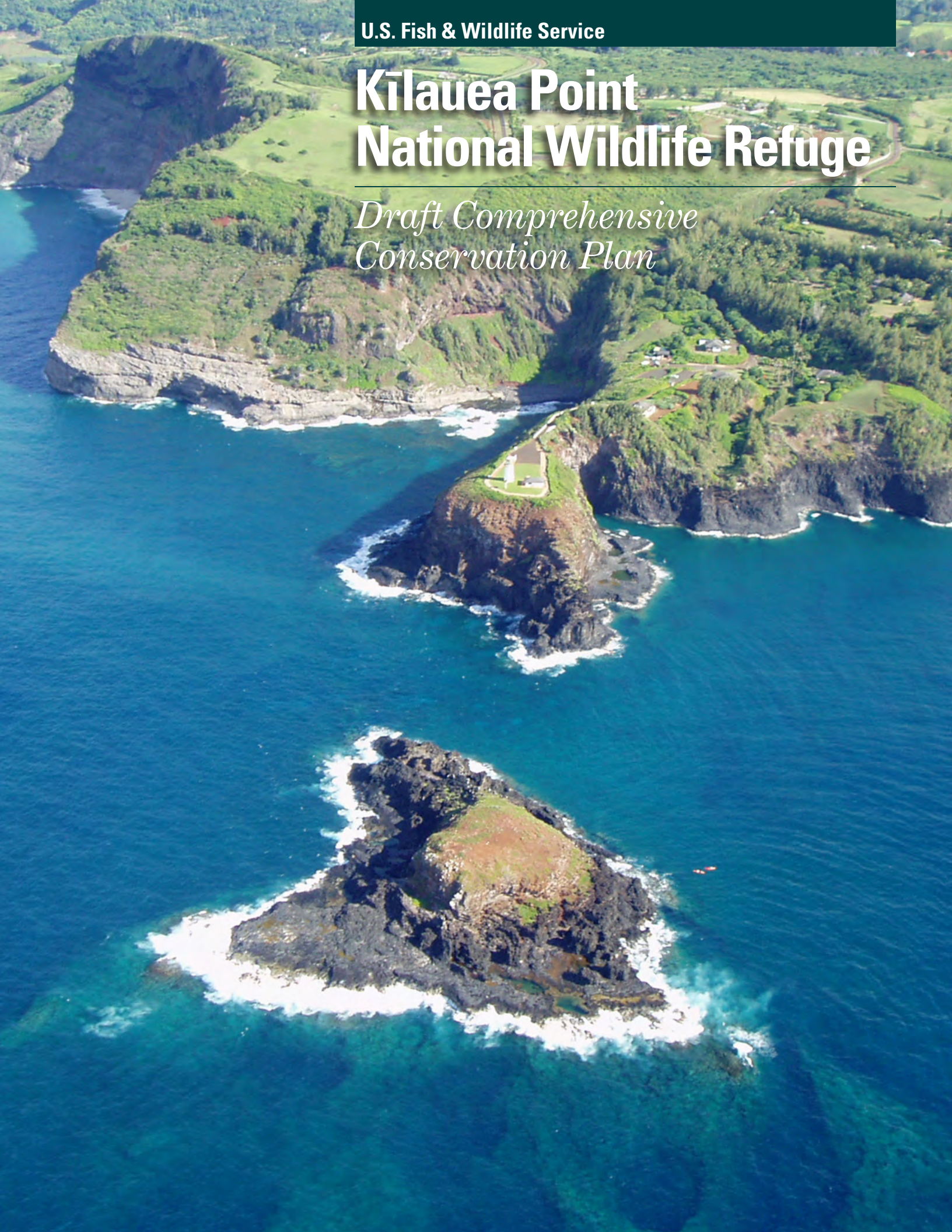
U.S. Fish & Wildlife Service

Kīlauea Point National Wildlife Refuge

Draft Comprehensive Conservation Plan



Refuge Vision

Shrouded in a salty mist, the steep cliffs of an ancient volcano plunge into a pounding north swell as Kīlauea Point National Wildlife Refuge stands as an oasis where abundant seabirds blanket the pali and ride updrafts. Here a symphony of sounds reverberates — from the whinny of mōlī to a chorus of rattling squawks from thousands of ʻā. Nēnē nestle within thriving native plant communities that blanket the red soil throughout the Refuge. ʻĪlio-holo-i-ka-uaua and honu bask in tranquil solitude at the edge of the turquoise waters teeming with marine life.

The dynamic and awe-inspiring experiences of Kīlauea Point provide kamaʻāina and visitors alike a sense of place and lasting interconnectedness with the natural world. Interwoven with cultural heritage, environmental education links the island's keiki and the youth beyond with the Refuge's unique ecosystems and native wildlife. Through strong community support, the Kīlauea lighthouse endures, telling its story, and remains a beacon promoting stewardship of the Refuge's resources for future generations.

He nuʻukia no ka puʻuhonua

Kau maila ka ʻehukai i ka pali kū o ka luapele, a papā mai ka nalu poʻi. Kū kilakila ʻo Kīlauea Point National Wildlife Refuge ma ke ano he kīpuka no ka manu o ka moana kūhohonu, a ma aneʻi lākou e kīkaha a kaʻaniu ai. Kūpinaʻi aʻe ka leo o ka mōlī, ua lau. Hauwalaʻau mai ka leo o ka ʻā, ua mano. Nonoho iho ka nēnē i ka nāhele ʻoiwi e uhi ana i ka lepo ʻulaʻula o neʻi. Lalala mehameha ka ʻīlio-holo-i-ka-uaua a me ka honu ma kaʻe o ke kai pāpaʻu piha o ka iʻa.

Poina ʻole nēia wahi ke hoʻokipa ʻia e ke kamaʻāina, pau pū me ka malihini i ke ʻano o nā mea a lākou i ʻike ai, i laʻa me ka pilina ma waena o kō a uka, a kō a kai. ʻO ka nohona kanaka a me ke aloha ʻāina ke kahua o ka haʻawina e aʻo aku ai i ka poʻe ʻōpio, i moākaka ia mau mea i ka ʻike a kō lākou mau maka ma kēia mua aku. Ma o ke kākoʻo a ke kaiāulu, kū mau ka hale ipu kukui ʻo Kīlauea i lama kuhikuhi o ka mālama ʻāina no nā hanauna e hiki mai ana.

