONE	BEN	NONE	BEN	—	—	NONE	BEN	—	—	—	—
	Bats	BEN	BEN	BEN	BEN	BEN	BEN	NONE	BEN	—	—	—	—	NONE	BEN	—	—
	Birds	BEN	BEN	BEN	BEN	BEN	BEN	—	—	NONE	BEN	BEN	BEN	—	—	—	—
	Insects	BEN	BEN	BEN	BEN	BEN	BEN	—	—	—	—	—	—	—	—	—	—
	Marine Mammals, Marine Reptiles, and Other At-risk Marine Species	BEN	BEN	—	—	—	—	—	—	—	—	BEN	BEN	—	—	BEN	BEN
	Coastal and Nearshore Biological Resources	BEN	BEN	—	—	—	—	—	—	—	—	NONE	NONE	—	—	NONE	NONE
Social and Cultural	Land Use	NONE	NONE	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Outdoor Recreation	BEN	BEN	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Cultural Resources	NEG	NEG	NEG	NEG	NEG	NEG	—	—	—	—	—	—	—	—	—	—

Notes: BEN = Beneficial, NONE= No Impact, NEG= Negligible, — = eliminated from further analysis in this section.

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3. Affected Environment and Environmental Consequences

3.1 Introduction

Chapter 3 describes the current condition of the physical, biological, and social environments in the project area, which serves as a baseline for comparing the potential beneficial or detrimental impacts of each alternative.

In compliance with NEPA, CEQ guidance, and Navy guidelines, this EA analyzes only those resource areas potentially subject to impacts. In cases where initial screening identified no impact for an individual resource at a given facility, the resource was not included for further analysis. Section 3.2.3 summarizes resources not carried forward for detailed analysis.

In some cases, even if initial screening determined there were no impacts to a resource, this analysis provides a detailed discussion of the resource because of its importance for site management, cultural significance, or biological value. In those instances, a description of the affected environment is included for the benefit of the reader and resource managers.

3.2 Methods for Determining Level of Impact

3.2.1 Effects Analysis

Evaluation of the effects of the Proposed Action on each resource (e.g., vegetation, birds, recreation) is based on the affected area, the degree of the effect (the extent of a measurable change to the resource), the duration of the effect (short-term versus long-term), and the nature of the effect as either adverse or beneficial. Because plan implementation would involve ongoing actions, this analysis assumes a long-term duration of the impact for all resources. Table 4 defines impact criteria for this analysis, which provide a consistent methodology for assessment of potential effects across resources and project areas.

Table 5 summarizes the impact level for each resource, based on the defined assessment criteria. This analysis compares the impacts of the Preferred Alternative against the No Action Alternative, which serves as the baseline scenario.

Table 4 Methods for Determining the Level of Impact

Impact Assessment Criteria	Criteria Category	Criteria Category Description
Degree of Effect	Low	A change in the resource condition is minimal and does not noticeably alter the resource's function in the environment.
Degree of Effect	Medium	A change in the resource condition is measurable or observable, and an alteration in the environment is noticeable and detectable.
Degree of Effect	High	A change in a resource condition is measurable or observable, and the alteration in resource's function is clear and consistently observable.
Affected Area	Local	Impact is limited geographically and would not extend to a broad region or broad sector of the resource population.
Affected Area	Regional	Impact extends beyond the project area, affecting the immediate project area, into the area of concern, and potentially the entire region.
Affected Area	State/Island Extent	Impact would potentially affect resources or populations in the entire island or beyond.
Resource Value	Common	The affected resource is considered usual or ordinary in the region, is not depleted, and is unprotected by legislation. The resource does not fill a distinctive or irreplaceable role in the region.
Resource Value	Important	The affected resource is protected by legislation other than the ESA, e.g., Migratory Bird Act, and/or fills a distinctive role in the local area or region that is important or irreplaceable.
Resource Value	Unique	The affected resource is listed as threatened or endangered (or proposed for listing) under the ESA or is depleted either within the locality or the region. The portion of the resource affected fills a distinctive ecosystem role within the locality or the region.
Duration	Temporary	Impact is intermittent, infrequent, and/or typically last less than 1 month.
Duration	Interim	Impact is frequent or extends for long periods of time. This includes longer term projects.
Duration	Long-term	Impact is permanent, or duration of the project is ongoing, and lasts for a period longer than 1 year.

Table 5 Summary Impact Levels

Impact Level	Description of Impact Level
Beneficial	Plan implementation would improve condition of a given resource, preserve or increase resource availability to the public, or increase the population of an important or unique resource population. Change can be of any magnitude but must be interpreted as a beneficial impact to the resource area of concern. Effect can be of any geographic extent. Context is dependent on the resource, e.g., a beneficial impact on vegetation can be an increase in the population of native or endangered (unique) species or a decrease in the population of invasive (often common) species. Impact can be of any duration, although it generally is improved long term.
No Impact	No effect of the proposed project on the resource for any criterion when compared to the No Action Alternative. Actions involve continuation of previously implemented INRMP management objectives and strategies, and/or actions involve the implementation of new or increased monitoring measures.
Negligible	Impacts are generally low in intensity (cannot be measured or observed), are of localized extent, and do not affect important or unique resources. Impact is either temporary or interim.
Minor	Impacts are unlikely but possible, and/or tend to be low in intensity, are local or regional in extent, and common resources may experience more intense impacts, unique resources are not impacted. Impact duration is either temporary or interim.
Moderate	Impacts are unavoidable with mitigation measures, may be of medium or low intensity, with potential for local or regional impacts. Resources are important in context. Impact duration is interim or long-term.
Major	Impacts are generally medium or high intensity, long-term or permanent in duration, of a regional or island wide extent, and negatively affect important or unique resources. Involves an irrevocable commitment of a unique resource. Impact duration is long-term.

3.2.2 Cumulative Effects with Other Reasonably Foreseeable Future Actions

This analysis considers additive impacts from Reasonably Foreseeable Future Actions (RFFAs) that may occur later in time or farther removed in distance from the Proposed Action but that have a reasonably close causal relationship to the Proposed Action. This analysis includes a review of public documents prepared by federal, state, and local government agencies, management plans, land use plans, and other planning related studies to determine potential effects from RFFAs that could combine with the potential effects of the Proposed Action. This analysis also includes a search of the SOH Office of Planning and Sustainable Development EA/EIS database to determine whether analyses of any properties adjacent to the PMRF facilities were completed and published for RFFAs. Table 6 provides a list of RFFAs relevant to this analysis. This list includes only those projects with a reasonably close causal relationship to the Proposed Action (the Preferred Alternative in this EA). Future actions with no potential to cause effects that could combine with effects of the Proposed Action do not appear in Table 6 since the analysis of those RFFAs does not forward the goal of informed decision-making. The resource analyses for each affected project location include evaluation of additive impacts from the RFFAs listed in Table 6.

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Table 6 Reasonably Foreseeable Future Actions

Project/Activity	Related Project Location	Project Sponsor	Project Description	Projected Completion Date
Power Grid Consolidation [1]	Barking Sands	Navy	Power Grid Consolidation, Range and Airfield Operations District and Personnel Support District.	Ongoing
Environmental Restoration Plan [2]	All facilities	Navy	Identifies Comprehensive Environmental Response, Compensation, and Liability Act and Resource Conservation and Recovery Act releases, as well as releases under related provisions; reports releases and recommends site restoration practices.	Ongoing
State Wildlife Action Plan [2]	All facilities	DLNR	Addresses threats to, and conservation needs of native flora and fauna.	Ongoing
Biosecurity Plan for Micronesia and Hawai'i [2]	All facilities	Navy	Recommends actions to address threats from non-native/invasive species.	Ongoing
Hawaiian Bird Conservation Action Plan [2]	All facilities	USFWS, Pacific Rim Conservation, DOFAW	Identifies research needs, primary threats, and conservation goals for Hawaiian birds that are in critical need of conservation.	Ongoing
Kawai'ele Bird Sanctuary [2]	Barking Sands	DLNR DOFAW	Continuance of typical activities, including sand mining for wetland and coastal upland restoration.	Ongoing
Advanced Radar Detection Laboratory (ARDEL) [2,3]	Barking Sands	Navy	Operation of the Advanced Radar Facility.	Ongoing
Implementation of the Integrated Cultural Resources Management Plan (ICRMP) [3]	All facilities	Navy	Preserve, protect, and enhance cultural resources.	Ongoing
Long-Range Missile Tests [3]	To Be Determined (TBD)	Missile Defense Agency	Several missile tests/launches are expected to occur into the future.	Ongoing
Commercial Wind Energy Development [4]	O'ahu	Various	Three offshore wind projects have been proposed for federal waters around O'ahu.	Proposed
Commercial Fishing Activities [4,5]	Barking Sands, Ka'ula, Ni'ihau	Various Commercial Vessels	Twenty major fisheries in Hawaiian waters include tuna, billfish, bottom fish, other species of pelagic fish, and a smaller invertebrate fishery.	Ongoing
Maritime Traffic [4,5]	Barking Sands, Ka'ula, Ni'ihau	Various Commercial Vessels	Ten harbors located on six major Hawaiian Islands serve the commercial cargo, passenger, and fishing industries. Two major points on Kaua'i are Nāwiliwili and Port Allen (both are small harbors).	Ongoing
Research Activities [5]	Barking Sands, Ka'ula, Ni'ihau	Various Vessels	Research and evaluation of fishery-dependent data to provide analyses of fishery dynamics and to understand factors affecting catch of non-target, associated, and dependent species (e.g., bycatch, and take of protected species).	Ongoing
Ongoing base infrastructure, operations, and maintenance activities [6]	All facilities	Navy	Ongoing activities at PMRF facilities result in incidental take of Newell's shearwaters. A BO was issued by USFWS for these activities.	Ongoing

Sources:

[1] MILCON Database (DoD 2018).

[2] 2023 INRMP (NAVFAC PAC 2022).

[3] HRC Final EIS (DoN 2008a).

[4] "Hawai'i-Southern California Training and Testing EIS/Overseas EIS" (DoN 2018).

[5] Pacific Islands Fisheries Science Center, Programmatic Environmental Assessment (URS Group 2015).

[6] USFWS; BO (USFWS 2018).

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3.2.3 Resources Not Carried Forward for Analysis

Subject matter experts concluded that the No Action Alternative and the Preferred Alternative would have no impact on the resources listed in Table 7. Therefore, this EA limits analysis of those resources to the screening-level analysis summarized in Table 7 below. CEQ guidance supports this approach, which serves to streamline the analysis, provide clarity for the reader, and reduce the document length.

Table 7 List of Resources Eliminated from Further Analysis

Resource	Description and Justification for Elimination
Air Quality	The U.S. Environmental Protection Agency (USEPA) assesses air quality based on the concentrations of principal pollutants, called "criteria pollutants," which include carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO2), ozone, suspended particulate matter less than or equal to 10 microns in diameter (PM10), fine particulate matter less than or equal to 2.5 microns in diameter (PM2.5), and lead (Pb). CO, SO_2, Pb, and other particulates are emitted directly into the atmosphere from emissions sources. Under the Clean Air Act, the USEPA established National Ambient Air Quality Standards (NAAQS) (40 C.F.R. part 50) for these pollutants. Areas that are and have historically been in compliance with the NAAQS are designated as attainment areas. Areas that violate a federal air quality standard are designated as non-attainment areas. In the SOH, the most common criteria air pollutant in exceedance of NAAQS is SO_2. This exceedance is due to volcanic activity on Hawai'i Island and is considered a "natural excluded event pollutant"; there are no designated non-attainment areas for criteria air pollutants in the State. Air quality is not addressed in the INRMP as a management objective; thus, the EA No Action and Preferred Alternatives do not include any actions specific to air quality. Therefore, air quality was not addressed in this EA.
Airspace Management	The No Action and Preferred Alternatives are entirely land-based. Airspace usage associated with training and testing at PMRF and its other installations is evaluated in the HRC EIS/OEIS (DoN 2008a) and complies with SOPs and Federal Aviation Administration requirements on airspace use. The use or modification of airspace would not occur as part of this project and no hazards to air navigation, or obstructions, would be introduced through the implementation of either alternative, therefore airspace management was not addressed in this EA.
Noise	Noise impacts from ongoing activities associated with training and testing at PMRF are evaluated in the HRC EIS/OEIS (DoN 2008a) and HSTT EIS/OEIS (DoN 2018). While the HRC/HSTT EIS/OEIS identifies noise as a potential impact associated with training and testing, these impacts are not addressed in the INRMP, and therefore are not addressed in this EA.
Infrastructure	The implementation of the INRMP would have no impact on public infrastructure, including but not limited to public utilities, telecommunication systems, and municipally separate storm water systems, therefore, were not carried forward for further analysis in this EA.
Transportation	Transportation is the movement within the area of effect of all equipment, facilities, materials, and people by ground, water, and air. The implementation of the INRMP would have no impact on existing transportation, so was not addressed in this EA.
Public Health and Safety	All resource management actions implemented as a part of the INRMP, balance the needs of the natural resources located at the respective PMRF facilities, while also ensuring the Navy's mission is carried out. Implementation of the INRMP would have no impact on public health and safety and therefore was not analyzed in this EA.

Table 7 List of Resources Eliminated from Further Analysis (Continued)

Resource	Description and Justification for Elimination
Hazardous Materials and Wastes	An analysis of the effects of facilities' operations on the use of hazardous materials and waste is evaluated in the PMRF Enhanced Capability EIS (DoN 1998). However, the INRMP does not include any resource management actions affecting hazardous materials, therefore, hazardous materials and waste was not addressed in this EA.
Socioeconomics	Socioeconomics depict the social and economic attributes of a community through the review of characteristics such as demographics, income, employment, and housing. Socioeconomic conditions in PMRF are evaluated in the PMRF Enhanced Capability EIS (DoN 1998). Implementation of the INRMP would have no impact on socioeconomic characteristics and therefore was not addressed in this EA.
Environmental Justice	Implementation of the INRMP would not impact environmental justice. There would not be disproportionately high environmental or health impacts on off-installation low-income or minority populations from the implementation of the INRMP; therefore, this resource area was not carried forward for further analysis in this EA.
Visual Resources	Visual resources include the generally valued visual features of a landscape that are experienced by people, such as ocean or mountain views. Impacts to visual resources would include any action that impedes an existing view of a visual resource. The INRMP does not include any management objectives that would affect visual resources at any of the areas associated with PMRF; therefore, visual resources were not evaluated in this EA.

3.3 Barking Sands

The Barking Sands site is located along the western coastline of Kaua‘i on the Mānā Coastal Plain (Figure 2). The facility encompasses 2,538 ac of Navy-owned and leased land. Barking Sands is bordered to the north by Polihale State Park, to the south by Kokole Point, to the east by agricultural lands, and to the west by the Pacific Ocean. Barking Sands is the principal operations site for PMRF and supports surface, subsurface, air, and space operations. Operations activities and their associated support facilities at Barking Sands are divided into four major areas—Nohili Sector (north), Mānā Point Sector (central), Majors/Waiapua‘a Bay Sector (south), and Offshore Sector—with unique activities that dictate the constraints for that area; see Section 2.2 of the INRMP for more information.

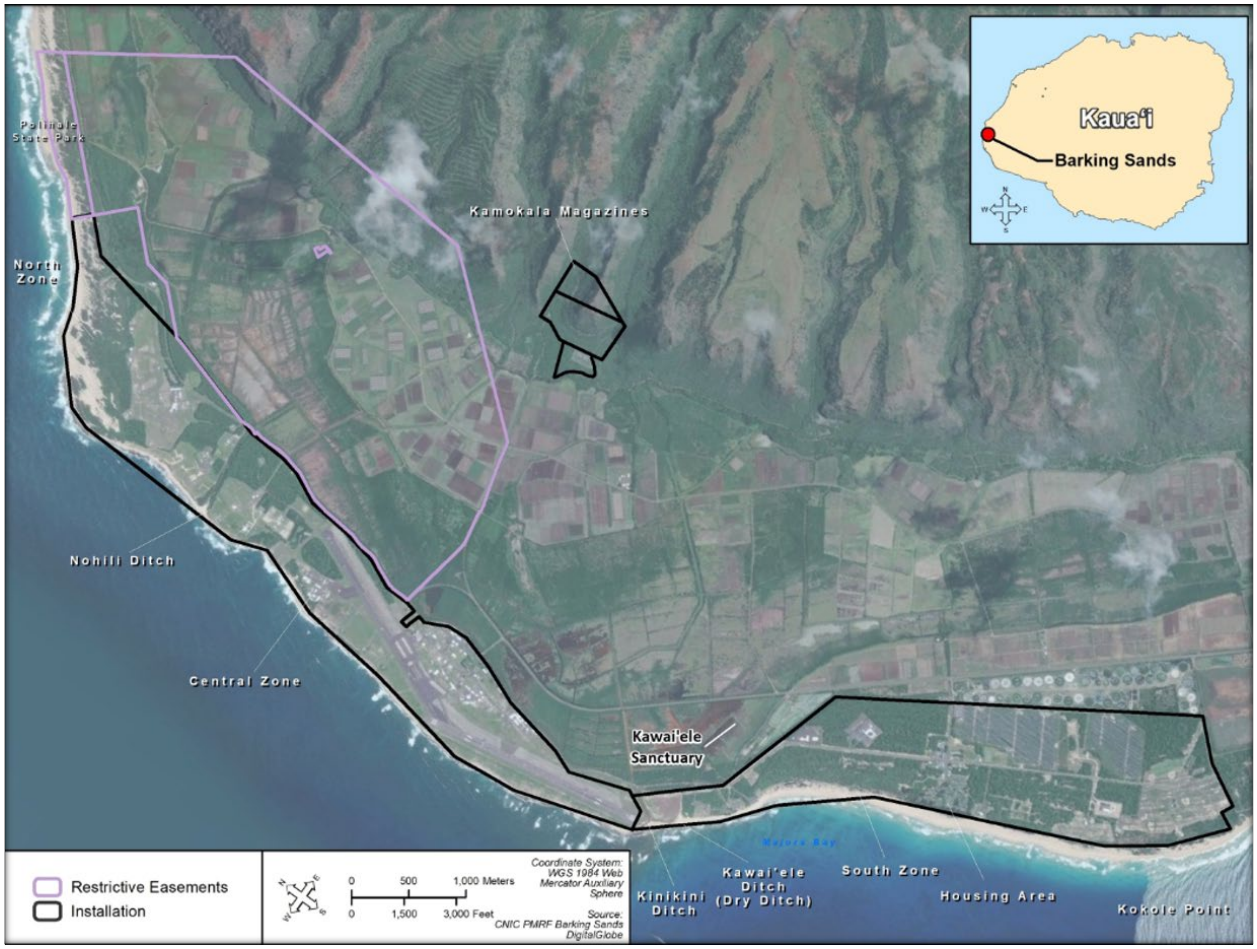


Figure 2 Barking Sands Main Zones

Although the PMRF installation boundary ends at the high-water mark (except when designated for Navy use per 33 C.F.R. § 334.1390 or 33 C.F.R. § 165.1406) and the Navy does not own submerged lands seaward of the high-water mark, PMRF monitors and manages the adjacent nearshore waters for the protection of aquatic species and habitats (NAVFAC PAC 2022). The Navy controls land access to adjacent nearshore waters and excludes boats and other watercraft during range operations and other activities (NAVFAC PAC 2022). Safety Zone (33 C.F.R. Section 165.1406) and Danger Zone (33 C.F.R. Section 334.1390) adjacent to Barking Sands are designated for Navy use and included in the INRMP study area. The Navy operates offshore underwater ranges associated with PMRF but does not have exclusive

jurisdiction over these areas. The Navy does, however, conduct annual marine mammal and sea turtle monitoring for offshore areas at PMRF (NAVFAC PAC 2022). The natural resources of the underwater ranges are discussed in the HRC EIS/OEIS (DoN 2008a) and the HSTT EIS/OEIS (DoN 2018). Relevant resource sections below discuss impacts associated with INRMP actions affecting nearshore and offshore waters at PMRF.

3.3.1 Physical Environment

3.3.1.1 Geology and Soils

This discussion of geological resources includes the topography, geology, and soil types in the project area. An area's elevation, slope, and surface features define its topography. The geology of an area may include bedrock materials, mineral deposits, and fossil remains. Soil refers to unconsolidated earthen materials that overlie bedrock or another parent material. Soil structure, elasticity, strength, shrink-swell potential, and erodibility determine the ability for the ground to support structures and facilities and determine the ability of the soil to absorb and drain water.

Affected Environment

Located on the west coast of Kaua'i on the Mānā Coastal Plain, the average elevation at Barking Sands is approximately 15 feet (ft) above mean sea level (MSL), with elevations ranging from sea level to approximately 75 ft at the highest point on the northern part of the property. At the southern end of the property, the topography is relatively flat, increasing from sea level to approximately 18 ft above MSL. Most coastal areas along Barking Sands exhibit beach erosion (C. H. Fletcher and Feirstein 2009; C. Fletcher et al. 2013; University of Hawai'i Coastal Geology Group 2013). The Mānā Coastal Plain is an accretionary strand plain that resulted from a convergence of longshore sediment transport from the north swell and trade wind swells from the east; the process was also preceded by a falling sea level at the end of the late Holocene epoch (C. H. Fletcher and Feirstein 2009; C. Fletcher et al. 2013; University of Hawai'i Coastal Geology Group 2013).

Soils at Barking Sands listed from most predominant to least predominant include: Jaucas loamy fine sand (JfB), beach sands (BS), Dune land (DL), Kaloko clay (Kfa), Kaloko clay loam (Kf), and fill land (Fd) (Figure 3) (USDA NRCS 2022). The topography, geology, and soil conditions at Barking Sands are described in depth in Section 3.3.1 of the INRMP.

Environmental Consequences

No Action Alternative

Under the 2010 INRMP, PMRF implemented the following strategies directly related to erosion control for soils and coastal dunes at Barking Sands:

1. *Base Planning:* Follow standard methods to control erosion during all new construction projects.
2. *Critical Habitat and Dune Vegetation Restoration Project:* Remove invasive vegetation and restore native vegetation to improve habitat and reduce erosion.
3. *Wildland Fire Control:* Use open spray nozzles when possible, to minimize erosion and destruction of cultural resources.

The continued implementation of the 2010 INRMP would result in a beneficial impact on soil and geological resources (sand) at Barking Sands, as the management actions improve the condition and long-term availability of the resource.

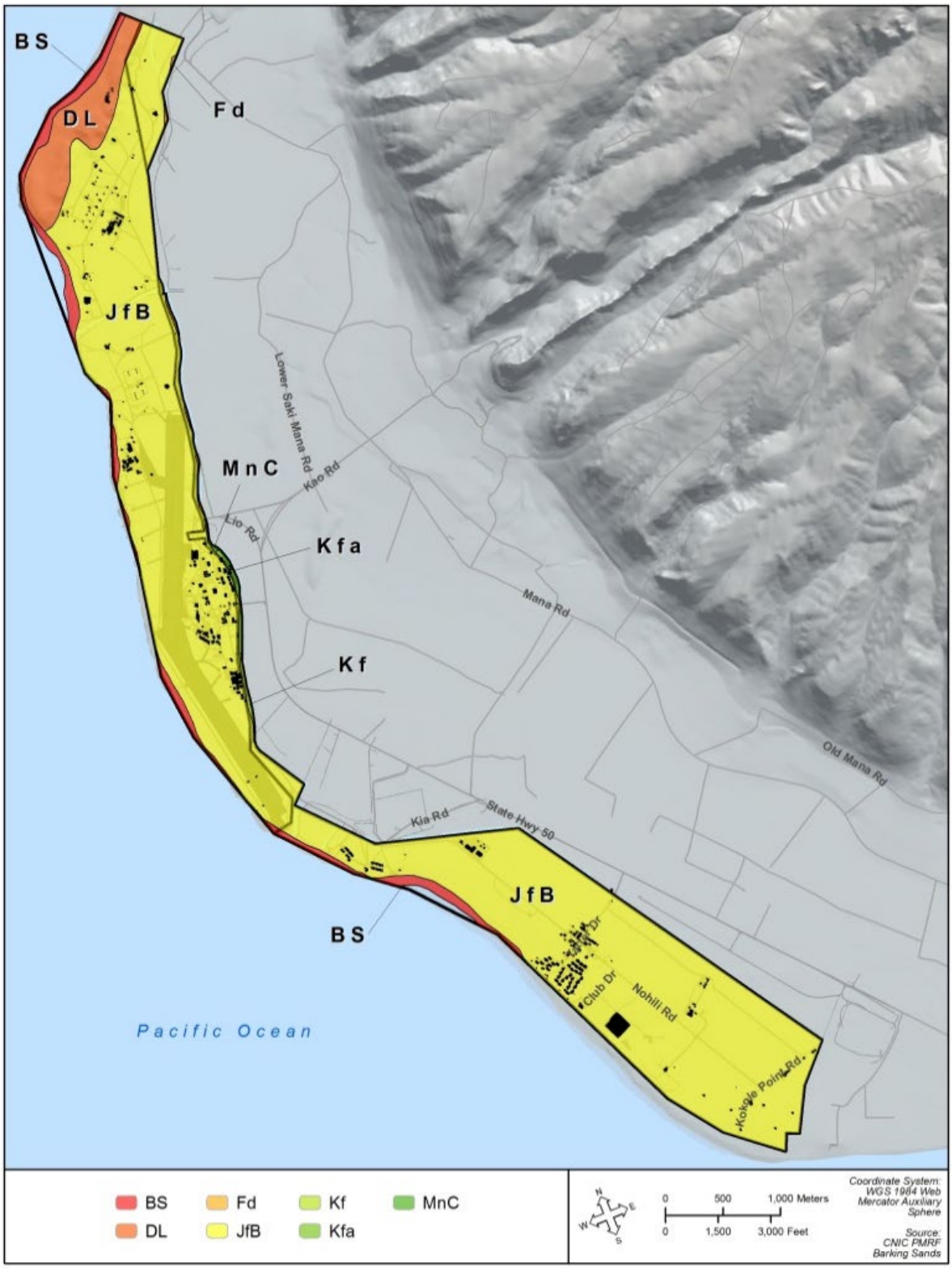


Figure 3 Barking Sands Soils

Preferred Alternative

The 2023 INRMP proposes to implement new erosion control measures at Barking Sands, to monitor and mitigate erosion, and to identify soil compaction sites. The erosion strategies include:

1. Conduct general surveys for erosion and soil compaction issues annually to prioritize restoration sites.
2. Mitigate and prevent erosion of coastal dune habitat by out-planting, establishing, and monitoring native dune building plants in areas identified as having erosion issues.
3. Implement additional security measures such as increased signage and roping off certain areas to reduce off-road vehicle presence in the Nohili Dunes area.
4. Participate in future cooperative studies assessing potential shoreline loss that threatens base infrastructure or sensitive habitats.

The proposed implementation measures would have a beneficial impact on soil and geological resources (sand) at Barking Sands compared to the No Action Alternative because new erosion monitoring and control and dune protection actions would improve the condition and long-term availability of the resource.

3.3.1.2 Water Resources

This discussion of water resources includes the physical characteristics of groundwater, surface water, nearshore marine waters, wetlands, and floodplains. Wildlife and vegetation are addressed in the Biological Resources section.

Groundwater is water that flows or seeps downward and saturates soil or rock, supplying springs and wells. Surface water resources generally consist of wetlands, lakes, rivers, and streams. Surface water is important for its contribution to the economic, ecological, recreational, and human health of a community or locale. A Total Maximum Daily Load (TMDL) is the maximum amount of a substance that can be assimilated by a water body without causing impairment. A water body is deemed impaired if water quality analyses conclude that exceedances of water quality standards occur.

Marine waters typically include estuaries, waters seaward of the historical height of tidal influence, and offshore high salinity waters. Marine water quality is described as the chemical and physical composition of the water that is affected by natural events and human influence. Nearshore areas include all submerged lands titled to the military and all other submerged lands that are adjacent to installations that extend from the mean high-water level, offshore to the boundary of any security areas controlled by the Military Services (DODI 4715.03). Although the PMRF installation boundary ends at the high-water mark (except when designated for Navy use per 33 C.F.R. § 334.1390 or 33 C.F.R. § 165.1406) and the Navy does not own submerged lands seaward of the high-water mark, PMRF conducts monitoring and implements proactive management to ensure conservation benefits are provided to aquatic species and habitats in waters adjacent to the installation (Miller et al. 2023).

Wetlands are jointly defined by the USEPA and U.S. Army Corps of Engineers as “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.” Wetlands generally include “swamps, marshes, bogs, and similar areas” (33 U.S.C. §§ 1251–1387).

Floodplains are areas of low-lying ground adjacent to rivers, stream channels, large wetlands, or coastal waters. Floodplain ecosystem functions include natural moderation of floods, flood storage and conveyance, groundwater recharge, and nutrient cycling. Floodplains also help to maintain water quality

and are often home to a diverse array of plants and animals. In their natural vegetated state, floodplains slow the rate at which the incoming overland flow reaches the main waterbody. Floodplain boundaries are most often defined in terms of the magnitude of inundation, that is, the 100-year and 500-year flood. Floodplain delineation maps are produced by the Federal Emergency Management Agency to define the boundaries of floodplains and the level of flood risk in an area.

Affected Environment

Surface waters within the PMRF Barking Sands project area include Kinikini Ditch and Nohili Ditch and a man-made oxidation pond located on the southern portion of the site (Figure 4). Easements allow the agricultural lands to the east of PMRF Main Base to dewater via a series of interconnected drainage ditches that discharge into the Pacific Ocean through the Kawai'ele (also known as Dry Ditch), as well as the Kinikini Ditch and Nohili Ditch outfalls. Primarily, Dry Ditch is utilized for flood control during high rain events. Narrow bands of wetland habitat border portions of the ditches and pond areas. The estuarine and marine systems along the shoreline comprise the only remaining natural wetland habitat at Barking Sands (Gomez 2021).

PMRF Barking Sands borders the Pacific Ocean; the installation boundary ends at the high-water mark. The SOH Department of Health classifies the nearshore waters adjacent to Barking Sands bounded by the 100-fathom contour as Class A. As such, they are designated as protected, primarily for recreational use and aesthetic enjoyment. Class A waters may be used for other purposes that comply with the protection and propagation of fish, shellfish, and wildlife, and marine recreation. The Barking Sands Beach is listed on the *Draft 2024 State of Hawai'i Quality Monitoring and Assessment Report* impairment list, pursuant to the Clean Water Act (CWA) § 303(d). Barking Sands Coastal Waters were found to be impaired by chlorophyll-a and turbidity, and it was determined that a TMDL is needed, but has not been established (DOH CWB 2022). Barking Sands is considered low priority for initiating TMDL development within the current monitoring and assessment cycle.

Groundwater resources at Barking Sands consist primarily of a lens of brackish groundwater that floats on seawater. The aquifer is recharged by rainfall and seepage from underlying sediments. The nearest fresh groundwater source is located at the inland edge of the coastal plain, along the base of the cliffs (Figure 4). The groundwater increases in salinity from the base of the Mānā Cliffs to the Pacific Ocean (DoN 2008a).

Environmental Consequences

No Action Alternative

The 2010 INRMP contains measures to prevent or minimize the release of pollutants associated with chemical pest and invasive species management, measures to clean up marine debris, and measures to protect wetlands. The erosion control measures described above in Section 3.3.1.1 also protect water quality. In addition to erosion control measures, the 2010 INRMP contains the following measures to protect water quality:

1. *Base-wide Predator Control:* Continue use of cage traps and other non-chemical methods as the primary means of predator control to prevent contamination of water resources. See also INRMP Appendix D – Legal Requirements for laws and policies related to water quality and pesticide and herbicide application.
2. *Marine Debris Cleanup:* Continue participation in marine debris clean up events.
3. *Wetlands Maintenance:* Ensure proper permitting and no-net-loss of wetland acreage. Coordinate with SOH to maintain the irrigation ditch systems at Barking Sands.

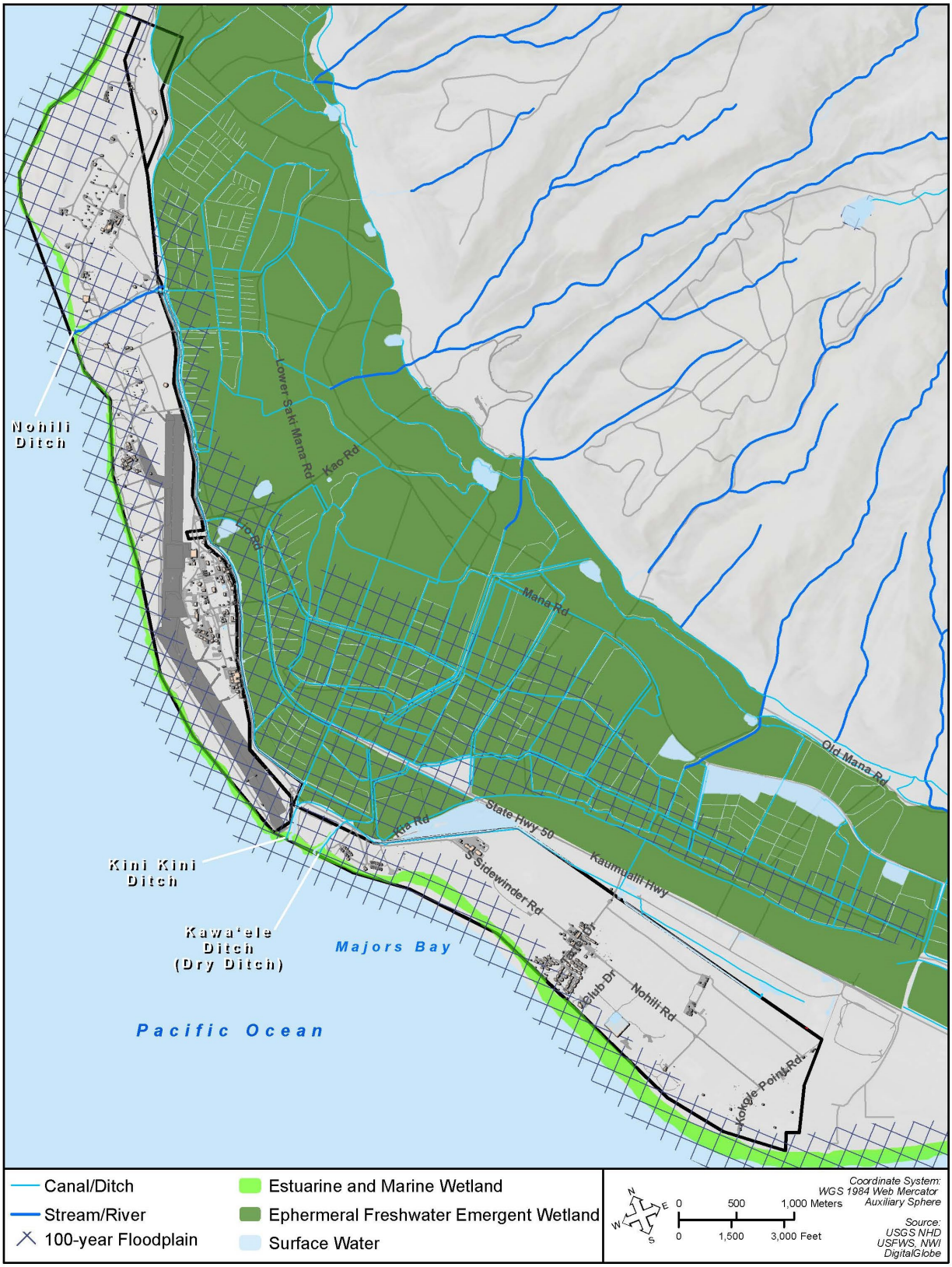


Figure 4 Water Resources at Barking Sands

The continued implementation of the 2010 INRMP would result in minor beneficial impacts to water resources at Barking Sands, as measures and best management practices (BMPs) implemented under the 2010 INRMP have prevented and/or minimized erosion, prevented adverse effects of pest and invasive species management actions on water resources that could otherwise have occurred without implementation of the INRMP, reduced marine debris, and protected wetlands.

Preferred Alternative

The erosion control measures discussed in Section 3.3.1.1 would protect water quality by reducing the total suspended solids entering downstream areas. This could decrease turbidity in nearshore waters and potentially reduce the total nutrients entering the system, which in turn would reduce concentrations of chlorophyll-a. In addition to erosion control measures, the 2023 INRMP includes the following strategies to protect water quality:

1. Coordinate all use of pesticides by natural resources staff with the Naval Facilities Engineering Systems Command (NAVFAC), Pacific (region; PAC) Pest Management Consultant (PMC) and ensure that all applicators have received appropriate certifications.
2. Supplement ongoing water quality testing to detect particulates and soluble chemicals in waters at PMRF. Testing should be conducted at least quarterly.
3. Establish a monitoring program for the nearshore environment of PMRF to inform future management decisions and monitor changes over time.
4. Partner with Department of Land and Natural Resources (DLNR) Division of Aquatic Resources (DAR) to incorporate regular monitoring site(s) in PMRF's nearshore waters into the State's regular monitoring schedule, as feasible.

When compared to the No Action Alternative, there is a minor beneficial impact associated with implementation of the 2023 INRMP on water resources because new erosion monitoring and control, improved dune protection, and new water quality testing and monitoring would improve the overall management and condition of water resources at Barking Sands.

3.3.1.3 Natural Hazards

Natural hazards at Barking Sands include hurricanes, tsunamis, flooding, landslides, and wildfire. For the purposes of this EA, the analysis will focus on wildfire and flooding, including flooding from sea level rise (SLR), as those are the only natural hazards for which a resource management action is planned. INRMP actions would not change or exacerbate the effect of other natural hazards, including tsunamis, hurricanes, and landslides at Barking Sands.

Affected Environment

Historically, wildfires were an uncommon natural occurrence in Hawai'i and did not play a significant ecological or evolutionary role in most Hawaiian ecosystems. However, the rapid spread of non-native grasses and fire-adapted species has changed the composition of many natural communities and has markedly increased fire frequency and size (Stone, Smith, and Tunison 1992). Wildfire is now a major threat to communities and natural resources in Hawai'i. Over the past decade, an average of over 1,000 wildfires has burned over 17,000 ac each year in Hawai'i (HWMO 2017).

Like many places in Hawai'i, fires are a major concern at Barking Sands Main Base due to the spread of non-native grasses and fire adapted species (NAVFAC PAC 2022). Based on statewide surveys conducted by the Hawai'i Wildfire Management Organization (HWMO), Barking Sands is in a high hazard fire area, associated with increased temperatures and high fuel levels. With increasing temperatures and high fuel

levels from non-native grasses and other vegetation, wildland fire intensity and frequency can be expected to increase throughout Kauaʻi.

The anticipated SLR from climate change is the primary driver of flood risk at Barking Sands. The Intergovernmental Panel on Climate Change predicts up to 3.2 ft of global SLR by the year 2100 if greenhouse gas (GHG) emissions continue to increase at the current rate (IPCC 2021). The SOH initiated efforts to assess Hawaiʻi's exposure to SLR and modeled chronic flooding hazards (coastal passive flooding, marine inundation, and coastal erosion) on the Main Hawaiian Islands (MHI). The modeling used the 3.2 ft SLR scenario to predict long-term (mid to latter half of this century) exposure to coastal hazards and SLR, and the 1.1 ft SLR scenario to depict current or short-term hazards. These chronic flooding hazards were combined to define the SLR exposure area (Hawaiʻi Climate Change Mitigation and Adaptation Commission 2017). Although past and future restoration management actions can help mitigate coastal dune erosion, the high wave energy along much of the Barking Sands shoreline, the predicted increases in storm surges, and SLR can potentially threaten the base's coastal infrastructure and natural and cultural resources.

In the coastal area of Kauaʻi where Barking Sands is located, the key impacts associated with SLR will be coastal flooding and wave inundation, erosion, and inland flooding (Codiga and Wager 2011). The extensive shoreline at several of the PMRF facilities will also be susceptible to tsunami inundation (Commander, Navy Region Hawaiʻi 2012). Impacts from inland flooding, saltwater intrusion, and some loss of seabirds and sea turtles nesting sites could be experienced as the result of SLR. Drainage issues from increases in the inundation of adjacent wetlands would be expected. State and county roads that provide primary access to all PMRF sites may not be usable due to flooding for weeks after a significant disaster (HHF Planners 2016). Climate change is also recognized by the USFWS as a specific threat to a number of the threatened and endangered species known to occur on or in the vicinity of PMRF including the short-tailed albatross (Section 3.3.2.4), Hawaiian monk seal (Section 3.3.2.6), green sea turtle (Section 3.3.2.6), and ʻōhai (*Sesbania tomentosa*) (Section 3.3.2.1).

Figure 5a illustrates the exposure areas under the 1.1 ft and 3.2 ft SLR scenarios at Barking Sands. SLR projections from the SOH Sea Level Rise Viewer depict potential future exposure areas for up to 3.2 ft of SLR (Figure 5a), which roughly corresponds to the 2100 Medium SLR Projection (Figure 5b).

According to a literature review of best practices in the selection of SLR projections for planning and decision making in Sweet et al. (2017), for situations where long-term risk management is a priority, planners should select a scientifically plausible upper bound for high value infrastructure planning (including military installations) and an intermediate estimate as a lower bound for lower-value assets and/or to account for the possibility of substantially reduced future emissions.

Shoreline erosion poses another hazard for PMRF. Though not considered in the SLR inundation mapping, shoreline change projections show that some areas of Barking Sands are vulnerable to shoreline erosion. The base is currently protected from shoreline fluctuations and overtopping by coastal dunes that run the entire length of the western boundary of the base. There is a natural variability of the shoreline position and dune size (width and height) based on wave climate, sediment transport patterns, wind, and storm seasonality; however, with SLR they are at increased risk of erosion. This can lead to dune breaching and overtopping, which would result in flooding of the base.

Barking Sands is only exposed to permanent inundation under the 2100 highest scenario (Figure 5c) but is already exposed to the 100-year storm surge under current conditions. Storm surge conditions are a stronger driver of flood risk on-base; it is unrealistic to assume that PMRF would not take action to

reduce storm surge exposure well before the base is exposed to permanent inundation. The highest projection of 2100 (8.2 ft of SLR) with a 100-year storm (Figure 5c) is the highest scenario considered and reflects best practices from National Oceanic and Atmospheric Administration (NOAA) guidance that planners should select a scientifically plausible upper bound for high value infrastructure planning (including military installations).