Comprehensive Conservation Plans provide long-term guidance for management decisions and set forth goals, objectives, and strategies needed to accomplish refuge purposes and identify the Service's best estimate of future needs. These plans detail program planning levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning and program prioritization purposes. The plans do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.

Mōlī. Amanda Gladics/USFWS

Kīlauea Point National Wildlife Refuge

Draft Comprehensive Conservation Plan and Environmental Assessment

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Readers' Guide

Native species discussed in this document are referred to by their Hawaiian names. Common English names and scientific nomenclature can be found in the glossary in Appendix A. The U.S. Fish and Wildlife Service endeavors to be accurate in its use of the Hawaiian language and correctly spell Hawaiian words, including the diacritical marks that affect the meaning and aid in pronunciation. This guide is provided to simplify pronunciation for the reader.

When Captain Cook arrived in the Hawaiian Islands in 1778, the Hawaiians had a totally oral tradition. In 1820, western missionaries standardized a written version of the Hawaiian language that features eight consonants and five vowels.

Consonants

H - as in English
K - as in English
L - as in English
M - as in English
N - as in English
P - as in English
W - after i and e pronounced like v
- after u and o pronounced like w
- at the start of a word or after a, pronounced like w or v
(‘) - ‘okina - a glottal stop

Vowels

A - pronounced like the a in far
E - pronounced like the e in bet
I - pronounced like the ee in beet
O - pronounced like the o in sole
U - pronounced like the oo in boot

Special Symbols

Two symbols appear frequently in Hawaiian words: the ‘okina and the kahakō. These two symbols change how words are pronounced. The ‘okina itself looks like an upside-down apostrophe and is a glottal stop – or a brief break in the word. An example of this in English is in the middle of the expression "uh-oh." The ‘okina is an official consonant – just as any of the other consonants.

The kahakō is a stress mark (macron) that can appear over vowels only and serve to make the vowel sound slightly longer. The vowels ā, ē, ī, ō, and ū sound just like their non-stress Hawaiian vowels with the exception that the sound is held slightly longer. Missing the ‘okina or kahakō can greatly change not only the how a word sounds, but also its basic meaning. A popular example of how an ‘okina and a kahakō can change the meaning of a word is "pau":

- pau = finished, ended, all done
- pa‘u = soot, smudge, ink powder
- pa‘ū = moist, damp
- pā‘ū = skirt

Refuge Place Names

Kīlauea	*(Key-Low-Way-Ah)*	meaning: spewing; much spreading

Seabirds

‘A (AHH)

Red-footed booby *Sula sula rubripes*

SPECIES STATUS:
State recognized as Indigenous

Mark MacDonald

Mō’lī (MOE-lee)

Laysan albatross *Phoebastria immutabilis*

SPECIES STATUS:
State recognized as Indigenous
North American Waterbird Conservation Plan - High concern

Sandra Hall

‘Ka‘upu (kah OO-poo)

Black-footed albatross *Phoebastria albatrus*

SPECIES STATUS:
State listed as Threatened
State recognized as Indigenous
IUCN Red List Ranking - Endangered

USFWS

‘Iwa (EE vah)

Great frigatebird *Fregata minor palmerstoni*

SPECIES STATUS:
State recognized as Indigenous

USFWS

Nēnē (NAY-NAY)

Hawaiian Goose *Branta sandvicensis*

SPECIES STATUS:
Federally listed as Endangered
State listed as Endangered
State recognized as Endemic

Laura Beauregard

Migrant Shorebirds

‘Akekeke (ah-kay-KAY-kay)

Ruddy Turnstone *Arenaria interpres*

SPECIES STATUS:
State recognized as Indigenous
U.S. Shorebird Conservation Plan - High Concern

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Hunakai (hoo-nah-KYE)

Sanderling *Calidris alba*

SPECIES STATUS:
State recognized as Indigenous
Hunakai means “sea foam.” Their habit of running along the receding waves on the shore in search of small sand crabs apparently reminded early Hawaiians of the sea foam or hunakai left behind by the waves. It shares the name with a coastal plant.

©Michael Walther

Kioea (kee-oh-AY-ah)

Bristle-thighed Curlew *Numenius tahitiensis*

SPECIES STATUS:
State recognized as Indigenous
IUCN Red List Ranking - Vulnerable

Laura Beauregard

Kōlea (KOHH-lay-ah)

Pacific Golden Plover *Pluvialis fulva*

SPECIES STATUS:
State recognized as Indigenous
U.S. Shorebird Conservation Plan - High Concern

©Tom Dove

‘Ūlili (OOO-lee-lee)

Wandering Tattler *Heteroscelus incanus*

SPECIES STATUS:
State recognized as Indigenous
U.S. Shorebird Conservation Plan - Moderate Concern

©Tom Dove

Other Native Animals

ʻŌpeʻapeʻa (OHH-pay ah-PAY ah)

Hawaiian Hoary Bat *Lasiurus cinereus semotus*

SPECIES STATUS:
Federally listed as Endangered

NPS

ʻIlio holo i ka uaua (EEE-lee-oh HO-loh EE kah OO-ah OO-ah)

Hawaiian Monk Seal Monachus schauinslandi

SPECIES STATUS:
Federally listed as Endangered

USFWS

Pueo (poo-AY-oh)

Hawaiian Short-eared Owl *Asio flammeus sandwichensis*

SPECIES STATUS:
State recognized as Endangered on Oʻahu
State recognized as Endemic

©Tom Dove

ʻAukuʻu (ow-KOO oo)

Black-crowned Night-Heron *Nycticorax nycticorax hoactli*

SPECIES STATUS:
State recognized as Indigenous

©Dan Clark

ʻAʻo (AH oh)

Newell's Shearwater *Puffinus auricularis newelli*

SPECIES STATUS:
Federally recognized as Endangered

Brenda Zaun

Native Plants

‘**Akoko** (ah-KOH-koh)

Chamaesyce celastroides

SPECIES STATUS:
State recognized as Endemic

USFWS

Hala (HAH-lah)

Beach Vitex *Pandanus tectorius*

SPECIES STATUS:
State recognized as Indigenous

USFWS

‘**Ilima** (ee-LEE-mah)

Hibiscus *Sida fallax*

SPECIES STATUS:
State recognized as Indigenous

USFWS

Naupaka Kahakai (now-PAH-kah kah-HAH-kye)

Scaevola sericea

SPECIES STATUS:
State recognized as Indigenous

USFWS

Pōhuehue (POHH-hoo-ay-HOO-ay)

Beach morning glory *Ipomoea pescaprae*

SPECIES STATUS:
State recognized as Indigenous

USFWS

Chapter 1
Introduction and Background

USFWS

Chapter 1. Introduction and Background

1.1 Introduction

Kīlauea Point National Wildlife Refuge (NWR or Refuge) is managed by the U.S. Fish and Wildlife Service (Service) as part of the National Wildlife Refuge System (Refuge System). It is one of three refuges that make up the Kaua‘i National Wildlife Refuge Complex (KNWRC or Complex): Kīlauea Point, Hanalei, and Hulē‘ia. This Comprehensive Conservation Plan (CCP) applies only to Kīlauea Point NWR.

The 199-acre Kīlauea Point NWR, located on the northernmost tip of Kaua‘i 2 miles north of Kīlauea Town, was established on February 15, 1985, becoming the 425th refuge in the Refuge System. Originally established to preserve and enhance seabird nesting colonies, the Refuge also provides habitat for the endangered nēnē (Hawaiian goose, *Branta sandvicensis*), other migratory birds, endangered ‘īlio-holo-i-ka-uaua (Hawaiian monk seal, *Monachus schauinslandi*), and native coastal plant communities which include naupaka kahakai (*Scaevola taccada*), ‘ilima (*Sida fallax*), ‘akoko (*Chamaesyce celastroides*) and others. The focus of Refuge management is to expand and enhance existing habitat for these species while combating the primary threats of invasive species and predators and allowing for public uses that are compatible with Refuge purposes and the Refuge System mission.

The Refuge is also home to a historic lighthouse that was once owned and operated by the U.S. Coast Guard. The lighthouse, as well as easy access to wildlife viewing and dramatic ocean and cliff views, makes this Refuge a top attraction on the island. Kīlauea Point NWR has the 4th highest visitation in the entire Refuge System with about 500,000 people visiting annually.

1.2 Significance of the Refuge

Kīlauea Point NWR is one of the few places in the main Hawaiian Islands with an abundant diversity of seabirds, and it provides a high-island refugium for seabird populations potentially affected by climate change (e.g., rising sea levels impacting low-lying nesting areas on the islands and atolls of the Northwestern Hawaiian Islands). ‘Ua‘u kani (wedge-tailed shearwaters**,** *Puffinus pacificus*) are the most numerous species on the Refuge, with an estimated 8,000–15,000 breeding pairs. The colony of ‘ā (red-footed boobies**,** *Sula sula*) may be the largest in the main Hawaiian Islands, with a maximum of 2,536 nests counted in 2006. About 200 pairs of mōlī (Laysan albatross**,** *Phoebastria immutabilis*) nest on and near the Refuge, the largest colony outside the Northwestern Hawaiian Islands. An estimated 150–350 pairs of koa‘e ‘ula (red-tailed tropicbirds**,** *Phaethon rubricauda*) nest on the Refuge, as well as smaller numbers of koa‘e kea (white-tailed tropicbirds**,** *Phaethon lepturus*). The Refuge harbors at least 11 prospecting or breeding pairs of ‘a‘o (Newell’s shearwater**,** *Puffinus auricularis newelli*), whose numbers are dwindling on Kaua‘i. The Refuge is the only easily accessible location where this threatened species nests and thus is a source of much information on its breeding biology. A remarkable total of 33 seabird species have been observed at Kīlauea Point over the years, making it one of the premier sites for seabirds in Hawai‘i. Additionally, there are 300 nēnē in the Kīlauea Point area, making the Refuge one of the largest concentrations on the island.

Dedicated in 1913, the Kīlauea Point Lighthouse Station guided ships and boats along Kaua‘i's rugged North Shore for 63 years before being deactivated by the Coast Guard in 1976. In 1979, the structure was placed on the National Register of Historic Places. The lighthouse was renamed in honor of the late Senator Daniel Inouye in May 2013.