Under the 2100 highest scenario, there would be catastrophic flooding across the entire base. Nearly all roads on the base could be exposed to deep flooding (greater than 3 ft). Almost all potable underground water lines on base could be exposed to flooding. Most airport support buildings—including the control tower building—could be within the area inundated.

Environmental Consequences

No Action Alternative

Current management actions implemented under the 2010 INRMP at Barking Sands to prevent natural hazards include wildland fire control as well as drainage pumps and ditch maintenance. The current strategies include:

1. Wildland Fire Control: Clear vegetation from around the launch pads and wet the vegetation near the launch pads just prior to launch to prevent wildland fires. Provide emergency fire crews during launches to extinguish any fire and minimize its effects.
2. Drainage Pumps and Ditch Maintenance: Continue to maintain the drainage pumps and ditches located within the 200-ac (81-ha) lease area. Continue to lease land at Barking Sands in order to maintain the drainage pumps and ditches to prevent flooding of the facility.

The continued implementation of the 2010 INRMP would result in a beneficial impact on natural hazards at Barking Sands, as the management actions mitigate the risk of wildland fire and flooding to surrounding areas.

Preferred Alternative

Actions proposed for implementation under the 2023 INRMP to mitigate wildland fire at Barking Sands include the following strategies:

1. Coordinate with the PMRF Fire Department on developing updates to the existing Fire Management Plan.
2. Remove deadfall in high-risk areas including near the Barking Sands missile launch site and the Kamokalā Ridge Magazines and replant with native, low fire risk species.

Compared to the No Action Alternative, these actions would have a beneficial impact on wildland fire management as updates to the existing Fire Management Plan and revegetation with low fire risk species would further reduce the threat of wildfire at the site.

New erosion control and dune protection measures under the Preferred Alternative, described in Section 3.3.1.1, would further protect the dunes, which serve as a natural barrier to coastal flooding.

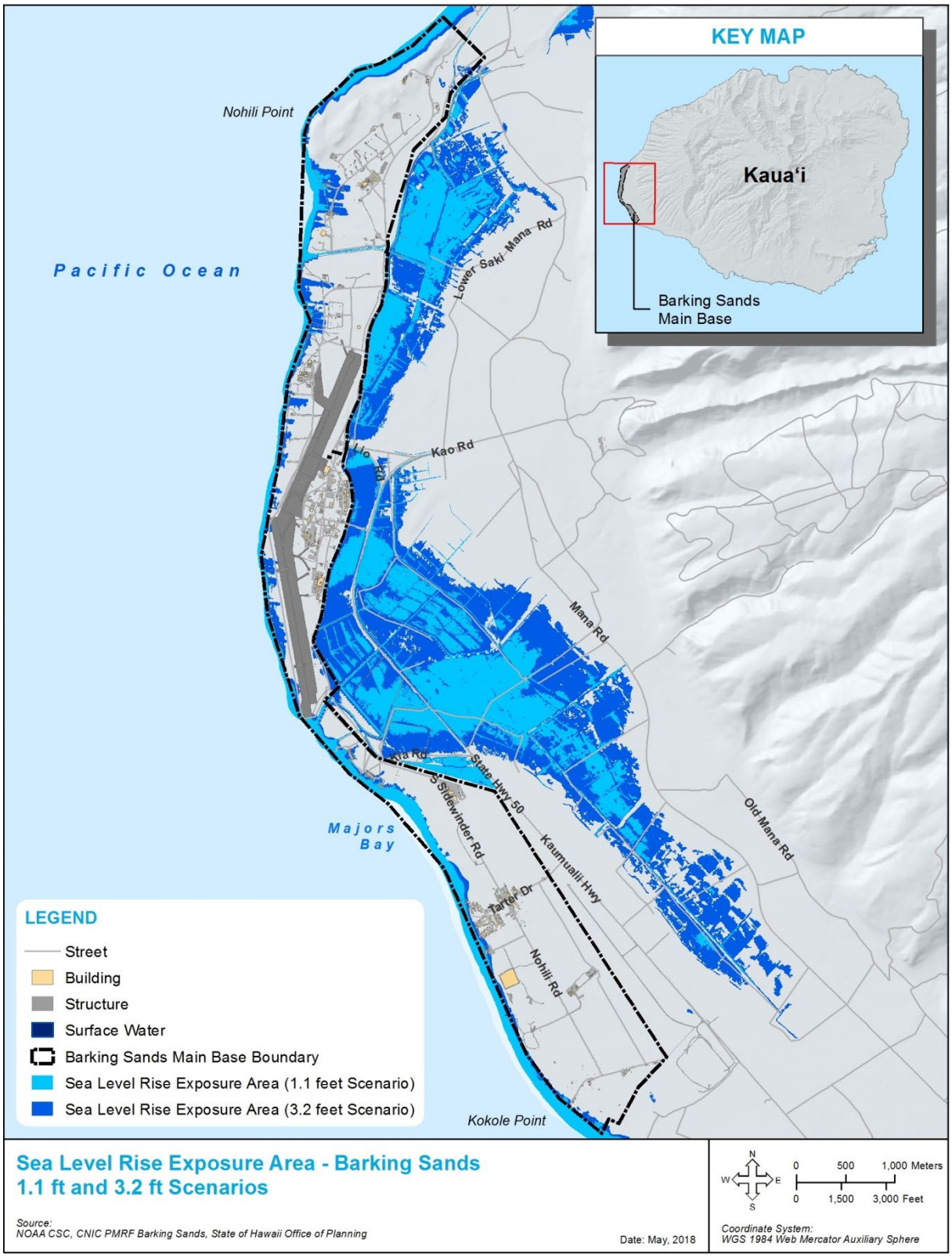


Figure 5a Barking Sands Exposure Areas Resulting from Sea Level Rise Scenarios (Tetra Tech, Inc. and University of Hawai'i Coastal Geology Group (2017) and CNIC PMRF (2018))

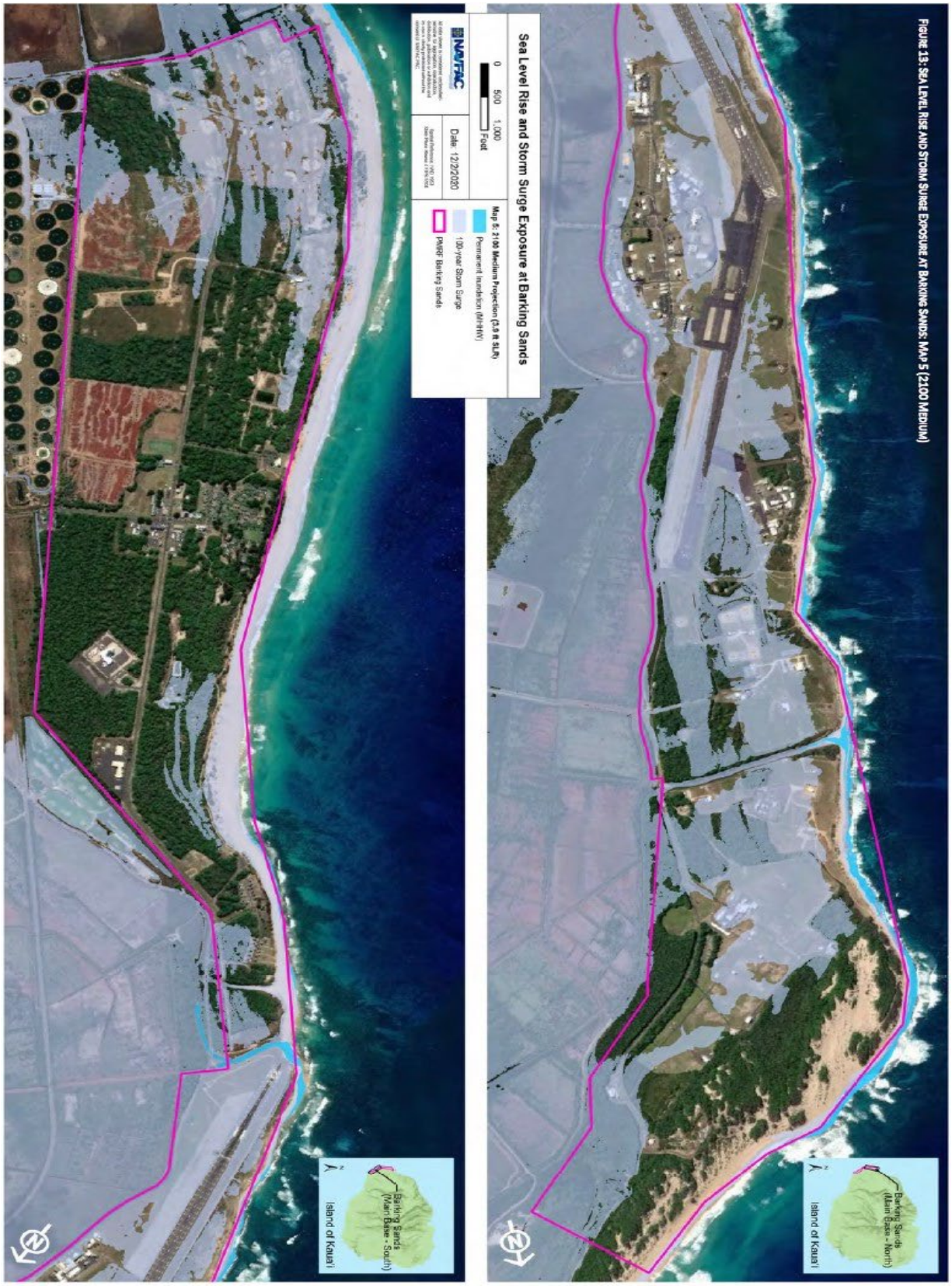


Figure 5b Barking Sands 3.9 ft SLR + MHHW 2100 Medium

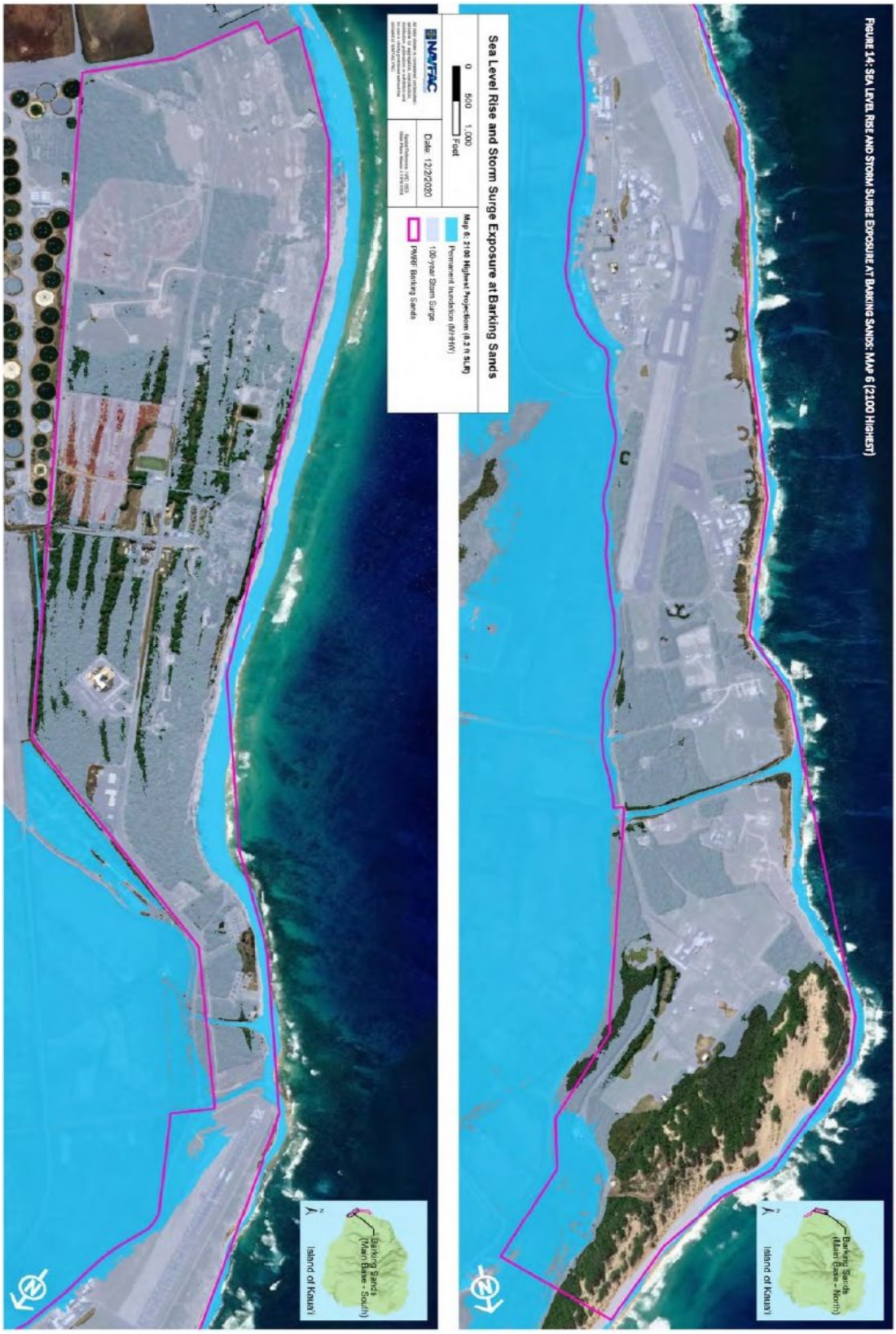


Figure 5c Barking Sands 8.2 ft SLR + MHHW 2100 Highest

3.3.1.4 Climate Change

Affected Environment

The increasing concentration of GHGs caused by human activities is a strong driver for global climate change (IPCC 2021). EO 13693 was issued in 2015 with the goal to reduce federal agency direct GHG emissions by at least 40 percent over the next decade from 2008 levels. In response to EO 13693, DoD set a target to reduce its GHG emissions by 25 percent by 2025 (DoD 2016). In 2016, the CEQ released final guidance for federal agencies on how they should consider the impacts of their actions on global climate change in their NEPA reviews. This final guidance recommended that agencies consider the potential effects of a Preferred Alternative on climate change by assessing GHG emissions and, vice versa, the effects of climate change on a Preferred Alternative and its environmental impacts. On January 20, 2021, EO 13990 titled, "Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis," was signed by the President. The potential impacts of the Preferred Alternative on climate change are considered in this section. Section 3.3.1.3 analyzes the impacts of climate change on the Preferred Alternative (e.g., erosion, flooding, SLR). Climate change is also discussed in depth in Section 5.3.4 of the 2023 INRMP.

Environmental Consequences

No Action Alternative

Impacts from GHG emissions are additive by nature, as individual emission sources are generally not large enough to have an impact on global climate change. GHG emissions resulting from the No Action Alternative would be primarily from vehicular trips made for natural resource survey purposes and, as individual sources, would not be large enough to have an appreciable effect on climate change. The continued implementation of the 2010 INRMP would have no impact on climate change.

Preferred Alternative

Impacts from GHG emissions are additive by nature, as individual emission sources are generally not large enough to have an impact on global climate change. GHG emissions resulting from the Preferred Alternative would be primarily from vehicular trips made for natural resource survey purposes and, as individual sources, would not be large enough to have an appreciable effect on climate change. Therefore, implementation of the Preferred Alternative would have no impact on climate change.

3.3.2 Biological Environment

The following section covers the flora and fauna that could occur at Barking Sands Main Base, including birds that fly over the project area. Identified habitat for the special species found at Barking Sands is shown in Figure 6. While the figure identifies the primary habitat locations for each species, there is potential for each species to be found outside the range identified in the figure.

3.3.2.1 Vegetation

Affected Environment

The vegetation present at the Barking Sands Facility was determined by botanical surveys conducted in 2000 and 2006, and a habitat classification and mapping effort was conducted at Barking Sands in 2005 (Table 8) (NAVFAC PAC 2005; 2006; Char 2000). Critical habitat has been designated for Ni'ihau panicgrass within the Barking Sands site (Figure 6) and the vegetation cover types identified within the site are provided in Table 8 and Figure 7. For a full list of plant species present at Barking Sands, see Appendix C of the 2023 INRMP (NAVFAC PAC 2022).

Wetland vegetation is also present at the Barking Sands Main Base. Various waterbirds, including two federally listed endangered birds (Section 3.3.2.4) utilize the small wetland area. Large, often floating mats of non-native species including seashore paspalum (*Paspalum vaginatum*) line the ditches. The lower banks of the ditches contain dense thickets of Indian fleabane (*Pluchea indica*) and mats of California grass (*Brachiaria mutica*), while the tops of the banks are lined with a narrow band of koa haole, long-thorn kiawe, and milo (*Thespesia populnea*).

There is no documentation of plant species federally listed under the ESA at the Barking Sands facility. However, potential special status species at Barking Sands include endangered Niʻihau panicgrass or lauʻehu and endangered Oʻahu riverhemp or ʻōhai.

Niʻihau panicgrass critical habitat is designated along PMRF's coastal strand habitat (Figure 6). However, the critical habitat is currently unoccupied by the species. The nearest known location is at Polihale State Park, just north of Barking Sands Main Base (USFWS 2008b).

Niʻihau panicgrass is endemic to the islands of Niʻihau and Kauaʻi and is federally listed as endangered under the ESA. Threats to Niʻihau panicgrass and its habitat include unauthorized off-road vehicle use and SLR encroaching on native habitat.

Major threats and concerns for native plants include habitat encroachment from development or invasive species, as well as the destruction of native and protected plant species and habitat from issues such as off-road vehicles, and climate change (Section 3.3.1.4).

Table 8 Vegetation Cover Types at Barking Sands

Cover Type	Native/Non-native	Area ac (ha)	Percent of Area
Agave	Non-native	2.3 (0.9)	0.10%
Agriculture	Non-native	22.5 (9.1)	0.96%
Long-thorn Kiawe (Long-thorn Algaroba)	Non-native	13.2 (5.3)	0.56%
Grass, Herb, Shrub	Non-native	0.3 (0.1)	0.01%
Kiawe Koa Haole Scrub	Non-native	1053.1 (426.2)	45.03%
Landscaped	Non-native	921.7 (373.0)	39.41%
Ruderal	Non-native	73.3 (29.7)	3.13%
Wetland Vegetation with Koa Haole	Non-native	25.3 (10.2)	1.08%
Aalii-Nama Scrub	Native	145.5 (58.9)	6.22%
ʻAkiʻaki (beach dropseed)	Native	0.2 (0.1)	0.01%
Naupaka	Native	20.9 (8.5)	0.89%
Naupaka, Ipomea	Native	0.5 (0.2)	0.02%
Pōhinahina	Native	1.8 (0.7)	0.08%
Pōhinahina-Naupaka Dune	Native	57.5 (23.3)	2.46%
Ipomoea	Native and Non-native	0.4 (0.2)	0.02%
Total	—	**2338.5 (946.4)**	**100.00%**

Source: NAVFAC PAC 2005.

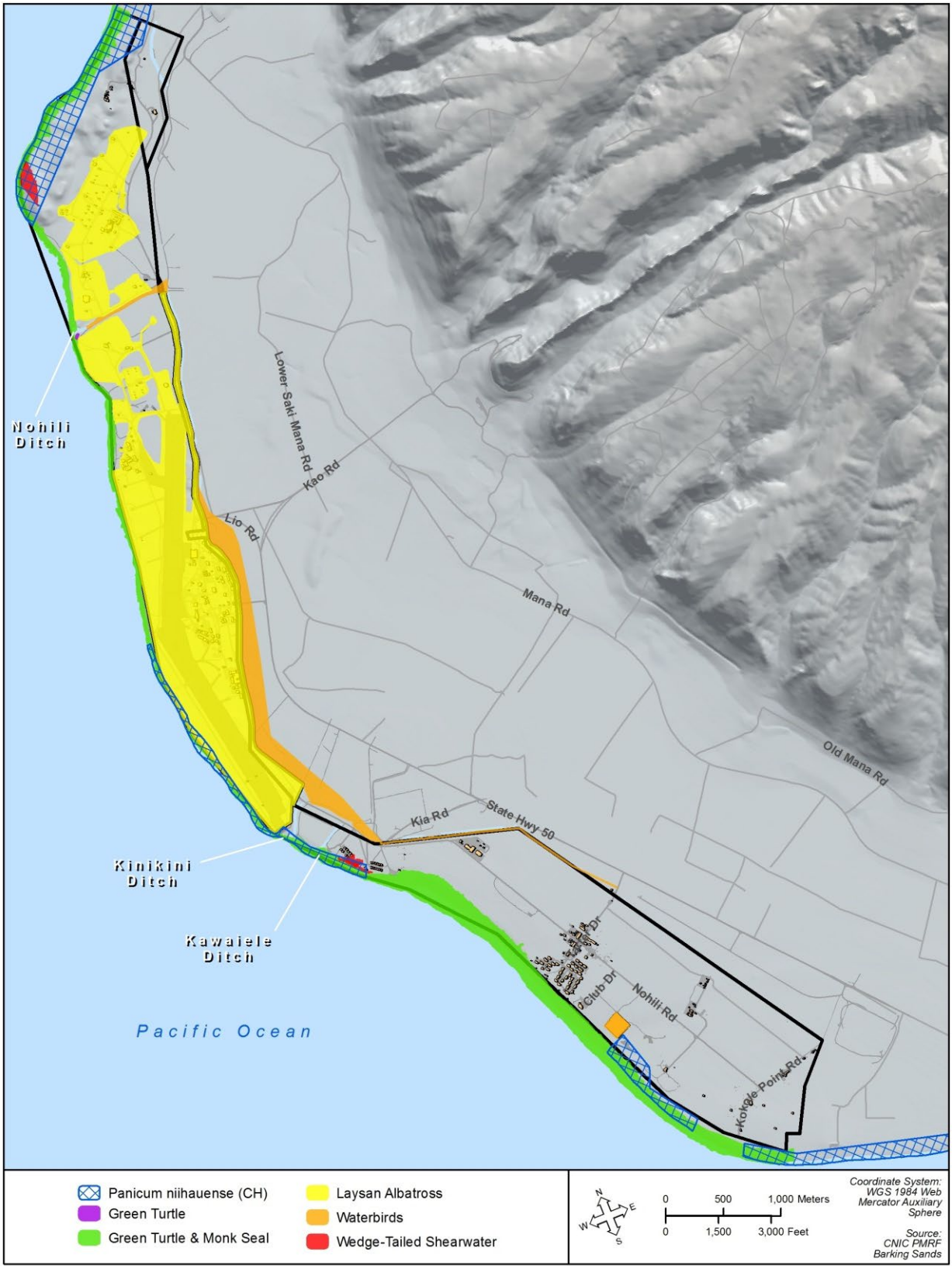


Figure 6 Protected Species General Habitat Location at Barking Sands

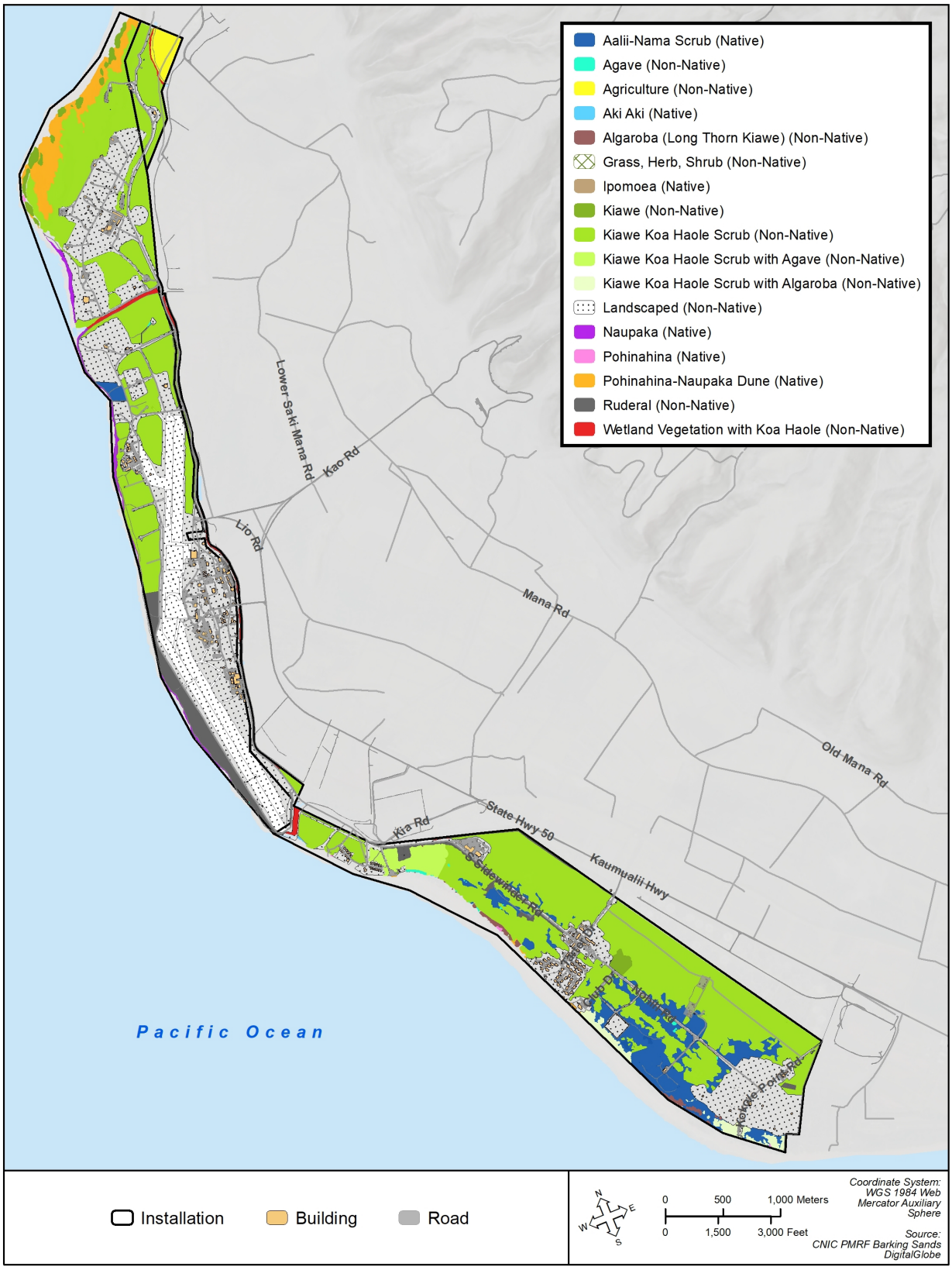


Figure 7 Vegetation Cover Types at Barking Sands

Environmental Consequences

Invasive Plant Management

No Action Alternative

To manage and prevent the spread of invasive, noxious, and priority invasive species, PMRF implemented the following actions at Barking Sands facilities.

1. Invasive Species Prevention and Control: Continue all invasive species prevention and control actions. Continue to work with Kaua'i Invasive Species Council (KISC) and other stakeholders on a coordinated approach to alien plant species control for Barking Sands. Continue preventive measures to avoid the introduction of alien species and inadvertent destruction of the environment via cargo on inbound aircraft.
2. Develop a Biosecurity Program: Prohibit living plant materials from being brought to Hawai'i from outside the State. Pressure-wash all Navy and contractor vehicles coming to Hawai'i on the mainland or point of origin to minimize the amount of seeds or propagules of non-native species being transported. Inspect all construction materials including sand, gravel, aggregate, or road base and certify that such materials are weed free prior to transport. Monitor to detect, assess, and eliminate non-native species on a regular basis. Continue efforts to establish native vegetation in areas where non-native vegetation is present.
3. Critical Habitat and Dune Vegetation Restoration Project: Continue to eradicate and control long-thorn kiawe.

The continued implementation of the 2010 INRMP would result in a beneficial impact on vegetation at Barking Sands, as the management actions reduce populations of harmful species.

Preferred Alternative

To minimize and prevent the encroachment of invasive species into protected species habitats and other priority native vegetation cover types to the greatest extent practicable, PMRF proposes to implement the following strategies:

1. Include biosecurity requirements and provisions in BOS and construction contracts to reduce the risk of introduction of invasive species and plant diseases.
2. Ensure that species identified as invasive in Hawai'i, including those on the Plant Pono "Black List", are not utilized for landscaping or erosion control projects by developing a Landscaping Guide to include in all base contracts, integrate into the installation appearance plan, and provide to project managers that specifies an approval process for species selection.
3. Ensure early detection and a rapid response to invasive plant species through a minimum of annual surveys at all high-risk and sensitive areas.
4. Conduct removal of invasive plant species in sensitive areas, monitor for re-growth, and restore using out-plantings, if necessary, with a target of 80 percent reduction in invasive species within the areas of concern.
5. Decrease driving on dune vegetation, which can further increase the spread of invasive species into native habitats; continue to prohibit driving in designated Ni'ihau panicgrass critical habitat and culturally sensitive areas.
6. Strive to find new opportunities to collaborate with partners on removing invasive and exotic vegetation and planting opportunities.
7. Ensure that post planting care, including irrigation, invasive plant/weed control, and long-term monitoring and maintenance is implemented for all native plant restoration projects.

8. Conduct removal of invasive plant species in sensitive areas, monitor for re-growth, and restore using out-plantings, if necessary, with a target of 80% reduction in invasive species within the areas of concern.

The above actions would add to the continued implementation of ongoing management strategies resulting in a beneficial impact on managing invasive plants at Barking Sands when compared to the No Action Alternative.

Native Plant Management

No Action Alternative

Under the 2010 INRMP, the following management actions address native plant management at Barking Sands:

1. *Landscape Design:* Use native plants whenever possible and use sterile soil to prevent the introduction of weeds. Plant a variety of native trees, shrubs, and ground covers. Continue to evaluate all future landscape design and installation projects for the potential to include habitat restoration and the use of native plants whenever possible.
2. *Protection of Natural Resources in Undeveloped Areas:* Review construction and maintenance projects to ensure contractors are aware of guidelines to avoid impacting sensitive vegetation.
3. *Native Medicinal Plant Garden Development/Maintenance:* Continue to maintain the native medicinal plant garden/display in the grassy area adjacent to the new Pass and Identification building at the Tartar Drive Gate (Main Gate).
4. *Plant Nursery Development:* Establish a plant nursery at Barking Sands to propagate native plants for landscaping and habitat restoration in cooperation with The National Tropical Botanical Garden.
5. *Critical Habitat and Dune Vegetation Restoration Project:* Conduct on-site dune vegetation restoration at Barking Sands through removal of kiawe, koa haole, and other invasive vegetation to include buffelgrass, crown flower, and golden-crown beard.
6. *Beach and Dune Access Restrictions:* Continue to avoid disturbing dune areas in order to maintain native vegetation, including *Nama*. Monitor for excessive traffic at areas adjacent to the beach cottages and other high-use recreational areas and, if necessary, cord off those areas to re-establish vegetation. Continue to prohibit off-road vehicle usage on the beach, and minimize usage by security personnel, to allow for reestablishment of native dune vegetation such as beach morning glory, pōhinahina, and paʻu o hiʻiaka.

Continued implementation of the No Action alternative would have a beneficial impact on native plants or native plant habitat at Barking Sands by encouraging the use of native plants for landscaping and by preventing disturbance of sensitive areas.

Preferred Alternative

The 2023 INRMP proposes the following strategies to conserve and enhance native plant communities to the greatest extent practical:

1. Update baseline floral surveys to improve understanding of plant community at PMRF.
2. Ensure and assist in the selection of locally sourced, non-invasive, and preferably native species, with a minimum of 50 percent native species for all new landscape planting projects by 2022 and 100 percent by 2028 while adhering to BASH requirements.

3. Ensure that post planting care, including irrigation, invasive plant/weed control, and long-term monitoring and maintenance is implemented for all native plant restoration projects.
4. Identify suitable locations for planting native Hawaiian plants, particularly those that benefit native pollinators in support of national pollinator objectives.
5. Strive to find new opportunities to collaborate with partners on removing invasive and exotic vegetation and planting opportunities.
6. The PMRF IEPD and NRM should continue to be the points of contact to provide relevant information on issues with potential to affect wildlife and native habitat, such as military operations and training, and tower and other construction and repair projects.
7. Mitigate and prevent erosion of coastal dune habitat by out-planting, establishing, and monitoring native dune building plants in areas identified as having erosion issues.

The above actions would have beneficial impacts on native plants and native plant habitat at Barking Sands when compared to the No Action Alternative, as they increase the viability and population numbers of native plants at Barking Sands.

Ni‘ihau Panicgrass (or Lau‘ehu)

No Action Alternative

There are no actions implemented under the 2010 INRMP that could affect Ni‘ihau panicgrass resources at Barking Sands; therefore, there are no impacts.

Preferred Alternative

To provide a conservation benefit to Ni‘ihau panicgrass critical habitat, the following strategies are proposed under the 2023 INRMP:

1. Work to improve protection, habitat and/or consider out-planting Ni‘ihau panicgrass. Protections will be aimed at preventing unauthorized off-road vehicle use and invasive plant removal, and to demonstrate benefit to the species.
2. Out-plant native species and remove invasive species in areas with suitable Ni‘ihau panicgrass habitat and ensure an irrigation system is in place until plants become well established.
3. Consider undergoing the approval process to out-plant the endangered Ni‘ihau panicgrass in the effort to remove or reduce amount of PMRF property designated as critical habitat for the species. Coordinate with Federal and State partners to secure material for out-planting if pursued.

The above actions likely would have a moderate beneficial impact on Ni‘ihau panicgrass and its unoccupied critical habitat at Barking Sands when compared to the No Action Alternative.

3.3.2.2 Nuisance and Invasive Animals

Affected Environment

Feral cats, roof (black) rats, Polynesian rats, and common house mice were documented during wildlife studies and regular biological monitoring. During wildlife studies, signs also indicated the presence of feral pigs and black tailed deer. Some of these species pose serious threats to native wildlife.

The invasive common house mouse (*Mus musculus*) was found at Barking Sands in recent biological surveys. The house mouse is considered abundant and relatively common in Hawaiian ecosystems. Recent research indicates that house mice can have population-wide deleterious effects on seabirds and can cause significant injury to native plants, invertebrates, and other native bird species (USFWS 2017).

Other nuisance species present at Barking Sands include the non-native barn owl (*Tyto alba*), and the cattle egret (*Bubulcus ibis*)—these species are listed under the USFWS control order as they are known to predate other native species (50 C.F.R. Section 21.55). Under this order, all PMRF facilities are covered for take of these two Migratory Bird Treaty Act (MBTA) species.

The coconut rhinoceros beetle (*Oryctes rhinoceros*) is considered an injurious wildlife species and is designated by the SOH Department of Agriculture (HDOA) as a pest for control (Hawai‘i Administrative Rule [HAR] 69A). The beetle is considered a major pest and there is potential for extensive damage if the species establishes itself. Although the coconut rhinoceros beetle has never been detected on Kaua‘i, there is potential for beetles to make their way to PMRF via air traffic from O‘ahu or Guam.

The little fire ant is also considered an injurious wildlife species (HAR 124) and is listed by HDOA as a pest for control (HAR 69A). Populations are currently limited to areas on the northern shore of Kaua‘i.

Environmental Consequences

No Action Alternative

Nuisance and invasive animal management actions implemented under the 2010 INRMP include the following:

1. Base-wide Predator Control: Continue base-wide predator control (dogs, cats, owls, rodents, barn owls, and cattle egrets) to protect both native and endangered species.
2. Invasive Species Prevention and Control: Continue all invasive species prevention and control actions. Continue to work with KISC and other stakeholders on a coordinated approach to alien plant species control for Barking Sands. Continue preventive measures to avoid the introduction of alien species and inadvertent destruction of the environment via cargo on inbound aircraft.
3. Develop a Biosecurity Program: Prohibit eggs and invertebrates (insects, snails and slugs) from being brought to Hawai‘i from outside the State. Pressure wash all Navy and contractor vehicles coming to Hawai‘i on the mainland or point of origin to minimize the amount of eggs or invertebrates of non-native species being transported. Inspect all construction materials including sand, gravel, aggregate, or road base and certify that such materials are invertebrate free prior to transport. Monitor to detect, assess, and eliminate non-native species on a regular basis.

The continued implementation of the 2010 INRMP would result in a beneficial impact on nuisance and invasive animal management at Barking Sands, as the management actions reduce populations of harmful species.

Preferred Alternative

The 2023 INRMP proposes the following management actions to control nuisance and invasive animal species.

1. Continue to fund control measures for non-native predator species at Barking Sands, Mākaha Ridge Tracking Station, and Kōke‘e Site C (PMRF Biological Opinion [BO], 2014).
2. Develop a PMRF Biosecurity Plan and include those requirements and provisions in BOS and construction contracts to ensure invasive ants, frogs, and other non-native wildlife are not introduced via equipment or landscaping efforts.
3. Increase outreach to base personnel on reporting and early detection for invasive species not yet established at PMRF. Ensure all observations or reports of high-risk invasive species are communicated to KISC and to all other appropriate contacts.

4. Conduct surveys to improve baseline knowledge of populations of invasive animals at PMRF.
5. Work with partner organizations to identify sources of feral cats and dogs off base to reduce the population of these non-native predators.
6. Consider partnering with the DLNR Division of Forestry and Wildlife (DOFAW) to do auditory predator deterrent studies on base and utilize the technology at PMRF if proven to be effective against predators.
7. Conduct ant surveys to assess presence of invasive ants including the little fire ants at the Nohili Dune's wedge-tailed shearwater colony. If little fire ants are detected, report to KISC and implement active control by using granular bait after fledglings have left the area.
8. Increase outreach about the hazards of feeding feral/invasive species with all personnel on PMRF and assist in the enforcement of such policies by practicing good communication with Security.
9. Continue to partner with the HDOA to ensure coconut rhinoceros beetle traps are checked and maintained at PMRF.

These measures would have a beneficial impact on nuisance and invasive animal management when compared with the No Action alternative because they would improve baseline knowledge of invasive species and reduce populations of common and problematic species.

3.3.2.3 Bats

Affected Environment

The only native terrestrial mammal in the SOH is the Hawaiian hoary bat (or ʻōpeʻapeʻa). The Hawaiian hoary bat is listed as endangered under the ESA. It has been documented year-round on the base and is most commonly found in the winter. The ʻōpeʻapeʻa roosts, forages, and may breed at Barking Sands. Breeding season occurs during the months of September through December, and pupping occurs from June through September. During studies conducted at all PMRF facilities, the bat exhibited highest occupancy from September through February. Barking Sands Main base supports suitable habitat for roosting and foraging, and is likely used for breeding, pupping, and rearing. Threats to the bat include habitat loss and mortality from barbed wire fences and radar transmissions.

Environmental Consequences

No Action Alternative

Management actions implemented under the 2010 INRMP for the Hawaiian hoary bat include the following:

1. Hawaiian Hoary Bats: Prior to the operation of radar units at Barking Sands at nighttime, personnel will visually survey for bats in the area of impact using Anabat, or closed-circuit television cameras.

The continued implementation of the 2010 INRMP would result in a beneficial impact on the Hawaiian hoary bat at Barking Sands by minimizing or preventing the adverse effects of radar operation on bats.

Preferred Alternative

The 2023 INRMP proposed the following activities, based on findings of the 2014 PMRF BO, to reduce impacts to the Hawaiian hoary bat:

1. Continue to avoid and minimize effects of base infrastructure, operations, and maintenance on Hawaiian hoary bats, by ensuring that trimming or removal of woody plants greater than 15 ft

tall is conducted outside of the Hawaiian hoary bat pupping season of 1 June to 15 September to avoid impacting bat pups.

2. Conduct follow-up acoustic surveys for Hawaiian hoary bats every 5 years. If bat roosting and pupping sites are of interest for management of the species, then a mist netting and tracking study could be performed, if warranted.
3. Work with USFWS to develop and implement a standard operating procedure (SOP) for bat roosting surveys if base operations warrant the need to remove and trim trees greater than 15 ft tall during the Hawaiian hoary bat pupping season.

The activities proposed under the 2023 INRMP, including restriction on the season of vegetation trimming, follow-up acoustic surveys, and development of SOPs for bat roosting surveys, would have a beneficial impact on the Hawaiian hoary bat when compared to the No Action alternative.

3.3.2.4 Birds

Affected Environment

Avian surveys conducted at Barking Sands have identified 54 species of birds (Bruner 2000; Hamer Environmental L.P. 2016; NAVFAC PAC 2006; PMRF 2018). Of these, 25 are native and 29 are non-native, though many have become naturalized on Kaua‘i (Pyle and Pyle 2017). Although non-native, most of these species are migratory and protected by the MBTA. In addition to formal surveys, PMRF natural resource biologists record incidental observations of listed species on a routine basis. These species are listed in Appendix C of the INRMP (NAVFAC PAC 2022).

Nine bird species listed as threatened or endangered under the ESA have been observed, and although the short-tailed albatross was the only seabird species observed during formal biological surveys, other seabirds are present in the vicinity and have the potential to fly over and/or are known to fallout on base. Fallout occurs when migratory birds do not reach their destination for a variety of reasons. Fallout may occur because of artificial light attraction, for which seabirds are particularly vulnerable. The effect of night lighting on seabirds is a major concern, as seabirds can be attracted to and disoriented by lights. When attracted to man-made lights, the birds, in particular fledglings, may become confused, collide with obstructions, or circle the artificial light until exhausted, resulting in fallout. Table 9 presents avifaunal species listed under the ESA that are known to occur on or adjacent to PMRF, as fly-overs, or in the nearshore waters of Barking Sands.

Major Threats

BASH concerns are applicable to all bird species present at Barking Sands. Table 10 lists threats to at-risk species.

Table 9 Endangered and Threatened Bird Species Present at Barking Sands

Type	Scientific Name	Common Name	Hawaiian Name	Federal Protection Status *
Seabirds	*Oceanodroma castro*	Band-rumped storm-petrel**	ʻAkēʻakē	E
Seabirds	*Phoebastria albatrus*	Short-tailed albatross**	—	E
Seabirds	*Pterodroma phaeopygia sandwichensis*	Hawaiian petrel**	ʻUaʻu	E
Seabirds	*Puffinus auricularis newelli*	Newell's shearwater**	ʻAʻo	T
Hawaiian Waterbirds	*Anas wyvilliana*	Hawaiian duck	Koloa maoli	E
Hawaiian Waterbirds	*Fulica alai*	Hawaiian coot	ʻAlae keʻokeʻo	E
Hawaiian Waterbirds	*Gallinula chloropus sandvicensis*	Hawaiian moorhen	ʻAlae ʻula	E
Hawaiian Waterbirds	*Himantopus mexicanus knudseni*	Hawaiian stilt	Aeʻo	E
Other	*Branta sandvicensis*	Hawaiian goose	Nēnē	T

*Federally listed under the ESA as E = Endangered, T = Threatened.
**Potential to fly over and/or known fallout on base.

Table 10 Threats to Special Status Bird Species

Bird Group or Species	Threats
Endangered Seabirds	BASH concerns, attraction to artificial light sources, and the striking of towers, powerlines, and antennas, and guy wires.
Laysan Albatross	See seabird concerns, predation of albatross by pigs and dogs.
Wedge-tailed Shearwater	See seabird concerns, negative human interactions (burrows crushed by foot traffic), habitat degradation.
Hawaiian Waterbirds	BASH concerns, avian botulism, threats to nest sites, vehicle strikes, vegetation removal, habitat degradation.
Hawaiian Goose	BASH concerns and airfield operations, vehicular strikes, nest site vulnerability, mortality or injury due to maintenance activities—specifically vegetation clearing, feeding of nēnē or nēnē inadvertently eating food thrown out by base personnel or visitors, and predators (feral pigs and dogs).
Migratory Birds	BASH concerns, development and habitat fragmentation.

Endangered and Threatened Seabirds

Endangered seabirds spend a large part of the year at sea, forage in the open ocean, and breed on Kauaʻi. Beginning in March and April, adults initiate breeding in colonial nesting grounds at high elevations in the interior portions of the island and fly over PMRF when traveling between nesting and foraging areas. Fledglings travel from the nesting colony to the sea in the fall, with potential to fly near PMRF. These species only fly to and from their burrows at night and depend on the moon and starlight for navigation. Due to this, the presence of unshielded lighting along their flyways can result in confusion and disorientation.

Based on radar surveys conducted by DOFAW from 2004 to 2008, an average of 15 nocturnal seabirds per hour flew over Kekaha and the Mā‘ā Plain (NAVFAC PAC 2022). A 2015 radar study at Barking Sands found lower numbers of birds passing over the base compared to other sites on Kaua‘i with an average of two target species per hour for the fall fledgling season. Passage rates were found to peak in early October, and during the fall fledging season. There are significant numbers of Newell's shearwater and Hawaiian petrel (*Pterodroma phaeopygia sandwichensis*) passing over and near the base with an estimated mean of 92 per night and an estimated total of 5,128 during the 2016 fall sampling period (Hamer Environmental L.P. 2016; NAVFAC PAC 2022).

Laysan Albatross and Wedge-tailed Shearwater

Other at-risk seabird species at Barking Sands include the Laysan albatross and the wedge-tailed shearwater. The Laysan albatross is a breeding visitor commonly observed during nesting season from Nohili ditch to north end of base. The Laysan albatross breeds in the months of November and December and fledges from June to July. The wedge tailed shearwater is also a breeding visitor and has three active nesting colonies on Barking Sands—Nohili Dunes, Kinikini Ditch, and the beach cottages area. The wedge-tailed shearwater's breeding season takes place from March to June and fledging occurs between mid-November and early-December.

Endangered Hawaiian Waterbirds

Endangered Hawaiian waterbirds utilize wetland areas adjacent to PMRF including the Kawai‘ele Waterbird Sanctuary and Mā‘ā Plains Forest Reserve, as well as the Mā‘ā Plain ditch system and ditches bordering PMRF property. On Barking Sands, they are generally limited to the PMRF oxidation pond complex, ditches, and beaches. All species of endangered Hawaiian waterbirds, except Hawaiian stilts, have been recorded nesting at PMRF.

Hawaiian Goose (Nēnē)

The nēnē, a year-round resident, occurs throughout Barking Sands, and is most commonly observed at the oxidation pond complex. Nesting activities have increased since 2009 (1 nest), to 39 nests in the 2021-2022 breeding season.

Migratory Birds

Several native migratory birds are known to fly-over or occur within Barking Sands for part of the year. These birds are federally protected under the MBTA. Some of these species use the islands actively for nesting, others use the Hawaiian Islands for the wintering grounds, and other MBTA birds are endemic. For a complete list of MBTA protected bird species, see the 2023 INRMP (NAVFAC PAC 2022).

Environmental Consequences

Endangered and Threatened Seabirds

No Action Alternative

Current management actions associated with the 2010 INRMP include:

1. Nocturnal Seabird Fallout Monitoring and Management: Consult with USFWS regarding fallout minimization and mitigation.

2. Use of Green Lights and Light Shielding to Protect Seabirds: Install and operate green bulbs, when plausible. Where green lights are not feasible, include shielding of white lights, install motion sensor lights, and determine areas where lights may be safely turned off.
3. Fauna Surveys Update/Initiate. Update fauna surveys and mapping, including protected bird species, in preparation for subsequent INRMP updates. Continue to coordinate with DOFAW to collect population-monitoring data for protected species.

The continued implementation of the 2010 INRMP would result in a beneficial impact on seabirds, as the management actions improve the long-term viability of populations present at Barking Sands.

Preferred Alternative

To avoid or minimize negative impacts to federally listed and endangered seabird species, the 2023 INRMP proposes the following strategies:

1. Continue to promote base-wide awareness and implementation of the PMRF Dark Skies Program (PMRF BO, 2018) through early annual trainings.
2. Continue to improve the Dark Skies Program lighting waiver system and grant standing waivers where applicable to stream-line the waiver process.
3. Continue Dark Skies implementation in areas adjacent to colonial nesting grounds at high elevation nesting sites during critical fledging timeframes.
4. Conduct systematic ground searches for fallen out seabirds after high-risk night operations.
5. Incorporate results of radar studies into future programs.
6. Pursue avenues to provide funding to Save Our Shearwaters (SOS) to assist with seabird rehabilitation costs.
7. Continue to host a SOS shearwater aid station at PMRF and monitor station during business days with SOS monitoring on weekends and holidays (PMRF BO, 2014).
8. Advise various tenants on base on appropriate safety lighting that is less attractive to endangered seabirds (i.e., motion sensing lights that go off after a set time period, shielded lights, facing light away from the coast, lower lumen, and lower to the ground).
9. Provide a 10-year calendar to mission planners with high-risk dates for endangered seabird fallout clearly depicted.
10. Develop a Wildlife Friendly Lighting Guide for installation personnel and tenants to assist in planning for lighting needs.

Implementation of the actions proposed in the revised 2023 INRMP would have a beneficial impact on endangered seabirds when compared with the No Action alternative because of improvements to the Dark Skies Program and continued support for SOS.

Laysan Albatross

No Action Alternative

Active management of the Laysan albatross is necessary as the birds are a serious BASH concern for air operations at PMRF. In response to BASH concerns, PMRF Barking Sands currently implements the following management activities under the 2010 INRMP.

1. Base-wide Predator Control: Continue base-wide predator control (dogs, cats, owls, rodents, barn owls, and cattle egrets) to protect MBTA-protected Laysan albatross on the installation.
2. Bird Aircraft Strike Hazard: Continue hazing program under the U.S. Department of Agriculture-Wildlife Services (USDA-WS) permit. Capture and relocate Laysan albatross found at Barking Sands to off-base locations. Continue the egg translocation at Barking Sands by removing Laysan albatross nests and placing them in incubators to be translocated to foster nests at KPNRW and

on private lands. Adopt similar policies for black-footed albatross to that of Laysan albatross to balance protection of the species with BASH requirements, if nesting shall occur in the area.

Continued implementation of the 2010 INRMP would result in a beneficial impact on Laysan albatross as management actions improve the long-term viability of populations present at Barking Sands.

Preferred Alternative

To minimize the impacts to Laysan albatross, while also providing flexibility for training and operations, the 2023 INRMP proposes the following strategies:

1. Continue the PMRF Laysan Albatross Egg Swap program (described above).
2. Work with partners to ensure that as many albatross eggs as possible stay on Kaua'i and find new suitable location for egg relocation.
3. Continue to translocate albatross to the north shore of Kaua'i daily from January-April.
4. Coordinate with DOFAW on potential new albatross release sites.
5. Closely monitor re-sights of translocated albatross by working with partners on the north shore of Kaua'i to enter data into the Airtable app database.
6. Use data analysis to assess the effectiveness of albatross translocations based on location of translocation, time of year, and whether the albatross is a known breeder, sub-adult, or new bird to PMRF.
7. Support research on the PMRF Laysan albatross population that increases the understanding of their behavior as it relates to the PMRF airfield.
8. Continue base-wide predator control to protect MBTA-listed species including Laysan albatross; monitor for pigs, dogs, and cats in known breeding areas prior to the albatross breeding season and increase control efforts as needed.

Implementation of the actions proposed in the 2023 INRMP would have a beneficial impact on the Laysan albatross compared to activities of the No Action Alternative due to increased monitoring and control activities and improved data analysis.

Wedge-tailed Shearwater

No Action Alternative

To address wedge-tailed shearwater threats, PMRF Barking Sands currently implements the following management activities under the 2010 INRMP.

1. *Enhance and Improve Beach Cottages Shearwater Colony:* Maintain and enhance the shearwater colony. Continue to have USDA-WS remove barn owls and haze the pueo from the area. Provide additional educational material to guests staying at the beach cottages. Consider blocking off the road behind the fenced area to vehicle traffic during the night while the birds are in residence. Consider installing a few boardwalks from the grassy area down to the beach flats. Consider installing a viewing boardwalk on the beach side of the fenced area to reduce burrow crushing. To control shearwater burrowing under beach cottages, sidewalks, and other infrastructure, unoccupied problem burrows should be crushed as soon as possible when observed. Burrows can legally be crushed anytime between burrow initiation (usually around March when the birds arrive to the colony) and when eggs are laid (during the 1st or 2nd week of June). Remove kiawe in undeveloped areas adjacent to the colony to provide additional nesting habitat.
2. *Invasive Species Prevention and Control:* Exclude wedge-tailed shearwater burrowing areas from any weeding or planting activities during the nesting season.

3. *SOS Support and Shearwater Banding:* Continue to coordinate with the Kaua'i Humane Society's SOS program along with coordinating with USFWS and DOFAW to conduct shearwater banding training at the wedge-tailed shearwater colony at Barking Sands Beach Cottages.

Continued implementation of the 2010 INRMP would result in a beneficial impact on wedge-tailed shearwaters as the management actions improve the long-term viability of populations present at Barking Sands.

Preferred Alternative

The 2023 INRMP proposes the following management actions to protect and enhance habitat, and improve understanding of wedge-tailed shearwaters:

1. Enhance wedge-tailed shearwater habitat in areas far from the PMRF airfield and human presence and develop deterrent measures for burrows in areas of human traffic and near the airfield.
2. Research and work with facilities and Morale, Welfare and Recreation (MWR) to implement methods for discouraging wedge-tailed shearwater from burrowing in the immediate vicinity of the PMRF beach cottages.
3. Continue to implement protective measures that prevent the crushing of burrows in the beach cottages area (e.g., signage, temporary rope fencing, wooden burrow tents, outreach materials in cottages).
4. Conduct annual wedge-tailed shearwater population surveys in the Kinikini Ditch, beach cottages, and Nohili Dunes areas.
5. Work with partners to collect additional data that supports adaptive management on PMRF and regional conservation objectives for shearwater species.
6. Conduct ant surveys to assess presence of invasive ants including the little fire ants at the Nohili Dune's wedge-tailed shearwater colony. If little fire ants are detected, report to KISC and implement active control by using granular bait after fledglings have left the area.
7. Continue to host a SOS shearwater aid station at PMRF and monitor station during business days with SOS monitoring on weekends and holidays (PMRF BO, 2014).

Implementation of the actions proposed in the revised 2023 INRMP would have a beneficial impact on the wedge-tailed shearwater when compared to activities of the No Action Alternative because of increased monitoring and coordination activities, habitat improvement away from the airfield, and continued SOS support.

Endangered Hawaiian Waterbirds

No Action Alternative

To minimize adverse effects on Hawaiian waterbirds located at Barking Sands, and in the adjacent Kawai'ele Waterbird Sanctuary and Mānā Forest Plains Forest Reserve, as well as the Mānā plain ditch system and ditches bordering PMRF property, current and historic management under the 2010 INRMP includes the following activities:

1. *Base-wide Predator Control:* Continue base-wide predator control (dogs, cats, owls, rodents, barn owls, and cattle egrets) to protect Hawaiian waterbirds within the vicinity of the ditches and oxidation ponds.
2. *Waterbird Species:* Initiate formal Navy participation in the State-wide waterbird counts that occur at the Barking Sands oxidation ponds in January and August.

3. *Invasive Species Prevention and Control:* Avoid completely clearing wetland areas (excluding the ditches) of vegetation, as dense growth provides important habitat for endangered, endemic waterbirds.
4. *Oxidation Pond Improvements:* Develop a plan for improvements to the oxidation ponds at Barking Sands to enhance waterbird habitat.
5. *Wetlands Maintenance:* Ensure proper permitting and no-net-loss of wetland acreage.
6. *Kawai'ele Wetlands Waterbird Sanctuary:* Continue to be involved with DLNR in the planning process for the restoration of the Kawai'ele wetland which is part of the Kawai'ele Wildlife Sanctuary located immediately east of Barking Sands. Enlist volunteers to help support wetland restoration.

The continued implementation of the 2010 INRMP would result in a beneficial impact on the at-risk Hawaiian waterbirds at Barking Sands, as the resource management actions would maintain and improve species' populations.

Preferred Alternative

To further address adverse effects on Hawaiian waterbirds and further improve the understanding of population dynamics to inform adaptive management decisions, the following strategies are proposed:

1. Continue to coordinate closely with Facilities Maintenance regarding restrictions on vegetation removal practices within a 100-ft (30.5-meter [m]) radius of waterbirds or their nests.
2. Discourage waterbird presence and nesting at the oxidation pond complex by maintaining vegetation at a height of less than 6 inches and by funding the installation of exclusionary measures.
3. Continue to coordinate with Facilities Maintenance to obtain environmental data on the oxidation pond regularly to better inform causes of avian botulism outbreaks and identify high risk conditions that require management actions.
4. Coordinate with Public Works to develop oxidation pond flushing protocols in response to avian botulism outbreaks or high-risk conditions.
5. Coordinate with Facilities Maintenance on all oxidation pond complex construction and restoration plans.
6. Supplement ongoing water quality testing to detect particulates and soluble chemicals in waters at PMRF. Testing should be conducted at least quarterly.
7. Replace and improve waterbird crossing signage at PMRF as needed to reduce risk of vehicle strikes (PMRF BO, 2014), evaluate efficacy of signs, and explore new tools to reduce vehicle strikes.
8. Continue to conduct regular monitoring for Hawaiian waterbird species at Barking Sands to effectively detect and reduce impacts to nests (PMRF BO, 2014).
9. Consider implementing a waterbird banding/telemetry program to track movement, monitor nest-site fidelity, and inform management on the base.

Implementation of the actions proposed in the 2023 INRMP would have a beneficial impact on Hawaiian waterbirds when compared to activities of the No Action Alternative because of increased monitoring and coordination activities.

Hawaiian Goose (Nēnē)

No Action Alternative

Nēnē management under the 2010 INRMP includes the following activities:

1. *Base-wide Predator Control:* Continue base-wide predator control (dogs, cats, owls, rodents, barn owls, and cattle egrets) to protect endangered nēnē while on the installation.
2. *Natural Resources Signs:* Continue to install, maintain, and update, as necessary, natural resources signs at the facility. PMRF and NAVFAC PAC Natural Resources staffs have prepared signs indicating appropriate behavior to protect and preserve threatened and endangered species and other protected species. The signs should be placed where such interactions are most likely, such as green turtle habitat at Nohili Ditch and areas of frequent Hawaiian monk seal activity at Barking Sands or Hawaiian goose activity.

Continued implementation of the 2010 INRMP would have a beneficial impact on nēnē by reducing predator populations and improving awareness of nēnē presence.

Preferred Alternative

To reduce PMRF operation impacts to nēnē while providing maximum flexibility for testing and training, the 2023 INRMP proposes the following management and monitoring strategies.

1. Collaborate with USFWS, PMRF Air Ops, and DOFAW to continue revising action plans, based on past observations and new knowledge, to facilitate rapid response to nēnē that have attempted to nest or have successfully nested on the airfield.
2. Coordinate with USFWS, DOFAW, PMRF Air Ops, and PMRF Public Works to annually review and update the PMRF Nēnē Management Plan (PMRF BO, 2014).
3. Work with PMRF Air Ops and USDA-WS to insure nēnē hazing efforts are increased prior to and during the breeding season with the possibility of including weekends especially if a nēnē pair has been regularly observed on or near the airfield.
4. Continue to conduct regularly standardized surveys of nēnē at PMRF Barking Sands, Mākaha Ridge, and Kōkeʻe sites to improve detection of nēnē nests, determine habitat types that attract the species, and to update management (PMRF BO, 2014).
5. Continue to communicate with facilities maintenance personnel about nēnē nest locations and collaborate with them to develop effective protective measures for the species and ensure that no vegetation removal or other persistent disturbances occur within 100 ft (30.5 m) of nest sites and goslings to reduce risk of take.
6. Support regular outreach to base visitors and personnel on the importance of not providing food and water to nēnē (PMRF BO, 2014), and develop outreach material aimed at increasing awareness of the species.
7. For all new construction at Barking Sands, including construction for tenant or customer DoD commands or other federal agencies, concrete, asphalt, gravel, xeriscaping, or native vegetation, rather than lawn, will be installed in open areas surrounding buildings and parking areas to decrease attraction of nēnē (PMRF BO, 2014).
8. Fund habitat modification that discourages nēnē presence near roadways, the airfield, and construction sites at Barking Sands.
9. Supplement ongoing water quality testing to detect particulates and soluble chemicals in waters at PMRF. Testing should be conducted at least quarterly.
10. Continue to explore and implement strategies to reduce risk of vehicle strikes, including additional vehicle calming measures, evaluate efficacy of permanent, temporary and marquee signs, and explore new tools to reduce vehicle strikes.
11. Continue to communicate and share data with USDA-WS and DOFAW regularly.
12. Collaborate with DOFAW to have all nēnē that hatch at PMRF banded and pursue permission and permits for PMRF natural resources staff to band birds if allowable.

13. Implement priority management actions identified in the PMRF Nēnē Management Plan. Work with partners to identify potential opportunities to collaborate on off-installation conservation efforts or research opportunities to inform nēnē management at PMRF and ensure a holistic approach that aligns with regional priorities for nēnē protection and recovery (PMRF BO, 2014).

Implementation of the actions proposed in the 2023 INRMP would have a beneficial impact on nēnē compared to the No Action Alternative due to increased monitoring, hazing, outreach, protection, and habitat improvement activities.

Migratory Birds

No Action Alternative

A MOU between the DOD and the USFWS is in effect to promote the conservation of migratory birds. The 2010 INRMP contains the following management activities to protect migratory birds at Barking Sands:

1. *Bird Aircraft Strike Hazard:* Continue hazing program under the USDA-WS permit.
2. *Protection of Wildlife from Potential Electromagnetic Radiation (EMR) Impacts:* Follow SOP requirements that ensure existing radars do not radiate lower than at least 4 to 6 degrees above horizontal to preclude EMR impacts on wildlife.
3. *Fauna Surveys Update/Initiate:* Update fauna surveys and mapping, including protected bird species, in preparation for subsequent INRMP updates.
4. *Nocturnal Seabird Fallout Monitoring and Management:* Consult with USFWS regarding fallout minimization and mitigation.
5. *Use of Green Lights and Light Shielding to Protect Seabirds:* Install and operate green bulbs, when plausible. Where green lights are not feasible, include shielding of white lights, install motion sensor lights, and determine areas where lights may be safely turned off.

The continued implementation of the 2010 INRMP would result in a beneficial impact on migratory birds at Barking Sands, as the resource management actions maintain and protect existing populations of migratory birds.

Preferred Alternative

To protect migratory birds and ensure the conservation of these species, the 2023 INRMP proposes the following actions:

1. Continue to incorporate monitoring of shorebirds, cattle egrets, and black-crowned night herons at wetland sites, and observations of barn owls, to inform control measures for non-native species and protective measures for native species. Conduct pueo surveys in high-quality habitat.
2. Keep track of any newly established non-native songbird species at PMRF and their numbers by participating in the annual Audubon Christmas Bird Count.
3. Continue to advise development projects at PMRF that have potential to negatively impact native MBTA species habitat on how to avoid impacts.
4. Advise development projects at PMRF on how to avoid creating habitat and foraging availability for non-native MBTA species at PMRF especially near the PMRF airfield.

Implementation of the Preferred Alternative would have a beneficial impact on migratory birds compared to the No Action Alternative. The resource management actions include increased monitoring and control of non-native birds and increased activities to advise development projects on how to improve native bird habitat and how not to create non-native bird habitat.

3.3.2.5 Insects

Affected Environment

Native insects and protected pollinator species

Coastal strand habitat at Barking Sands, consisting of relatively intact communities of plants native to Hawai‘i, has the potential to support a variety of native insect species. General baseline surveys for terrestrial invertebrate species as well as additional surveys for the federally endangered *Drosophila musaphilia* and *Drosophila sharpi* were conducted at Barking Sands and Kōke‘e Sites in 2021. To date, a total of 769 taxa have been found at PMRF with 675 of them identified to species. Of the 675 species identified, a significant number (347) are considered native endemics with numerous rare and undescribed species encountered. The 2021 baseline surveys also identified the rare endemic fly *Bryania bipunctata*, previously known only from the Northwestern Hawaiian Islands (NWHI) and Kaho‘olawe, and several native coastal midges at Barking Sands.

Known species of pollinators present at PMRF facilities include the introduced monarch butterfly (*Danaus plexippus*), the honeybee (*Apis spp*.), and the carpenter bee (*Xylocopa sp.*). At Barking Sands, honeybees (*Apis* spp.) generally swarm each year. In 2015, several bee swarms were captured, via swarm traps and transferred to hives at the northern and southern ends of Barking Sands. Beehives were determined to be in healthy condition when inspected for evidence of the intestinal parasite varroa mite (*Varroa destructor*) and other honeybee threats by the State apiarist.

Pollinator protections are implemented on PMRF facilities in accordance with the MOU between the DoD and the Pollinator Partnership, a non-profit 501(c)(3) organization that coordinates with the North American Pollinator Protection Campaign (NAPPC) to promote awareness and scientific understanding of pollinators. The MOU is entered pursuant to the provisions of the Sikes Act, and supports the Presidential Memorandum *Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators*; see Appendix B of the 2023 INRMP (NAVFAC PAC 2022).

Major threats to pollinator populations include loss of plant species associated with pollination, and the use of neonicotinoid pesticides.

Environmental Consequences

Native insects and protected pollinator species

No Action Alternative

Management actions under the 2010 INRMP that protect pollinator species and enhance habitat supportive of native insects include:

1. *Landscape Design:* Continue to utilize sterile soil to prevent the introduction of pests such as nematodes and weeds.
2. *Landscape Design:* Use native plants whenever possible and use sterile soil to prevent the introduction of weeds. Plant a variety of native trees, shrubs, and ground covers. Continue to evaluate all future landscape design and installation projects for the potential to include habitat restoration and the use of native plants whenever possible.
3. *Base-wide Predator Control:* Continue use of cage traps and other non-chemical methods as the primary means of predator control to prevent adverse effects to pollinators. See also INRMP Appendix D – Legal Requirements for laws and policies related to pesticide and herbicide application.

The continued implementation of the 2010 INRMP would result in a beneficial impact on native insects and protected pollinator species at Barking Sands, as the resource management actions improve habitat supportive of native insects and minimize exposure of pollinator species to harmful chemicals and pesticides.

Preferred Alternative

The 2023 INRMP contains the following strategies to improve habitat supportive of native insects and protect pollinator species:

1. Conduct species inventory at additional PMRF sites, and conduct monitoring for native invertebrate species. Consider coordinating with USFWS entomologists to identify priority species and provide expertise and training to natural resources staff.
2. Coordinate all use of pesticides by natural resources staff with the NAVFAC PAC PMC and ensure that all applicators have received appropriate certifications.
3. Ensure that treatments will not have negative effects on protected species.
4. Prohibit the use of neonicotinoids at PMRF sites.
5. Ensure that plant communities found to support native terrestrial invertebrate species are protected, enhanced, and that construction or removal projects have minimal effects on these populations.

The proposed 2023 INRMP strategies would have a beneficial impact on native insects and protected pollinator species compared to the No Action Alternative, as the actions include, in addition to continuing protection of habitat supportive of native insects and continuing management of the use of pesticides to minimize pollinator exposure, new monitoring for native invertebrate species and prohibition of the use of neonicotinoids.

3.3.2.6 Marine Mammals, Marine Reptiles, and Other At-Risk Marine Species

Affected Environment

The Hawaiian monk seal , humpback whale (*Megaptera novaeangliae*), spinner dolphin (*Stenella longirostris)*, and Hawaiian green sea turtle are the most likely species to be observed within 12 nautical miles of the PMRF coastline. All marine mammals known to occur on or in the waters adjacent to Barking Sands are protected by the ESA and/or the MMPA. Threats to these species include stranding, entanglement in marine debris, fishing practices, vessel strikes, threats from military training and testing exercises—evaluated in the HRC EIS/OEIS (DoN 2008a), and disease (i.e., toxoplasmosis transmitted by feral cat feces).

Hawaiian Monk Seal

Hawaiian monk seals were the first species to be listed as depleted under the MMPA on July 22, 1976 (41 Federal Register [Fed. Reg.] 30120) and were listed as an endangered species under the federal ESA on November 23, 1976 (41 Fed. Reg. 51612). The International Union for Conservation of Nature (IUCN) classifies the Hawaiian monk seal as endangered, and the Hawaiian monk seal is also protected under SOH law Hawai‘i Revised Statutes (HRS) § 195D-4.5 (NMFS 2015). Current estimates for individuals are 1,200 in the NWHI and 400 in the MHI (the islands of Hawai‘i, Maui, Moloka‘i, Lana‘i, Kaho‘olawe, O‘ahu, Kaua‘i, and Ni‘ihau); although there has been an increasing population trend in the past twenty years, primarily in the MHI, they are still at roughly one-third of their historic population (NOAA Marine Debris Program 2024).

Monk seal critical habitat was designated in 2015. Hawaiian monk seals utilize the beaches of Barking Sands to “haul-out” or rest year-round, particularly in winter/early spring. There is one documented

pupping event in 1999 at Barking Sands. Waters adjacent to PMRF are used by monk seals to access beaches and exhibit other shallow water behaviors like foraging. Monk seals are opportunistic feeders in both shallow nearshore waters and in deep offshore waters where they dive to significant depths preying on a variety of fish, cephalopods, and crustaceans (Cahoon et al., 2013). Their primary food sources are found around 0-30 ft deep and include reef fish, eels, octopus, squid, and all crustaceans including lobster, crab, and shrimp. Deeper dives are to about 1,700 ft where they bring up bottom fish like snapper and grouper.

Feeding and foraging behaviors of Hawaiian monk seals have been studied in both the NWHI and the MHI. Unlike the NWHI monk seals, the MHI population does not appear to be affected by limited food availability and competition with offshore fisheries; the interactions of greatest concern are between people and seals on beaches, and nearshore fishing activities (Lowry et al. 2011, Parrish et al. 2023, Parnell et al. 2024). Behavioral patterns can increase the risk of harm, such as foraging in nearshore waters, increasing the potential for interactions with fishing gear (Robinson et al. 2022).

Main concerns for the monk seals at Barking Sands include harassment of hauled out seals by people and pets, disturbance of monks seals from military training and testing exercises, negative fisheries interactions, marine debris entanglement and ingestion, and disease, specifically toxoplasmosis transmitted by feral cat feces (Barbieri et al. 2016; Harting et al. 2020). Protection strategies addressed in the INRMP for monk seals and their beach and nearshore habitats at Barking Sands pertain to addressing upstream erosion and runoff, protecting and monitoring critical habitat, conducting regular monk seal beach surveys, continuing law enforcement, improving water quality at coastal outflows, and addressing pressures from coastal and nearshore fishing activities.

Whales and Dolphins

Several species of whales and dolphins have been observed in the coastal waters near Barking Sands. These species are listed in Table 11. Three of the cetacean species present within the Barking Sands footprint are protected under the ESA: the MHI insular false killer whale *Pseudorca crassidens*), the fin whale (*Balaenoptera physalus*), and the sperm whale or palaoa (*Physeter microcephalus*), which are all listed as endangered. All other whale and dolphin species are protected under the MMPA.

PMRF provides support for the operation of offshore underwater ranges. The underwater ranges are within open ocean areas and extend into territorial waters, which are not under the jurisdiction of PMRF. Therefore, these offshore areas are not included in the INRMP. However, the Navy has conducted marine mammal monitoring in the MHIs, including the underwater range areas at PMRF, since 2008. The marine resources of the underwater ranges were discussed in the Marine Resources Assessment for the Hawaiian Islands Operating Area (DoN 2005) and analyzed in depth in the HSTT EIS/OEIS (DoN 2018). Ongoing marine mammal monitoring and research in Hawai‘i, which is primarily conducted at PMRF, is documented in annual marine species monitoring reports which support the U.S. Pacific Fleet’s ESA and MMPA authorizations (www.navymarinespeciesmonitoring.us).

Threats to whale and dolphin species include incidental take, inadequate fishing regulations, small population size, standings, environmental contaminants and naturally occurring biotoxins, marine debris ingestion and entanglement, vessel strike, adverse effects from military training and testing exercises, disease, and adverse effects associated with climate change (NOAA 2022).

INRMP strategy actions on beach, shoreline, and nearshore areas are not anticipated to affect or exacerbate threats to these species. However, for these species, conservation strategies include the

implementation of SOPs to reduce the likelihood of overlap in time and space with other stressors, and the implementation of mitigation measures reducing the likelihood of impacts.

Table 11 Whale and Dolphin Species Present at Barking Sands

Scientific Name	Common Name	Hawaiian Name	Federal Protection Status*
Globicephala macrorhynchus	Short-finned pilot whale	—	MMPA
Stenella attenuata	Pantropical spotted dolphin	Kiko	MMPA
Megaptera novaeangliae	Humpback whale	Koholā kuapiʻo	MMPA
Stenella longirostris	Spinner dolphin	Naiʻa	MMPA
Steno bredanensis	Rough-toothed dolphin	—	MMPA
Tursiops truncatus	Bottlenose dolphin	Naiʻa	MMPA
Pseudorca crassidens	False killer whale- MHI Insular Distinct Population Segment	—	E
Balaenoptera physalus	Fin whale	—	E
Physeter microcephalus	Sperm whale	Palaoa	E
Stenella coeruleoalba	Striped dolphin	—	MMPA
Mesoplodon desirostris	Blainville's beaked whale	—	MMPA
Ziphius cavirostris	Cuvier's beaked whale	—	MMPA
Kogia sima	Dwarf sperm whale	—	MMPA
Lagenodelphis hosei	Fraser's dolphin	—	MMPA
Orcinus orca	Killer whale	—	MMPA
Peponocephala electra	Melon-headed whale	—	MMPA
Feresa attenuata	Pygmy killer whale	—	MMPA
Kogia breviceps	Pygmy sperm whale	—	MMPA
Grampus griseus	Risso's dolphin	—	MMPA

*Federally listed under the ESA as E = Endangered, T = Threatened.

Green and Hawksbill Sea Turtles

Green sea turtles (or honu) in Hawaiʻi belong to the Central North Pacific Distinct Population Segment and are listed as threatened under the ESA. Populations of this species occur in the NWHI (French Frigate Shoals) and in the MHI, but this latter group is the result of captive rearing and relocating of turtles from the NWHI to Oʻahu. Genetic testing revealed only 15 females were responsible for all the clutches laid in the MHI (Frey et al. 2013).

Green sea turtles in the MHI were found to have an algal-based diet dominated by red algae (Rhodophyta) (Arthur and Balazs 2008) and regularly utilize PMRF beaches and nearshore waters for resting and foraging. Green sea turtles are commonly hauled out near the waters at the Nohili Ditch outfall and in front of Shenanigan's Restaurant. A total of 10 confirmed green sea turtle nests at Barking Sands were documented between 2015 and 2021. Nests were observed at Barking Sands on the southern coast, near the southern edge of the airfield, and at Nohili Dunes.

The Hawksbill sea turtle or honu'ea (*Eretmochelys imbricate*) has not been recorded at the Barking Sands Main Base facility; however, there is a possibility for the species to nest at PMRF or forage in its nearshore waters. The hawksbill sea turtle is critically endangered and is listed as endangered under the ESA.

Threats to sea turtle populations at Barking Sands include damage to sea turtle nests by vehicles driving on the beach (e.g., compaction of sand, crushing of eggs/hatchlings), stranding or entanglement in marine debris, beachfront lighting, and small boat collisions with green sea turtles.

Appendix C of the INRMP specifically addresses sea turtles.

Giant Manta Ray and Oceanic Whitetip Shark

The giant manta ray (*Manta birostris*), listed in 2018, is threatened under the ESA by NOAA fisheries throughout the species' range. Their range includes tropical, subtropical, and temperate bodies of water. They are common in offshore waters and near productive coastlines (Kashiwagi et al. 2011). While considered solitary and pelagic, they congregate at cleaning stations around offshore reefs and feeding in shallow waters during the day at depths of less than 10 m (Rohner et al. 2013). Documented dives of tagged rays show the species conducts night descents to 200-450 m depths (Rubin et al. 2008, Stewart et al. 2016) with maximum diving depth exceeding 1,000 m (Marshall et al. 2011). Diving behavior appears influenced seasonally and with shifts in prey; this species spends a greater proportion of time at the surface from April to June and in deeper waters from August to September (Miller and Klimovich 2017). Feeding studies show that adults and juveniles target the same prey, indicating they may occupy the same habitats within a location (Stewart et al. 2017). Giant manta rays primarily feed on planktonic organisms such as euphausiids, copepods, mysids, decapod larvae and shrimp, yet evidence indicates they also consume small and moderate sized fishes, too (Carpenter and Niem 2001; The Hawai'i Association for Marine Education and Research Inc. 2005; Rohner et al. 2017a; Stewart et al. 2017).

Major threats to the species include commercial fishing, commercial fishing bycatch, and international gill raker trade (NOAA 2018c). There have been no surveys conducted at PMRF for the species since its 2018 listing. Offshore areas are not under the jurisdiction of PMRF or the INRMP management study area; however, an updated BO for offshore activities covered under HCTT is expected by December 2025. INRMP management actions are not anticipated to affect or exacerbate threats to the species.

The oceanic whitetip shark (*Carcharhinus lonigmanus*) was listed as threatened in 2018 under the ESA by NOAA fisheries throughout all its range. This shark species is migratory but with high site-fidelity (Whitney et al. 2012) and found in offshore, tropical, and warm-temperate waters (Young et al. 2016). On occasion individuals visit shallower waters near land, especially around oceanic islands but are found at depths of up to 492 ft (150 m) (NOAA 2018d). This species has a clear preference for open ocean waters between 10-dgrees north and 10-degrees south. Genetic evidence separates Western Atlantic and Indo-Pacific populations, however, limited sampling in the Pacific leaves open questions about the connectivity dynamics in this large region (Ruck et al. 2024). Oceanic whitetips are epipelagic opportunistic hunters, preferring to forage in the upper layers of deep-water areas. They feed on bony fishes including lancetfish, oarfish, barracuda, jacks, dolphinfish, marlin, tuna, and mackerels. Other prey consists of stingrays, sea turtles, sea birds, gastropods, squid, crustaceans, and carrion (dead whales and dolphins) (Compagno et al. 2005). Little is known about the movement or potential migration paths for oceanic whitetips. In the Pacific, satellite tags to observe this shark's behavior revealed a pattern in their movements, reproductive biology, and fisheries interactions such that females exhibited higher philopatry than males and were more likely to be found in shallow waters throughout the year whereas male sightings in shallow waters were highest in April and May; pupping season appears to be May into early June (Whitney et al. 2012).

There have been no surveys conducted for the species; however, its current range includes nearshore and pelagic waters off the coast of the Islands. Major threats include bycatch and shark fin trade (NMFS 2018b). Offshore areas are not under the jurisdiction of PMRF or the INRMP management study area. INRMP management actions are not anticipated to affect or exacerbate threats to the species; compliance with all federal laws, regulations, and ESA mandates will occur.

Environmental Consequences

Hawaiian Monk Seal

No Action Alternative

Management actions in the 2010 INRMP that protect the Hawaiian monk seal include the following:

1. *Base-wide Predator Control:* Continue base-wide predator control (dogs, cats, owls, rodents, barn owls, and cattle egrets) to protect endangered Hawaiian monk seals.
2. *Hawaiian Monk Seal Protection:* Continue to employ a number of SOPs to protect, record and report monk seals to DAR that haul out on the beach or are observed injured or struggling. Continue to restrict recreational shore fishing to designated areas to reduce monk seal entanglement. Continue to restrict dogs off leashes along the beach to limit the potential for seal-dog interactions. Continue to ensure training activities do not affect hauled-out seals at PMRF beaches. Continue to prohibit vessel landing on Ka‘ula Island due to UXO concerns.
3. *Fishing Survey:* Monitor level of fishing activity and ecosystem health, as it relates to fish stock abundance, monk-seal hookings, and marine debris, through surveys investigating level of fishing activity.
4. *Natural Resources Signs:* Place signage in areas of frequent Hawaiian monk seal activity at Barking Sands.

The continued implementation of the 2010 INRMP would result in a beneficial impact on monk seals at Barking Sands, as the management actions improve the long-term viability of monk seal populations present at Barking Sands.

Preferred Alternative

Monk seal protection SOPs would continue under the proposed INRMP. Objectives of the 2023 INRMP for PMRF that specifically address Hawaiian monk seal management include:

1. Continue to ensure that Security reports sightings of monk seals during daily patrols at PMRF beaches and erects signage and barricades if observed where people frequent.
2. Continue to report observations of hauled-out Hawaiian monk seals to NOAA as soon as possible and provide high quality photos to assess seal health, ID, and aid in population abundance monitoring.
3. Collaborate with NOAA to implement Hawaiian monk seal recovery objectives when feasible.
4. Continue base-wide predator control to remove non-native predators, including feral cats and collaborate with partners on studies regarding toxoplasmosis at PMRF to inform these efforts; conduct outreach about the disease and its effects on wildlife and human health.
5. Continue to monitor for, and remove, marine debris as part of regular monk seal surveys at beaches frequently used by hauled out monk seals.
6. Continue to develop and install signage and implement trainings, educational materials, and presentations for security, other appropriate personnel, and the public on monk seals and the proper response to wildlife related observations.

7. Continue surveys and measuring of nearshore water quality parameters at six sites at Barking Sands (each with three sampling points) for habitat conservation and protection purposes.
8. Conduct regular surveys approximately five times per week of beaches near the Nohili Ditch outfall and Diver's Landing for monk seal presence, and all other beaches approximately twice per week.

The above actions would have a beneficial impact on the Hawaiian monk seal when compared to the No Action Alternative, as the Preferred Alternative includes increased monitoring for Hawaiian monk seals and new studies regarding potential sources of Hawaiian monk seal disease.

Whales and Dolphins

No Action Alternative

Current management of the whale and dolphin species under the 2010 INRMP involves surveys and monitoring. PMRF reports stranded, beached, and/or dead whales along the installation's shoreline in partnership with NOAA Fisheries. The 2010 INRMP includes one management action related to whales and dolphins:

1. Humpback Whales and Other Cetaceans: Continue to participate in the NOAA Ocean Count on the last Saturday of December, January and February of each year.

As whale and dolphin management in the 2010 INRMP is limited to participation in existing NOAA cetacean surveys three times annually, continued implementation of the 2010 INRMP would have no impact on whales and dolphins.

Preferred Alternative

To protect and monitor populations of whales and dolphins at Barking Sands, the 2023 INRMP proposes the following strategies.

1. Continue to report all observations of marine mammal strandings or deaths to National Marine Fisheries Service (NMFS) and assist in response efforts.
2. Improve coordination and communication regarding marine mammal strandings and other observations of note with NAVFAC PAC and COMPACFLT.
3. Implement and collaborate with partners on studies regarding toxoplasmosis at PMRF to inform predator control efforts and conduct outreach about the disease and its effects on wildlife and human health.
4. PMRF will cooperate with the ADC so that it can comply with the CWA and other environmental regulatory requirements where there is a nexus with federal monies or property.

These strategies would have beneficial impacts on whales and dolphins in the Barking Sands project area when compared to the No Action Alternative due to implementation of toxoplasmosis studies to better understand threats to marine species.

Green and Hawksbill Sea Turtles

No Action Alternative

Since 2006, monitoring and reporting of sea turtle activity has occurred at PMRF. Management actions implemented under the 2010 INRMP include:

1. Sea Turtle Management: Continue logbook of sea turtle (most likely green turtles) observations including sightings, tracks, and nesting events. Continue to protect, monitor, and record any sea

turtle nests. Continue SOPs which require that beaches are surveyed one hour prior to beach landing exercises, and if sea turtles are present, then delay training until the animal(s) voluntarily leave the area.
2. Natural Resources Signs: Continue to install, maintain, and update, as necessary, green turtle habitat signs at the facility.

The continued implementation of the 2010 INRMP would result in a beneficial impact to sea turtles at Barking Sands, as the management actions improve the long-term viability of turtle populations present at Barking Sands.