1.3 Proposed Action

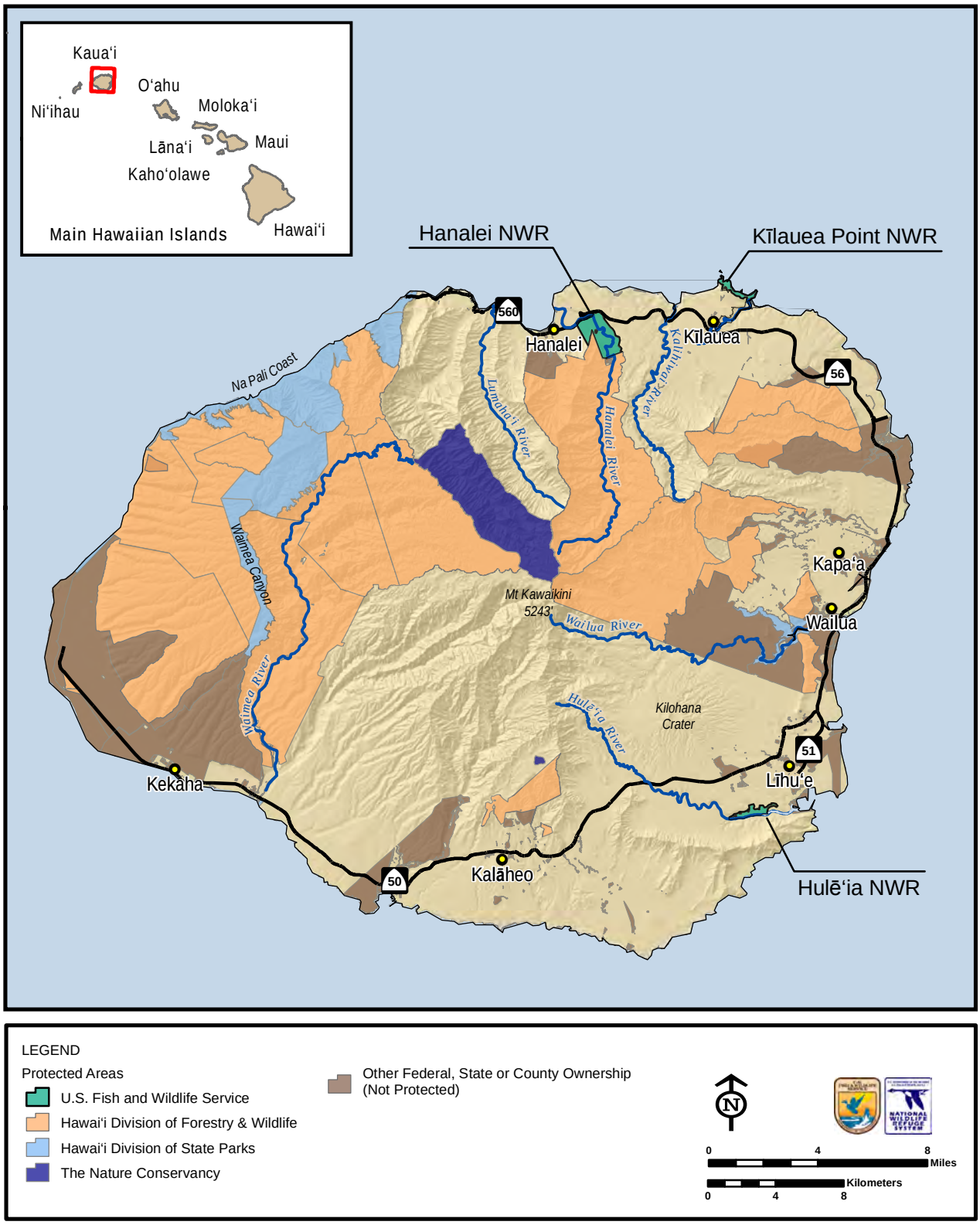
We, the U.S. Fish and Wildlife Service, manage wildlife refuges as part of the Refuge System. We propose to adopt and implement a CCP for Kīlauea Point NWR. This document is the Refuge's draft CCP and Environmental Assessment (EA). A CCP sets forth management guidance for a refuge for a period of 15 years, as required by the National Wildlife Refuge System Administration Act (16 U.S.C. 688dd -688ee, et seq.) (Refuge Administration Act) as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57) (Improvement Act). The Refuge Administration Act requires CCPs to identify and describe:

- The purposes of the Refuge;
- The fish, wildlife, and plant populations, their habitats, and the archaeological and cultural values found on the Refuge;
- Significant problems that may adversely affect wildlife populations and habitats and ways to correct or mitigate those problems;
- Areas suitable for administrative sites or visitor facilities; and
- Opportunities for fish and wildlife-dependent recreation.

The proposed action in the CCP is to implement Alternative D, which has been identified as the Service's preferred alternative. The Service has developed and examined a total of four alternatives for future management of Kīlauea Point NWR and disclosed anticipated effects for each alternative, pursuant to the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. 4321-4347). The goals, objectives, and strategies under Alternative D best achieve the purpose and need for the CCP while maintaining balance among the varied management needs and programs. The preferred Alternative D represents the most balanced approach for achieving the Refuge's purposes, vision, and goals; contributing to the Refuge System's mission; addressing relevant issues and mandates; and managing the Refuge consistently with sound principles of fish and wildlife management.

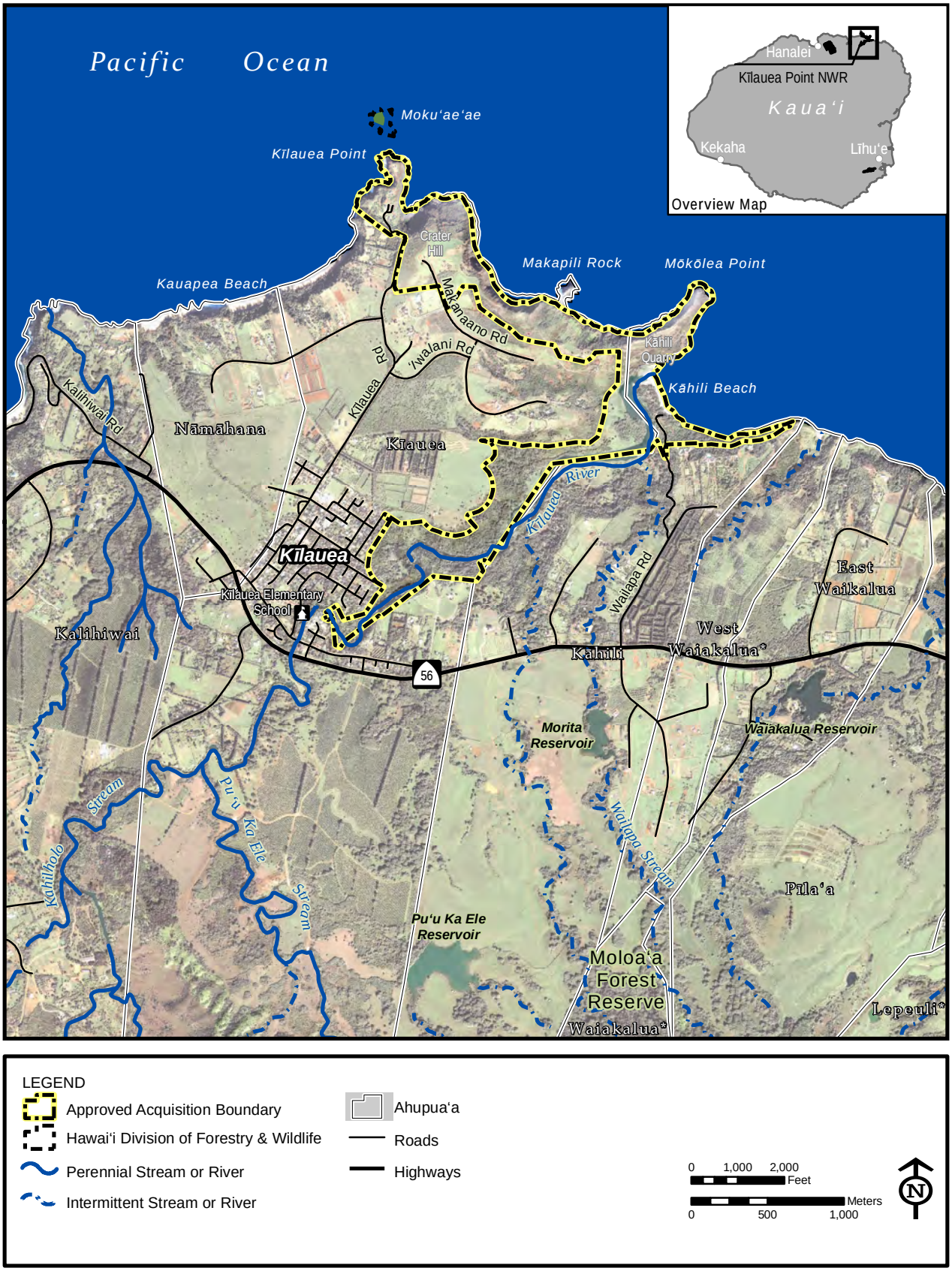
The preferred alternative may be modified between the draft and final documents depending upon comments received from the public or other agencies and organizations. The Service's Regional Director for the Pacific Region will decide which alternative will be implemented. For details on the specific components and actions comprising the range of alternatives, see Chapter 2.

Figure 1-1. Regional Area, Kaua‘i County.



The back sides of maps are blank to improve readability.

Figure 1-2. Local Area, Kīlauea Point NWR, Kaua'i County.



Map Date: 9/16/2014 File: 11-067-3.mxd
Image: NAIP 2004

Title: Local Area, Kilauea Point
USFWS R1 Refuge Information Branch

The back sides of maps are blank to improve readability.

1.4 Need for and Purpose of Action

The need for the CCP is derived from the overall Refuge System mission, goals, and policies, as described in or promulgated by the Refuge Administration Act. The purpose of developing the CCP is to provide the Refuge Manager with a 15-year management plan for the conservation of fish, wildlife, and plant resources and their related habitats, while providing opportunities for compatible, wildlife-dependent recreational uses. The CCP, when fully implemented, should achieve Refuge purposes; help fulfill the Refuge System mission; maintain and, where appropriate, restore the ecological integrity of the Refuge and the Refuge System; help achieve the goals of the National Wilderness Preservation System; and meet other mandates. The CCP must be specific to the planning unit and identify the overarching wildlife, public use, or management needs for the Refuge (602 FW 3.4C1d).

1.5 Legal and Policy Guidance

1.5.1 The U.S. Fish and Wildlife Service

All national wildlife refuges are managed by the Service, an agency within the Department of the Interior (DOI). The Service is the principal Federal agency responsible for conserving, protecting, and enhancing the Nation's fish and wildlife populations and their habitats.

The mission of the Service is "working with others to conserve, protect, and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people." Although we share this responsibility with other Federal, State, Territorial, tribal, local, and private entities, the Service has specific trust responsibilities for migratory birds, endangered and threatened species, interjurisdictional fish, and certain marine mammals. The Service has similar trust responsibilities for the lands and waters we administer to support the conservation and enhancement of fish, wildlife, plants, and their habitats. The Service also enforces Federal wildlife laws and international treaties for importing and exporting wildlife, assists with State and Territorial fish and wildlife programs, and helps other countries develop wildlife conservation programs.

1.5.2 National Wildlife Refuge System

A refuge is managed as part of the Refuge System within a framework provided by legal and policy guidelines. The Refuge System is the world's largest network of public lands and waters set aside specifically for conserving wildlife and protecting ecosystems.

The needs of wildlife and their habitats come first on refuges, in contrast to other public lands that are managed for multiple uses. Refuges are guided by various Federal laws and Executive orders, Service policies, and international treaties. Fundamental are the mission and goals of the Refuge System and the designated purposes of the refuge unit as described in establishing legislation, Executive orders, or other documents establishing, authorizing, or expanding a refuge.

Key concepts and guidance of the Refuge System are derived from the Refuge Administration Act, the Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4), as amended, Title 50 of the Code of Federal Regulations (CFR), and the Fish and Wildlife Service Manual (FW). The Refuge Administration Act is implemented through regulations covering the Refuge System, published in

Title 50, subchapter C of the Code of Federal Regulations. These regulations govern general administration of units of the Refuge System.

National Wildlife Refuge System Mission and Goals

The mission of the Refuge System is "to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (Refuge Administration Act).

The goals of the Refuge System, as articulated in the Mission, Goals, and Purposes policy (601 FW 1) are:

- Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered;
- Develop and maintain a network of habitats for migratory birds, anadromous and inter-jurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life-history needs of these species across their ranges;
- Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts;
- Provide and enhance opportunities to participate in compatible, wildlife-dependent recreation (hunting, fishing, wildlife observation and photography, and environmental education and interpretation); and
- Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.

National Wildlife Refuge System Administration Act

Of all the laws governing activities on National Wildlife Refuges, the Refuge Administration Act undoubtedly exerts the greatest influence. The Improvement Act amended the Refuge Administration Act in 1997 by including a unifying mission for all national wildlife refuges as a system, a new process for determining compatible uses on refuges, and a requirement that each refuge be managed under a CCP, developed in an open public process.

The Refuge Administration Act states that the Secretary of the Interior shall provide for the conservation of fish, wildlife, and plants and their habitats within the System as well as ensure that the biological integrity, diversity, and environmental health of the Refuge System are maintained. House Report 105–106 accompanying the Improvement Act states ''… the fundamental mission of our System is wildlife conservation: wildlife and wildlife conservation must come first.'' Biological integrity, diversity, and environmental health are critical components of wildlife conservation. As later made clear in the Biological Integrity, Diversity and Environmental Health (BIDEH) Policy (601 FW 3) "the highest measure of biological integrity, diversity, and environmental health is viewed as those intact and self-sustaining habitats and wildlife populations that existed during historic conditions."

Under the Refuge Administration Act, each refuge must be managed to fulfill the Refuge System mission as well as the specific purposes for which it was established. The Refuge Administration Act requires the Service to monitor the status and trends of fish, wildlife, and plants in each refuge.