Preferred Alternative

Green and hawksbill turtle management strategies proposed under the 2023 INRMP include:

1. Continue to ensure daily patrols of PMRF's beaches for sea turtles to collect observational data and check for stranded, injured, or entangled turtles are conducted by partnering with Security.
2. Conduct surveys by biologists approximately five times per week of beaches near the Nohili Ditch outfall and Diver's Landing for sea turtle presence and ensure that marine surveys in nearshore areas quantify sea turtles and potential foraging or resting habitat.
3. Continue to survey beaches for sea turtle nesting activity during the nesting season, protect all nests observed with ropes and signage, mitigate light attraction issues on beaches, and coordinate with DAR to excavate nests.
4. Continue to encourage good communication between Security and natural resources regarding sea turtle activity on PMRF beaches to reduce negative impacts to the species from Security beach patrol vehicles.
5. Develop and use USFWS-approved outreach, educational materials, and signage with the objective to educate and provide information to residents, recreational users, visitors, and staff about proper procedures and acceptable activities within sea turtle habitat and how to act when coming in contact with sea turtles.
6. Continue to implement surveys to ensure no sea turtles are in affected areas during training exercises or in-water work.
7. An interagency agreement was established in fiscal year (FY) 23 to allow the Navy to partner with the NMFS PIFSC to deploy SPLASH tags (GPS and Argos radio transmitters that are attached to the turtle carapace) and will be pursued at PMRF.
8. An appendix was added to the INRMP that is specific to sea turtle management actions at PMRF.
9. Supplement ongoing water quality testing to detect particulates and soluble chemicals in waters at PMRF. Testing should be conducted at least quarterly.

Compared to the No Action Alternative, the above 2023 INRMP activities would have a beneficial impact on green and hawksbill sea turtles due to increased surveys and monitoring and outreach and educational activities.

Giant Manta Ray and Oceanic Whitetip Shark

No INRMP management actions are anticipated to affect or exacerbate threats to the species. Therefore, there will be no impact to the species.

3.3.2.7 Coastal and Nearshore Biological Resources

Affected Environment

For the INRMP and this associated EA, Barking Sands nearshore environment is broken into three sectors. The Nohili Sector (also referred to as the North Zone) located in the northern portion of Barking sands, the Mānā Point Sector (also referred to as the Central Zone) in the central area of Barking Sands, and the Majors Bay/Waiapua'a Bay Sector (also referred to as the South Zone) in the southern portion (Figure 8 and Figure 9).

Fish, Essential Fish Habitat, and Corals

The bathymetric characteristics of the nearshore environment at Barking Sands provide considerable shelter for many fish and invertebrate species. Based on 2000 and 2006 surveys, the Nohili sector contained the highest species richness ranging from 72 to 78 species recorded over a 30-minute period of observation. Fish counts were lower on the flat limestone platforms of the Mānā, and Major Point sectors compared to the Nohili sector. At Majors/Waiapua'a Bay, 22 species of fish were observed in 2000, and a total of 30 species were recorded in 2006. At Mānā Point, a total of 30 species were encountered in 2000, and a total of 55 species were recorded in 2006 (Dollar and Brock 2007). The Navy is conducting a further study, as of 2022 (NAVFAC PAC 2022).

In 2006 surveys, mean fish biomass was 110 g/m^2 in the Nohili sector, approximately 50 g/m^2 in the Mānā Point Sector, and 10 g/m^2 in the Majors/Waiapua'a Bay Sector. During both surveys the total fish biomass remained relatively constant, likely attributed to the decline in fishing activities at Barking Sands (Dollar and Brock 2007). Fish biomass in both the Nohili sector and the Mānā Point sector is generally considered high for the MHI (McCoy et al. 2016).

Essential Fish Habitat (EFH) includes all "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. 1802(10)). EFH therefore includes all water surrounding PMRF facilities, including the benthic habitat, corals, coastal streams and rivers necessary for the spawning of anadromous or amphidromous fish. EFH has been designated and described along the entire Kaua'i shoreline and surrounding waters up to the 200-nautical mile exclusive economic zone (EEZ) for a number of species complexes including bottom fish species, pelagic fishes, crustaceans, precious corals, and coral reef ecosystem taxa (NAVFAC PAC 2022).

The Navy must provide a written assessment to NMFS for any activity that may adversely affect EFH. The standard notification and consultation process provides recommendations to minimize, offset, or mitigate impacts associated with activities. Activities that impact EFH include general operation and construction projects adjacent to any nearshore waters or streams.

A narrow fringing reef follows the coastline up to Nohili Point and Barking Sands; coral cover is low for most offshore areas and is dominated by stony corals including lobe coral pōhaku puna (*Porites lobata)*, cauliflower coral ko'a *(Pocillopora meandrina),* and ringed rice coral (*Montipora patula).* Coral cover is highest in the Nohili area, on the north side of the Main Base, ranging 32 to 39 percent total coral cover. At the south end of the Main Base the nearshore region of Majors/ Waiapua'a Bay there is little to no solid reef structures, and benthic cover is predominately sandy bottom. Antler coral (*Pocillopora eydouxi*) dominates the offshore sector, depth ranging from 49 to 66 ft (DoN 2008a). Other corals found offshore have a collective coverage of about 5 percent; these corals include cauliflower coral, lobe coral,

rice coral, and others. Also present along the shelf break are black coral (*Antipathes spp.*) and wire coral (*Cirrhipathes anguina*) (DoN 2010; NAVFAC PAC 2022).

To avoid impacting coral reefs in the coastal and nearshore environment, the Navy conducts environmental reviews of any action likely to affect U.S. coral reef ecosystems in accordance with NEPA and DoD policy. The PMRF Natural Resources Program has conducted periodic surveys of the marine nearshore environment to assess species diversity, abundance, and demographic structure along the Barking Sand's shoreline (Dollar and Brock 2007).

Current manageable threats to coral reefs at PMRF include derelict fishing gear, marine debris, and land-based pollution and sedimentation. Crown-of-thorns (COTS) sea stars also have potential to damage reefs if populations reach outbreak levels. Populations were not at outbreak levels in 2007 surveys (Dollar and Brock 2007).

Macroinvertebrates

Macroinvertebrates are discussed in Section 3.3.6.4 of the 2023 INRMP. Macroinvertebrate species observed in the Barking Sands nearshore environment include limpets or ʻopihi (*Cellana* spp.), littorine snails (*Littorina sp. and Nerita sp.*), rock oyster (*Spondylus tenebrosus),* cone shells (Conus spp.), sea urchins (*Echinometra mathaei*), and sea cucumbers (*Holothuria atra*) (Dollar and Brock 2007). In 2013, surveys were conducted along the entire coastline of the PMRF to assess the density and structure of ʻopihi populations on the installation and to compare them to other ʻopihi populations on Kauaʻi and across the Hawaiian Archipelago (Bird and Toonen 2014). An estimated 110,000 black foot ʻopihi, or ʻopihi makaiauli (*Cellana exarata*), and 4,000 yellow foot ʻopihi, or ʻopihi ʻalinalina, (*C. sandwicensis*) were found at Barking Sands during the course of the 2014 study. Giant ʻopihi, ʻopihi kōʻele (*C. talcosa*), were also observed but were rare likely due to lack of suitable habitat on the installation. ʻOpihi are culturally significant marine mollusks historically over-harvested in Hawaiʻi (Bird and Toonen 2014).

COTS sea stars were recorded at the Majors/Waiapuaʻa Bay section of Barking Sands in 2006 (Dollar and Brock 2007). COTS are corallivorous (coral-eating) invertebrates that can inflict devastating impacts on the ecological integrity of reef systems and can alter coral community structure when populations reach outbreak levels, or exceedance of approximately 1,500 organisms per square kilometer (km^2) (Timmers et al. 2011).

Environmental Consequences

Fish, Essential Fish Habitat, and Corals

No Action Alternative

The Navy currently limits onshore fishing at Barking Sands to the Recreation Area and the Special Use Area (Section 3.3.3.2). Fishing restrictions allow for only pole, throw net, and spear fishing. Fishing and beach access restrictions are enforced by installation security personnel, who patrol the beach several times per day.

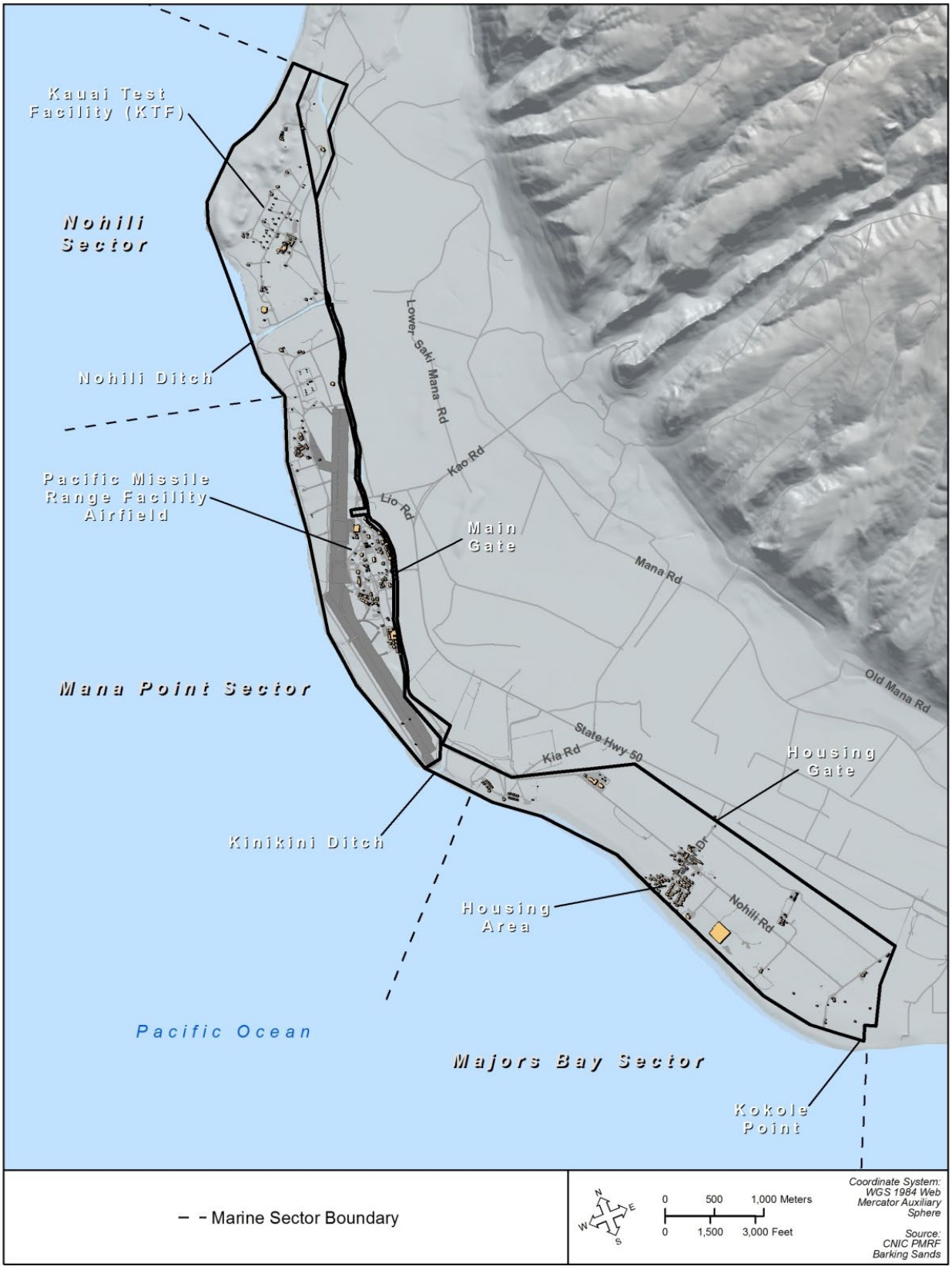


Figure 8 Marine Sector Boundaries for Barking Sands

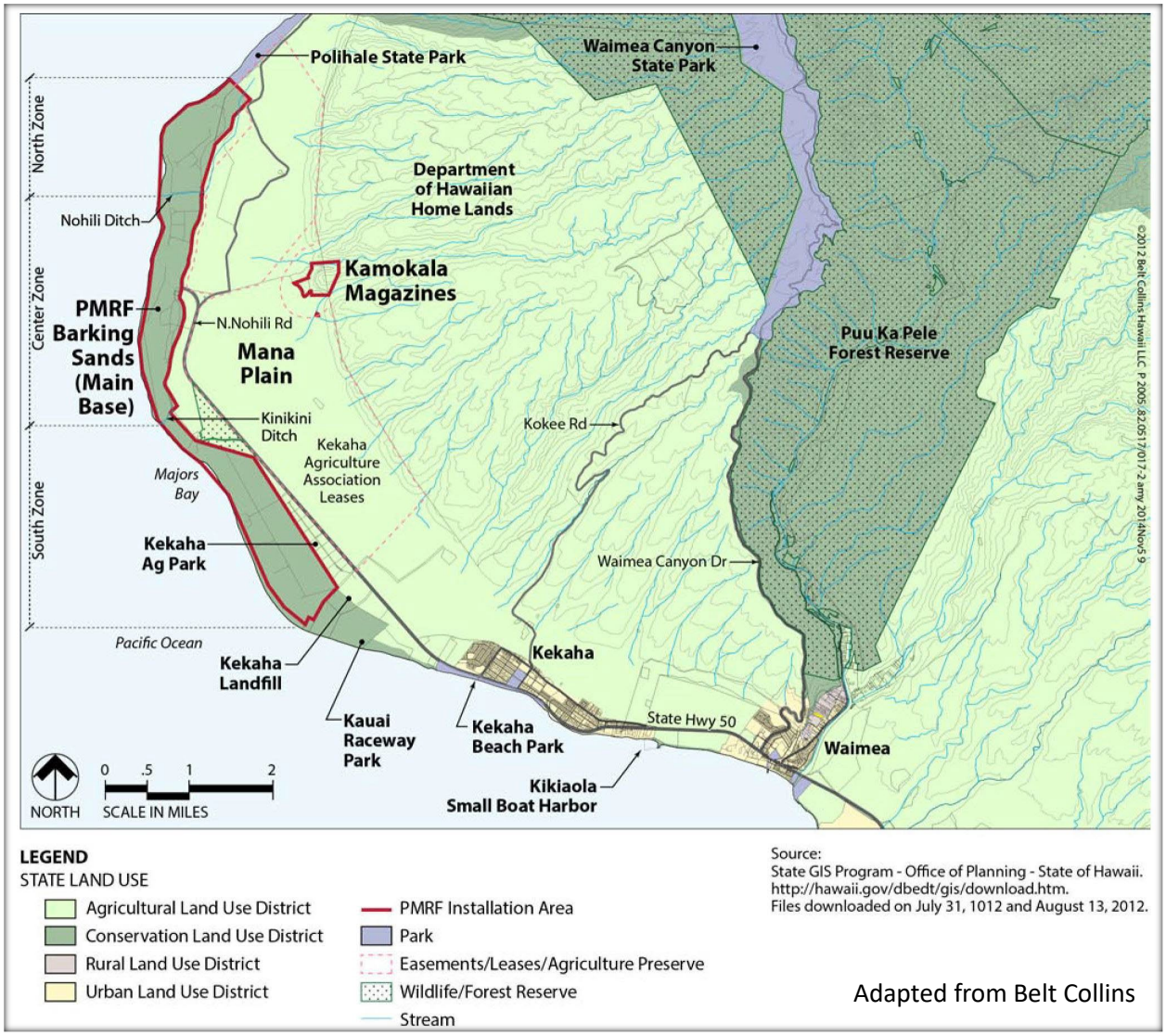


Figure 9 PMRF Barking Sands, Kamokalā Magazines, and Surrounding Land Use (DoN 2014b)

Management actions in the 2010 INRMP related to fish and EFH include:

1. *Marine Resources and Fisheries Survey Update:* Fund a follow-on survey to the 2006 marine resources and fisheries survey of the coastal/marine environment at Barking Sands.
2. *Fishing Survey:* Level of fishing activity and ecosystem health, as it relates to fish stock abundance, monk-seal hookings, and marine debris, should be monitored through surveys investigating level of fishing activity. A fee for fishing-gear rental and for fishing access to base should be instituted to cover costs.

The continued implementation of the 2010 INRMP would result in minor beneficial impact by monitoring the health of fish, EFH, and the coastal/marine environment.

Preferred Alternative

The 2023 INRMP proposes to employ a systematic approach to managing coastal and nearshore resources, using a process that includes inventory, monitoring, modeling, management, assessment, and evaluation. To achieve this objective, the following strategies are proposed:

1. Establish a monitoring program for the nearshore environment of PMRF to inform future management decisions and monitor changes over time.
2. Partner with DLNR DAR to incorporate regular monitoring site(s) in PMRF's nearshore waters into the State's regular monitoring schedule, as feasible.

In addition to the direct management actions affecting fish, EFH, and coral, there is an anticipated beneficial impact on coral reefs from reduced runoff associated with erosion control measures (Section 3.3.1.1). The lower sediment load and improved runoff quality improves water quality, which results in a beneficial impact on coral reef species (Dollar and Brock 2007).

Implementation of the actions proposed in the revised 2023 INRMP would have a beneficial impact on fish, EFH, and corals when compared to activities of the No Action Alternative due to improved erosion control and increased environmental monitoring of nearshore waters.

Macroinvertebrates

The management actions associated with macroinvertebrate species at PMRF involve general nearshore monitoring actions; therefore, there is no impact associated with the implementation of the INRMP.

3.3.3 Social and Cultural Environment

3.3.3.1 Land Use

The term land use refers to real property classifications that indicate either natural conditions or the types of human activity occurring on a parcel. Two main objectives of land use planning are to ensure orderly growth and compatible uses among adjacent property parcels or areas.

The SOH designates the following Land Use Categories: agricultural, conservation, rural, and urban. Additional land use categories applicable to the Barking Sands facility are defined in the Kaua'i County General Plan. Most of the lands at PMRF are ceded lands—crown lands of the Hawaiian monarchy that were "ceded" to the federal government during Hawai'i's annexation in 1898. If released from federal use, these lands are to be returned to the State to resolve Native Hawaiian claims to the land (Commander, Navy Region Hawai'i 2012). Land use controls outside the installation boundaries are critical to range operations at PMRF and are governed by various real estate agreements (HHF Planners 2016).

The Office of the Chief of Naval Operations Instruction (OPNAVINST) 11010.40 establishes an encroachment management program to ensure operational sustainment that has direct bearing on land use planning on installations. Additionally, the joint instruction OPNAVINST 11010.36C and Marine Corps Order 11010.16 provides guidance administering the Air Installation Compatible Use Zone (AICUZ) program, which recommends land uses that are compatible with noise levels, accident potential, and obstruction clearance criteria for military airfield operations. OPNAVINST 3550.1A and Marine Corps Order 3550.11 provide guidance for a similar program, Range AICUZ (RAICUZ). This program includes range safety and noise analyses and provides land use recommendations which would be compatible with Range Compatibility Zones and noise levels associated with military range operations.

Primary land use constraints on Barking Sands are related to the military operations and trainings. These constraints include:

- *AICUZ:* For the promotion of compatible development in the vicinity of airfields as well as the protection of the public safety and health as well as protection of the Navy's national defense mission.
- *Range AICUZ:* Provides land use recommendations which would be compatible with Range Compatibility Zones and noise levels associated with military range operations.
- *Explosives Safety Quantity Distance (ESQD) Arcs:* Arcs designed to protect an exposed site (e.g., inhabited building, public highway) from explosive materials to afford an acceptable degree of protection and safety for the exposed site.
- *Ground Hazard Areas (GHAs):* Arcs with a radius of 6,000 ft for Navy Vandal missile launches and 10,000 ft for Strategic Target Systems launches to exclude non-essential personnel and the public from the hazardous areas.
- *EMR Zones:* Areas placed around transmitter sites and tracking radars to negate hazards to personnel (HERP), hazards to ordnance (HERO), or hazards to fuel (HERF).
- *Antiterrorism Force Protection (AT/FP):* Unified Facilities Criteria (UFC) 4-010-01, DoD Minimum Antiterrorism Standards for Buildings (2013) establishes standards to protect all inhabited DoD buildings from terrorist attacks. UFC 2-100-01, Installation Master Planning (2012) lists the standoff distances during the master planning phase to meet the UFC 4-010-01 requirements. The local threat environment and construction standards would determine if these standoffs need to be increased or changed, as plans are further developed.
- *Aviation Safety Zones:* Established around the ends of active runways in order to control the activities and number of people on the ground at risk in the event of an aircraft accident during take-off or landing.
- *Clear Zone (CZ):* The area closest to the end of the runway is the most hazardous.
- *Accident Potential Zone (APZ I and II):* APZ I is an area beyond the CZ that possesses a significant potential for accidents. APZ II is an area beyond APZ I with a lower, but still significant, potential for accidents.

Affected Environment

Barking Sands occupies approximately 2,538 ac of Navy-owned and Navy-leased land and has approximately 7.6 mi of shoreline. Barking Sands is in a SOH Land Use Commission (LUC) designated Conservation District. The land uses surrounding Barking Sands include agricultural, recreational, and a landfill. The eastern border is adjacent to a State Agricultural District (SOH LUC 2012), a 5,000 ac Agricultural Preservation Initiative (API) area administered by the HDOA. North of Barking Sands is Polihale State Park. The State's 158 ac Kekaha Agricultural Park and Kekaha Landfill lie south of Barking Sands (Figure 9). The County of Kaua'i classifies Barking Sands as military land use, and its surrounding lands as open and agricultural. Kaua'i County has designated the dune area from Nohili Point to the north boundary of PMRF as a scenic ecological area (County of Kauai Planning Department 2018).

Barking Sands Main Base is the principal operations area for PMRF and supports surface, subsurface, air, and space activities. Based on the unique activities that dictate the constraints for the area, Barking Sands can be divided into three areas: North Zone, Central Zone, and South Zone (Figure 9). North Zone is used for missile assembly and launch operations and RDT&E programs and therefore has controlled access. The Central Zone houses the Main Operations Area and Airfield Operations Areas (AOA). The Main Operations Area supports functions related to flight and range operations, maintenance, supply, and storage. AOA includes a runway, airfield operations and administrative facilities, and the helicopter

landing pad and hangar. The South Zone contains personnel support, housing, community support, and recreation facilities. The most southern end provides special areas that can be used for range operations with unique needs and constraints, such as launching and antenna use. Figure 10 illustrates the generalized land use at PMRF at Barking Sands (Commander, Navy Region Hawai'i 2012).

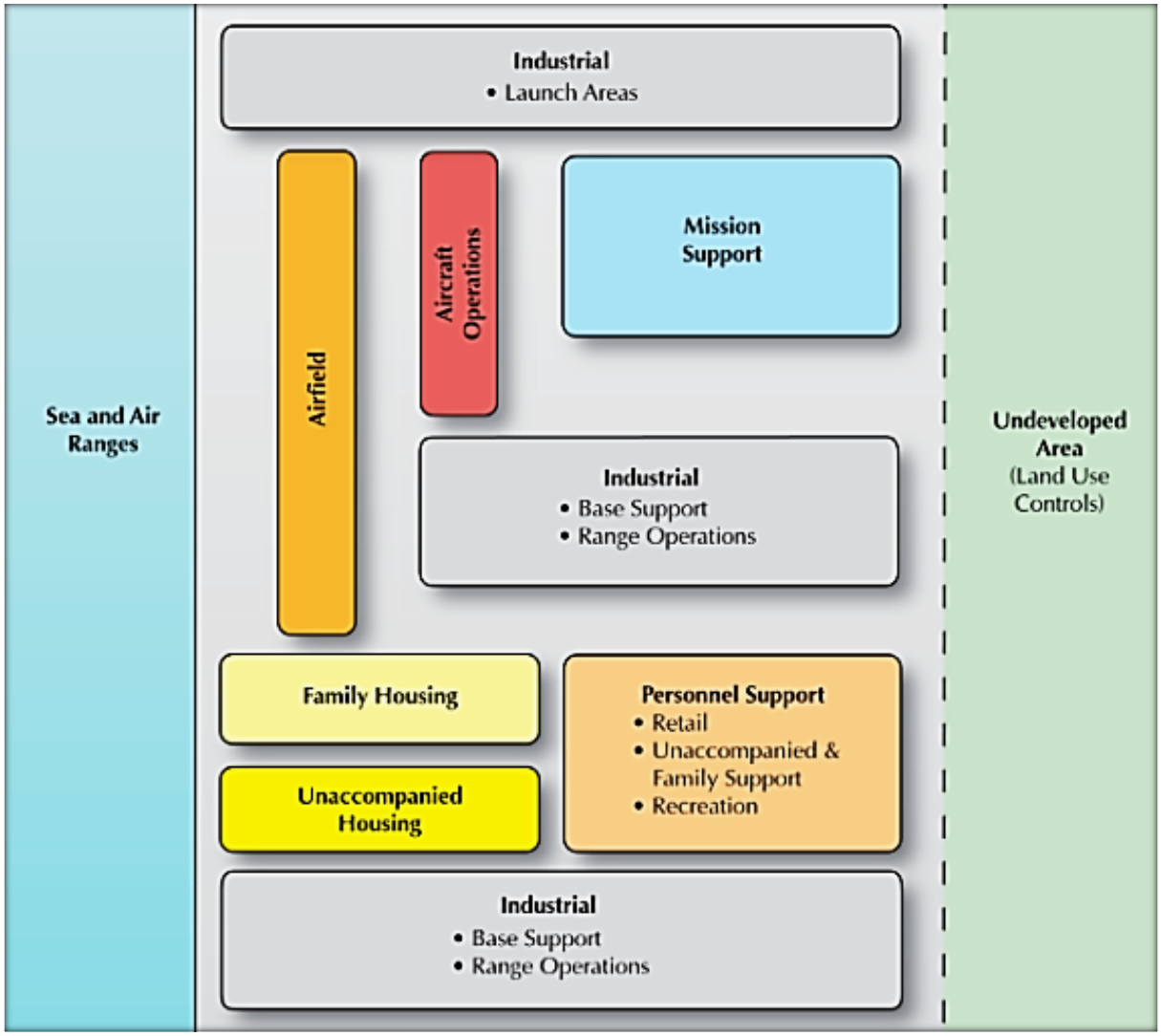


Figure 10 PMRF Barking Sands Generalized Land Use (Commander, Navy Region Hawai'i 2012)

Military operations related land use constraints present at Barking Sands include AICUZ, ESQD Arcs, GHAs, EMRs, AT/FP, Aviation Safety Zones, CZs, and APZs. Parts of the GHAs extend off base. As such, PMRF coordinates with the SOH and DLNR Division of State Parks to ensure impacted areas of Polihale Beach Park remain clear during missile launches. The ESQD arcs on Barking Sands extend beyond its borders into agricultural lands and the ocean on the northern portion of the base. Barking Sands has an MOU with the SOH to restrict land use within the ESQD arcs that extend to off base property. A portion of the Barking Sands recreation beach lies within the CZ. This area is closed to recreation purposes during daylight hours and all other times when the airfield is in use. The APZ I in the central zone extends from both the north and south ends of the runway; however, APZ II is not required for either end since the flight tracks beyond this area are over the ocean. Other development constraints are critical habitats

and wetlands, flood zones/tsunami evacuation zones, habitats for rare, threatened and endangered species, and sites on which significant cultural and historic resources occur (Figure 11).

The primary land use constraint on Barking Sands is the military mission, which restricts or constrains land use during certain operations and training events.

Land seaward of the upper wash of waves or the vegetation line is State land, except when designated for Navy use per 33 C.F.R. § 334.1390 or 33 C.F.R. § 165.1406. The Navy must limit public access to restricted beach areas for public safety during operational hours.

Barking Sands is in a SOH LUC-designated State Conservation District with its eastern border adjacent to a State Agricultural District (SOH LUC 2012). A 5,000-ac API area, which is administered by the HDOA, Agribusiness Development Corporation, lies within the agricultural district. These lands are leased to various agricultural operations, including multi-national seed corporations. This low-elevation land is drained by a ditch system, approximately 40 miles long, which traverses PMRF to discharge into the Pacific Ocean at Kinikini Outfall. The ditch system allows the water table to remain below the root zone during the growing season and diverts upland stormwater runoff from agricultural lands. Except during heavy rainfall when flow is gravity fed, the ditch system is controlled by a pump.

Modified development, construction projects, and real estate actions on Barking Sands trigger NEPA evaluation early in the site approval process. Most of these development activities are covered by existing categorical exclusions (CATEXs). A record of CATEX describing BMPs and regulatory requirements is prepared as a NEPA process and not part of INRMP management actions.

Environmental Consequences

No Action Alternative

The No Action Alternative would carry forward the management strategies from the 2010 INRMP. Procedures would continue to be implemented to assure coordination among facilities planners, resource managers, and SOH and County officials. The PMRF Installation Environmental Program Director would continue to be the point of contact to provide relevant information on issues with the potential to affect wildlife and native habitat, such as military operations and training, and tower and other construction and repair projects. Management actions in the 2010 INRMP related to land use include the following:

1. *Base Planning:* A routine procedure should continue to be implemented to assure coordination among facilities planners, resource managers, SOH, and county officials. Continue to utilize the PMRF Environmental Coordinator as the point of contact to provide relevant information on issues with potential to affect wildlife and native habitat, such as military operations and training, and tower and other construction and repair projects.
2. *Protection of Natural Resources in Undeveloped Areas:* Review construction and maintenance projects at PMRF to ensure contractors are aware of guidelines to avoid impacting sensitive vegetation.
3. *Base Planning:* Continue to follow standard methods to control erosion for all new construction projects. The proposed Maritime Directed Energy Test Center at Barking Sands should be sited to avoid protected species and their habitat.
4. *Base Planning:* Review locations and plans for any new equipment towers in order to minimize effects on protected species and their habitat.

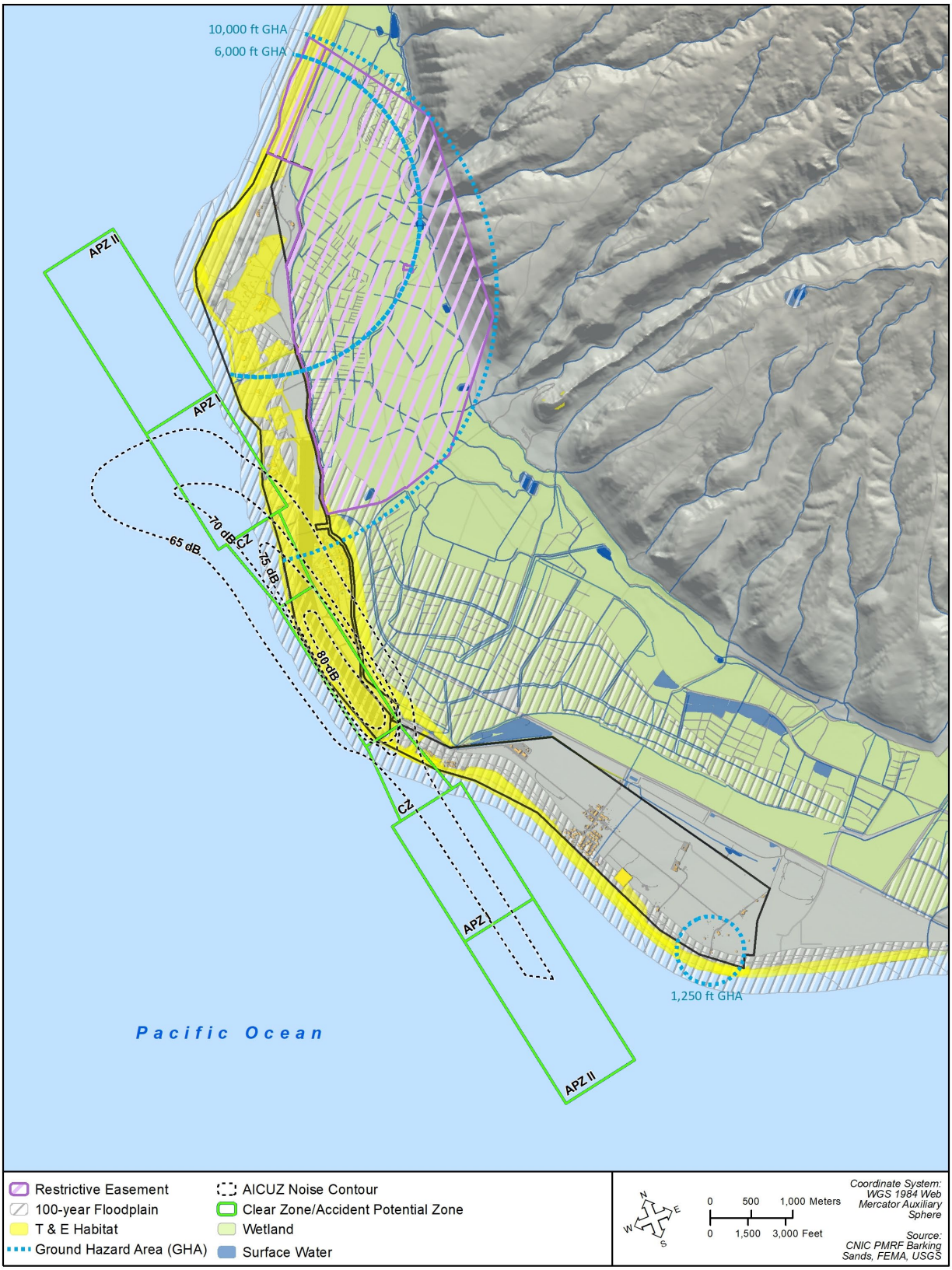


Figure 11 Barking Sands Main Base Constraints

Continued implementation of the 2010 INRMP would not include any management actions leading to land use change; therefore, the No Action Alternative would have no impacts on land use.

Preferred Alternative

The primary purpose of an INRMP is to ensure no net loss in the capability of military lands to support the military mission of the installation. In the 2023 INRMP, the management, preservation, and enhancement of land areas, such as developing oxidation pond flushing protocols, considering designating the Nohili Dunes as a Special Conservation Area, and removing invasive species from landscaped areas, would improve the ecosystem integrity of military lands. The Preferred Alternative would be compatible with existing land use at the Barking Sands Main Base and its surrounding areas.

The 2023 INRMP contains the following strategies related to land use:

1. Continue to implement coordination among facilities planners, resource managers, SOH, and county officials.
2. The PMRF IEPD and NRM should continue to be the points of contact to provide relevant information on issues with potential to affect wildlife and native habitat, such as military operations and training, and tower and other construction and repair projects.

No new land uses or land use alterations would occur as the result of the implementation of the 2023 INRMP. Therefore, no impacts on land use would occur.

3.3.3.2 Outdoor Recreation

Affected Environment

The wide sandy beaches at Barking Sands provide various types of recreational activities, such as walking, jogging, sunbathing, swimming, surfing, and fishing. PMRF employees, active duty, reserve and retired military and dependents have recreational access to approximately 2.0 mi of coastline. Historically, the public also had access to the beaches and water areas along the Barking sands shoreline. After the terrorist attacks on September 11, 2001, most civilian beach access was restricted. In 2005, the MWR Guest Card Program was initiated, allowing card-holding civilians to access PMRF through the main gate, travel unrestricted to Majors/Waiapua'a Bay or Shenanigans, use Majors/Waiapua'a Bay and Shenanigans facilities, and access the recreational beach areas (Figure 12). The areas accessible for fishing, surfing, recreation, and socializing extend from

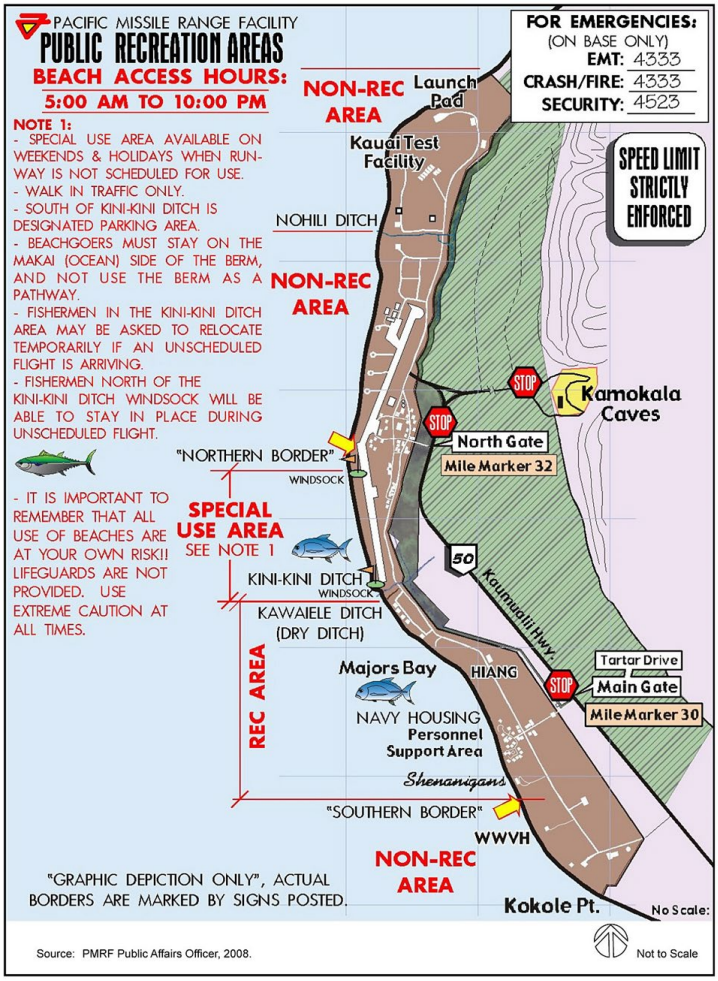


Figure 12 Barking Sands Recreational Areas

Shenanigans (All-Hands Club) to Kinikini Ditch (south end of runway), Monday through Friday, and into the Special Use Recreation Area (Kinikini to the northern windsock of the runway) on weekends and holidays, except during heightened force protection conditions or range operational periods. Beach use hours are from 5 a.m. to 10 p.m. The public can walk or drive onto the north end of the base via the beach, although security is enforced, and other deterrents are being examined.

The Navy also maintains beach cottages adjacent to Majors/Waiapuaʻa Bay, which provide recreational opportunities for visitors to Barking Sands. The cottages are available to active duty and retired military and their dependents year-round. All PMRF recreational facilities are accessible to disabled persons in accordance with Secretary of the Navy Memorandum of August 15, 2002. The Navy limits shore fishing at Barking Sands to the Recreation Area and the Special Use Area. Fishing restrictions allow only for pole, throw net, and spear fishing. Fishing and beach access restrictions are enforced by installation security details, which patrol the beach several times per day.

Environmental Consequences

No Action Alternative

The 2010 INRMP implements the following management actions related to outdoor recreation:

1. *Fishing, Surfing, Windsurfing, and Beach Activities:* Continue to provide beach access through Barking Sands for surfing and boating to PMRF employees, active duty, reserve, and retired military and dependents, as well as any U.S. citizen who possess a valid annual PMRF Recreation Pass.
2. *Dissemination of Pertinent Natural Resources Information to Recreation Pass Program Applicants:* Provide PMRF Recreation Pass Program applicants with information on invasive species, aquatic hitchhikers, and other pertinent natural resources information as part of the application process.
3. *Beach and Dune Access Restrictions:* Continue all beach and dune access restrictions. Monitor for excessive traffic at areas adjacent to the beach cottages and other high-use recreational areas and temporarily cord off areas to re-establish the vegetation, if necessary.

The outdoor recreation management actions from the 2010 INRMP would continue to provide military personnel, their dependents, and the public an opportunity to participate in outdoor recreation activities. In addition, the management actions would help to protect the natural resources and ecosystem at Barking Sands and maintain or enhance its recreational quality. Therefore, the No Action Alternative would be beneficial to the outdoor recreation resources at Barking Sands.

Preferred Alternative

The 2023 INRMP contains the following strategies related to outdoor recreation:

1. Continue to provide public opportunities for natural resource related outdoor recreation where it does not conflict with public health and safety, the military mission, or security.
2. Ensure that the degree of access allowed for outdoor recreation is consistent with conservation of natural resources.
3. Continue to promote awareness among recreational users of the importance of resource stewardship and promote a sense of pride in the natural environment of PMRF.
4. Provide PMRF Recreation Pass Program applicants with information on pertinent natural resources information as part of the application process.
5. Continue to restore and enhance natural and cultural resource assets at PMRF for public benefit and enjoyment.

6. Develop a Natural Resources Information Center to include brochures and other materials promoting self-guided nature walks and bird watching opportunities both on base and in the surrounding areas. Information on threats to native Hawaiian ecosystems and threatened and endangered species should be included, with particular emphasis on the introduction and spread of alien plant species and the negative effects of off-road vehicles in sensitive environments and measures that can be taken to avoid such impacts.

The 2023 INRMP would continue to provide military personnel, their dependents, and the public an opportunity to participate in outdoor recreation activities and would have a minor beneficial impact on outdoor recreation by developing a Natural Resources Information Center providing information on self-guided nature walks and bird watching opportunities.

3.3.3.3 Cultural Resources

DoN is aware that there may be circumstances under which the protection and enhancement of natural resources could affect cultural resources. Appendix A summarizes applicable cultural resources laws, regulations, and requirements. When natural resources projects resulting from this INRMP have been precisely defined, they will be evaluated for potential effects on cultural resources. Section 106 consultation will be initiated with the State Historic Preservation Officer and native Hawaiian organizations, if appropriate, in accordance with the National Historic Preservation Act (NHPA), 16 U.S.C. § 470 (f), as amended, and its implementing regulations, 36 C.F.R. part 800. In addition, other potentially applicable federal cultural resource statutes include the Archaeological Resources Protection Act of 1979 (16 U.S.C. §§ 470aa-470ll) and Native American Graves Protection and Repatriation Act (25 U.S.C. § 3001 et seq.). The existing ICRMP for various Navy properties that fall under PMRF shall be considered for cultural resources compliance (NAVFAC PAC 2012). The ICRMP also provides further instruction on existing Navy agreements, which may include Memorandum of Agreement, Programmatic Agreement, and Comprehensive Agreement (DoN 1999; 2011b; 2012).

Affected Environment

Cultural resources at PMRF Barking Sands include archaeological sites, historic architectural resources, and traditional cultural places. More than 90 previous archaeological and historic architectural studies have been conducted addressing PMRF Complex lands in Hawai'i. All these resource types and previous studies are addressed in detail in the 2012 *Integrated Cultural Resources Management Plan for the Pacific Missile Range Facility, Kauai Island, State of Hawai'i, FY 2012-2017* (NAVFAC PAC 2012), referred to going forward as the ICRMP. The ICRMP provides a historic context, inventory of resources, probability maps of culturally sensitivity areas, and descriptions of previously conducted studies. It also provides a gap analysis identifying future research needs as well as a series of SOPs for addressing compliance, avoidance, mitigations or impacts to cultural resources. A Historic Asset Management Process (HAMP), completed in 2011 (DoN 2011a) provides additional information about historic facilities, along with a decision-making workflow to identify the appropriate procedures for addressing historic facilities.