Additionally, the Refuge Administration Act identifies six wildlife-dependent recreational uses for the Refuge System. These uses are hunting, fishing, wildlife observation and photography, and environmental education and interpretation. Under the Refuge Administration Act, the Service is to grant these six wildlife-dependent public uses, when compatible, special consideration in the planning for, management of, establishment, and expansion of units of the Refuge System. The overarching goal of the wildlife-dependent public uses program is to enhance opportunities and access to quality, wildlife-dependent visitor experiences on refuges while managing refuges to conserve fish, wildlife, plants, and their habitats. When determined compatible on a refuge-specific basis, these six uses assume priority status among all uses of the refuge in question. The Service is to make extra efforts to facilitate priority wildlife-dependent public use opportunities.

When preparing a CCP, Refuge Managers must re-evaluate all general public, recreational, and economic uses (even those occurring to further refuge habitat management goals) proposed or occurring on a refuge for appropriateness and compatibility. No refuge use may be allowed or continued unless it is determined to be appropriate and compatible. Generally, an appropriate use is one that contributes to fulfilling a refuge's purposes, the Refuge System mission, or goals or objectives described in an approved refuge management plan. A compatible use is a use that, in the sound professional judgment of the Refuge Manager, will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purpose(s) of the refuge. Draft appropriate use findings and compatibility determinations for existing and proposed uses for Kīlauea Point NWR are in Appendices A and B of this draft CCP/EA.

The Refuge Administration Act also requires that, in addition to other formally established guidance, the CCP must be developed with the participation of the public. Issues and concerns articulated by the public play a role in guiding alternatives considered during the development of the CCP, and together with the formal guidance, can play a role in selection of the preferred alternative. It is Service policy that CCPs are developed in an open public process and that the Service is committed to securing public input throughout the process. Appendix I of the draft CCP/EA details public involvement that has been undertaken during this CCP process.

1.5.3 Other Laws and Mandates

Many other Federal laws, Executive orders, Service policies, and international treaties govern the Service and Refuge System. Examples include the Migratory Bird Treaty Act of 1918 (MBTA), Refuge Recreation Act of 1962, National Historic Preservation Act of 1966 (NHPA), and the Endangered Species Act of 1973 (ESA). For additional information on laws and other mandates, a list and brief description of Federal laws of interest to the Service can be found in the Laws Digest at http://www.fws.gov/laws/Lawsdigest.html.

In addition, over the last few years, the Service has developed or revised numerous policies and Director's Orders to reflect the mandates and intent of the Improvement Act. Some of these key policies include BIDEH; Compatibility (603 FW 2); Comprehensive Conservation Planning Process (602 FW 3); National Wildlife Refuge System Mission and Goals and Refuge Purposes (601 FW 1); Appropriate Refuge Uses (603 FW 1); General Guidelines for Wildlife-Dependent Recreation (605 FW 1); Wilderness Stewardship (610 FW 1-5); and the Director's Order for Coordination and Cooperative Work with State Fish and Wildlife Agency Representatives on Management of the National Wildlife Refuge System. These policies and others in draft or under development can be found at: http://refuges.fws.gov/policymakers/nwrpolicies.html.

In developing a CCP, refuges must consider these broader laws and policies as well as Refuge System and ecosystem goals and vision. The CCP must be consistent with these and Refuge purposes. For Kīlauea Point NWR, specific examples of these broader laws include:

- ESA;
- MBTA;
- NHPA; and the
- Historic Sites, Buildings, and Antiquities Act of 1935.

1.6 Refuge Establishment and Purposes

1.6.1 Legal Significance of the Refuge Purpose(s)

The purpose(s) for which a refuge was established or acquired is of key importance in refuge planning. Purposes must form the foundation for management decisions. Refuge purposes are the driving force in the development of the refuge vision statements, goals, objectives, and strategies in a CCP and are critical to determining the compatibility of existing and proposed refuge uses.

The purpose(s) of a refuge are specified in or derived from the law, proclamation, Executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit.

Unless the establishing law, order, or other document indicates otherwise, purposes dealing with the conservation, management, and restoration of fish, wildlife, and plants, and the habitats on which they depend take precedence over other purposes in the management and administration of any unit. Where a refuge has multiple purposes related to fish, wildlife, and plant conservation, the more specific purpose will take precedence in instances of conflict. When an additional unit is acquired under an authority different from the authority used to establish the original unit, the addition takes on the purpose(s) of the original unit, but the original unit does not take on the purpose(s) of the newer addition. When a conflict exists between the Refuge System mission and the purpose of an individual refuge, the refuge purpose may supersede the mission.

1.6.2 Purpose and History of Refuge Establishment

Since 1985, the Refuge has continued to undergo expansion and as such, there are several authorities related to its establishment. They are as follows:

- *The Transfer of Certain Real Property for Wildlife Conservation Act (16 U.S.C. 667b-667d, May 19, 1948, as amended 1949, 1972, and 1995).* This act provides authority to the Administrator of the General Services Administration to transfer real property no longer needed by a Federal agency to the Secretary of the Interior if the land has particular value for migratory birds.
- *Refuge Recreation Act (16 U.S.C. §§ 460k through 460k-4, September 28, 1962, as amended 1966, 1972, 1973, and 1978).* This act authorizes the Secretary of the Interior to allow public recreation in Federal conservation areas when compatible with the purposes of these areas, acquire lands that are suitable for incidental fish and wildlife-oriented recreational development, protect natural resources, and conserve endangered or threatened species.