The site's historic context is provided in greater detail in the ICRMP (NAVFAC PAC 2012), and is summarized as follows. Barking Sands lies within the arid coastal plain traditionally known as Mānā in the ahupua'a (land division) of Waimea within the moku (district) of Kona. This area was important for habitation, agriculture, and ceremonial activities, including the presence of burial grounds in the dunes. The area was extensively occupied by early Hawaiians, and was well-known historically for its offshore fishing grounds, taro cultivation in the marshes, and upland sandalwood forests; habitations included temporary fishing camps and permanent villages (NAVFAC PAC 2012).

Traditional fishing and subsistence agriculture remained the way of life in the Mānā area after the initial arrival of Europeans in the Hawaiian Islands in 1779. After the Māhele of 1848, when Kamehameha II introduced a system of private land ownership, Mānā became Crown Lands, owned by the king. Agriculture continued to some degree, but some lands were leased, introducing cattle ranching and market agriculture such as coffee and fruit. In the late nineteenth century, the land was consolidated under a lease as part of large sugar plantation operations, with marshy areas near Barking Sands leased to Chinese farmers to grow rice (NAVFAC PAC 2012). Two plantation worker camps, Mana Camp and Saki Mana, were located close to and partially within the current Barking Sands site (Martin 2002).

During World War II, an airfield was developed at Barking Sands, and after the commencement of the Cold War, the site was used for research and development of significant missile defense programs of that era. Of all the PMRF land areas, Barking Sands has the greatest number of identified cultural resources. Most cultural and historic studies have occurred within this area. Listings of all previously inventoried sites, cultural places, and historic facilities, as well as all previous studies at PMRF, are provided in the 2012 ICRMP (NAVFAC PAC 2012).

Traditional Cultural Places/Properties

In traditional Hawaiian cultural geography, place names refer to both the landforms and to events that occurred there (NAVFAC PAC 2012). Traditional cultural places are usually identified first by the presence of a traditionally used name, and then through documented associations with historical events, traditional stories, and chants. The large number of historically named places in the Waimea district, more than 98 percent of the area's geographic features, underscores the importance of the area to early Hawaiians.

Thirteen traditional cultural places/properties (TCPs) have been identified at Barking Sands and are considered culturally sensitive. TCPs play an important role in community cultural traditions, beliefs, and activities and must be considered in planning under NEPA, NHPA, EO 13007, and other authorities. Within the TCPs, named places that contribute to their significance include, but are not limited to, the following: Nohili Dunes, Nohili Ditch, Kawaiʻele, Kūākiʻi Pōhaku, Kawaiʻele Ditch, Kinikini, Keanapuka, Kapuaʻi, Kohomahana, Kokole, Moelaoa, Palaeholani, Waiapuaʻa, and Wailono. For more details, see Table 4.6 in the 2012 ICRMP (NAVFAC PAC 2012).

Archaeological Sites

Of the more than 80 inventoried archaeological sites at Barking Sands identified in the ICRMP, 31 are eligible for listing in the National Register of Historic Places (NRHP). An additional 28 are not eligible for NRHP listing and 24 others remain undetermined or unevaluated.

Within PMRF Barking Sands, the highest archaeological sensitivity is on Nohili Dunes and the beach areas of the north and central coastline as far south as Waiapuaʻa Bay, where the likelihood of encountering subsurface archaeological resources remains high (NAVFAC PAC 2012). The coastal dunes are the location of numerous known burials, as well as other significant archaeological sites, mostly with a traditional Hawaiian affiliation. According to the ICRMP, these may include habitation sites, low stone walls, midden deposits, and surface scatters. There is moderate archaeological sensitivity in undeveloped areas inland of the dunes, where there is moderate likelihood of finding subsurface archaeological resources, mostly remains of habitation sites. There is a lower sensitivity based on a low probability of archaeological sites in the south end of Barking Sands and in developed inland areas, according to the probability determinations in the 2012 ICRMP (NAVFAC PAC 2012).

Plantation-era archaeological sites have not been documented in as much detail as traditional Hawaiian resources. However, nine sites are documented at Barking Sands. They include two cemeteries, road traces, debris scatters, and three plantation ditches (Kawai'ele, Kinikini, and Nohili). Kawai'ele Ditch is believed to have existed previously and was said to have been constructed by the Menehune (a legendary race of people, small in stature, to whom magical powers are attributed), but was later modified to support sugar cultivation (NAVFAC PAC 2012). The Saki Mana plantation camp area is also identified as a likely location of subsurface archaeological resources and lies within a restrictive easement area.

Archaeological sites related to military uses during World War II and the Cold War have been documented at PMRF, including 44 total sites, 16 of which are considered eligible for listing in the NRHP. These include remains of small concrete and wood structures, and earth-and-concrete aircraft revetments in the former airfield area in the inland portions of Barking Sands, as well as trash deposits and other small features (NAVFAC PAC 2012).

Historic Architectural Resources

Eight historic architectural studies have been undertaken at PMRF facilities, but have mostly focused on Barking Sands, since it contains the vast majority of built features of all PMRF sites. Nine facilities located at PMRF Barking Sands are considered eligible historic properties for NRHP with temporal affiliation to military history (NAVFAC PAC 2012).

Environmental Consequences

For clarity, and to avoid duplication due to the similarity of impacts from the different actions on each of the resource types, the impacts on types of cultural resources defined above—archaeological, traditional cultural places, and historic architectural—are analyzed together in the analysis that follows.

No Action Alternative

There are no management actions under the 2010 INRMP that directly address cultural resources. However, management actions for natural resources can have direct and indirect effects on cultural resources, which include the following:

- *Erosion Control Measures:* These can be beneficial to cultural resources because they retain subsurface artifacts in place, protecting them from erosion damage and exposure to the elements. However, erosion control measures involving excavation of soil or driving of stakes or posts can have adverse impacts to subsurface archaeological resources, with the potential to damage undocumented resources if appropriate mitigation measures are not observed during installation.
- *Vegetation Planting and Removal:* Dune restoration involving excavation for planting new vegetation can have adverse impacts to subsurface archaeological resources, with the potential to damage undocumented resources if appropriate mitigation measures are not observed during installation.
- *Outdoor Recreation:* Recreational access to sensitive cultural resource areas such as Nohili Dunes increases the risk of archaeological site disturbance due to pedestrian or vehicular access resulting in accidental or intentional movement of artifacts.

Under the No Action Alternative, the proposed strategies had negligible impacts on cultural resources; in some cases, impacts were beneficial.

In general, the construction of fencing, signage, irrigation systems, and interpretive displays, as well as planting and removing vegetation, can result in ground disturbance, which could adversely impact archaeological subsurface resources. This is particularly an issue of concern in the Nohili Dunes area and other coastal dunes, where burials are often found.

Many activities under the No Action Alternative are foreseen to have no impact on cultural resources, including monitoring and studies, research activities, invasive animal management (except ungulate fencing installation), all wildlife management activities (except sign installation), and marine resource management. Land management planning activities are required to coordinate with cultural resources guidance. Some activities have a beneficial impact, including restrictions of off-road vehicle use, which prevents damage to archaeological sites, particularly in sensitive, erosion-prone dune areas.

The effects on cultural resources under the No Action Alternative would be low in degree of effect, long-term in duration, and localized. Due to the mitigation measures instituted as part of ICRMP policies, the adverse effect would be negligible.

Preferred Alternative

There are no management actions under the 2023 INRMP that directly address cultural resources. However, management actions for natural resources can have direct and indirect effects on cultural resources, which include the following:

- *Erosion Control Measures:* Impacts on cultural resources are generally the same as under the No Action Alternative. The addition of annual surveys for erosion and soil compaction under this alternative is beneficial, as it would allow for identification of impacts to subsurface cultural resources and prompt mitigation in coordination with cultural resources staff.
- Activities to encourage or discourage burrowing birds, especially in the Nohili Dunes and other coastal dune areas frequented by burrowing seabirds, have the potential for a negligible adverse effect on subsurface cultural resources due to the potential for below-ground disturbance or excavation (see above).

The 2012 ICRMP provides guidance on how to protect archaeological resources, addresses the inadvertent discovery of archaeological materials and of human remains, and other SOPs intended to mitigate impacts on cultural resources by actions undertaken at PMRF. The INRMP actions are required to be implemented using the SOPs detailed in the 2012 ICRMP; and some of the actions would, in the long-term, reduce soil erosion that damages cultural resources, resulting in a beneficial impact.

Significant historic and archaeological resources are present at Barking Sands. As a steward of cultural resources, the DoN must comply with federal regulations relating to those resources (e.g., NRHP). The presence of cultural resources increases costs associated with staffing, planning, and mitigation of effects to cultural resources throughout PMRF. Cultural resources compliance at Barking Sands shall be in accordance with the Navy Regional PA, as amended (Commander, Navy Region Hawai‘i 2024). The INRMP does not propose activities that would affect historic properties. No further analysis is required at this time.

3.3.4 Additive Impacts

Additive impacts from RFFAs at Barking Sands are summarized in Table 12. Section 3.2.1 describes the criteria for determining the level of impact, including additive impacts. Resources eliminated for analysis at this site are discussed in Section 3.2.3.

Table 12 Additive Impacts at Barking Sands

Environment	Resource	Description of Impact
Physical	Geological Resources	Additive impacts to geological and soil resources may include temporary land disturbance associated with power grid consolidation construction (including possible excavation and trenching, general environmental restoration activities, and construction of photovoltaic energy systems). Other projects with potential land disturbing activities include Mānā Forest Reserve Wetland Restoration, Kawaiʻele Bird Sanctuary restoration and sand mining, and the Navy Environmental Restoration Plan. Appropriate BMPs in accordance with CWA Section 402 would be implemented to prevent major erosion and soil loss. Actions listed above represent temporary disturbances. With appropriate mitigation BMPs implemented, impacts to soil and geological resources are minimized.
Physical	Water Resources	Additive impacts to water resources may occur from increased runoff associated with land disturbance from constructions activities, see geological resources above. Additionally, impacts to water quality may be incurred as a result of explosives and explosives by-products and other munitions, these impacts result from operations at Barking Sands. Other impacts may include all pest management actions that utilize poisons, pesticides, and/or insecticides potentially including the State Wildlife Action Plan, and the USFWS Hawaiian Bird Conservation Action Plan.
Physical	Natural Hazards	No additive impacts to Natural Hazards are anticipated. The projects listed in Table 6 do not change current use of the PMRF facilities significantly enough to produce a detrimental effect.
Physical	Climate Change	Impacts from GHG emissions are additive in nature, as individual emission sources are not large enough to have appreciable impact on global climate change. Projects with GHG emissions include any projects that involve use of heavy equipment, gas- or diesel-powered vehicles, or use of ships or aircraft. Reductions in GHG emissions long-term would result from alternative energy production, from projects including photovoltaic and battery energy storage systems, commercial wind-energy development, and power-grid consolidation. Additive impacts from SLR are anticipated in the future for land-based projects located in the SLR exposure area.
Biological	Vegetation	Additive impacts to vegetation may result from the following projects: Navy environmental restoration, State Wildlife Action Plan, Biosecurity Plan for Micronesia and Hawaiʻi, and Mānā Plain Forest Reserve Wetland Restoration. Impacts from these projects are anticipated to be additive and beneficial.
Biological	Nuisance and Invasive Animals	No additive impacts to nuisance and invasive animal control are anticipated from projects listed in Table 6.
Biological	Bats	Additive impacts to bats at Barking Sands may result from projects including power grid consolidation, photovoltaic energy systems, and wind energy development. The principle impacts from these activities occur during clearing and grubbing activities during construction. Wind energy projects are known to impact the species—the DLNR has set forth guidance for protection of the species for wind-energy project specifically. Impacts to the Hawaiian hoary bat at the ARDEL station are addressed within the INRMP. With appropriate measures in place to protect the hoary bat, impacts to the species are anticipated to be neutral.

Table 12 Additive Impacts at Barking Sands (Continued)

Environment	Resource	Description of Impact
Biological	Birds	BASH mitigation measures for and impacts of various operational air activities including testing and training are addressed in the INRMP. Additional projects impacting birds include wind energy development, long-range missile tests, and the USAF long-range strike weapons systems evaluation program. Projects with beneficial impacts to birds in the project area include the State Wildlife Action Plan, the Hawaiian Bird Conservation Action Plan, Mānā Plain Forest Reserve Wetland Restoration, and the Kawai'ele Bird Sanctuary restoration. The BO for Newell's shearwaters estimates an average of seven fallouts per year resulting from operations, maintenance, and infrastructure at PMRF facilities (all sites). These are not part of the Proposed Action and are analyzed separately in the EIS/OEIS and BO (USFWS 2018; DoN 2008a).
Biological	Insects	Native and pollinator insects may benefit from projects including the State Wildlife Action Plan, the Hawaiian Bird Conservation Action Plan, Mānā Plain Forest Reserve Wetland Restoration, and the Kawai'ele Bird Sanctuary restoration. Additive impacts to insects are anticipated to be beneficial at Barking Sands.
Biological	Marine Mammals, Marine Reptiles and Other At-risk Marine Species	Additive impacts to marine mammals, marine reptiles, and other at-risk marine species include potential impacts from Navy sonar testing, and noise impacts from long-range missile tests, long-range strike weapons systems evaluation program. Other potential impacts to marine mammals in the vicinity of Barking Sands include bycatch, and derelict fishing debris from recreational and commercial fishing, and maritime traffic.
Biological	Coastal and Nearshore Biological Resources	Additive impacts to coastal and nearshore resources at Barking Sands include impacts from commercial and recreational fishing activities.
Social	Land Use	No additive impacts to land use are anticipated. The projects listed in Table 6 do not change current use of the PMRF facilities.
Social	Outdoor Recreation	Additive impacts to outdoor recreation are related to operation of Barking Sands facilities, long-range missile tests, long-range strike weapons systems evaluation program require additional closures to access, affecting recreation. The 2023 INRMP includes a management action to continue restoring and enhancing natural and cultural resource assets at PMRF for public benefit and enjoyment. The adoption of the State Wildlife Action Plan, the Hawaiian Bird Conservation Action Plan, the Mānā Plain Wetland Restoration Project, the continuance of wetland and coastal upland restoration would benefit public recreational activities (e.g., bird watching) at Barking Sands. Therefore, the additive impact on outdoor recreation at Barking Sands is beneficial.

Table 12 Additive Impacts at Barking Sands (Continued)

Environment	Resource	Description of Impact
Social	Cultural Resources	Projects at Barking Sands with potential impacts to cultural resources include the Navy's Power Grid Consolidation and ARDEL, Photovoltaic and Battery Energy Storage Systems, and ongoing long-range missile tests; and DOFAW Mānā Plain Forest Reserve Wetland Restoration and Kawai'ele Bird Sanctuary; as well as aspects of various plans, including the Navy Environmental Restoration Plan and Biosecurity Plan for Micronesia and Hawai'i, the DLNR State Wildlife Action Plan, and USFWS Hawaiian Bird Conservation Action Plan. Significant historic and archaeological resources are present at Barking Sands. As a steward of cultural resources, the DoN must comply with federal regulations related to those resources (e.g., NRHP). The presence of cultural resources increases costs associated with staffing, planning, and mitigation of effects to cultural resources throughout PMRF. The analysis in this EA addresses the natural resource management program in a programmatic context. As management decisions are made and specific project designs are developed, further project and site-specific analysis and/or regulatory compliance (e.g., NEPA, NHPA, Native American Graves Protection and Repatriation Act) may be required. Cultural Resources compliance at PMRF shall be in accordance with the applicable ICRMP SOP and Navy agreements (DoN 1999; 2011b; 2012). At Barking Sands, additive impacts of the action, together with these past, present, and RFFAs would result in a negligible impact to cultural resources. This is because like the INRMP, the relevant DoD projects and other actions on installation land are required to be implemented using the SOPs detailed in the 2012 ICRMP, which include consideration and mitigation of potential impacts to cultural resources. Most of the RFFAs involve no physical alterations that would affect the area's known or potential cultural resources. Therefore, no additive impacts to cultural resources are anticipated.

3.4 Mākaha Ridge

The Mākaha Ridge Tracking Station encompasses 244 ac and serves as PMRF's secondary missile tracking and surveillance station (Figure 13). Mākaha Ridge is a finger ridge of the Nā Pali coast on the west-northwest side of Kaua'i within the SOH Forest Reserve, located approximately seven miles north of Barking Sands. Structures at the site consist of eight buildings and two lattice-support communication towers. Tracking and surveillance activities occur inside the buildings at Mākaha Ridge, including a Frequency Interference Control building, telemetry building, communications building, laboratory, power plant, maintenance facility, and guard shack (DoN 2010).

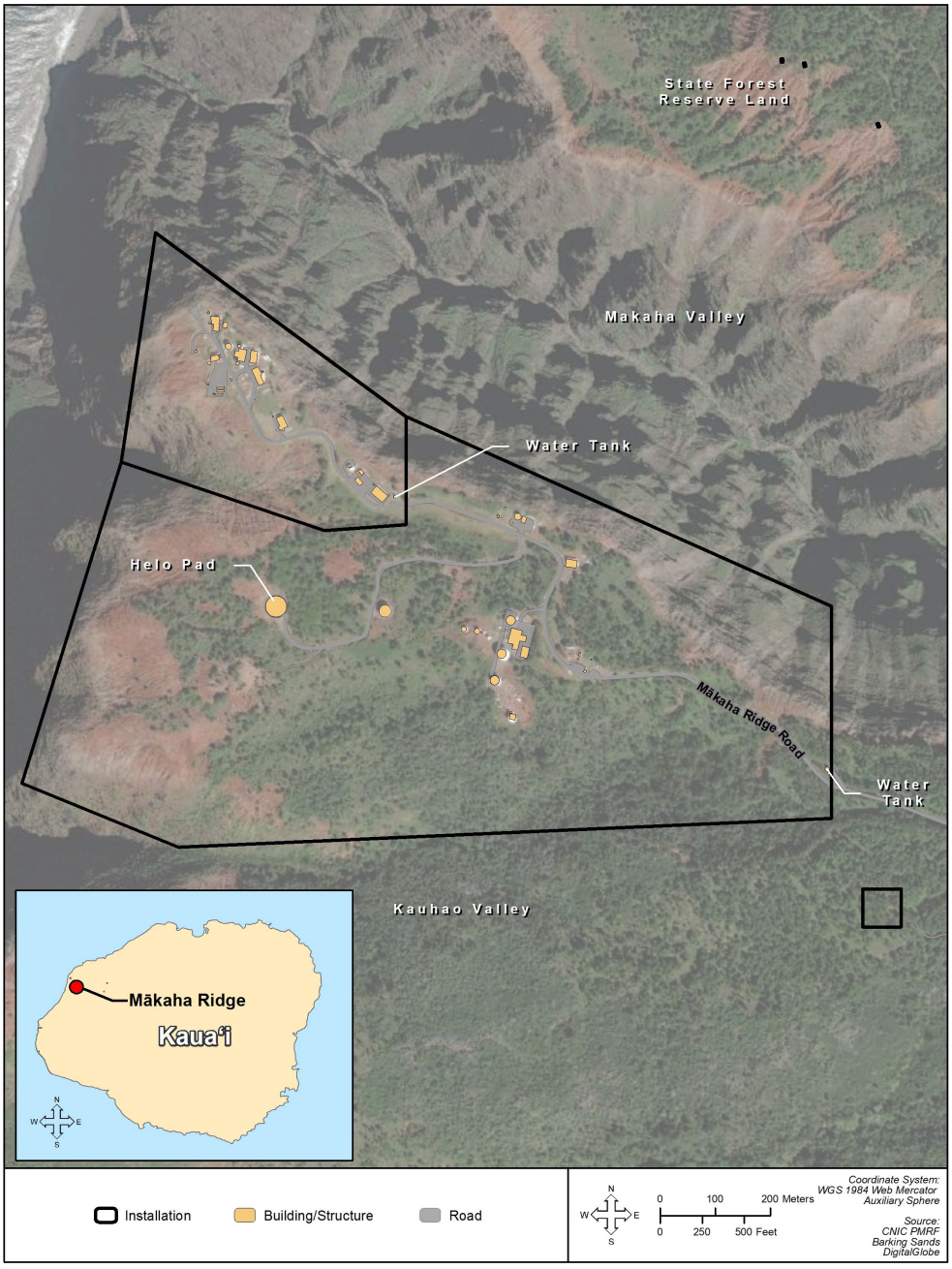


Figure 13 Overview of Facilities Located at Mākaha Ridge

Based on the location of this site, the resources identified in Table 13 are not affected and, therefore, are not further analyzed in this EA.

Table 13 Resources Eliminated from Discussion at Mākaha Ridge

Resource	Description and Justification for Elimination
Natural Hazards	Natural hazards that could affect Mākaha Ridge include hurricanes, landslides, flooding, and wildfire. However, the implementation of the INRMP would have no impact on the susceptibility of the facilities to natural hazards and would not impede evacuation activities necessary should a natural hazard such as a hurricane occur. Wildfire management would be limited to coordination with the appropriate fire department. The INRMP would not exacerbate the effect of any natural hazard.
Climate Change	The implementation of the 2023 PMRF INRMP is anticipated to have minimal GHG emissions. The Preferred Alternative is anticipated to have no to negligible impacts to climate change. SLR caused by climate change would not impact this site because of its location and elevation.
Marine Mammals, Marine Reptiles, and Other At-risk Marine Species	Mākaha Ridge is located inland away from the marine environment. INRMP activities at Mākaha Ridge would not impact at-risk marine species.
Coastal and Nearshore Biological Resources	Mākaha Ridge is located inland away from the marine environment. INRMP activities at Mākaha Ridge would not impact coastal and nearshore biological resources.
Land Use	The primary purpose of INRMP is to ensure no net loss in the capability of military lands to support the military mission of the installation. The implementation of the 2023 INRMP is not anticipated to lead to new land uses or land use alterations. Therefore, no impacts on land use would occur.
Outdoor Recreation	The 2023 INRMP does not contain strategies related to outdoor recreation at Mākaha Ridge. The 2023 INRMP would shift active hunting to further reduce goat and other ungulate populations from the Mākaha Ridge site to the Kamokalā Ridge site, maintaining recreational hunting opportunities. Therefore, the Preferred Alternative is anticipated to have no effects on outdoor recreation due to the continuing availability of recreational hunting at other sites.

3.4.1 Physical Environment

3.4.1.1 Geology and Soils

Affected Environment

Mākaha Ridge Tracking Station is located on the cliffs of the Nā Pali ridgeline, with site elevations ranging from 1,400 ft at the cliff face to 1,800 ft along the eastern perimeter, with general slope decreasing from east to west.

Soil types at Mākaha Ridge include rock outcrop (rRO), rough broken land (rRR), badlands (BL), badland-mahana complex (BM), Niu silty clay loam (NcE2, NcD), Pakala clay loam (PdA), and Pu‘u ‘Ōpae silty clay loam (PwC, PWe), shown in Figure 14. These soils generally exhibit high runoff and moderate to severe erosion hazards (USDA NRCS 2022). Areas around Mākaha Ridge facilities have been identified as highly eroded. These areas generally have little-to-no vegetation and have been targeted for restoration activities. Eroded, bare soil covers approximately 18 percent of Mākaha Ridge Tracking station. Soil erosion at Mākaha Ridge is exacerbated by feral ungulates that graze on soil stabilizing vegetation.

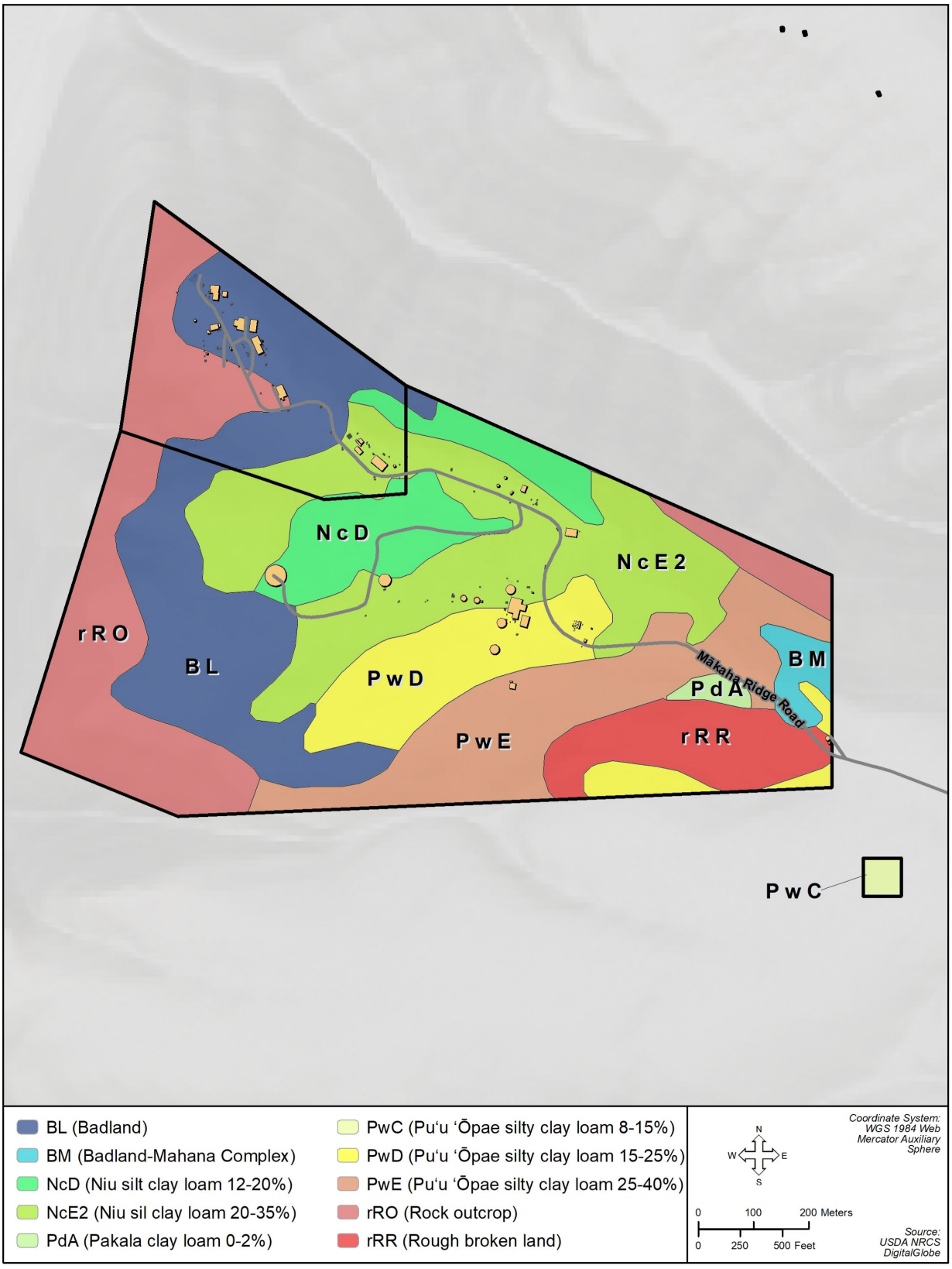


Figure 14 Soils at Mākaha Ridge

Environmental Consequences

No Action Alternative

Under the 2010 INRMP, the following strategies have been implemented to minimize soil erosion at the Mākaha Ridge Tracking Station:

1. *Base Planning:* Follow standard methods to control erosion during all new construction projects.
2. *Soil Erosion Control:* Limit vehicle access to paved roads and designated paved parking areas. Limit pedestrian traffic to established walkways. Stabilize slopes with soil-stabilizing cloth and out plantings of native drought tolerant species. Install an ungulate exclusion fence around protected plants and re-planted areas.
3. *Feral Goat Control:* Install exclusion fencing to exclude the goats from Mākaha Ridge Tracking Station to deter the consumption of erosion-inhibiting vegetation.

The continued implementation of the 2010 INRMP would result in a beneficial impact to soil at Mākaha Ridge, as the management actions improve the soil conditions and long-term availability of the resource at Mākaha Ridge.

Preferred Alternative

To minimize and restore erosion and soil compaction sites, the 2023 INRMP proposes the following strategies:

1. Conduct general surveys for erosion and soil compaction issues annually to prioritize restoration sites.
2. Monitor ungulate exclusion fence for areas vulnerable to ingress monthly and regularly monitor site for ungulate presence. Remove ungulates when identified within the fenced area. Maintain Mākaha Ridge ungulate exclusion fencing for erosion control.
3. Out-plant native, drought tolerant plants in areas identified as having erosion and soil compaction issues. Ensure that a regular monitoring schedule and a sufficient irrigation system are in place until plants are well established.

When compared to the No Action Alternative the Proposed Actions under the 2023 INRMP would have a beneficial impact on soils at Mākaha Ridge as the action would improve the soil condition in the long-term, when complete.

3.4.1.2 Water Resources

Affected Environment

The Mākaha Ridge Tracking Station has several intermittent streams both on and adjacent to the station, but no perennial water features occur at the site (NAVFAC PAC 2022). Two aquifers located beneath the station are valuable sources of drinking water. One basal, unconfined, dike aquifer (Aquifer Code 20301112) is currently used for drinking water, although no wells are located at the station. This fresh water is highly vulnerable to contamination. The other unused aquifer is a high-level (freshwater is not in contact with seawater), unconfined dike aquifer (Aquifer Code 20301212); it is a fresh drinking water source that is also highly vulnerable to contamination. Both aquifers identified at Mākaha Ridge are part of the Waimea Aquifer Sector of the Kekaha Aquifer System (John F. Mink and Lau 1992).

Environmental Consequences

No Action Alternative

Minor beneficial impacts on water resources would result from erosion control management actions (Section 3.4.1.1) and application control policies for pest management activities that utilize pesticides, herbicides, and rodenticides (Section 3.3.1.2).

Preferred Alternative

The same as under the No Action Alternative, minor beneficial impacts on water resources would result from BMPs and application control policies for pest management activities that utilize pesticides, herbicides, and rodenticides (Section 3.3.1.2), as well as from erosion control measures (Section 3.4.1.1).

When compared to the No Action Alternative, implementation of the 2023 INRMP would have a beneficial impact on water resources due to improved erosion control measures.

3.4.2 Biological Environment

3.4.2.1 Vegetation

Affected Environment

Cliff vegetation is primarily composed of native Hawaiian mixed shrub coastal cliff and mixed shrub dry coastal cliff and koa communities—a small percentage is considered non-native. Two federally listed endangered plants, the dwarf iliau and Hawai'i scaleseed , are known to occur on the dry cliffs of Mākaha Ridge (Wood 2006). Dwarf iliau is found on the dense, hard rock outcrops with nearly vertical faces. Two significant colonies of Hawai'i scaleseed grow on north facing, precipitous slopes around the Mākaha Ridge Tracking Station. Threats to native vegetation within the cliff communities include habitat degradation by feral goats and competition with non-native plants.

Plant surveys completed in 2000 and 2006, and an unmanned aerial drone survey conducted in 2019, identified 134 species of vascular plants, 100 of which are introduced (2 are believed to be Polynesian introductions) and 34 of which are indigenous (21 of the indigenous species also are endemic). The vegetation can be grouped into three general types: cliff vegetation, pine plantings/mixed scrub, and ruderal vegetation (NAVFAC PAC 2022). The vegetation cover types identified within the site are provided in Table 14 and Figure 16.

Table 14 Vegetation Cover Types at Mākaha Ridge

Cover Type	Native/Non-native	Area ac (ha)	Percent of Area
Eroded, Bare Soil	Non-native	44.2 (17.9)	18%
Hawaiian Mixed Shrub Coastal Cliff	Native	79.6 (32.2)	32%
Landscaped	Non-native	22.7 (9.2)	9%
Mixed Shrub Dry Coastal Cliff	Non-native	10.24 (4.1)	4%
Mixed Shrub Dry Coastal Cliff with Koa	Native	47.1 (19.1)	19%
Pine, Mixed Shrub	Non-native	43.6 (17.7)	18%
Total	-	**247.4 (100.1)**	**100%**

Source: NAVFAC PAC 2005.

Environmental Consequences

Invasive Plant Management

No Action Alternative

There are no actions implemented under the 2010 INRMP that could affect invasive plants resources at Mākaha Ridge; therefore, there are no impacts.

Preferred Alternative

General vegetation management strategies described in Section 3.3.2.1 are implemented at Mākaha Ridge, as applicable, to minimize and prevent the encroachment of invasive species into protected species habitats and other priority native vegetation cover types to the greatest extent practicable. The 2023 INRMP management strategies would result in a beneficial impact at Mākaha Ridge when compared to the No Action Alternative.

Native Plant Management

No Action Alternative

General vegetation management strategies described in Section 3.3.2.1 are implemented at Mākaha Ridge, as applicable. In addition, past vegetation management specific to Mākaha Ridge implemented under the 2010 INRMP is listed below:

1. *Native Plant Restoration:* The 2009 Feral Ungulate Management Plan calls for revegetation of selected eroded areas within the facility with native species expected to be found in and around Mākaha Ridge Tracking Station.

Continued implementation of the No Action alternative would have a beneficial impact on native plants at Mākaha Ridge by preventing disturbance in sensitive areas.

Preferred Alternative

General vegetation management strategies described in Section 3.3.2.1 are implemented at Mākaha Ridge, as applicable. In addition, vegetation management specific to Mākaha Ridge implemented under the 2023 INRMP is listed below:

1. Out-plant native, drought tolerant plants in areas identified as having erosion and soil compaction issues. Ensure that a regular monitoring schedule and a sufficient irrigation system are in place until plants are well established.

The above actions would have beneficial impacts on native plants and native plant habitat at Mākaha Ridge when compared to the No Action Alternative, as they increase the viability and population numbers of native plants and inhabitable vegetation space.

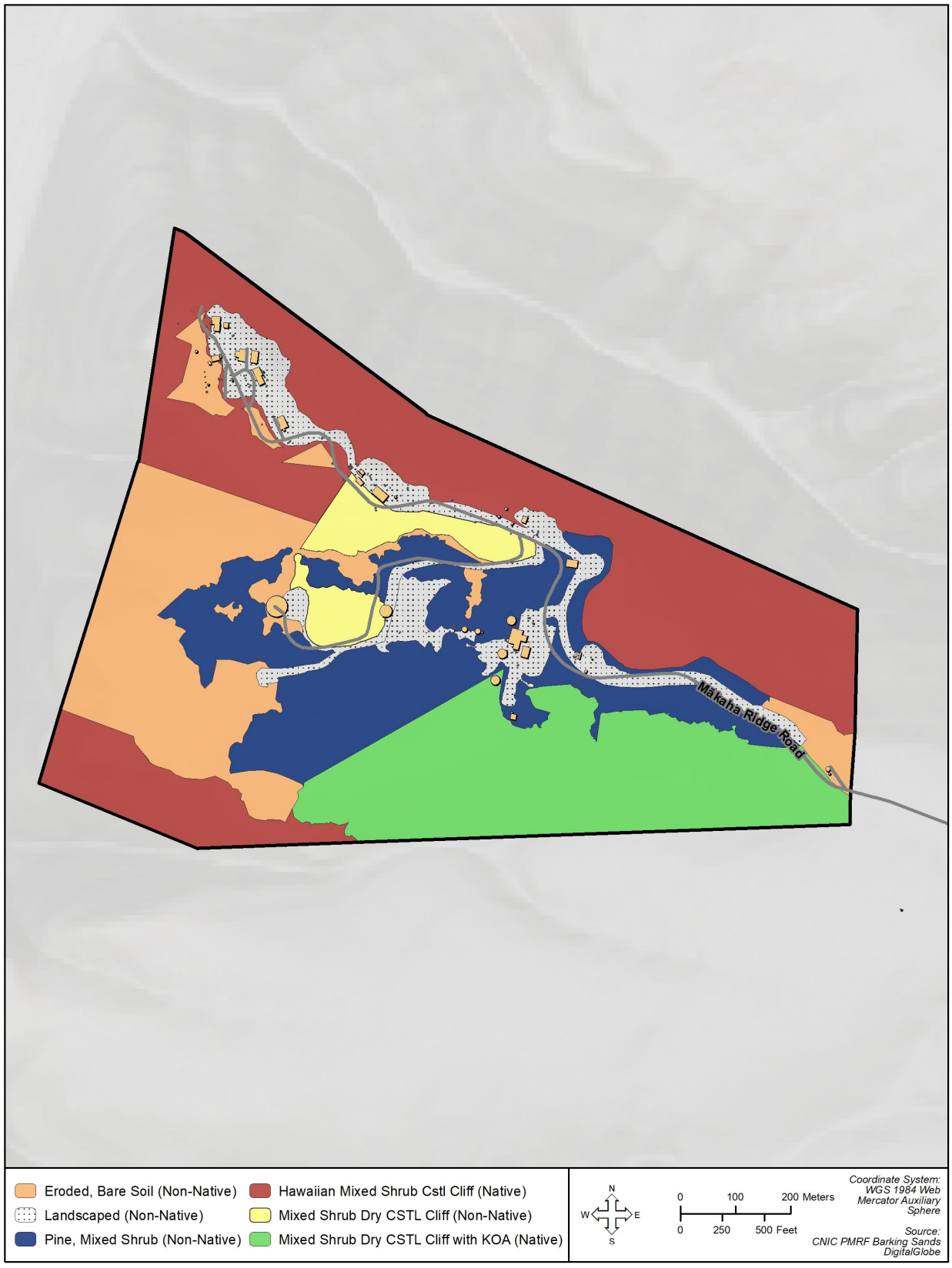


Figure 15 Vegetation Cover Types Present at Mākaha Ridge

Dwarf Iliau and Hawai'i Scaleseed

No Action Alternative

The 2010 INRMP implemented the following management actions for the conservation of dwarf iliau and Hawai'i scaleseed:

1. *Protected Species Monitoring and Reporting:* Conduct annual monitoring and status of protected species (dwarf iliau and Hawai'i scaleseed) .
2. *Botanical Surveys and Mapping:* Update the status of protected species (dwarf iliau and Hawai'i scaleseed) in preparation for the next INRMP.

The continued implementation of the 2010 INRMP would result in a beneficial impact to conservation efforts of unique plant populations present at Mākaha Ridge.

Preferred Alternative

The activities proposed under the 2023 INRMP include:

1. Implement erosion control efforts that directly benefit areas where protected species are present.
2. Conduct a reassessment of the status and condition of listed plant species on the cliffsides of Mākaha Ridge Tracking Station populations every five years and collaborate with partners to grant them access for further research and conservation efforts.

These actions would have beneficial impacts on populations of dwarf iliau and Hawai'i scaleseed compared to the No Action Alternative due to new targeted erosion control measures.

3.4.2.2 Nuisance and Invasive Animals

Affected Environment

All mammal species, except for the Hawaiian hoary bat, are non-native to Mākaha Ridge. Feral goats, feral cats, roof (black) rats, Polynesian rats, and common house mice were documented during 2000 wildlife studies. Signs also indicated the presence of feral pigs and black tailed deer. Feral goats are considered common at Mākaha Ridge Tracking Station (NAVFAC PAC 2022).

Environmental Consequences

No Action Alternative

The 2010 INRMP outlines specific measures to combat disturbances from nuisance and invasive animal species at Mākaha Ridge Tracking Station. These management actions are listed below:

1. *Feral Goat Control:* Install exclusion fencing to exclude the goats from Mākaha Ridge Tracking Station.
2. *Trial Goat Hunting:* Institute a trial goat hunting program with the Barking Sand Archery Club or other organization in coordination with the DLNR DOFAW to reduce the presence of goats at the Mākaha Ridge Tracking Station.

Continued implementation of feral goat control would have a beneficial impact on the control of nuisance animal species at the Mākaha Ridge Tracking Station.

Preferred Alternative

Under the 2023 INRMP, the general strategies for controlling nuisance and invasive animals described in Section 3.3.2.2 would be implemented at Mākaha Ridge, as applicable. These management strategies would have a beneficial impact on the control of nuisance and invasive animals at Mākaha Ridge, as compared to the No Action Alternative.

3.4.2.3 Bats

Affected Environment

The only native terrestrial mammal in the SOH is the Hawaiian hoary bat or ʻōpeʻapeʻa. The Hawaiian hoary bat is listed as endangered under the ESA. It has been documented year-round on the base and is most commonly found in the winter. The ʻōpeʻapeʻa roosts, forages, and may breed at Mākaha Ridge. Breeding season occurs during the months of September through December, and pupping occurs from June through September. During studies conducted at all PMRF facilities, the bat exhibited highest occupancy from September through February. Mākaha Ridge Tracking Station supports suitable habitat for roosting and foraging, and is likely used for breeding, pupping and rearing. Threats to the bat include habitat loss and mortality from barbed wire fences and radar transmissions.

Environmental Consequences

No Action Alternative

The 2010 INRMP includes the following management action related to Hawaiian hoary bats at Mākaha Ridge:

1. *Protected Species Monitoring and Reporting-Hawaiian Hoary Bats Surveys:* If Hawaiian hoary bats are observed up at Mākaha Ridge Tracking Station, evaluate the results to determine if regular monitoring is required.

The continued implementation of the 2010 INRMP would result in a beneficial impact on bats at Mākaha Ridge, as the management action improves understanding of the Hawaiian hoary bat populations.

Preferred Alternative

The Hawaiian hoary bat management strategies proposed under the 2023 INRMP (Section 3.3.2.3), including restriction on the season of vegetation trimming, follow-up acoustic surveys, and development of SOPs for bat roosting surveys, would have a beneficial impact on the Hawaiian hoary bat at Mākaha Ridge when compared to the No Action alternative.

3.4.2.4 Birds

Affected Environment

Three federally listed bird species are known to occur in or flyover Mākaha Ridge Tracking Station. The threatened nēnē is the only ESA listed bird species that has been documented on facility grounds. The two endangered seabird species (Newell's shearwater and Hawaiian petrel) have not been documented on site; however, active colonies are located in the region and the species may fly over the region. Other special status species documented include bird species protected under the MBTA—the white-tailed tropicbird (*Phaethon lepturus*) and the Pacific golden plover (*Pluvialis fulva*).

Nēnē populations at Mākaha Ridge have declined in recent years; however, they are still commonly observed on site.

Environmental Consequences

No Action Alternative

Under the 2010 INRMP, general endangered seabird and migratory bird management actions (Section 3.3.2.4) would be implemented at Mākaha Ridge, as applicable. In addition, the 2010 INRMP contains the following nēnē management action specific to Mākaha Ridge:

1. *Predator Control:* Update funding annually to protect nēnē if it is determined that predators are affecting nēnē nests at the Mākaha Ridge Tracking station.

Continued implementation of the 2010 INRMP would result in a beneficial impact to birds at Mākaha Ridge, as the management actions improve monitoring and protection of endangered seabirds, migratory birds, and nēnē.

Preferred Alternative

The 2023 INRMP management strategies for endangered seabirds, migratory birds, and nēnē (Section 3.3.2.4) would be implemented at Mākaha Ridge, as applicable. Implementation of the actions proposed in the 2023 INRMP would have a beneficial impact on endangered seabirds, migratory birds, and nēnē compared to the No Action Alternative due to improvements to the Dark Skies Program, improved management of habitat creation and protection, and increased monitoring of at-risk species.

3.4.2.5 Insects

See Section 3.3.2.5 for an analysis of native insects and protected pollinator species at PMRF. Although no native terrestrial invertebrate species have been identified at Mākaha Ridge specifically, native vegetation cover types may support native insect populations and future surveys may identify native insects at the site.

No Action Alternative

See Section 3.3.2.5 for an analysis of native insect and pollinator management actions applicable to all PMRF facilities, including enhancement of habitat supportive of native insects and policies to control and manage the use of pesticides and herbicides. Continued implementation of the 2010 INRMP would result in a beneficial impact to insects as the resource management actions benefit pollinators, which are ecologically important.

Preferred Alternative

General management strategies to protect native insects and pollinators described in Section 3.3.2.5 would be implemented at Mākaha Ridge, as applicable. All management actions involving the protection of native and/or pollinator species would comply with the existing MOU between the DoD and the pollinator partnership. Implementation of the 2023 INRMP would have a beneficial impact on native insects and protected pollinator species in the area, as the management strategies include species inventory at additional PMRF sites and prohibition of chemicals and pesticides (e.g., neonicotinoids) harmful to protected pollinators.

3.4.3 Social and Cultural Environment

3.4.3.1 Cultural Resources

Affected Environment

Mākaha Ridge is located in the ahupua'a of Waimea in the moku of Kona on the island of Kaua'i, located high on the steep finger ridges of the Nā Pali coast. It has not been identified as a traditional cultural place.

Significant architectural resources have not been identified at this facility. Buildings and structures in this site are of recent construction. No significant historic and archeological resources are present at Mākaha Ridge. As a steward of cultural resources, the DoN must comply with federal regulations relating to those resources (e.g., NRHP). The presence of cultural resources increases costs associated with staffing, planning, and mitigation of effects to cultural resources throughout PMRF. The INRMP does not propose activities that would affect historic properties. No further analysis is required at this time.

Environmental Consequences

No Action Alternative

There are no management actions under the 2010 INRMP that directly address cultural resources. However, management actions for natural resources can have direct and indirect effects on cultural resources, which include the following:

- *Erosion Control Measures:* At Mākaha Ridge, these include similar activities to Barking Sands, and additionally, the installation of retaining walls; construction of walls involves excavation of soil for footings or grading, which can have adverse impacts to subsurface archaeological sites. Impacts of this activity at Mākaha Ridge are negligible due to the low potential for subsurface cultural resources.
- *Ungulate Control Measures:* These can be beneficial to cultural resources because they are protected from damage by ungulates. However, installation of fence posts requiring excavation can have adverse impacts to subsurface archaeological resources, with the potential to damage undocumented resources if appropriate mitigation measures are not observed. Impacts of this activity at Mākaha Ridge are negligible due to the low potential for subsurface cultural resources.

The effects on cultural resources under the No Action Alternative would be low in degree of effect, temporary during construction activities and varying from temporary to long-term throughout operation and maintenance, localized, and unlikely to affect important cultural resources. Some impacts would be beneficial. No significant historic and archaeological resources are present at Mākaha Ridge. As a steward of cultural resources, the DoN must comply with federal regulations relating to those resources (e.g., NRHP). The presence of cultural resources increases costs associated with staffing, planning, and mitigation of effects to cultural resources throughout PMRF. Cultural resources compliance at Mākaha Ridge shall be in accordance with the Navy Regional Programmatic Agreement, as amended (DoN 2024). The INRMP does not propose activities that would affect historic properties. No further analysis is required at this time.

Preferred Alternative

There are no management actions under the 2023 INRMP that directly address cultural resources. However, management actions for natural resources can have direct and indirect effects on cultural resources, which include the following:

1. *Ungulate control measures:* Similar to the No Action Alternative, the impacts of this activity at Mākaha Ridge would be negligible due to the lack of identified cultural resources and low potential for subsurface cultural resources.

The effects on cultural resources under the Preferred Alternative would be low in degree of effect, temporary during construction activities and varying from temporary to long-term throughout operation and maintenance, localized, and unlikely to affect important cultural resources owing to the lack of identified cultural resources and low potential for them to occur. Some impacts would be beneficial. In addition, the INRMP actions are required to be implemented using the SOPs described in the ICRMP, as noted earlier in the Barking Sands section. Therefore, the overall impact to cultural resources would be adverse but negligible.

3.4.4 Additive Impacts

Additive impacts at Mākaha Ridge are summarized in Table 15. Resources eliminated for analysis at this site are discussed in Section 3.4 and a description of the analysis criteria used is described in Section 3.2.2.

Table 15 Additive Impacts at Mākaha Ridge

Environment	Resource	Description of Impact
Physical	Geological Resources	No additive impacts to geological resources are anticipated from projects listed in Table 6.
Physical	Water Resources	Additive impacts that may occur at Mākaha Ridge would result from pest management actions that utilize poisons, pesticides, and/or insecticides potentially including the State Wildlife Action Plan, and the USFWS Hawaiian Bird Conservation Action Plan. Appropriate measures would be taken to prevent impacts to water resources associated with the application of pest management poisons, pesticides, or insecticides.
Biological	Vegetation	Additive impacts to vegetation may result from the following projects: Navy environmental restoration, State Wildlife Action Plan, and Biosecurity Plan for Micronesia and Hawai'i. Impacts from these projects are anticipated to be additive and beneficial.
Biological	Nuisance and Invasive Animals	No additive impacts to nuisance and invasive animal control are anticipated from projects listed in Table 6.
Biological	Bats	Additive impacts to bats may result from the following projects: Navy environmental restoration, State Wildlife Action Plan, Biosecurity Plan for Micronesia and Hawai'i. Impacts from these projects are anticipated to be additive and beneficial.
Biological	Birds	BASH from various operational air activities including testing and training is addressed in the INRMP. Additional projects impacting birds include wind energy development, long-range missile tests, and the USAF long-range strike weapons systems evaluation program. Projects with beneficial impacts to birds in the project area include the State Wildlife Action Plan and the Hawaiian Bird Conservation Action Plan.
Biological	Insects	Native and pollinator insects may benefit from projects including the State Wildlife Action Plan, the Hawaiian Bird Conservation Action Plan, Mānā Plain Forest Reserve Wetland Restoration, and the Kawai'ele Bird Sanctuary restoration. Additive impacts to insects are anticipated to be beneficial at Mākaha Ridge.
Social	Cultural Resources	Projects at Mākaha Ridge with potential impacts to cultural resources include the Electric Power Source Mākaha Ridge Tracking Station; and aspects of various plans, including the Navy Environmental Restoration Plan and Biosecurity Plan for Micronesia and Hawai'i; the DLNR State Wildlife Action Plan; and USFWS Hawaiian Bird Conservation Action Plan. However, most of the relevant projects are planning projects that would not affect the site's potential cultural resources. Planning projects would also consider mitigating cultural resource impacts within their own project actions, limiting the possibility of any increased level of impact. This is because like the INRMP, the relevant DoD projects and other actions on installation land are required to be implemented using the SOPs detailed in the 2012 ICRMP, which include consideration and mitigation of potential impacts to cultural resources. Therefore, no additive impacts to cultural resources are anticipated.

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3.5 Kōkeʻe Sites

The Kōkeʻe sites are located on five small parcels (Sites A–E) that total 22.4 ac of land along the coastal ridgeline of Kaunuohua, near the northwestern terminus of Waimea Canyon (Figure 17). The sites are bordered by Kōkeʻe State Park on all sides and forest areas extend within the property boundaries.

- **Kōkeʻe Site A**
  Support buildings for tracking and command, training and administration, and logistics support (4.6 ac).
- **Kōkeʻe Site B**
  Power plant and fuel storage facility (2.1 ac).
- **Kōkeʻe Site C**
  Boresight (firearm adjustment) equipment, operations and maintenance support, microwave antenna, radar facilities and support buildings (2.1 ac).
- **Kōkeʻe Site D**
  Transmitter building and antenna support facilities (2.8 ac).
- **Kōkeʻe Site E**
  National Aeronautics and Space Administration Kōkeʻe Geophysical Observatory with large antenna arrays (6.7 ac).
- Based on the location of this site, the resources identified in Table 16 are not affected and therefore are not further analyzed in this EA.

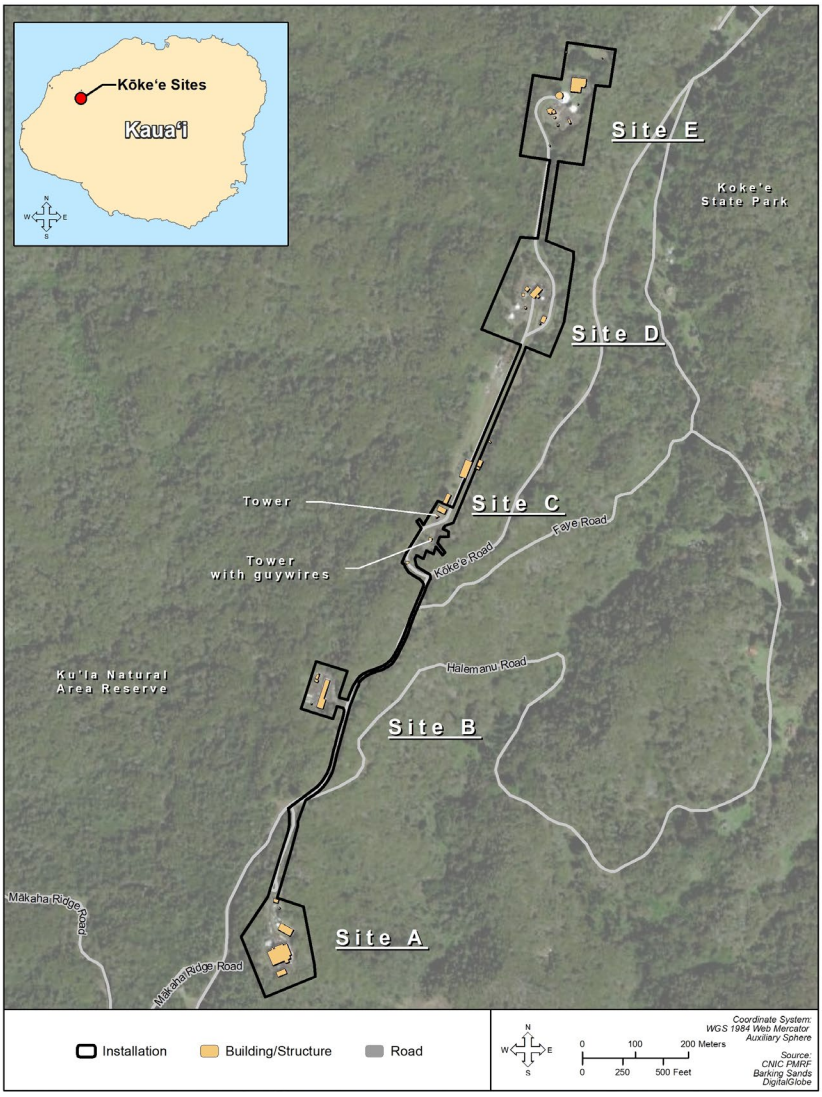


Figure 16 Kōkeʻe Sites Overview Map

Table 16 Resources Eliminated from Discussion at Kōkeʻe Sites

Resource	Description and Justification for Elimination
Natural Hazards	Natural hazards that could affect Kōkeʻe Sites include hurricanes, landslides, and wildfire. However, the implementation of the INRMP would have no impact on the susceptibility of the facilities to natural hazards and would not impede evacuation activities necessary should a natural hazard such as a hurricane occur. Wildfire management would be limited to coordination with the appropriate fire department. The INRMP would not exacerbate the effect of any natural hazard.
Climate Change	The implementation of the 2023 PMRF INRMP is anticipated to have minimal GHG emissions. The Preferred Alternative is anticipated to have no to negligible impacts to climate change. SLR caused by climate change would not impact this site because of its location and elevation.
Marine Mammals, Marine Reptiles, and Other At-risk Marine Species	Kōkeʻe sites are located inland; there are no management actions proposed by the 2010 or 2023 INRMP affecting marine species at Kōkeʻe Sites.
Coastal and Nearshore Biological Resources	Kōkeʻe sites are located inland; there are no management actions proposed by the 2010 or 2023 INRMP affecting coastal and nearshore resources at Kōkeʻe Sites.
Land Use	The primary purpose of INRMP is to ensure no net loss in the capability of military lands to support the military mission of the installation. The implementation of the 2023 INRMP is not anticipated to lead to new land uses or land use alterations. Therefore, no impacts on land use would occur.
Outdoor Recreation	The Kōkeʻe Sites are restricted areas and generally do not offer any outdoor recreation opportunities.

3.5.1 Physical Environment

3.5.1.1 Geology and Soils

Affected Environment

Elevations at the Kōkeʻe sites range from 3,710 to 3,800 ft above MSL. The sites are located on a coastal ridge, composed of lava formations from the Waimea Canyon series. The dominant soil type is Kōkeʻe silty clayey loam (KSKE) (0 to 35 percent slope), characterized by medium runoff and moderate erosion. A small section of Site A contains Kōkeʻe silty clayey loam (KSKF), (35 to 70 percent slope), which is very similar to KSKE, but is characterized by severe erosion hazards and rapid runoff (Figure 17). Despite soil characteristics exhibiting vulnerability to erosion, no significant erosion concerns have been identified at these sites.

Environmental Consequences

No Action Alternative

The continued implementation of the 2010 INRMP would result in no impact on soil and geological resources at the Kōkeʻe sites, as the INRMP does not include erosion control measures for these sites beyond standard construction erosion control BMPs that would be implemented independently of the INRMP, as described under the Base Planning management action:

1. *Base Planning:* Follow standard methods to control erosion during all new construction projects.

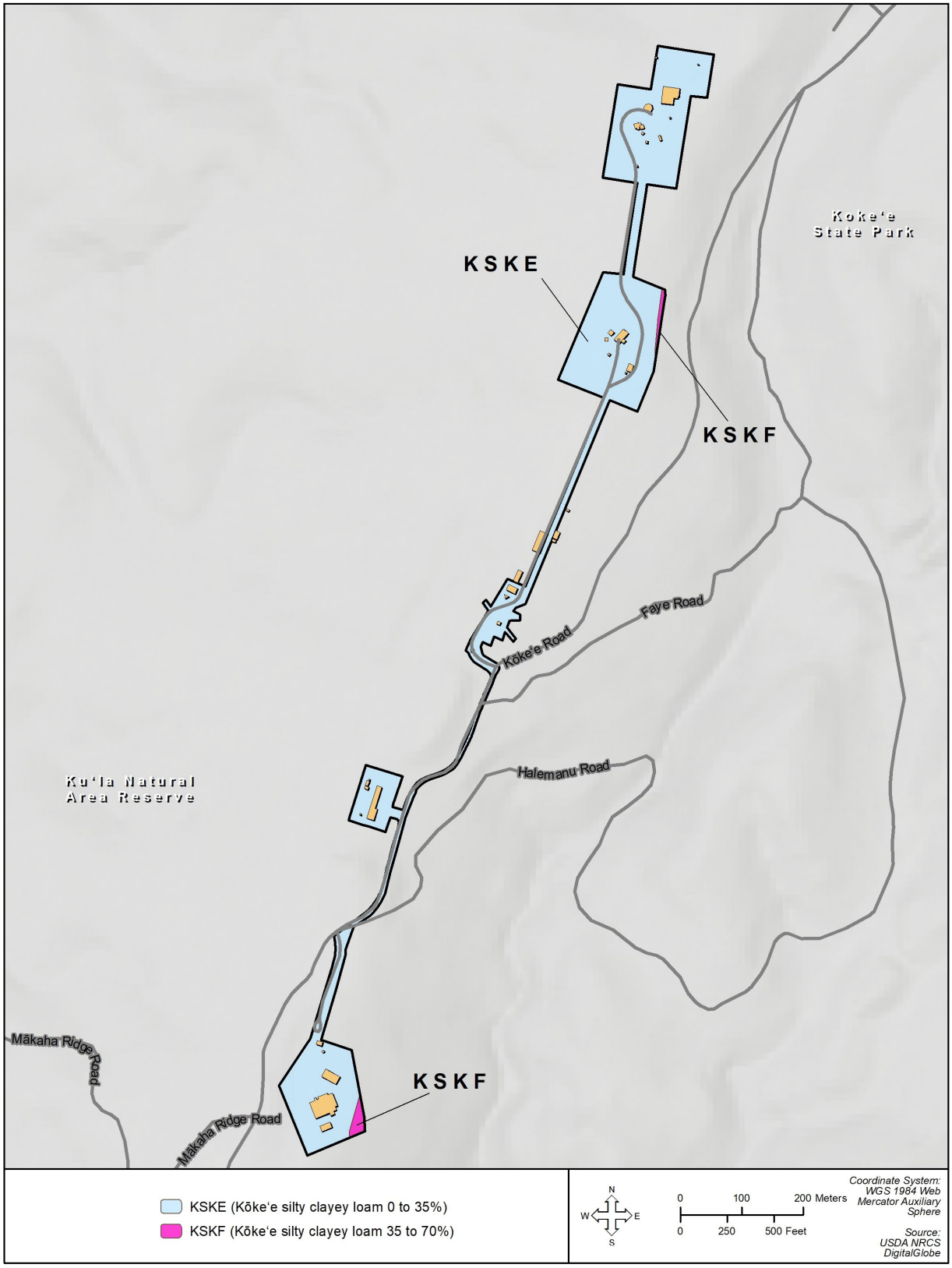


Figure 17 Soils at Kōke'e Sites

Preferred Alternative

Erosion management practices, including construction BMP implementation, would continue under the 2023 INRMP, resulting in no impact compared to the No Action alternative.

3.5.1.2 Water Resources

Affected Environment

There are no surface waters or wetland resources located at the Kōkeʻe Sites, though numerous streams lie at the bases of the surrounding canyons. Beneath the Kōkeʻe sites is one aquifer that is part of Waimea Aquifer Sector (John F. Mink and Lau 1992). This high-level, unconfined dike aquifer (Aquifer Code 20301212) is considered an irreplaceable fresh water source and is highly vulnerable to contamination.

Environmental Consequences

No Action Alternative

There are no actions implemented under the 2010 INRMP that could affect water resources at the Kōkeʻe sites; therefore, there are no impacts.

Preferred Alternative

The 2023 INRMP proposes the following management action to protect water resources from pesticide contamination at the Kōkeʻe Sites:

1. Coordinate all use of pesticides by natural resources staff with the NAVFAC PAC PMC and ensure that all applicators have received appropriate certifications.

In comparison to the no action implementation under the 2010 INRMP, implementation of the 2023 INRMP would have a beneficial impact on water resources at the Kōkeʻe sites.

3.5.2 Biological Environment

3.5.2.1 Vegetation

Affected Environment

There are substantial populations of invasive plant species intermixed with native forest species at the Kōkeʻe sites. Invasive species historically observed include Asian melastome , strawberry guava (*Psidium cattleianum*), and prickly blackberry (*Rubus argustus);* these species are classified as priority invasive species by the KISC (Figure 18).

Native trees including koa (*Acacia koa*), ohia ʻōlapa (*Cheirodendron trigynum*), and ʻohe‘ohe (*Tetraplasandra kavaiensis*), which are known or suspected host species for the endangered Hawaiian picture-wing flies, have been documented at the Kōkeʻe sites. Past botanical surveys have determined that there are no federally listed or endangered species present at the Kōkeʻe sites (DoN 2010; NAVFAC PAC 2022). The endangered understory shrub halemanu ʻakoko (*Euphorbia halemanui*) has been documented outside of site D in past botanical studies, though none has been documented on site (NAVFAC PAC 2022).

Environmental Consequences

Invasive Plant Management

No Action Alternative

In addition to the site-specific actions, invasive vegetation management strategies described in Section 3.3.2.1 are implemented at the Kōkeʻe sites, as applicable. Past invasive vegetation management specific to the Kōkeʻe sites implemented under the 2010 INRMP are listed below:

1. *Melastome Eradication:* Provide KISC, Navy or SOH biologists access to a small patch of Asian melastome found near the roadside at Kōkeʻe Site D in order to eradicate this population.

The continued implementation of the 2010 INRMP would result in a beneficial impact to vegetation at the Kōkeʻe sites, as the management actions support the eradication of invasive vegetation populations at the Kōkeʻe sites.

Preferred Alternative

General vegetation management strategies are described in Section 3.3.2.1. The overarching goal of these management strategies is to reduce populations of priority invasive species and allow for the reestablishment of native plant species.

New general invasive species management strategies, described in Section 3.3.2.1, would cover the full range of potential invasive species found on site. In addition, the following management strategy would address invasive plants at the Kōkeʻe sites specifically:

1. Conduct invasive plant removals annually in areas near known Hawaiian Picture-wing Fly habitat to promote native tree health and propagation and reduce introductions of invasive species into adjacent habitat due to Navy operations.

In comparison to the implementation actions under the 2010 INRMP, implementation of the 2023 INRMP would have a beneficial impact on vegetation habitat at the Kōkeʻe sites.

Native Plant Management

No Action Alternative

General native vegetation management strategies described in Section 3.3.2.1 are implemented at the Kōkeʻe sites, as applicable. Additionally, past native vegetation management specific to Kōkeʻe sites implemented under the 2010 INRMP are listed below:

1. *Native Plant Habitat Improvement:* Conduct invasive vegetation removal, particularly in areas around existing native vegetation.

The continued implementation of the 2010 INRMP would result in a beneficial impact to vegetation at the Kōkeʻe sites, as the management actions support native vegetation growth at the Kōkeʻe sites.

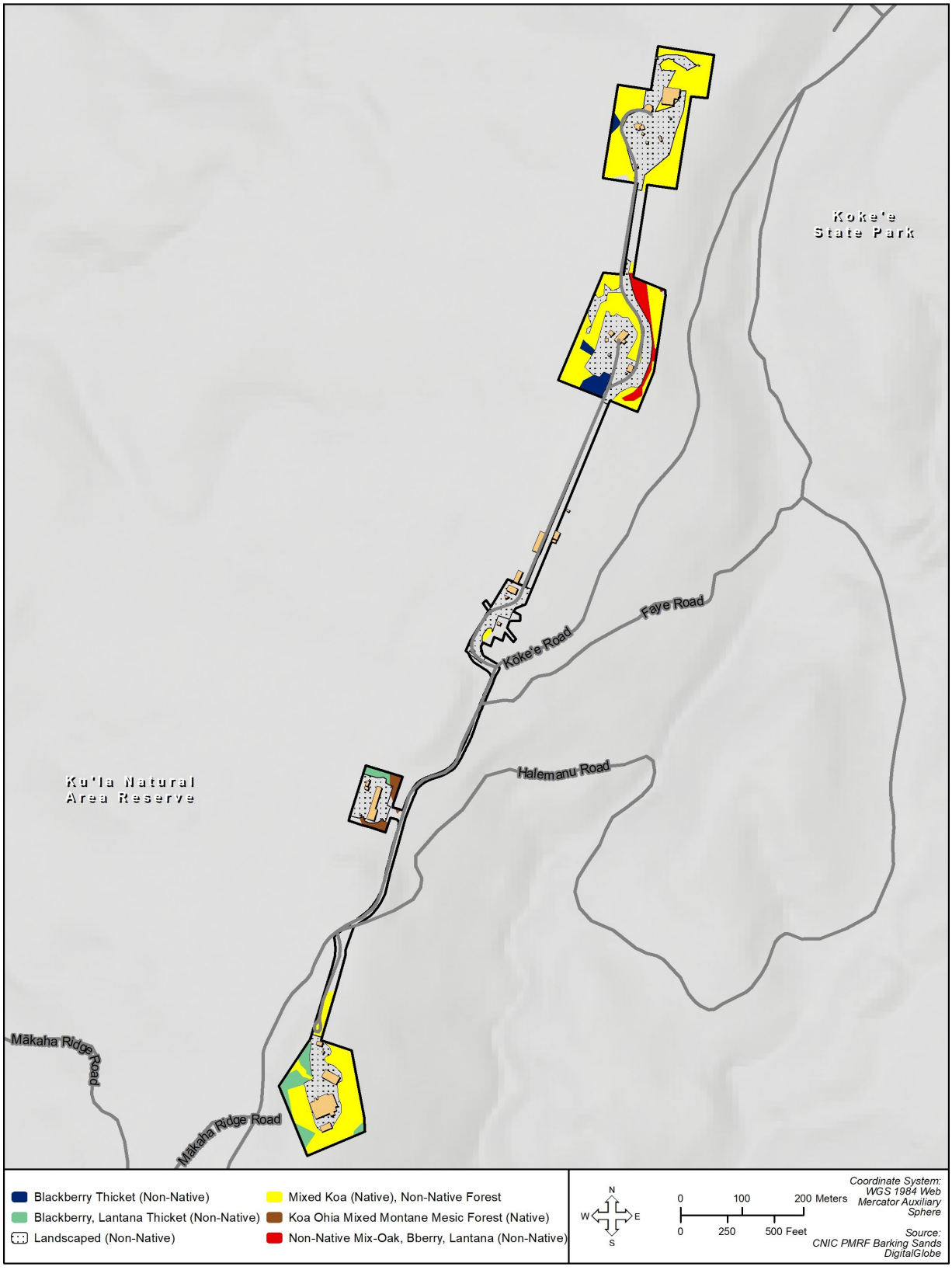


Figure 18 Vegetation Cover Types Present at Kōkeʻe Sites

Preferred Alternative

General native vegetation management strategies described in Section 3.3.2.1 are implemented at the Kōkeʻe sites, as applicable. The 2023 INRMP also includes site specific native vegetation management strategies:

1. Conduct invasive plant removals annually in areas near known Hawaiian Picture-wing Fly habitat to promote native tree health and propagation and reduce introductions of invasive species into adjacent habitat due to Navy operations.

In comparison to the implementation actions under the 2010 INRMP, implementation of the 2023 INRMP would have a beneficial impact on vegetation habitat at the Kōkeʻe sites, specifically within Hawaiian Picture-wing Fly habitat.

3.5.2.2 Nuisance and Invasive Animals

Affected Environment

Nuisance and invasive animal species identified at the Kōkeʻe sites include non-native feral cats, rat species (Norwegian rat and roof rat), and feral pigs.

Environmental Consequences

No Action Alternative

There are no actions implemented under the 2010 INRMP that could affect nuisance and invasive animal species at the Kōkeʻe sites; therefore, there are no impacts.

Preferred Alternative

More aggressive nuisance and invasive animal management strategies proposed in the 2023 INRMP, described in Section 3.3.2.2, would be implemented at the Kōkeʻe sites, as applicable. These strategies would have a beneficial impact on nuisance and invasive animal control, as compared to the No Action Alternative.

3.5.2.3 Bats

Affected Environment

The federally listed endangered Hawaiian hoary bat was documented at the Kōkeʻe sites during each survey, in 2000, 2010, and sampling from 2010 to 2011 (Bruner 2000; Bonaccorso and Pinzari 2011).

Environmental Consequences

No Action Alternative

Management actions for the Hawaiian hoary bat implemented under the 2010 INRMP are described in Section 3.3.2.3, and are implemented at the Kōkeʻe sites, as applicable. The continued implementation of the 2010 INRMP would result in a beneficial impact to bats at the Kōkeʻe sites as the management actions improve the viability of the Hawaiian hoary bat populations at the Kōkeʻe sites.

Preferred Alternative

Management actions for the Hawaiian hoary bat proposed under the 2023 INRMP are described in Section 3.3.2.3 and are implemented at the Kōkeʻe sites, as applicable. The activities proposed under the 2023 INRMP would have a minor beneficial impact on the Hoary Bat compared to the No Action Alternative, as the actions involve additional species monitoring actions.

3.5.2.4 Birds

Affected Environment

Five ESA-listed bird species were identified in past surveys at the Kōkeʻe sites or are known to fly over the sites. These species include the nēnē, the scarlet honeycreeper or ʻiʻiwi (*Vestiaria coccinea*), Newell's shearwater, Hawaiian petrel, and band-rumped storm petrels (*Oceanodroma castro*). MBTA species documented at the sites include the ʻamakihi (*Chlorodrepanis stejnegeri*), ʻapapane (*Himatione sanguinea*), and the pueo.

Environmental Consequences

No Action Alternative

Under the 2010 INRMP, general endangered seabird, nēnē, and migratory bird management actions (Section 3.3.2.4) would be implemented at the Kōkeʻe sites, as applicable.

Continued implementation of the 2010 INRMP would result in a beneficial impact to birds at the Kōkeʻe sites, as the management actions improve monitoring and protection of endangered seabirds, migratory birds, and nēnē.

Preferred Alternative

The 2023 INRMP management strategies for endangered seabirds, migratory birds, and nēnē (Section 3.3.2.4) would be implemented the Kōkeʻe sites, as applicable. In addition, the 2023 INRMP proposes the following management actions to protect, enhance, and improve understanding of Newell's shearwater at Kōkeʻe Site C:

1. Continue to fund and implement surveys to assess mortality from tower strikes at Kōkeʻe Site C to include scavenger trials, searcher efficiency trials, and carcass searches in accordance with USFWS communication tower monitoring protocols (PMRF BO, 2018).
2. Continue to fund and implement acoustic and visual monitoring programs of communication towers at Kōkeʻe Site C for seabird strikes to inform management and provide data to be used in the re-evaluation of the Newell's shearwater portion of the PMRF Base-wide BO.
3. Minimize the potential for death or injury of Newell's shearwater due to collisions with PMRF communication towers located at Kōkeʻe Site C (PMRF BO, 2018).

Implementation of the actions proposed in the 2023 INRMP would have a beneficial impact on endangered seabirds, migratory birds, and nēnē compared to the No Action Alternative due to improvements to the Dark Skies Program, improved management of habitat creation and protection, and increased monitoring of at-risk species.

3.5.2.5 Insects

Affected Environment

High elevation ʻohia and koa forest at the PMRF Kōkeʻe likely support native populations of native insect species. As discussed earlier, two species of endangered Hawaiian picture-wing fly can also be found on or near the Kōkeʻe sites. These picture-wing flies are single-island endemic to Kauaʻi and have USFWS designated critical habitat near the Kōkeʻe sites (Figure 19). *D. musaphilia* was identified near Site B in a 2010 survey (DoN 2010). Major threats to the island endemic picture-wing fly include: habitat degradation by feral ungulates and as a result of wildfire; spread and competition from non-native species into their habitat; soil disturbance (enhancing spread of non-native species); loss of host plants (koa); predation by non-native insects such as yellow jacket wasps and ants; and parasites (NAVFAC PAC 2022; USFWS 2008a; 2012). Current base operations and maintenance activities at the Kōkeʻe sites are low-impact and do not occur in the forested areas surrounding the sites and are therefore not likely to affect the federally listed Hawaiian picture-wing fly species.

Environmental Consequences

No Action Alternative

See Section 3.3.2.5 for an analysis of native insect and pollinator management actions applicable to all PMRF facilities, including enhancement of habitat supportive of native insects and policies to control and manage the use of pesticides and herbicides. In addition, the 2010 INRMP contains the following management action for native insects specific to the Kōkeʻe sites:

1. *Hawaiian Picture-Wing Fly:* Perform surveys for the recently listed *D. sharpi*. When these surveys occur, *D. musaphilia* should also be included.

Continued implementation of the 2010 INRMP would result in a beneficial impact to insects as the resource management actions benefit pollinators and improve understanding of listed species at the Kōkeʻe sites.

Preferred Alternative

General management strategies to protect native insects and pollinators described in Section 3.3.2.5 would be implemented at the Kōkeʻe sites, as applicable. All management actions involving the protection of native and/or pollinator species would comply with the existing MOU between the DoD and the pollinator partnership. In addition to general native insect and protected pollinator management strategies, the 2023 INRMP includes the following native insect management strategies specific to the Kōkeʻe sites:

1. Conduct periodic surveys every 5 years to assess presence/absence of endangered Hawaiian picture-wing fly species at and directly adjacent to PMRF Kōkeʻe sites.
2. Conduct invasive plant removals in areas near known Hawaiian picture-wing fly habitat to promote native tree health and propagation and reduce introductions of invasive species into adjacent habitat due to Navy operations.

Implementation of the 2023 INRMP would have a beneficial impact on native insects and protected pollinator species in the area, as the management strategies include habitat restoration, species inventory at additional PMRF sites, and prohibition of chemicals and pesticides (e.g., neonicotinoids) harmful to protected pollinators.

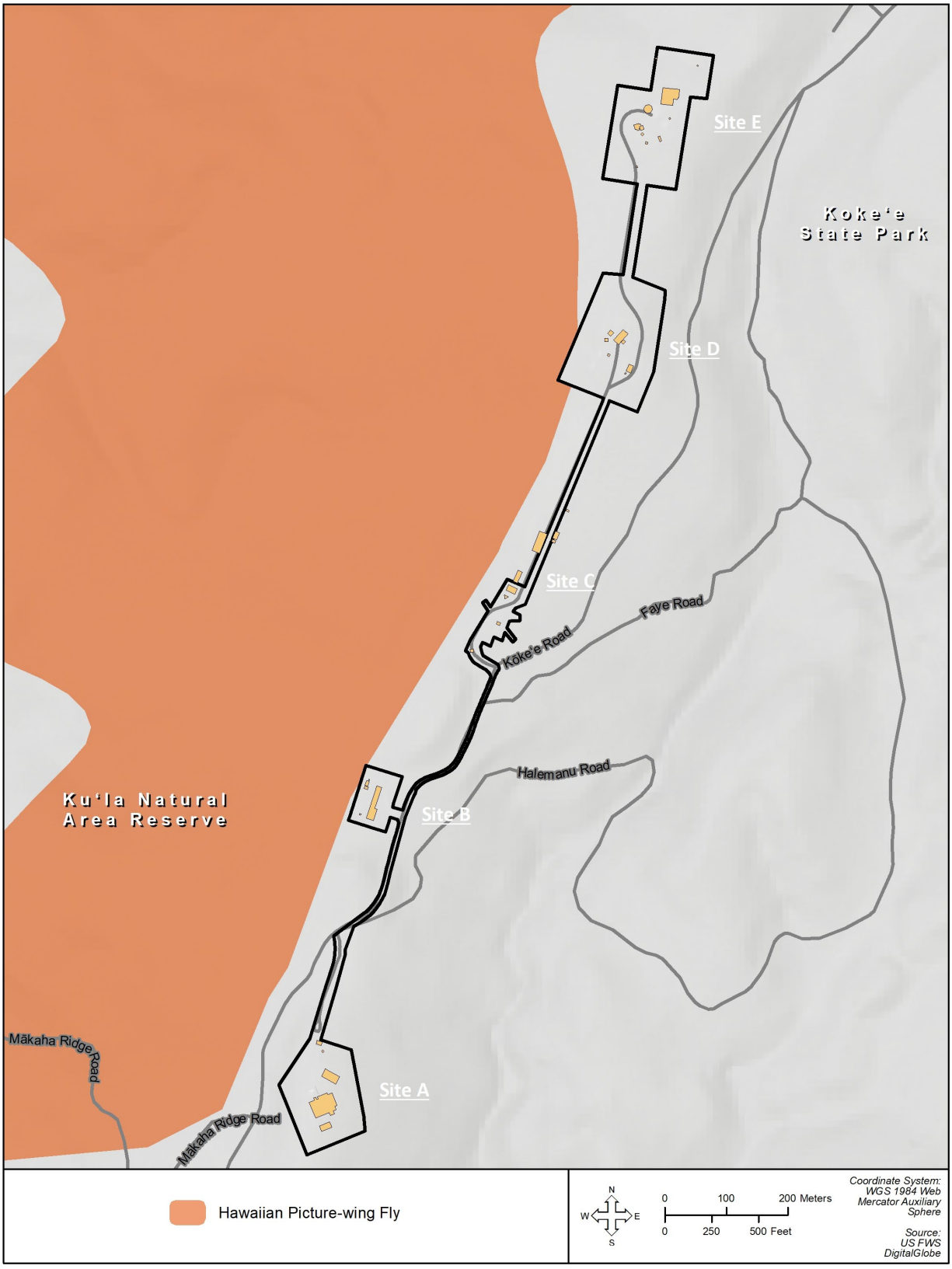


Figure 19 Federally Designated Critical Habitat for Hawaiian Picture-wing Fly

3.5.3 Social and Cultural Environment

3.5.3.1 Cultural Resources

Affected Environment

Kōkeʻe is located in the ahupuaʻa of Waimea in the moku of Kona on the island of Kauaʻi, located high on the uplands above Waimea Canyon within Kōkeʻe State Park. It has not been identified as a traditional cultural place.

Only one archaeological study has occurred in this area (Dowden and Rosendahl 1993), and it did not identify any sites. No significant historic and archaeological resources are present at Kōkeʻe sites. As a steward of cultural resources, the DoN and National Aeronautics and Space Administration must comply with federal regulations relating to those resources (e.g., NRHP). The presence of cultural resources increases costs associated with staffing, planning, and mitigation of effects to cultural resources throughout PMRF. Cultural resources compliance at Kōkeʻe sites shall be in accordance with the Navy Regional PA, as amended (Commander, Navy Region Hawaiʻi 2024). The INRMP does not propose activities that would affect historic properties. No further analysis is required at this time.

Significant architectural resources have not been identified at this facility. Buildings and structures in this area are of recent construction. In the 2011 HAMP, the Kōkeʻe Sites were classified as a "tertiary zone" with low historic resource sensitivity.

Environmental Consequences

No Action Alternative

There are no management actions under the 2010 INRMP that directly address cultural resources. However, management actions for natural resources can have direct and indirect effects on cultural resources, which include the following:

1. Native plant management activities implemented at the Kōkeʻe Sites may have a negligible impact on cultural resources due to potential for ground disturbance when removing or planting vegetation. Because of the lack of identified cultural resources and low probability of subsurface archaeological resources, the impact of this activity would be negligible.

The effects on cultural resources under the No Action Alternative would be low in degree of effect, temporary during construction activities and varying from temporary to long-term throughout operation and maintenance, localized, and unlikely to affect important cultural resources owing to the lack of identified cultural resources and low potential for them to occur. Some impacts would be beneficial. The overall impact to cultural resources would be adverse but negligible.

Preferred Alternative

There are no management actions under the 2023 INRMP that directly address cultural resources. However, management actions for natural resources can have direct and indirect effects on cultural resources, which include the following:

1. Surveys for soil compaction may have a beneficial impact, as described in previous sections.
2. Native plant management and erosion control activities, as described in previous sections, may have a negligible impact on cultural resources due to ground disturbance. Because of the low probability of subsurface archaeological resources, the impact of this activity would be negligible.

The effects on cultural resources under the Preferred Alternative would be low in degree of effect, temporary during construction activities and varying from temporary to long-term throughout operation and maintenance, localized in extent, and unlikely to affect important cultural resources owing to the lack of identified cultural resources and low potential for them to occur. Some impacts would be beneficial. In addition, the INRMP actions are required to be implemented using the SOPs described in the ICRMP, as noted earlier in the Barking Sands section. The overall impact to cultural resources would be adverse but negligible.

3.5.4 Additive Impacts

Additive impacts at Kōkeʻe Sites are summarized in Table 17. Resources eliminated for analysis at this site are discussed in Section 3.4 and a description of the analysis criteria used is described in Section 3.2.2.

Table 17 Additive Impacts at Kōkeʻe Sites

Environment	Resource	Description of Impact
Physical	Geological Resources	Additive impacts to geological resources are not anticipated from projects listed in Table 6.
Physical	Water Resources	Additive impacts to water resources are not anticipated from projects listed in Table 6.
Biological	Vegetation	Additive impacts to vegetation may result from the following projects: Navy environmental restoration, State Wildlife Action Plan, and the Biosecurity Plan for Micronesia and Hawaiʻi. Impacts from these projects are anticipated to be additive and beneficial.
Biological	Nuisance and Invasive Animals	No additive impacts to nuisance and invasive animal control are anticipated from projects listed in Table 6.
Biological	Bats	Additive impacts to bats may result from the following projects: Navy environmental restoration, State Wildlife Action Plan, Biosecurity Plan for Micronesia and Hawaiʻi. Impacts from these projects are anticipated to be additive and beneficial.
Biological	Birds	Operational additive impacts to birds at Kōkeʻe sites include potential tower and antenna strikes, addressed in the INRMP and BO (USFWS 2018). Projects with beneficial impacts to birds in the project area include the State Wildlife Action Plan, and the Hawaiian Bird Conservation Action Plan.
Biological	Insects	The Hawaiian Picture wing-fly was identified near Kōkeʻe sites and has designated critical habitat adjacent to the site. Additive impacts to the picture wing fly may result from Navy environmental restoration activities, the State Wildlife Action Plan, and the Biosecurity Plan for Micronesia and Hawaiʻi. Impacts from these projects are anticipated to be additive and beneficial.
Social	Cultural Resources	Projects at the Kōkeʻe Sites with the potential to impact cultural resources include aspects of various plans, including the Navy Environmental Restoration Plan and Biosecurity Plan for Micronesia and Hawaiʻi, the DLNR State Wildlife Action Plan, and USFWS Hawaiian Bird Conservation Action Plan. All the relevant projects are planning projects which also take into account mitigating cultural resource impacts within their own project actions, limiting the possibility of any increased level of impact. This is because like the INRMP, the relevant DoD projects and other actions on installation land are required to be implemented using the SOPs detailed in the 2012 ICRMP, which include consideration and mitigation of potential impacts to cultural resources. Therefore, no additive impacts to cultural resources are anticipated.