- *Endangered Species Act (ESA) (16 U.S.C. §§ 1531-1544, December 28, 1973, as amended 1976, 1977, 1978, 1979, 1980, 1982, 1984, 1988, 1992, and 1997).* The ESA provides for the conservation of threatened and endangered species of fish, wildlife, and plants by Federal action and by encouraging the establishment of state programs. It supersedes and strengthens two earlier endangered species acts, the Endangered Species Preservation Act of 1966 and The Endangered Species Conservation Act of 1969. Section 5 of the ESA provides guidance for the Service to use its existing authorities to acquire lands to conserve those species listed as endangered or threatened. It also provides for the determination and listing of endangered and threatened species and the designation of critical habitats. Section 7 of the ESA requires Refuge Managers to perform consultations before initiating projects that affect or may affect endangered species.
- *Kīlauea Point Expansion Act of 2004 (Expansion Act) (16 USC 668dd December 23, 2004).* The Expansion Act, Public Law 108-481, directs the Secretary of the Interior to acquire by donation, purchase with donated or appropriated funds, or exchange, all or a portion of approximately 234 acres of land adjacent to the Kīlauea Point NWR to be managed for the protection and recovery of endangered Hawaiian water birds and other endangered birds, including the nēnē (Hawaiian goose), and the conservation and management of native coastal strand, riparian, and aquatic biological diversity.

As a result of the various establishment authorities above, there are several purposes for Kīlauea Point NWR:

- ... particular value in carrying out the national migratory bird management program.16 U.S.C. § 667b (An Act Authorizing the Transfer of Certain Real Property for Wildlife, or other purposes)
- ... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ...16 U.S.C. § 460k-1
- ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended)
- ... to conserve (A) fish or wildlife which are listed as endangered species or threatened species .... or (B) plants … 16 U.S.C. § 1534 (Endangered Species Act of 1973)
- (1) the protection and recovery of endangered Hawaiian waterbirds and other endangered birds, including the Nene (Hawaiian goose); and (2) the conservation and management of native coastal strand, riparian, and aquatic biological diversity. Public Law 108-481 (Kīlauea Point National Wildlife Refuge Expansion Act of 2004).

1.6.3 Land Status and Ownership

The Refuge approved boundary is made up of lands owned in fee by the Service, non-Service owned lands (in-holdings), and easements. The following provides a summary of major land status and ownership actions from past to present.

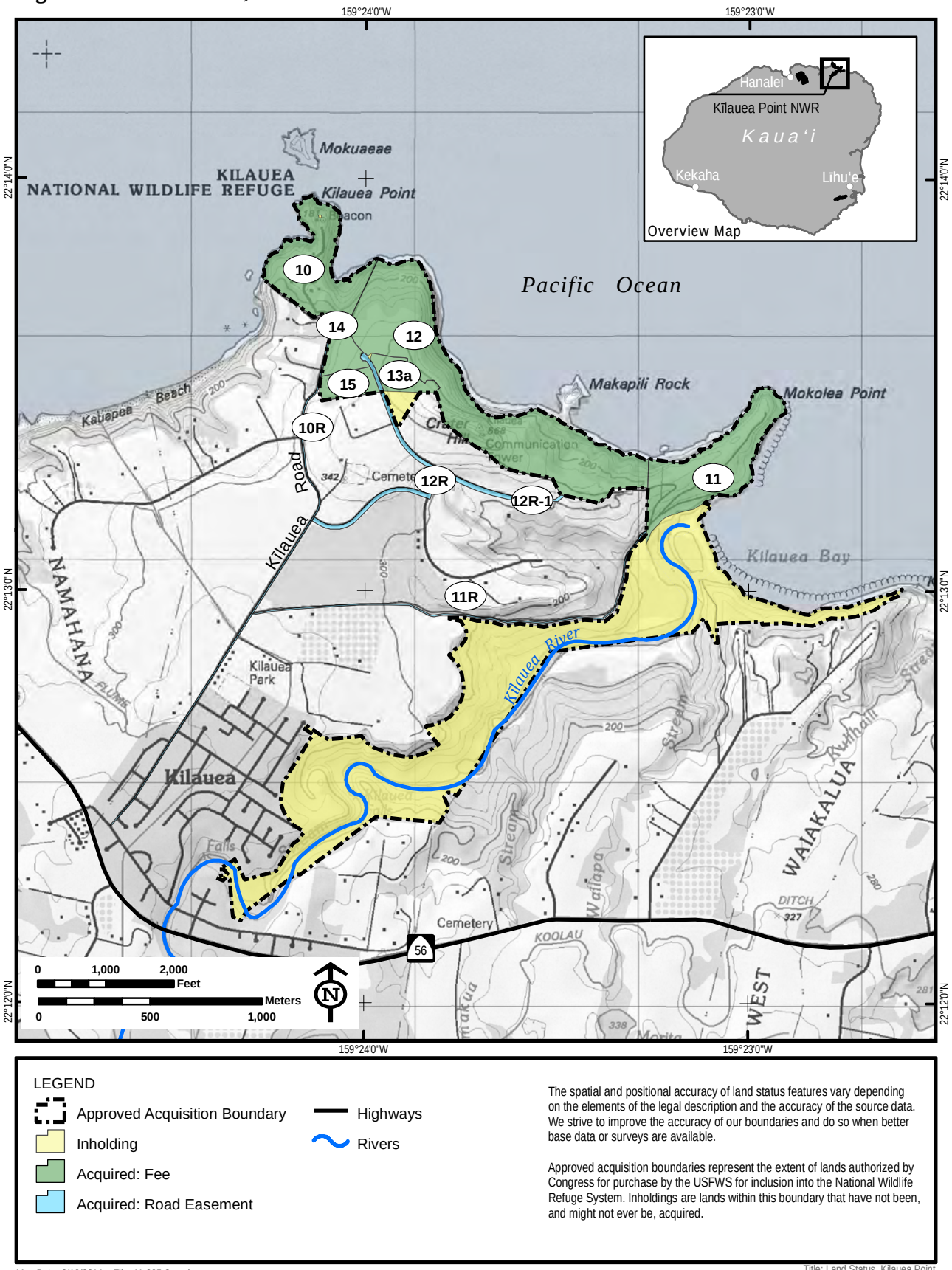
- 1976–Agreement with the U.S. Coast Guard allowed the Service to use Kīlauea Point to administer its other refuges on Kaua‘i (Hanalei and Hulē‘ia);
- 1985–Under Public Law 80-537, the U.S. Coast Guard transferred 31-acre Kīlauea Point to the Service (negotiations began in 1984);