3.6 Kamokalā Ridge

The Kamokalā Ridge Magazines are located approximately 1.5 miles east of Barking Sands on the western edge of the Pu'u Ka Pele upland area and occupy an area of 104 ac (Figure 20). Facilities at the site provide ordnance storage for the Navy, Hawai'i Air National Guard, Department of Energy, and for other military commands with temporary requirements for training and storage, as necessary. The site consists of two earth-covered magazines, 10 ordnance storage magazines that have been excavated into the cliff face of Kamokalā Ridge, and a missile assembly building. The magazines provide secure storage for Class 1.1 explosives.

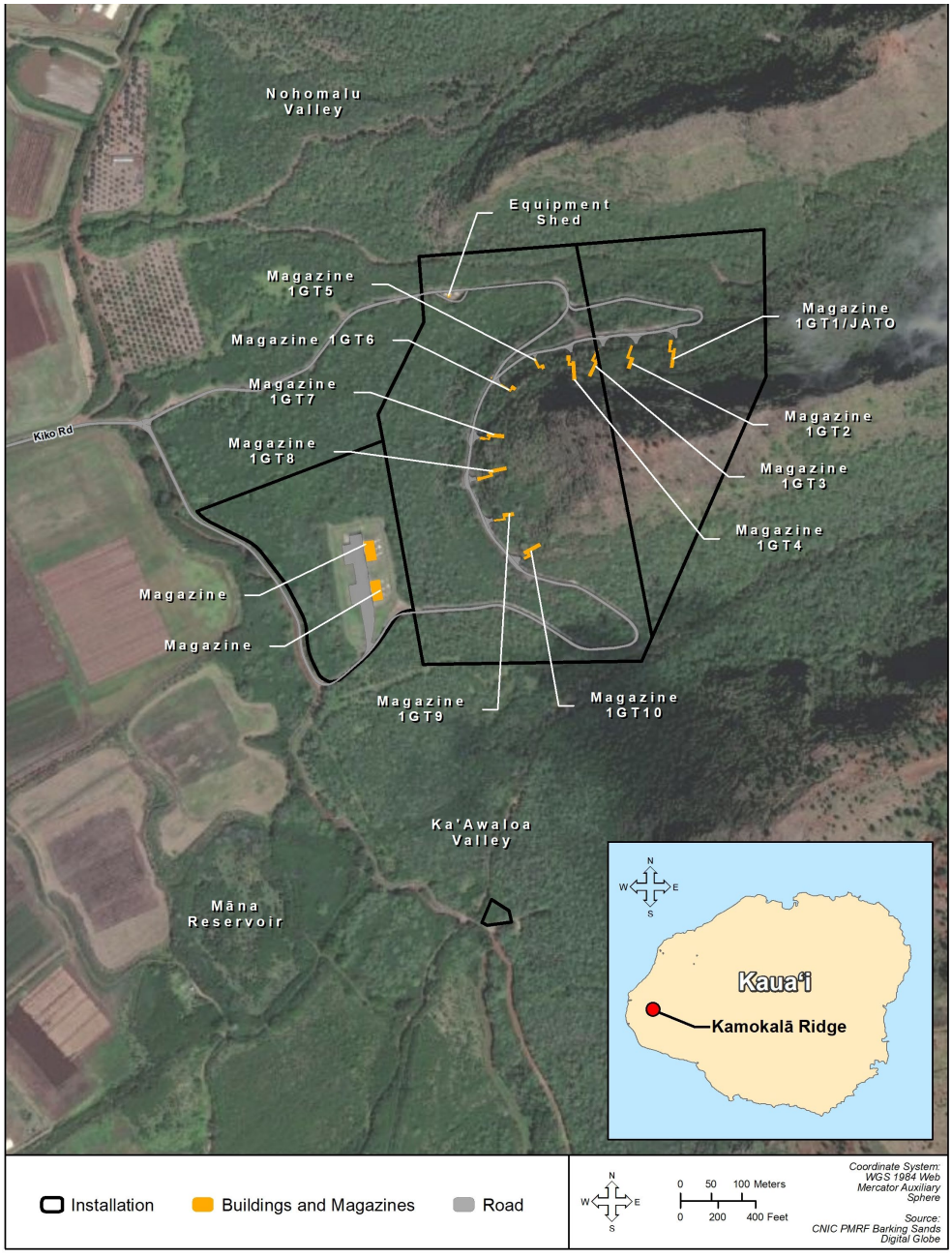


Figure 20 Kamokalā Ridge Overview Map

Based on the remote location of this site, the resources identified in Table 18 are not affected and therefore, are not further analyzed in this EA.

Table 18 Resources Eliminated from Discussion at Kamokalā Ridge

Resource	Description and Justification for Elimination
Climate Change	The implementation of the 2023 PMRF INRMP is anticipated to have minimal GHG emissions. The Preferred Alternative is anticipated to have no to negligible impacts to climate change. SLR caused by climate change would not impact this site because of its location and elevation.
Birds	There are no management actions at Kamokalā Ridge, past or present, which would impact birds at the facility.
Insects	There are no management actions at Kamokalā Ridge, past or present, which would impact insects at the facility.
Marine Mammals, Marine Reptiles, and Other At-risk Marine Species	Kamokalā Ridge is located inland; there are no management actions proposed by the 2010 or 2023 INRMP affecting marine species at Kamokalā Ridge.
Coastal and Nearshore Biological Resources	Kamokalā Ridge is located inland; there are no management actions proposed by the 2010 or 2023 INRMP affecting coastal and nearshore resources at Kamokalā Ridge.
Land Use	The primary purpose of INRMP is to ensure no net loss in the capability of military lands to support the military mission of the installation. The implementation of the 2023 INRMP is not anticipated to lead to new land uses or land use alterations. Therefore, no impacts on land use would occur.
Outdoor Recreation	The Kamokalā Ridge Magazines is a restricted area and generally does not offer any outdoor recreation opportunities.
Cultural Resources	Kamokalā Ridge lies within the area historically known as Mānā; there was extensive occupation and activity in this vicinity by early Hawaiians, including heiau and agricultural terracing. The munitions storage magazines were built in the World War II period to support the Barking Sands airfield operations. The area's historic context is detailed in the 2012 ICRMP. Previous studies include two archaeological surveys that cover a portion of the Kamokalā Ridge site (Gonzalez and Peyton 1999; McGerty and Spear 1997). Kamokalā Ridge has not been identified as a traditional cultural place, and four traditional archaeological sites identified in the area during these studies have been determined not eligible for listing in the NRHP (NAVFAC PAC 2012). The 2011 Cultural Landscape Report documented the 10 NRHP-eligible World War II-era munitions storage magazines (DoN 2011a). Kamokalā Ridge is within the HAMP secondary (moderate) sensitivity zone (DoN 2011a). No present or future management actions implemented under the 2010 and 2023 INRMPs take place at the Kamokalā Ridge facility that would impact significant cultural resources. Significant historic and archaeological resources are present at Kamokalā Ridge. As a steward of cultural resources, the DoN must comply with federal regulations relating to those resources (e.g., NRHP). The presence of cultural resources increases costs associated with staffing, planning, and mitigation of effects to cultural resources throughout PMRF and other areas. Cultural resources compliance at Kamokalā Ridge shall be in accordance with the Navy Regional PA, as amended (DoN 2024) and ICRMP. The INRMP does not propose activities that would affect historic properties. No further analysis is required at this time.

3.6.1 Physical Environment

3.6.1.1 Geology and Soils

Affected Environment

The Kamokalā Ridge Magazines elevation ranges from 80 to 760 ft above MSL. The area is composed of lava formations from the Nā Pali formation and is characterized by highly eroded volcanic terrain. The site lies at bottom of the Kamokalā ridgeline, and the edge of the Mānā Plain. Soils are primarily silty clay types and include the Kekaha (KOYE and KoB) Series, Rubble Land (rRU), Rock outcrop (rRO), and the Waiawa (WJF) series (Figure 21). Some of the soils present at Kamokalā Ridge Magazines (WJF and rRO), are characterized by severe erosion hazard and rapid runoff. Other soil types (Kekaha series) are characterized by medium runoff and lower erosion hazards.

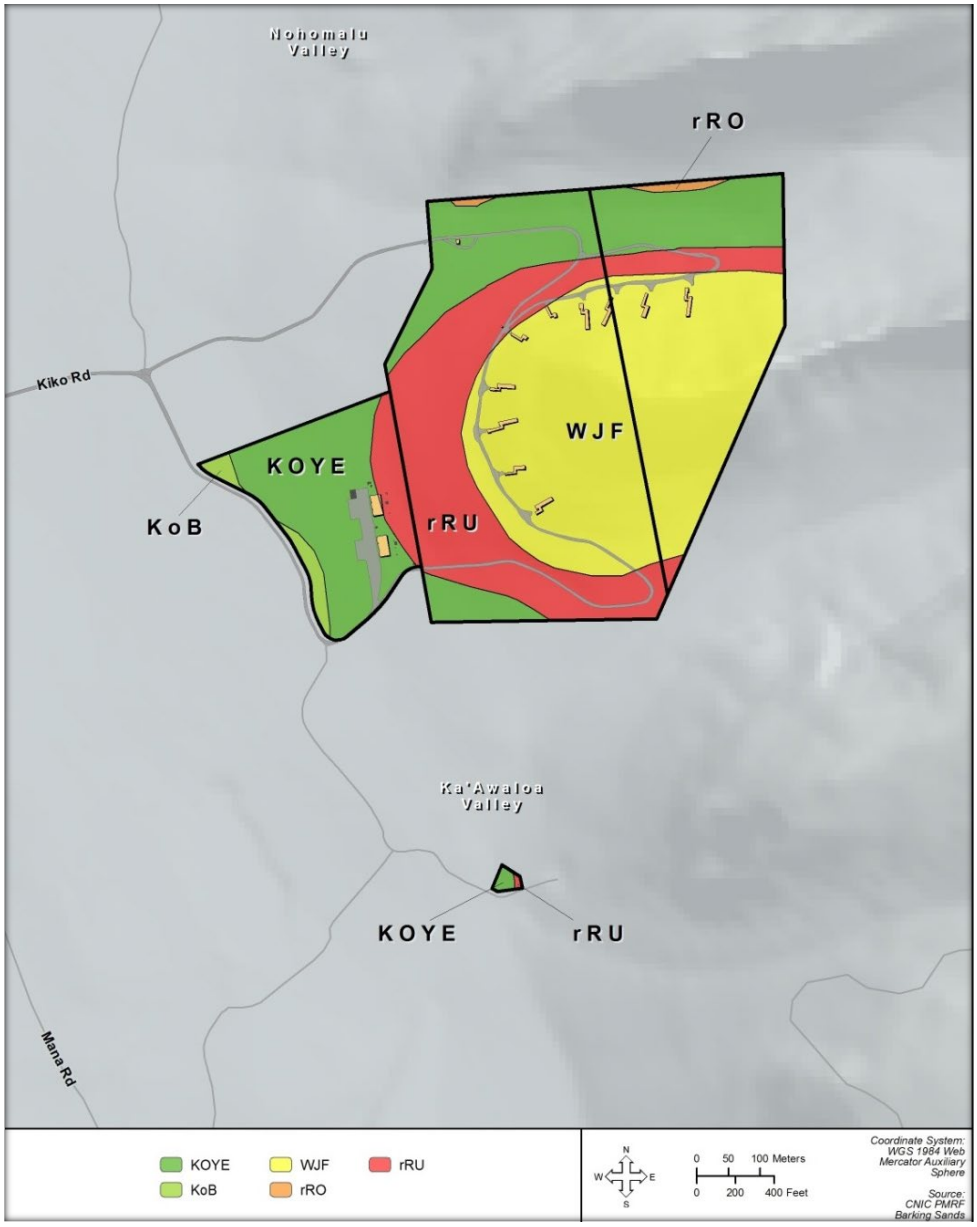


Figure 21 Soils at Kamokalā Ridge

Environmental Consequences

No Action Alternative

The continued implementation of the 2010 INRMP would result in no impact on soil and geological resources at Kamokalā Ridge, as the INRMP does not include erosion control measures for these sites beyond standard construction erosion control BMPs that would be implemented independently of the INRMP, as described under the Base Planning management action:

1. *Base Planning:* Follow standard methods to control erosion during all new construction projects.

Preferred Alternative

Erosion management practices, including construction BMP implementation, would continue under the 2023 INRMP, resulting in no impact compared to the No Action alternative.

3.6.1.2 Water Resources

Affected Environment

Surface waters flow from north to south into ephemeral streams of the Nahomalu and Ka‘awaloa Valleys and eventually reach the Mānā Plain. The only surface water identified at this site is a boulder-strewn stream that is usually dry, but floods during heavy rains. One aquifer on site (Aquifer Code 20301112) is currently used for drinking water (John F. Mink and Lau 1992).

Environmental Consequences

No Action Alternative

There are no actions implemented under the 2010 INRMP that could affect water resources at the Kamokalā Ridge; therefore, there are no impacts.

Preferred Alternative

There are no actions implemented under the proposed 2023 INRMP management actions that would impact water resources at the Kamokalā Ridge Magazines; therefore, there are no impacts.

3.6.1.3 Natural Hazards

Affected Environment

Kamokalā Ridge is vulnerable to natural hazards including wildland fires, hurricanes, landslides, and flooding. Kamokalā Ridge is located in an area currently designated as high hazard for fire risk by the HWMO (NAVFAC PAC 2022). With increasing temperatures and high fuel levels from non-native grasses and other vegetation, wildland fire intensity and frequency can be expected to increase.

Environmental Consequences

No Action Alternative

In the 2010 INRMP, management of natural hazards at Kamokalā Ridge, including wildland fire, is limited to coordination with the appropriate fire department and therefore continued implementation of the 2010 INRMP would have no impact on natural hazards at Kamokalā Ridge.

Preferred Alternative

In addition to coordination with the PMRF Fire Department to develop updates to the existing Fire Management Plan (Section 3.3.1.3), the 2023 INRMP contains the following natural hazard management strategy specific to Kamokalā Ridge:

1. Remove deadfall in high-risk areas including near the Barking Sands missile launch site and the Kamokalā Ridge Magazines and replant with native, low fire risk species.

The above actions are more extensive than the No Action Alternative as they require updates to the Fire Management Plan and clearing of deadfall in high-risk areas. These actions would have a beneficial impact on the facilities and surrounding resources by further reducing the threat of wildfire.

3.6.2 Biological Environment

Little natural resource management occurs at the Kamokalā Ridge site as few special status species are present. Nuisance wildlife and predators at the Kamokalā Ridge Magazines include deer, feral cats, pigs, and goats and could be targeted for control in the future, if funding allows. The Hawaiian hoary bat is the only special status species listed under the ESA that has been identified at the Kamokalā Ridge Magazines site.

3.6.2.1 Vegetation

Affected Environment

Kamokalā Ridge consists of lowland dry and mesic forest, woodland, and shrubland (Juvik, Juvik, and Paradise 1998). However, the site is composed of 50 percent vegetation and 50 percent rock outcrop. The site is highly disturbed and is dominated by introduced species. The vegetation cover types identified within the site are provided in Table 19 and Figure 22.

Environmental Consequences

No Action Alternative

General vegetation management strategies described in Section 3.3.2.1 are implemented at Kamokalā Ridge, as applicable. In addition, past vegetation management specific to Kamokalā Ridge implemented under the 2010 INRMP is listed below:

1. *Native Plant Habitat Improvement:* Conduct invasive vegetation removal, particularly in areas around existing native vegetation.

The continued implementation of the 2010 INRMP would result in a beneficial impact on the conservation of native plants.

Table 19 Vegetation Cover Types at Kamokalā Ridge

Cover Type	Native/Non-native	Area ac (ha)	Percent
Aalii Scrub	Native	3.9 (1.6)	4%
Cliff, Boulder Field	Non-native	0.8 (0.3)	1%
Grass, Herb, Shrub	Non-native	0.5(0.2)	0%
Greater Than 25% Wiliwili	Native	4.1 (1.6)	4%
Koa Haole Scrub, Forest	Non-native	73.4 (29.7)	75%
Koa Haole Scrub, Less Than 25% Wiliwili	Non-native	5.8 (2.4)	6%
Pili Grass	Native	4.4 (1.8)	4%
Ruderal	Non-native	4.9 (2.0)	5%
Total		97.7 (39.5)	100%

Source: NAVFAC PAC 2005.

Preferred Alternative

General vegetation management strategies described in Section 3.3.2.1 are implemented at Kamokalā Ridge, as applicable, to minimize and prevent the encroachment of invasive species into protected species habitats and other priority native vegetation cover types to the greatest extent practicable. The 2023 INRMP management strategies would result in a beneficial impact at Kamokalā Ridge when compared to the No Action Alternative.

3.6.2.2 Nuisance and Invasive Animals

Affected Environment

Due to the lack of protected species present at Kamokalā Ridge, little natural resource management occurs at the site. Nuisance wildlife and predators at the Kamokalā Ridge Magazines include deer, feral cats, pigs, and goats. Mammal surveys that were conducted in 2006 found black-tailed deer, pigs, cows (family Bovidae) and feral cats at the Kamokalā Ridge Magazines (NAVFAC PAC 2022).

Environmental Consequences

No Action Alternative

There are no actions implemented under the 2010 INRMP that could affect nuisance and invasive animal species at the Kamokalā Ridge; therefore, there are no impacts.

Preferred Alternative

The 2023 INRMP would implement the following strategies for control of nuisance and invasive species at Kamokalā Ridge:

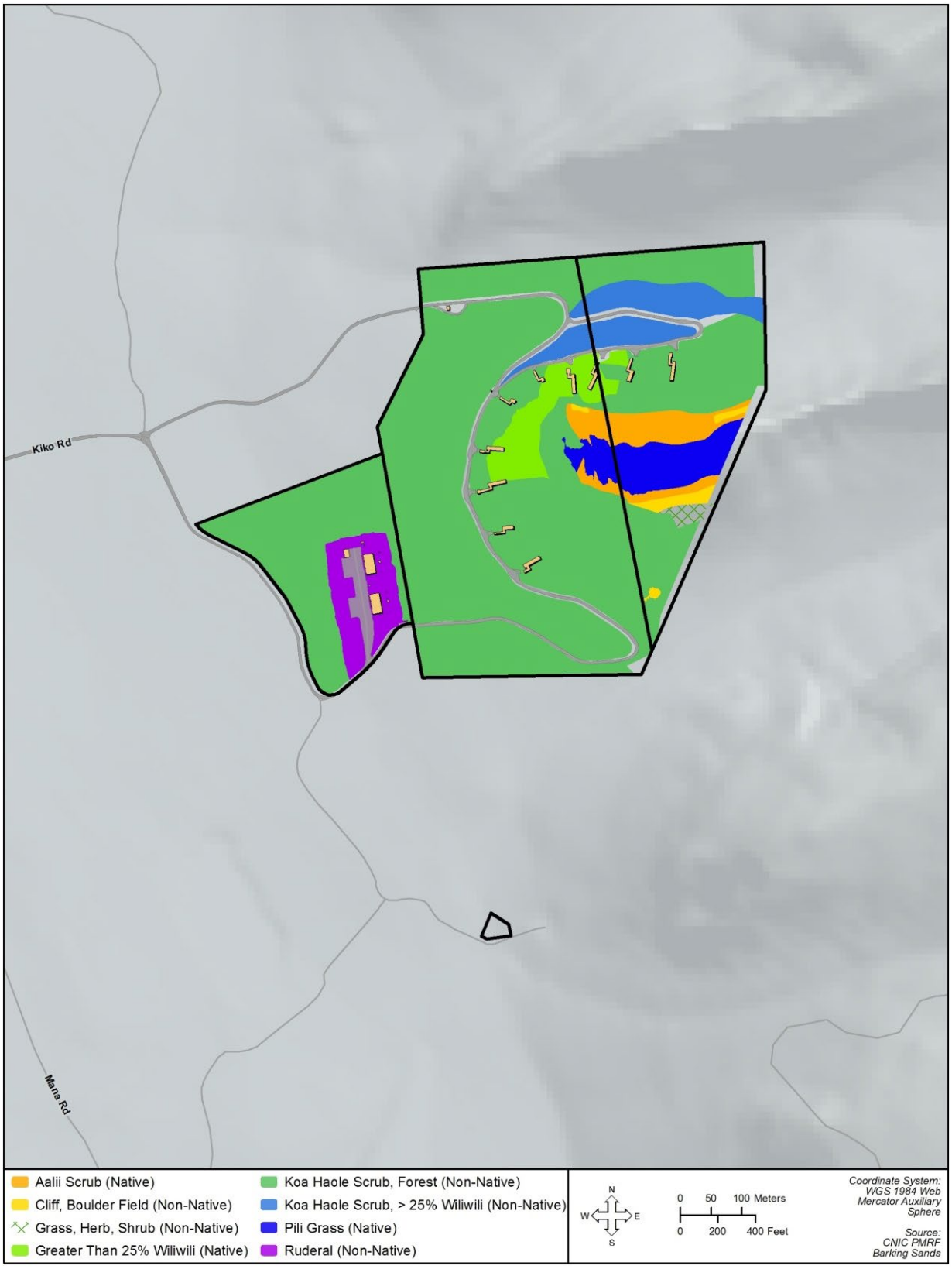


Figure 22 Vegetation at Kamokalā Ridge

1. Work with the PMRF Archery Club to control ungulate populations at the Kamokalā Ridge site by implementing trapping and baiting stations if the animals become a nuisance to Navy operations or pose a risk to protected species.
2. Conduct observations to identify feral cat presence at Kamokalā Ridge and consider expanding cat trapping if presence is consistent or becomes a nuisance.

This approach will have a beneficial impact at Kamokalā Ridge, as compared to the No Action Alternative by controlling for nuisance and invasive animal disruptions on site.

3.6.2.3 Bats

Affected Environment

Only one special status species, Hawaiian hoary bat, has been identified in the Kamokalā Ridge Magazines. The Hawaiian hoary bat has been identified at all past biological surveys at Kamokalā Ridge (Bruner 2000; Bonaccorso and Pinzari 2011; NAVFAC PAC 2022).

Environmental Consequences

No Action Alternative

There are no actions implemented under the 2010 INRMP that could affect bat species at the Kamokalā Ridge; therefore, there are no impacts.

Preferred Alternative

The Hawaiian hoary bat management strategies proposed under the 2023 INRMP (Section 3.3.2.3), including restriction on the season of vegetation trimming, follow-up acoustic surveys, and development of SOPs for bat roosting surveys, would have a beneficial impact on the Hawaiian hoary bat at Kamokalā Ridge when compared to the No Action alternative.

3.6.3 Social and Cultural Environment

All Social and Cultural resources for Kamokalā Ridge have been eliminated for further analysis for the reasons stated above in Table 18.

3.6.4 Additive Impacts

Additive impacts at Kamokalā Ridge are summarized in Table 20. Resources eliminated for analysis at this site are discussed in Section 3.6 and a description of the analysis criteria used is described in Section 3.2.2.

Table 20 Additive Impacts at Kamokalā Ridge

Environment	Resource	Description of Impact
Physical	Geological Resources	No additive impacts to geological resources or soils are anticipated from projects listed in Table 6.
Physical	Water Resources	No additive impacts to water resources are anticipated from projects listed in Table 6.
Physical	Natural Hazards	No additive impacts to Natural Hazards are anticipated. The projects listed in Table 6 do not change current use of the PMRF facilities significantly enough to produce a detrimental effect.
Biological	Vegetation	Additive impacts to vegetation may result from the following projects: Navy environmental restoration, State Wildlife Action Plan, and the Biosecurity Plan for Micronesia and Hawai'i. Impacts from these projects are anticipated to be additive and beneficial.
Biological	Nuisance and Invasive Animals	No additive impacts to nuisance and invasive animal control are anticipated from projects listed in Table 6.
Biological	Bats	Additive impacts to bats may result from the following projects: Navy environmental restoration, State Wildlife Action Plan, and Biosecurity Plan for Micronesia and Hawai'i. Impacts from these projects are anticipated to be additive and beneficial.

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3.7 Port Allen

The Port Allen site is located on the southern shore of Kaua'i, approximately 17 miles from the Main Base. The Navy leases the west side of the pier and west side of the pier building. The lease site is 1.0 ac. This site provides berthing facilities for three weapons recovery boats and a building for warehousing and support facilities, including communications, maintenance/repair, and engineering. Navy Seaborne Powered Target boats are moored at Port Allen as required for training exercises.

The Port Allen facility is limited to a leased portion of a pier and a small, paved area for parking and storage; its inclusion in the INRMP was restricted to a discussion of potential impacts of outdoor lighting on protected nocturnal Hawaiian seabirds. The analysis in this EA will be limited to these activities as well. The physical environment will not be discussed as no management actions will occur that affect geology and soil resources as land cover at the Port Allen facility is paved, and there are no surface water resources on site. Water resources are limited to the embayment surface waters in the harbor, which are not impacted by INRMP management actions.

Based on the location of this site, the resources identified in Table 21 are not affected and therefore, are not further analyzed in this EA.

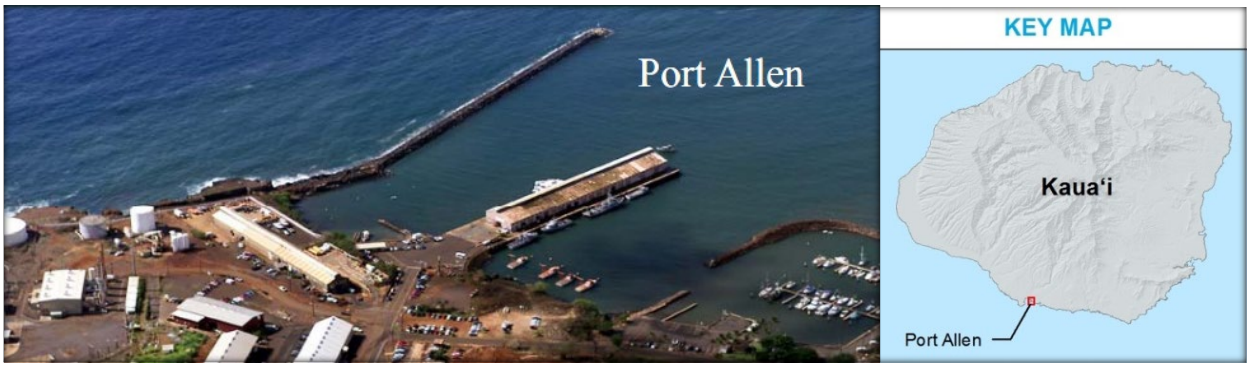


Figure 23 Port Allen Aerial Photo (DoN 2008b)

Table 21 Resources Eliminated from Discussion at Port Allen

Resource	Description and Justification for Elimination
Geology and Soils	There are no management actions at Port Allen, past or present, which would impact geology and soils in the facility vicinity.
Water Resources	There are no management actions at Port Allen, past or present, which would impact water resources in the facility vicinity.
Natural Hazards	The implementation of the No Action or the Preferred Alternatives would have no impact on the susceptibility of the facilities to natural hazards and would not impede evacuation activities necessary should a natural hazard, such as a hurricane, occur. Wildfire management would be limited to coordination with the appropriate fire department. The INRMP would not exacerbate the effect of any natural hazard and is therefore eliminated from further analysis.
Climate Change	The implementation of the 2023 INRMP is anticipated to have minimal GHG emissions. The Preferred Alternative is anticipated to have no to negligible impacts to climate change. The west side of the pier and west side of the pier building that the Navy leases is not anticipated to be impacted by SLR caused by climate change due to the elevation of the pier.

Table 21 Resources Eliminated from Discussion at Port Allen (Continued)

Resource	Description and Justification for Elimination
Vegetation	There are no past management actions at Port Allen, and 2023 INRMP management actions are limited to survey updates and general native plant restoration BMPs, which would not affect vegetation in the facility vicinity.
Nuisance and Invasive Animals	Although there are feral cats at Port Allen and PMRF funds pest control staff as part of the BOS contract, there is no impact such on animals associated with past or present management actions implemented under the 2010 or 2023 INRMP at the Port Allen facility; it is therefore not further evaluated in this EA.
Bats	There are no known bat species to be present at the Port Allen Facility; therefore, bats are not further evaluated in either INRMP or this EA.
Insects	There are no management actions at Port Allen, past or present, which would impact insects in the facility vicinity.
Marine Mammals, Marine Reptiles, and Other At-risk Marine Species	There are no management actions at Port Allen, past or present, which would impact marine species in the facility vicinity.
Coastal and Nearshore Biological Resources	There are no management actions at Port Allen, past or present, which would impact marine species in the facility vicinity. The Navy leases, but does not control, a portion of the pier and conducts INRMP actions for that leased area (i.e., reducing lighting impacts). A Navy SOP is in place to prevent fueling release. PMRF also complies with Section 7 consultations and other federal regulations in-water and offshore, however marine operations are not covered under the INRMP.
Land Use	Because of the limited land area and natural resources present at Port Allen, natural resources management actions are limited to measures focused on minimizing potential impacts to federally protected nocturnal seabirds by coordinating with facilities owner and USFWS to address lighting issues at the port. This management strategy would not impact land use. Therefore, no impacts to land use would occur.
Outdoor Recreation	The management actions from the 2023 INRMP would not decrease or increase the military use of the leased building and pier and the surrounding waters of Port Allen. Therefore, the recreational fishing and boating activities at and around Port Allen would not be impact by the Preferred Alternative.
Cultural Resources	Port Allen is located at a small boat harbor on Hanapēpē Bay, in the ahupua‘a of ‘Ele‘ele, in the moku of Waimea on the southwestern coast of Kaua‘i. Traditionally an area of salt pans, Port Allen was used as a sugar plantation shipping facility in the late nineteenth and early twentieth centuries. No archaeological surveys have occurred in this area, and no archaeological sites or traditional cultural places have been identified within it. According to the 2012 ICRMP, the lack of undeveloped land in the small area results in a probability of very low to none for cultural resources (NAVFAC PAC 2012). Port Allen has one historic architectural resource, Facility 387A, built in 1939 as a warehouse pier for sugar plantation use; it is designated by the Navy as Category II, and is determined eligible for NRHP listing. No present or future management actions implemented under the 2010 and 2023 INRMPs take place at the Port Allen facility that would impact cultural resources. Therefore, it is not further evaluated in the EA.

3.7.1 Physical Environment

All resources in Port Allen's physical environment have been eliminated for further analysis for the reasons stated above in Table 21.

3.7.2 Biological Environment

3.7.2.1 Birds

Affected Environment

Endangered seabirds are known to fly over the Port Allen facilities. While there have been no documented fallouts of seabirds at the Port Allen facility, seabirds have been known to fallout in the vicinity. These fallouts are not known to be a result of attraction or disorientation to lighting on Navy-leased property (NAVFAC PAC 2014). The Newell's shearwater is the endangered seabird species of particular concern at the Port Allen facility.

Environmental Consequences

No Action Alternative

The 2010 INRMP does not contain management actions specific to Port Allen. The lack of any management actions would result in negative impacts to birds.

Preferred Alternative

To minimize direct and indirect impacts to federally listed, endangered Hawaiian seabird species and migratory birds while providing maximum flexibility for training and operations, the 2023 INRMP proposes the following strategy:

1. Coordinate with facilities owner and USFWS to address lighting issues and continue to implement the Dark Skies program to the extent possible at the facility.
2. Train staff to recognize, respond and report to any circling or downed seabirds seen at the facility.

The Proposed Actions under the 2023 INRMP would have a beneficial impact on endangered seabird species and migratory birds, when compared to No Action Alternative.

3.7.3 Social and Cultural Environment

All Social and Cultural resources for Port Allen have been eliminated for further analysis for the reasons stated above in Table 21.

3.7.4 Additive Impacts

Additive impacts at Port Allen are summarized in Table 22. Resources eliminated for analysis at this site are discussed in Section 3.7 and a description of the analysis criteria used is described in Section 3.2.2.

Table 22 Additive Impacts at Port Allen

Environment	Resource	Description of Impact
Biological	Birds	Additive impacts to birds would result from lighting associated with any foreseeable construction activities. This concern is addressed in the USFWS BO for Newell's shearwaters (USFWS 2018). Continued reduction of night lighting at Port Allen would prevent additive impacts to seabirds flying over Port Allen.

3.8 Ka‘ula Island

Ka‘ula Island is located southwest of the island of Ni‘ihau (Figure 24). The island is uninhabited and totals 108 ac in area. The training area is approximately 10 ac on the southern tip of the island. Ka‘ula Island is used as a target range for aircraft using inert ordnance or gunnery activities. For safety purposes, the Navy has established a 3 mi radius around Ka‘ula Island as a Danger Zone to prevent vessels or other crafts from entering or remaining in the Danger Zone except those that have been authorized by the Navy (33 C.F.R. Section 334.1340(a)). Fishing boats are permitted in the Danger Zone when training exercises are not being conducted. Land access for surveys of Ka‘ula Island have been prohibited since 1998. Seabirds, whales, dolphins, seals, and other marine wildlife are the primary users of the island and its surrounding waters. Primary threats to these species at Ka‘ula Island are from military training exercises. Strict SOPs are implemented as a part of these exercises to mitigate impact to the species, the impacts on these species resulting from training exercises are evaluated in the HRC EIS/OEIS (DoN 2008a).

Based on the location of this site, the resources identified in Table 23 are not affected and therefore, are not further analyzed in this EA.

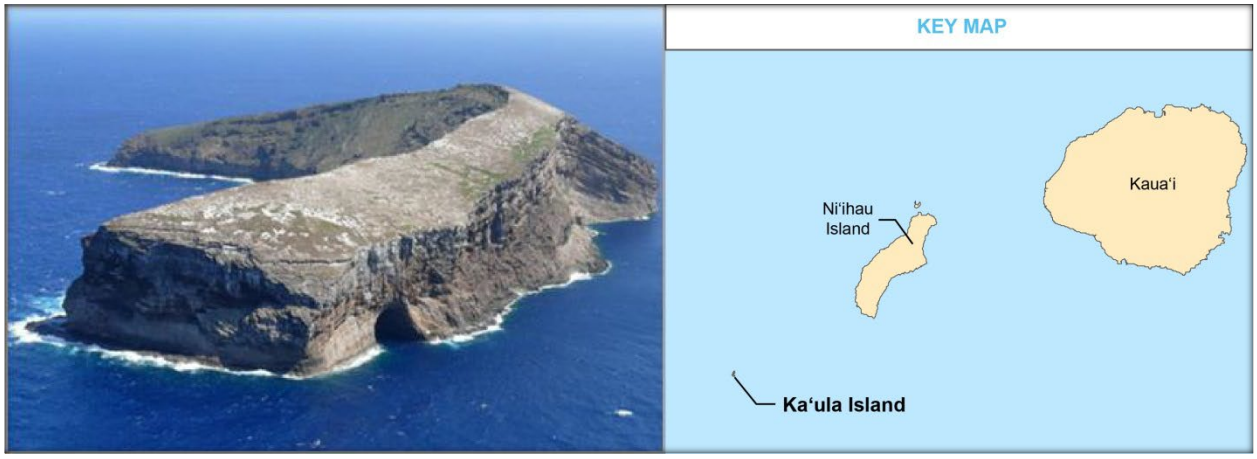


Figure 24 Ka‘ula Island Aerial Photo

3.8.1 Physical Environment

3.8.1.1 Climate Change

Affected Environment

Ka‘ula Island, also called Ka‘ula Rock, is a small (108 ac [44 ha]), crescent-shaped volcanic islet located approximately 55 mi (88 kilometers [km]) southwest of Kaua‘i and 22 mi (35 km) west-southwest of Ni‘ihau. This uninhabited island is on a 27 mi^2 (70 km^2) shoal surrounded by the 100-fathom (0.2 km) depth contour.

Environmental Consequences

No Action Alternative

The 2010 INRMP contains no management actions at Ka‘ula Island that could affect climate change, therefore there would be no impacts on climate change associated with continued implementation of the 2010 INRMP.

Table 23 Resources Eliminated from Discussion at Ka‘ula Island

Resource	Description and Justification for Elimination
Geology and Soils	There are no management actions, past or present, implemented under the 2010 and 2023 INRMPs that could impact geology and soils at Ka‘ula Island.
Water Resources	There are no management actions, past or present, implemented under the 2010 or 2023 INRMPs that would impact water resources.
Natural Hazards	Natural hazards that could affect Ka‘ula Island include hurricanes, landslides, and wildfire. Wildfire management would be limited to coordination with the appropriate fire department. The No Action and Preferred Alternatives would not exacerbate the effect of any natural hazards and are therefore eliminated from further analysis.
Vegetation	There are no past management actions at Ka‘ula Island, and 2023 INRMP management actions are limited to survey updates.
Bats	There are no known bat species to be present at Ka‘ula Island; therefore, bats are not further evaluated in either INRMP or this EA.
Insects	There are no management actions at Ka‘ula Island, past or present, which would impact insects at the site.
Land Use	The primary purpose of INRMP is to ensure no net loss in the capability of military lands to support the military mission of the installation. The implementation of the 2023 INRMP is not anticipated to lead to new land uses or land use alterations. Therefore, no impacts on land use would occur.
Outdoor Recreation	Ka‘ula Island is a restricted area; terrestrial access is off-limits at all times. Outdoor recreation opportunities are not applicable.
Cultural Resources	Ka‘ula Island is uninhabited by humans and located to the west of Kaua‘i. Historic and archaeological resources may be present at Ka‘ula Island. As a steward of cultural resources, the DoN must comply with federal regulations relating to those resources (e.g., NRHP). The presence of cultural resources increases costs associated with staffing, planning, and mitigation of effects to cultural resources throughout PMRF and other areas. Cultural resources compliance at Ka‘ula shall be in accordance with the Navy Regional PA, as amended (Commander, Navy Region Hawai‘i 2024) and ICRMP. The INRMP does not propose activities that would affect historic properties. No further analysis is required at this time. No present or future management actions implemented under the 2010 and 2023 INRMPs take place at Ka‘ula Island that would impact cultural resources.

Preferred Alternative

Impacts from GHG emissions are additive by nature, as individual emission sources are generally not large enough to have an impact on global climate change. GHG emissions resulting from implementation of the 2023 INRMP would be primarily from ships conducting surveys around the island and, as individual sources, would not be large enough to have an appreciable effect on climate change.

3.8.2 Biological Environment

3.8.2.1 Nuisance and Invasive Animals

Affected Environment

Six of the 27 bird species identified on Kaʻula Island during bird surveys from 1932 to 2011 are non-native. Of these, the barn owl, house finch, and Warbling (Japanese) white-eyes were the only species consistently recorded in multiple surveys (Pepi et al. 2009). Non-native rodent species, including Polynesian rats and common house mice, have also been documented on Kaʻula Island (Pepi et al. 2009).

Environmental Consequences

No Action Alternative

The 2010 INRMP contains no management actions related to nuisance and invasive species control at Kaʻula Island and therefore no impact would occur with continued implementation of the 2010 INRMP.

Preferred Alternative

Under the 2023 INRMP, the following management strategy is proposed to control nuisance and invasive species at Kaʻula Island:

1. Partner with DOFAW and other partners to coordinate barn owl and other predator control efforts on Kaʻula Island if access is safe and allowable and control methods are practicable.

Implementation of the 2023 INRMP would have a beneficial impact on control of nuisance and invasive species at Kaʻula Island.

3.8.2.2 Birds

Affected Environment

During surveys at Kaʻula Island conducted from 1932 to 2021, no ESA listed bird species have been recorded (NAVFAC PAC 2022). From the surveys conducted in 2009, 2011, 2017, and 2021 all of the birds identified are protected under the MBTA (Fujimoto 2011; Pepi et al. 2009; Normandeau Associates, Inc. and APEM, Ltd. 2016). Most of the MBTA identified species are considered breeding or winter visitors. The most abundant species included the sooty tern (*Onychoprion fuscatus*), the great frigatebird (*Frigata minor*), the brown noddy (*Anous stolidus*), the red-footed booby (*Sula sula*), and the wedge-tailed shearwater (Normandeau Associates, Inc. and APEM, Ltd. 2016; 2021; Fujimoto 2011; Pepi et al. 2009).

Of the seabirds present at Kaʻula Island, some of the seabird species may include burrow nesting species, including the endangered Hawaiian petrel, the threatened Newell's shearwater, and the wedge-tailed shearwater. However, because it is too dangerous to conduct land-based surveys on the island it is difficult to determine their presence on the island, as aerial surveys are unable to count burrow nests. It should be noted that historical surveys (conducted from 1932-1998) did not record the presence of these species; however, their populations may have reestablished on island since surveys were conducted. See Appendix C of the 2023 INRMP to view a complete list of species present (NAVFAC PAC 2022).

Environmental Consequences

No Action Alternative

The 2010 INRMP includes the following management actions to minimize adverse effect on endangered seabirds and MBTA-protected species at Ka‘ula Island:

1. *Fauna Surveys Update/Initiate:* Update fauna surveys and mapping, including protected bird species, in preparation for subsequent INRMP updates.
2. *MBTA Compliance:* Continue to limit inert ordnance target training to the predetermined area (~9 percent of the land area) at the southern tip of Ka‘ula Island.

The continued implementation of the 2010 INRMP would result in a beneficial impact on birds at Ka‘ula Island, as the management actions improve understanding of protected bird populations and limit the ordnance target training to specific areas to reduce adverse effects on birds at Ka‘ula Island.

Preferred Alternative

Boat based seabird surveys were conducted from 2009–2012 in support of U.S. Pacific Fleet’s Coastal Zone Management Act (CZMA) consultations with the SOH on the HRC EIS/OEIS (Navy 2008). Boat surveys were replaced by aerial imagery surveys starting in 2013 with the goal of achieving better counts of seabirds, including those on the top of the island and Ka‘ula-focused cetacean surveys were discontinued. Survey reports are provided to the SOH’s Office of Planning and Sustainable Development and the frequency of the surveys may be modified through the U.S. Pacific Fleet’s CZMA consultation process. Under the 2023 INRMP, the following actions are proposed to protect seabirds and MBTA-protected bird species at Ka‘ula Island:

1. Continue implementing all military training SOPs.
2. Conduct aerial seabird surveys of Ka‘ula Island as needed for management planning to inform species presence, location, and numbers.
3. Seek authorization to conduct land-based updates to faunal surveys on Ka‘ula Island.

The preferred alternative actions would have a minor beneficial impact on the bird species present at Ka‘ula Island when compared to the No Action Alternative, as the actions involve regular monitoring of protected species.

3.8.2.3 Marine Mammals, Marine Reptiles, and Other At-risk Marine Species

Affected Environment

Federally listed marine mammals are known to occur in the waters near or adjacent to Ka‘ula Island (see Table 11). The endangered Hawaiian monk seal frequents the shoreline and ledges along the high-water mark (Pepi et al. 2009; Uyeyama et al. 2011; Richie, Uyeyama, and Fujimoto 2012; Normandeau Associates, Inc. and APEM, Ltd. 2021), and nearby waters support at least three ESA-listed cetacean species: the fin whale, the sperm whale, and the MHI insular false killer whale. A further 16 MMPA-protected cetacean species have been observed nearby, including 11 dolphins: the bottlenose dolphin (*Delphinus delphis*), spinner dolphin, rough-toothed dolphin (*Steno bredanensis*), striped dolphin (*Stenella coeruleoalba*), pantropical spotted dolphin (*Stenella attenuata*) , Fraser’s dolphin (*Lagenodelphis hosei*), Risso’s dolphin (*Grampus griseus*), short-finned pilot whale (*Globicephala macrorynchus*), pygmy killer whale (*Feresa attenuta*), killer whale (*Orcinus orca*) and melon-headed whale (*Peponocephala electra*); and five whale species: pygmy sperm whale (*Kogia breviceps*), dwarf sperm whale (*Kogia sima*), humpback whale, Blainville’s beaked whale (*Mesoplodon densirostris*), and

Cuvier's beaked whale (*Ziphius cavirostris*) (Baird et al. 2019; 2021; 2022; Baird, Mahaffy, and Lerma 2021; Pepi et al. 2009; Uyeyama et al. 2011; Richie, Uyeyama, and Fujimoto 2012; DoN 2014a).

The oceanic whitetip shark, the giant manta ray, the green sea turtle, and the Hawksbill sea turtle are species known to occur in the offshore waters at Ka'ula Island. There are no beaches on Ka'ula Island for basking nor have sea turtles been observed during shipboard or aerial surveys.

All marine mammals known to occur on or in the waters adjacent to Ka'ula Island are protected by the ESA and/or the MMPA. Specific concerns for these species include: stranding, entanglement in marine debris, vessel strikes, and threats from military training and testing exercises—evaluated in the HSTT EIS/OEIS (DoN 2018).

Environmental Consequences

No Action Alternative

The 2010 INRMP contains the following management actions related to marine mammals, marine reptiles, and other at-risk marine species:

1. *Hawaiian Monk Seal Protection:* Prohibit vessel landing on Ka'ula Island due to UXO concerns. Limit fishing at Ka'ula Island to maintain a marine environment with ample fish biomass and reduced stray fishing lines and nets, providing a benefit to the seals. Continue to check in all sorties to the Fleet Area Control and Surveillance Facility to ensure the absence of a monk seals within the drop zone.

The continued implementation of the 2010 INRMP would result in a beneficial impact to marine mammals at Ka'ula Island, as the management actions involve protection of the marine environment and SOPs to prevent adverse effects from military training activities.

Preferred Alternative

To maintain and enhance habitat and populations of marine mammals, marine reptiles, and other at-risk marine species on Ka'ula Island and better understand the population dynamics of those species, the 2023 INRMP contains the following management strategies:

1. Continue implementing all military training SOPs with regards to marine mammal and marine turtle interactions.
2. Seek authorization to conduct land-based updates to faunal surveys on Ka'ula Island.
3. Continue to report all observations of marine mammal strandings or deaths to NMFS and assist in response efforts.
4. Improve coordination and communication regarding marine mammal strandings and other observations of note with NAVFAC PAC and COMPACFLT.
5. Implement and collaborate with partners on studies regarding toxoplasmosis at PMRF to inform predator control efforts and conduct outreach about the disease and its effects on wildlife and human health.

The above actions would have a beneficial impact on the Hawaiian monk seal, marine mammals, and sea turtles at Ka'ula Island when compared to the No Action Alternative as the actions involve increased monitoring and studies about disease for the monk seal, marine mammals, and sea turtles present at Ka'ula Island.

There is no anticipated impact of INRMP activities on the giant manta ray or the oceanic whitetip shark at Ka'ula Island.

3.8.2.4 Coastal and Nearshore Biological Resources

Fish and Essential Fish Habitat

Affected Environment

Ka‘ula Island is surrounded by Ka‘ula Bank, which supports some coral reefs; the entire bank has been identified as a habitat area of particular concern (HAPC) in the Coral Reef Ecosystem Fisheries Management Plan. HAPCs are designated high priority areas for conservation, management, and/or research; these areas are established to focus and prioritize conservation efforts in areas that are rare, sensitive, stressed, or important to ecosystem function. The entire bank around Ka‘ula Island is designated as a coral reef ecosystem HAPC, based on its ecological function, its susceptibility to human impact, and its existing protective status (WPRFMC 2001).

Environmental Consequences

No active management occurs at Ka‘ula under the No Action and Preferred Alternatives. Due to the military activities, fishing activities are limited, lessening fishing pressure. Due to the lack of past and present management actions under the INRMP for fish and EFH, there is no impact associated with the Proposed Action.

3.8.3 Social and Cultural Environment

All Social and Cultural resources for Ka‘ula Island have been eliminated for further analysis for the reasons stated above in Table 23.

3.8.4 Additive Impacts

Additive impacts at Ka‘ula Island are summarized in Table 24. Resources eliminated for analysis at this site are discussed in Section 3.8 and a description of the analysis criteria used is described in Section 3.2.2.

Table 24 Additive Impacts at Ka‘ula Island

Environment	Resource	Description of Impact
Physical	Climate Change	Impacts from GHG emissions are additive in nature, as individual emission sources are not generally large enough to have an appreciable impact on global climate change. Projects with GHG emissions include any projects that involve use of heavy equipment, gas- or diesel-powered vehicles, or use of ships or aircraft including long range missile tests, and the long-range strike weapons systems evaluation program. The impacts from the No Action and Preferred Alternatives, while added to the impacts from these projects, are not large enough to have an appreciable effect on GHG emissions and global climate change.
Biological	Nuisance and Invasive Animals	No additive impacts to nuisance and invasive animal control are anticipated from projects listed in Table 6.
Biological	Birds	BASH from various operational air activities including testing and training is addressed in the INRMP. Additional projects impacting birds include wind energy development, long-range missile tests, and the USAF long-range strike weapons systems evaluation program. The INRMP recognizes that operations have a negative impact on bird species present at Ka‘ula Island. Infrastructure, operations, and maintenance activities, and the effect of these activities on Newell’s shearwaters is further evaluated in the BO.
Biological	Marine Mammals, Marine Reptiles and Other At-risk Marine Species	Additive impacts to marine mammals, marine reptiles, and other at-risk marine species include potential impacts from Navy sonar testing, and noise impacts from long-range missile tests, long-range strike weapons systems evaluation program. Other potential impacts to marine mammals in the vicinity of Ka‘ula Island include bycatch, and derelict fishing debris from recreational and commercial fishing, and maritime traffic.
Biological	Coastal and Nearshore Biological Resources	Additive impacts to coastal and nearshore resources at Ka‘ula Island include impacts from commercial and recreational fishing activities, which are limited around the island.

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3.9 Mauna Kapu

The Mauna Kapu facility is located on 2.0 ac within the Honouliuli Forest Reserve in West O'ahu in the Waianae Mountain Range. The area includes a communications and radar tracking facility and frequency monitoring station building (0.4-ac site) and utility easements (1.5 ac). The property boundary is fenced.

While there are relatively few natural resource management actions at the Mauna Kapu facility, the site lies adjacent the Honouliuli and Nānākuli Forest Reserves, which supports several state and federally listed bird, snail, and plant species, management actions at the Mauna Kapu site have potential to impact these species and must be assessed through the NEPA process.

Based on the location of this site, the resources identified in Table 25 are not affected and therefore, are not further analyzed in this EA.

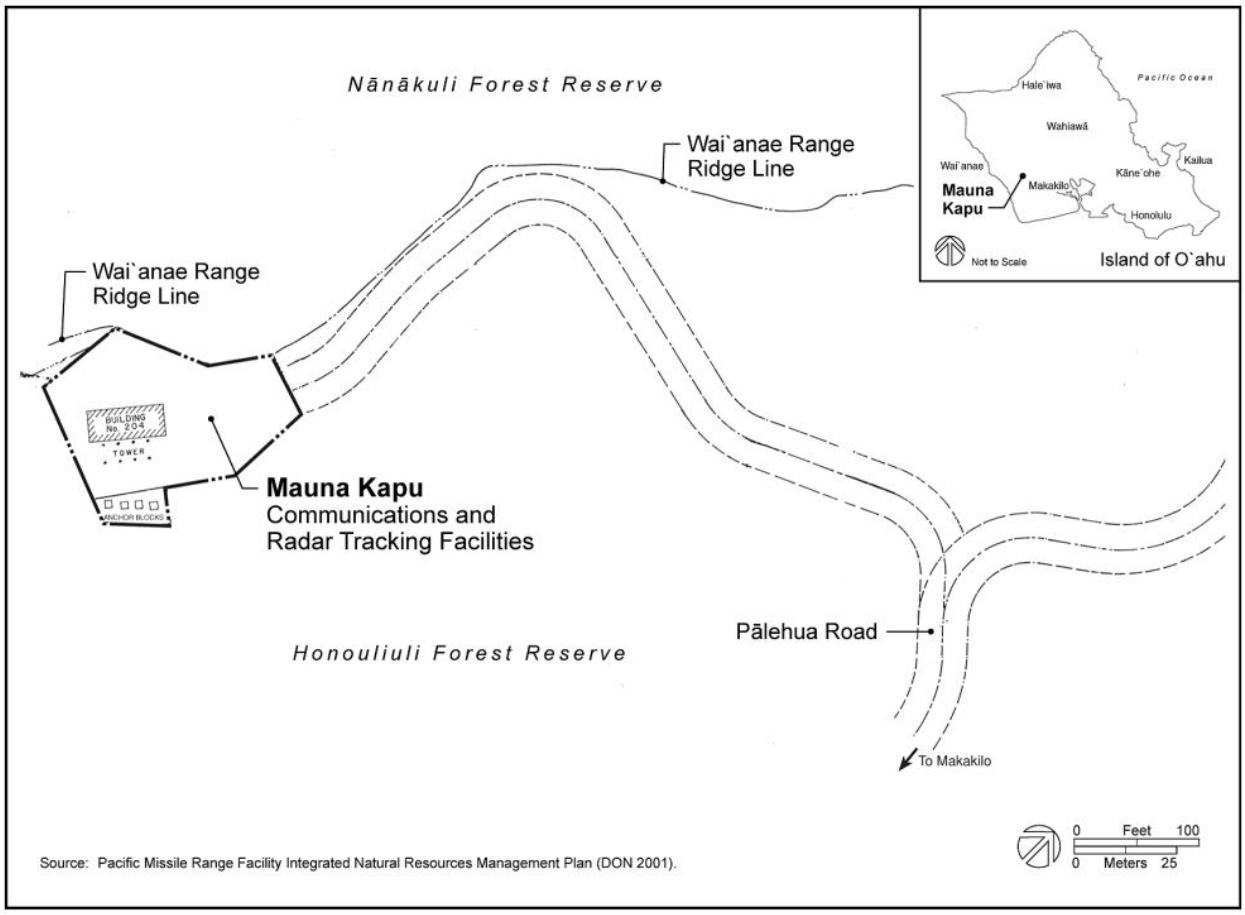


Figure 25 Mauna Kapu Location Map (DoN 2001)

Table 25 Resources Eliminated from Discussion at Mauna Kapu

Resource	Description and Justification for Elimination
Geology and Soils	No specific actions involving erosion control would be implemented at Mauna Kapu. PMRF would continue to follow standard methods to control erosion during all new construction projects. There is no impact associated with this action; therefore, it is not evaluated further in this EA.
Water Resources	The Mauna Kapu facility has no surface water or wetlands. The site overlies a high-level unconfined dike aquifer, which is part of the ʻEwa Aquifer System of the Pearl Harbor Aquifer Sector. The aquifer is an irreplaceable fresh water source with high vulnerability to contamination (J. F. Mink and Lau 1990). No present or future management actions implemented under the 2010 and 2023 INRMPs take place at the Mauna Kapu facility that would impact water resources. Therefore, it is not further evaluated in the EA.
Natural Hazards	Natural hazards that could affect Mauna Kapu include hurricanes, landslides, flooding, and wildfire. However, the implementation of the No Action and Preferred Alternatives would have no impact on the susceptibility of the facilities to natural hazards and would not impede evacuation activities necessary should a natural hazard occur, so is therefore eliminated from further analysis for this site. Wildfire management would be limited to coordination with the appropriate fire department.
Climate Change	The implementation of the 2023 PMRF INRMP is anticipated to have minimal GHG emissions. The Preferred Alternative is anticipated to have no to negligible impacts to climate change. SLR caused by climate change would not impact this site because of its location and elevation.
Vegetation	There are no past management actions at Mauna Kapu, and 2023 INRMP management actions are limited to survey updates and general native plant restoration BMPs, which would not affect vegetation in the facility vicinity.
Nuisance and Invasive Animals	There are neither nuisance nor invasive animals known to be present at Mauna Kapu. There is no impact such on animals associated with past or present management actions implemented under the 2010 or 2023 INRMP at Mauna Kapu; it is therefore not further evaluated in this EA.
Birds	Formal animal and bird surveys were not conducted for the 2010 or 2023 INRMPs, due to the small land area. Areas surrounding the facility provide habitat for threatened and endangered species including the ESA listed Oʻahu ʻelepaio (*Chasiempis sandwichensis gayi*), and the Hawaiian short-eared owl or pueo, which is State listed as endangered on the island of Oʻahu. There are no active management actions implemented at Mauna Kapu facility that could impact the federally listed ESA species present in the facility's vicinity. Proposed 2023 INRMP management actions at the facility are not anticipated to impact ESA or MBTA species potentially present at Mauna Kapu and in the facility vicinity, therefore it is not further evaluated in the EA.
Insects	There are no management actions at Mauna Kapu, past or present, which would impact insects at the site.
Marine Mammals, Marine Reptiles, and Other At-risk Marine Species	Mauna Kapu is located inland; there are no management actions proposed by the 2010 or 2023 INRMP affecting marine species at Mauna Kapu.
Coastal and Nearshore Biological Resources	Mauna Kapu is located inland; there are no management actions proposed by the 2010 or 2023 INRMP affecting coastal and nearshore resources at Mauna Kapu.

Table 25 Resources Eliminated from Discussion at Mauna Kapu (Continued)

Resource	Description and Justification for Elimination
Land Use	The primary purpose of INRMP is to ensure no net loss in the capability of military lands to support the military mission of the installation. The implementation of the 2023 INRMP is not anticipated to lead to new land uses or land use alterations. Therefore, no impacts on land use would occur.
Outdoor Recreation	The Mauna Kapu Facility is a restricted area and generally does not offer any outdoor recreation opportunities.
Cultural Resources	No significant historic and archaeological resources are present at Mauna Kapu. As a steward of cultural resources, the DoN must comply with federal regulations relating to those resources (e.g., NRHP). The presence of cultural resources increases costs associated with staffing, planning, and mitigation of effects to cultural resources throughout PMRF. Cultural resources compliance at Mauna Kapu shall be in accordance with the Navy Regional PA, as amended (DoN 2024). The INRMP does not propose activities that would affect historic properties. No further analysis is required at this time.

3.9.1 Physical Environment

All resources related to Mauna Kapu's physical environment have been eliminated for further analysis for the reasons stated above in Table 25.

3.9.2 Biological Environment

Little natural resource management occurs at the Mauna Kapu site as it encompasses only a small, enclosed area. The site is located upland approximately 3 mi from the shoreline, and thus actions do not affect the coastal or nearshore environment, or marine species.

3.9.2.1 Bats

Affected Environment

Monitoring surveys for bats were not prepared for the 2010 or 2023 INRMP. There are no known federally listed threatened or endangered species or critical habitat at the Mauna Kapu facility.

Environmental Consequences

No Action Alternative

The 2010 INRMP includes no active management of natural resources at the Mauna Kapu facility. Therefore, there are no impacts on bats present at the project site.

Preferred Alternative

To assess the occurrence of bats and other wildlife populations utilizing the facilities, the 2023 INRMP proposes the following strategy:

1. Conduct baseline fauna surveys.

The above management action is anticipated to have a minor beneficial impact on the Hawaiian hoary bat, if present at the facility, as it involves developing baseline survey monitoring actions to better understand species presence.

3.9.3 Social and Cultural Environment

All social and cultural resources for Mauna Kapu have been eliminated for further analysis for the reasons stated above in Table 25.

3.9.4 Additive Impacts

Additive impacts at Mauna Kapu are summarized in Table 26 below. Resources eliminated for analysis at this site are discussed in Section 3.9 and a description of the analysis criteria used is described in Section 3.2.2.

Table 26 Additive Impacts at Mauna Kapu

Environment	Resource	Description of Impact
Biological	Bats	Additive impacts to bats may result from the following projects: Navy environmental restoration, State Wildlife Action Plan, and Biosecurity Plan for Micronesia and Hawai'i. Impacts from these projects are anticipated to be additive and beneficial.

3.10 Ni‘ihau Island

Ni‘ihau Island is a privately-owned island that is 44,800 ac (18,130 ha) in size and lies approximately 17 mi (27 km) southwest of Kaua‘i (DLNR 2015). The dimensions of the island are approximately 18 mi (29 km) in length by 8 mi (13 km) in width stretching from the southwest to the northeast (C. H. Fletcher and Feirstein 2009). The Navy leases approximately 1,170 ac on the northeastern corner of Ni‘ihau, an island located southwest of Kaua‘i. PMRF operates radar units, optics, and electronic warfare sites on Ni‘ihau. PMRF also flies drone targets for the Aegis Ballistic Missile Defense System, a ship-based combat system, along the east coast of the island. Navy activities at Ni‘ihau include island-wide downed pilot training, helicopter terrain flight operations, electronic warfare exercises, special warfare operations training, target and interceptor launches, amphibious landings, helicopter landing areas, and unmanned aerial vehicle contingency landing support. These activities may take place on land, in the nearshore environments, and low-level altitudes above land or sea.

This EA focuses on the Navy lease area in the northeast corner of the island and coastal area where Navy vessels come ashore on a regular basis for maintenance and resupply, and areas where beach landing may occur (non-cliff coastal areas that have a beach or accessible flat, rocky area outside of the reserved areas). The width of the coastal area covered includes the distance from 4.9 ft in depth at low tide, through the water edge, and into the terrestrial environment 16.4 ft inland.

Based on the location of this site (DoN 2008b), the resources identified in Table 27 are not affected and, therefore, are not further analyzed in this EA.

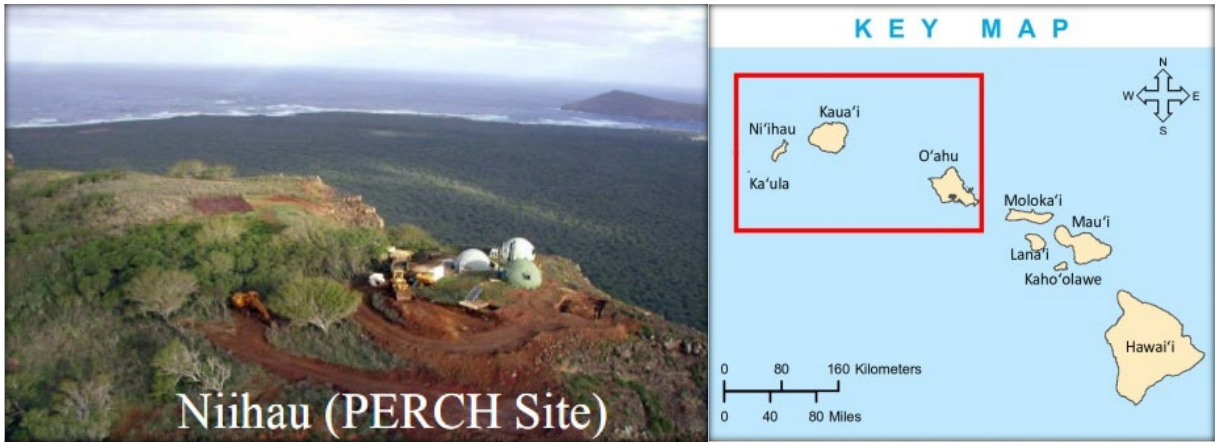


Figure 26 Ni‘ihau Aerial Photo and Key Map

Table 27 Resources Eliminated from Discussion at Niʻihau Island

Resource	Description and Justification for Elimination
Geology and Soils	Niʻihau Island ranges in elevation from sea level to approximately 1,281 ft above MSL along the volcanic uplands of Paniau on the northeast side of the island. The island consists of remnant of a single volcano, and is composed of basalt rock, with extensive alluvial deposits. Beaches include boulder beaches, sandy coasts of calcium carbonate sand, and sand dunes as high as 98 ft. The main landowner, the Robinson family, has not allowed soil surveys on the island, therefore soil data is unavailable from the Natural Resources Conservation Service Web Soil Survey (USDA NRCS 2022). Management actions at Niʻihau Island are limited due to restrictions set by the landowners. Therefore, there are no past or proposed erosion control measures to be implemented at Niʻihau; therefore, there is no impact on geology or soils associated with the Proposed Action, and it is not evaluated further in this EA.
Water Resources	There is little surface water available on the island of Niʻihau, there are no perennial streams, and the lakes that form typically evaporate during dry seasons. Two of the natural freshwater lakes on the island include Halulu Lake—approximately 182 ac in size, and Halāliʻi Lake—an intermittent lake approximately 841 ac in size. Much of the groundwater previously tested has salinity, which is too high for drinking. Water catchment serves as the primary drinking water source for most island residents. Management actions at Niʻihau Island are limited due to restrictions set by the landowners. Therefore, there are no past or proposed measures to be implemented at Niʻihau that would affect water resources; therefore, there is no impact on water resources associated with the Proposed Action, and it is not evaluated further in this EA.
Natural Hazards	Natural hazards that could affect Niʻihau Sites include hurricanes, landslides, flooding, SLR, and wildfire. However, the implementation of the No Action and Preferred Alternatives would have no impact on the susceptibility of the facilities to natural hazards and would not impede evacuation activities necessary should a natural hazard, such as a hurricane, occur. Therefore, it will be eliminated from further analysis at this site. Wildfire management would be limited to coordination with the appropriate fire department.
Vegetation	Vegetation at Niʻihau consists primarily of non-native plant species, with dominant vegetation cover types including kiawe forest, grasslands, and ruderal koa haole shrublands. Small areas of eucalyptus (*Eucalyptus robusta*) and common ironwood (*Casuarina equisetifolia*) occur throughout the island (DoN 2008a). Native false sandalwood (*Myoporum sandwicense*) can be found at higher elevation in mixed kiawe/koa haole forests. Northeastern coastlines, within the site contain herb and grassland communities. Within the area of concern there has been no documentation of federally threatened or endangered plant species. On the island of Niʻihau, south of the site there is federally designated critical habitat for the plant alula or ʻōlulu (*Brighamia insignis*). The endangered Nihoa pritchardia or loʻulu (*Pritchardia aylmer-robinsonii*) has also been documented on Niʻihau, although its range is also outside of areas used by the Navy. Management actions at Niʻihau are limited due to restrictions and land-use agreements with the landowners. There are no past management actions at Niʻihau, and 2023 INRMP management actions are limited to survey updates and general native plant restoration BMPs, which would not affect vegetation in the facility vicinity.
Nuisance and Invasive Animals	There are neither nuisance nor invasive animals known to be present at Niʻihau. There is no impact such animals associated with past or present management actions implemented under the 2010 or 2023 INRMP at Niʻihau; it is therefore not further evaluated in this EA.
Bats	There are no known bat species to be present at Niʻihau; therefore, bats are not further evaluated in either INRMP or this EA.

Table 27 Resources Eliminated from Discussion at Niʻihau Island (Continued)

Resource	Description and Justification for Elimination
Birds	Endangered Hawaiian waterbirds are known to occur on Niʻihau Island although they have not been documented in the project area. Included are the Hawaiian duck, Hawaiian coot, and Hawaiian stilt (Pyle and Pyle 2017; USFWS 2011). The federally protected Laysan albatross also occurs on the island during its breeding and fledging season from November to July. Up to 190 pairs have been observed during surveys. The Navy's natural resources management actions are limited in scope due to agreements with the landowner. Management strategies for birds under the 2023 INRMP would be limited to surveys to better understand potential impacts to waterbirds. The Navy's INRMP activities, both past and present are anticipated to have no impact on bird species present at Niʻihau.
Insects	There are no management actions at Niʻihau Island, past or present, which would impact insects at the site.
Land Use	The primary purpose of INRMP is to ensure no net loss in the capability of military lands to support the military mission of the installation. The implementation of the 2023 INRMP is not anticipated to lead to new land uses or land use alterations. Therefore, no impacts on land use would occur.
Outdoor Recreation	Although the owners of the island provide helicopter tour and safari tour for tourists, the Navy does not use Niʻihau Sites for recreational activities.
Cultural Resources	Traditional Hawaiian language and lifestyles have been preserved on Niʻihau to a great degree due to limitations on access and development. Cultural resource information is limited to notes in the Bishop Museum and cultural resource surveys conducted for the Navy. The Navy has undertaken archaeological investigations in areas of operations and determined that they contained no prehistoric or historic archaeological sites; nonetheless, coastal dune and sandy areas may contain sensitive sites. A few previously identified sites were noted in the 2010 INRMP: a pre-contact area of agricultural features and shelters on the northwestern corner of the island, and a former Coast Guard navigation feature and nearby ruin of a B-25 aircraft on the southwestern side of the island; and a few scattered buildings and structures that relate to early ranching activities. The No Action and Preferred Alternatives include studies and monitoring; however, there are no actions that could affect cultural resources at Niʻihau. Therefore, it is not further evaluated in the EA.

3.10.1 Physical Environment

3.10.1.1 Climate Change

Affected Environment

Niʻihau Island is a privately owned island that is 44,800 ac in size. With prior permission from the landowner and upon undergoing environmental review via the NEPA process and NHPA, the Navy can conduct training activities throughout the island, its nearshore environments, and at low level altitudes above land or sea.

Environmental Consequences

No Action Alternative

Impacts from GHG emissions are additive by nature, as individual emission sources are generally not large enough to have an impact on global climate change. GHG emissions resulting from continued implementation of the 2010 INRMP would be primarily from vehicles and vessels for the purpose of

surveying Hawaiian monk seals and sea turtles (large vessel, small boat, helicopter, and jeep) and, as individual sources, would not be large enough to have an appreciable effect on climate change.

Preferred Alternative

GHG emissions from the implementation of the 2023 PMRF INRMP also primarily come from the use of vehicles and vessels (large vessel, small boat, helicopter, and jeep) for survey purposes. These emissions sources would not be large enough to have an appreciable effect on climate change.

3.10.2 Biological Environment

Information on species distribution on Niʻihau Island is relatively limited. There are no known wildlife species that are considered endemic to Niʻihau, and species known to be present include the Hawaiian monk seal, the green sea turtle, endangered seabird species, migratory shorebirds, and Hawaiian waterbirds. There is federally designated critical habitat for one plant on the island, ʻōlulu (*Brighamia insignis*). The endangered plant Nihoa pritchardia or loʻulu (*Pritchardia aylmer-robinsonii*) has also been identified on the island. No threatened, endangered, or candidate plant species are known within the Navy-used sites.

3.10.2.1 Marine Mammals, Marine Reptiles, and Other At-Risk Marine Species

Affected Environment

Hawaiian Monk Seal

The Hawaiian monk seal uses the Niʻihau coastline to haul out, bask, and pup. It is thought that Niʻihau has some of the best coastal habitats available in the State for the Hawaiian monk seal. In coordination with the landowners of Niʻihau, Navy conducted the first comprehensive monk seal survey around the shoreline of the island in 2013. The Navy has been funding ongoing surveys with NOAA Fisheries since that time.

Whales and Dolphins

The endangered MHI insular false killer whale has been documented in the area by ship-board surveys (Carretta et al. 2018), and endangered sperm whale and fin whale have rarely been observed in adjacent waters. Dolphins that can occur in nearby or adjacent waters are: Short-finned pilot whale, pygmy killer whale, Fraser's dolphin, melon-headed whale, pantropical spotted dolphin, striped dolphin, spinner dolphin, rough-toothed dolphin, and bottlenose dolphin. Other whales recorded in the area include the pygmy sperm whale, dwarf sperm whale, humpback whale, Blainville's beaked whale, and Cuvier's beaked whale (Baird et al. 2019; 2021; 2022; Baird, Mahaffy, and Lerma 2021).

Sea Turtles

The green sea turtle frequents the beaches and nearshore waters of Niʻihau Island. The turtle has been observed resting and occasionally nesting on select beaches. The hawksbill sea turtle is also likely present in nearshore waters, although it has not been documented.

Giant Manta Ray and Oceanic Whitetip Shark

ESA-listed threatened species, including the giant manta ray and oceanic whitetip shark, are likely present in offshore waters surrounding the island. There have been no surveys conducted to determine their current occurrences around the island. INRMP actions would not impact these at-risk species.

Environmental Consequences

Hawaiian Monk Seal

No Action Alternative

Due to the potential for Navy operations on Ni'ihau to occur near Hawaiian monk seal habitat, the Navy currently takes the following actions under the 2010 INRMP:

1. *Hawaiian Monk Seal Protection:* Continue to maintain training and contacts with NOAA's Marine Mammal Stranding Network and execute a quick response to any monk seal beaching or entanglement events on PMRF beaches or nearshore waters
2. *Monk Seal Monitoring:* Identify and monitor individual monk seals to establish tracking trends such as abundance, survival, birth rate and movements between islands. Support a photography and data collection program to document where and when monk seals are observed. Train Ni'ihau residents on monk seal monitoring, photography, and data collection at a location determined by Ni'ihau Ranch.

The continued implementation of the 2010 INRMP would result in beneficial impacts on Hawaiian monk seals at Ni'ihau Island, as the management actions involve implementation of monitoring measures, and support regional conservation and assist in effective management of the species.

Preferred Alternative

The 2023 INRMP proposed the following management strategies for Hawaiian monk seals on Ni'ihau Island:

1. Continue to adhere to management strategies implemented by Ni'ihau Ranch on Ni'ihau, including restricted access, feral animal control, and not allowing dogs or ATVs on the island.
2. Continue to conduct twice yearly surveys through partnership with NOAA Fisheries for Hawaiian monk seals on Ni'ihau.

Implementation of the 2023 INRMP is anticipated to have no impact on Hawaiian monk seals as it is a continuation of previous management strategies under the 2010 INRMP.

Whales and Dolphins

No Action Alternative

The 2010 INRMP contains no management actions related to whales and dolphins on Ni'ihau and therefore the continued implementation of the 2010 INRMP would have no impact on these species.

Preferred Alternative

The 2023 INRMP proposed the following management strategies to protect whales and dolphins and their habitat on and near Ni'ihau Island:

1. Continue to report all observations of marine mammal strandings or deaths to NMFS and assist in response efforts.
2. Improve coordination and communication regarding marine mammal strandings and other observations of note with NAVFAC PAC and COMPACFLT.

The above actions would have a beneficial impact on whales and dolphins at Ni'ihau Island when compared to the No Action Alternative as the actions involve increased monitoring and studies about disease for marine mammals present at Ni'ihau Island.

Sea Turtles

No Action Alternative

Due to the potential for Navy operations on Ni'ihau to occur near sea turtle habitat, the Navy currently takes the following action under the 2010 INRMP:

1. *Sea Turtle Monitoring:* Support a program to document where and when sea turtles are observed on land, as well as in sea turtle nests. Train Ni'ihau residents on sea turtle monitoring and sea turtle nest data collection at a location determined by Ni'ihau Ranch.

The continued implementation of the 2010 INRMP would result in beneficial impacts on sea turtles at Ni'ihau Island, as the management action improves understanding of the sea turtle population and supports effective management of the species.

Preferred Alternative

The 2023 INRMP proposed the following management strategies for sea turtles on Ni'ihau Island:

1. If proposed Navy operations have the potential to impact sea turtles or habitat, conduct surveys for listed sea turtles and nesting activity on Ni'ihau to understand habitat use and trends.

Implementation of the 2023 INRMP is anticipated to have no impact on sea turtles as it is a continuation of previous management strategies under the 2010 INRMP.

Giant Manta Ray and Oceanic Whitetip Shark

No INRMP management actions are anticipated to affect or exacerbate threats to the species. Therefore, there will be no impact to the species.

3.10.2.2 Coastal and Nearshore Biological Resources

Affected Environment

There have been no coastal or nearshore biological surveys conducted as a part of the past INRMP activities. The NOAA conducts regular monitoring assessments as a part of their Pacific Reef Assessment and Monitoring Program. During their surveys from 2010, 2013, and 2015, they found that coral cover ranges from 0–10 percent for most areas around the island, and turf algae dominates most benthic communities (Heenan et al. 2014; McCoy et al. 2016). Ni'ihau's reefs are generally poorly developed due to extreme wave energy, and lack of substantial bays that shelter coral development (Hollingsworth 2008).

Waters surrounding Ni'ihau are considered EFH. Fish biomass at Ni'ihau is on average higher than that of the other MHIs, averaging between 50-60 g/m^2 for all fishes, with primary consumers generally exhibiting the highest abundance when compared to other consumer groups (Heenan et al. 2014; McCoy et al. 2016). Fishing is limited on Ni'ihau, which likely attributes to the higher fish biomass exhibited at Ni'ihau.

Environmental Consequences

There are no actions implemented under the past 2010 INRMP or the proposed 2023 INRMP that could affect the coastal and nearshore environment (including fish, EFH, or corals) at Ni'ihau, therefore no impact would occur as a result of INRMP management actions at Ni'ihau.

3.10.3 Social and Cultural Environment

All Social and Cultural resources for Niʻihau Island have been eliminated for further analysis for the reasons stated above in Table 27.

3.10.4 Additive Impacts

Additive impacts at Niʻihau Island are summarized in Table 28. Resources eliminated for analysis at this site are discussed in Section 3.10 and a description of the analysis criteria used is described in Section 3.2.2.

Table 28 Additive Impacts at Niʻihau Island

Environment	Resource	Description of Impact
Physical	Climate Change	Impacts from GHG emissions are additive in nature, as individual emission sources are not large enough to have appreciable impact on global climate change. Projects with GHG emissions include any projects that involve the use of heavy equipment, gas- or diesel-powered vehicles, or the use of ships or aircraft including long range missile tests, and the long-range strike weapons systems evaluation program. The impacts from the No Action and Preferred Alternatives, combined with the abovementioned projects, are not large enough to have an appreciable effect on GHG emissions and global climate change.
Biological	Marine Mammals, Marine Reptiles and Other At-risk Marine Species	Additive impacts to marine mammals, marine reptiles, and other at-risk marine species include potential impacts from Navy sonar testing, and noise impacts from long-range missile tests, long-range strike weapons systems evaluation program. Other potential impacts to marine mammals in the vicinity of Niʻihau Island include bycatch, and derelict fishing debris from recreational and commercial fishing, and maritime traffic.
Biological	Coastal and Nearshore Biological Resources	Additive impacts to coastal and nearshore resources at Niʻihau include impacts from commercial and recreational fishing activities, which are limited around the island.

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4. Irreversible and Irretrievable Commitments of Resources

Resources that are irreversibly or irretrievably committed to a project are those that are used on a long-term or permanent basis. This includes the use of non-renewable resources such as metal and fuel, and natural or cultural resources. These resources are irretrievable in that they would be used for this project when they could have been used for other purposes. Human labor is also considered an irretrievable resource. Another impact that falls under this category is the unavoidable destruction of natural resources that could limit the range of potential uses of that particular environment.

Implementation of the Preferred Alternative would involve human labor; the consumption of fuel, oil, and lubricants for vehicles used in conducting surveys and projects; and loss of natural resources such as invasive species from resource management activities. However, the Preferred Alternative would incorporate updated protection and conservation measures for the natural resources found at the PMRF Complex. These types of activities and labor are not in short supply and their continued use would not adversely impact the availability of these resources. Implementing the Preferred Alternative would not result in a significant irreversible or irretrievable commitment of resources.

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5. Agency and Individual Consultations

Regulations from the CEQ direct agencies to involve the public in preparing and implementing their NEPA procedures. In compliance with the Sikes Act, the Navy developed the revised INRMP cooperatively with the USFWS, DLNR, and NMFS. Entities from other local and State agencies, Native Hawaiian organizations, as well as private landowners in the project vicinity, and the public were invited to provide comments on the Revised 2023 INRMP and the associated Draft EA. The comments were considered in the preparation of the Final Revised 2023 INRMP and this EA.

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Appendix A – Key Documents and Relevant Laws, Regulations, and Memorandums of Understanding

Key Documents

Analysis of other PMRF sites as part of prior studies and NEPA assessments were used in preparing this EA. Key documents include the following:

- *INRMP:* The 2023 PMRF INRMP provides management recommendations for natural resources actions that protect federally protected species, prevent designation of additional critical habitat, reduce soil erosion; protect and restore land and waterways from invasive nonnative species infestation; and promote the protection and enhancement of wetlands and floodplains (NAVFAC PAC 2022).
- *ICRMP:* The PMRF ICRMP (NAVFAC PAC 2012) is intended to provide procedural guidance for identifying, evaluating, and managing historic properties located at PMRF. The ICRMP is a management resource tool used to achieve compliance with Sections 106 and 110 of the National Historic Preservation Act (NHPA), and other federal preservation laws. The ICRMP also provides further instruction on existing Navy agreements, which may include Memorandum of Agreement, Programmatic Agreement, and Comprehensive Agreement (DoN 1999; 2011b; 2012). The INRMP accounts for the ICRMP when planning and performing natural resource management activities that may affect cultural resources.
- *Hawai‘i Range Complex (HRC) Final EIS/OEIS (DoN 2008a):* Addresses environmental impact of ongoing and proposed activities with the Navy's existing HRC, which included PMRF.
- *PMRF Master Plan:* The PMRF Master Plan is included as Chapter 4 of the Navy's Final Regional Integration Plan (2012). The PMRF Master Plan directs land use and land management at PMRF. It identifies facility and land use constraints, controls, issues (e.g., facility shortfalls, compatibly with surrounding land uses), and needs (Commander, Navy Region Hawai‘i 2012). The INRMP is consistent with the PMRF Master Plan.

Relevant Laws, Regulations, and Memorandums of Understanding

The Navy has prepared this EA based on federal laws, statutes, regulations, and policies pertinent to the implementation of the Proposed Action.

The Coastal Zone Management Act (CZMA) of 1972, 16 U.S.C. § 1451-1468 sets up a national framework for states and territories to consider and manage coastal resources and establishes national policy to preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation's coastal zone. The CZMA requires that all federal actions, including those on federal lands, that may have reasonably foreseeable effects on the uses or resources of a state's coastal zone be consistent with the enforceable policies of the State's coastal management program (NOAA, 2018).

In 1977, the Coastal Zone Management (CZM) Program was instituted in Hawai‘i under HRS Chapter 205A. This program mandates that federal projects on State-owned land undergo a review to ensure

their alignment with the Hawai'i CZM Program. As per this program, all lands within the State are subject to a federal consistency review. The SOH Office of Planning and Sustainable Development issued a concurrence letter on July 9, 2009, for De Minimis Activities that "are expected to have insignificant direct or indirect (cumulative and secondary) coastal effects, and should not be subject to further review by the Hawai'i CZM Program on the basis and condition that the listed activities are subject to and bound by full compliance with the corresponding "Project Mitigation/ General Conditions."" requiring that the Navy or Marine Corps staff shall notify State CZM of de minimis list usage for projects which require an Environmental Assessment (EA). A copy of the Draft INRMP will be sent to the State CZM Program for review. Since the management plan is a programmatic document, the Navy did not seek a Federal Consistency determination. In the future, as specific natural resource projects are proposed, it will be submitted to the State CZM Program for consistency review if the Proposed Action requires an EA.

The following are the pertinent federal laws, statutes, regulations, and policies:

- NEPA (42 U.S.C. sections 4321-4370h)
- Procedural Provisions of NEPA (40 C.F.R. parts 1500-1508)
- Navy regulations for implementing NEPA (32 C.F.R. part 775)
- Sikes Act (16 U.S.C. §§ 670a-670o, 74 Stat. 1052)
- ESA (16 U.S.C. section 1531 et seq.)
- MMPA (16 U.S.C. section 1361 et seq.)
- Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (16 U.S.C. section 1801 et seq.)
- MBTA (16 U.S.C. section 703-712)
- CZMA (16 U.S.C. section 1451 et seq.)
- CWA (33 U.S.C. section 1251 et seq.)
- NHPA (54 U.S.C. section 306108 et seq.)
- Archaeological Resources Protection Act
- Executive Order (EO) 13089, Coral Reef Protection
- EO 11988, Floodplain Management
- EO 12088, Federal Compliance with Pollution Control Standards
- EO 13007, Indian Sacred Sites
- EO 13352, Facilitation of Cooperative Conservation
- EO 13423, Strengthening Federal Environmental, Energy, and Transportation Management
- EO 13693, Planning for Federal Sustainability in the Next Decade
- EO 13751, Safeguarding the Nation from the Impacts of Invasive Species
- EO 13990, Climate Crisis: Efforts to Protect Public Health and Environment and Restore Science
- Secretary of the Navy Instruction 5090.8A, Policy for Environmental Protection, Natural Resources, and Cultural Resources Programs
- 65 Federal Register 62565 – Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management

Memorandums of Understanding (MOUs):

- MOU between DoD and USFWS and the Association of Fish and Wildlife Agencies for a Cooperative Integrated Natural Resources Management Program on Military Installations (Tripartite Agreement)
- MOU between DoD and the Pollinator Partnership
- MOU between DoD and USFWS to Promote the Conservation of Migratory Birds
- MOU between DoD and Bat Conservation International

Appendix B – List of Preparers

This EA was prepared collaboratively between the Navy and contractor preparers.

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