- 1988–With assistance from the Trust for Public Lands, the Service added Mōkōlea Point (38 acres) and Crater Hill (91 acres) to the Refuge (Tracts 11, 12, 12R, 12R-1), both under the authority of the ESA:
    - Mōkōlea Point was purchased in fee with the Land and Water Conservation Fund at $1.6 million dollars. There is an access easement in favor of Seacliff Plantation (formerly the Pali Moana Corporation) for beach access and parking over and across Kāhili Quarry Road (Tract 11) as well as for emergency and maintenance operations. This access is subject to reasonable rules and regulations for the protection of wildlife;
    - The Crater Hill parcel was donated by Pali Moana Corporation (which is now Seacliff Plantation) through the Trust for Public Lands. Seacliff Plantation retained a non-exclusive access easement along pedestrian and equestrian trails within the Refuge boundary which are 20 feet in width, with only 10 feet of this allowed for improvements (running along and near the southern boundary of Tract 12 and egress to the trail through Tract 13). Both trails follow the same route entering the Refuge from the east gate and continuing to Mōkōlea Point (the exact alignment has never been determined). The Service also has conservation easements on these same tracts as well as right of ingress and egress for emergency and maintenance purposes. The use of this property is highly regulated under the conveyance documents; general unsupervised public use and construction of any buildings or other structures are prohibited on Tract 12. In addition, the State retained the mineral and metallic mines rights and easements for utilities maintained;
- 1993–Tract 14 (7 acres) was purchased at $2.7 million dollars from ARC Partners, Ltd, with existing utility easements and State rights for mineral and metallic mines intact;
- 1994–Tracts 13a (7 acres) and 15 (7 acres) were also purchased. Tract 15, at $1.975 million, was purchased from an individual, subject to existing utility and irrigation ingress and egress easements and State rights for mineral and metallic mines intact. Tract 13a was acquired by exchange from Pali Moana Company for the release of a conservation easement on 3.154 acres (small triangle protruding from the south of Tract 13) and an equalization payment of $200,000. There is also an Open Space Easement area within Tract 13a;
- 2004–Congress approved the expansion of the Refuge boundary by up to 234 additional acres (Kaua‘i county council passed a resolution in support of this expansion). A Land Protection Plan and Environmental Assessment were conducted and completed in 2007. The Service selected the alternative that expanded the Refuge boundary by 202 acres. However, no land in this expanded boundary area has been acquired by the Refuge (though a landowner did donate 5 acres to the Kaua‘i Land Trust to hold as an addition to the Refuge).

The following is a list of additional easements on the Refuge not identified above:

- Kaua‘i Island Utility Cooperative currently has easement rights under a Special Use Permit to allow placement of electric utility lines underground;
- The U.S. Coast Guard reserved an access easement over the existing roadway for maintenance and repair of the beacon and aids-to-navigation light. They also reserved a visual easement to provide an unobstructed view from the sea to the beacon. Additionally, they have jurisdiction over a 30x30-foot inholding on Kīlauea Point.

Figure 1-3. Land Status, Kīlauea Point NWR.



The back sides of maps are blank to improve readability.

Under the State Land Use Law (Act 187), Hawai‘i Revised Statute Chapter 205, all lands and waters in the State are classified into four districts: Agriculture, Rural, Conservation, and Urban. Conservation Districts, under the jurisdiction of the Hawai‘i Department of Land and Natural Resources, are further divided into five subzones: Protective, Limited, Resource, General, and Special (Hawai‘i Administration Rules, Title 13, Chapter 5). The other three districts are under the jurisdiction of the counties.

According to the land use classifications, the fee portion of Kīlauea Point NWR is zoned mostly as agriculture, though not considered prime agricultural land according to the State's agricultural lands of importance. Areas along the coast are zoned as conservation. A majority of the Refuge (everything east of the Overlook, a turnaround at the end of a road) is also zoned as a special management area according to the Coastal Zone Management program.

1.7 Relationship to Other Planning Efforts

When developing a CCP, the Service considers the goals and objectives of existing national, regional, State, Territorial, and ecosystem plans, and assessments. The CCP is expected to be consistent, as much as possible, with existing plans and assist in meeting their conservation goals and objectives (602 FW 3). This section summarizes some of the key plans reviewed by members of the core team while developing this CCP.

1.7.1 Relationship to Refuge Plans

Kīlauea Point NWR

- Draft Public Use Management Plan (1989);
- Complex-wide Draft Plant Restoration Strategy (1999);
- A Handbook for Outreach (2001);
- Visitor Uses Study (2002);
- Visitors Services Evaluation Report (2003);
- Complex-wide Wildland Fire Management Plan (2004);
- Alternative Transportation System Study (2006);
- Kīlauea Point NWR Alternative Transportation Systems Study, Refuge Visitor Projections Report (March 2006);
- Kīlauea Point Light Station Historic Structures Report (April 2006);
- Kīlauea Point NWR Alternative Transportation Systems Study, Final Report (September 2006)
- Environmental Assessment for the Proposed Expansion of Kīlauea Point National Wildlife Refuge (August 2007);
- Complex-wide Invasive Species Management Plan (2008);
- Transportation Assistance Group Report (2009); and
- Environmental Assessment for the Nihoku Ecosystem Restoration Project (2014).

1.7.2 Other Plans and Assessments

***A Conservation Action Plan for Black-footed Albatross (*Phoebastria nigripes*) and Laysan Albatross (*P. immutabilis*) (Naughton 2007)*.** This plan is intended to provide a framework for partnership-based conservation and management actions and facilitate a collaborative, proactive

approach to albatross conservation. Recommendations focused mainly on population monitoring and management; fisheries bycatch mitigation and monitoring; habitat restoration and invasive species control; contaminant and disease monitoring and abatement; at-sea habitat utilization; and education and outreach.

Draft Revised Recovery Plan for the Nēnē or Hawaiian Goose (*Branta sandvicensis*) (USFWS 2004). The nēnē was declared a federally endangered species in 1967. It is considered one of the most endangered geese in the world. The recovery plan aims to restore and maintain multiple self-sustaining nēnē populations on Hawaiʻi, Maui Nui (Maui, Molokaʻi, Lānaʻi, Kahoʻolawe), and Kauaʻi. The recovery of the nēnē focuses on the following objectives:

- Identify and protect nēnē habitat, focusing on the identification and protection of sufficient habitat to sustain target population levels;
- Manage habitat and existing populations for sustainable productivity and survival complemented by monitoring changes in distribution and abundance;
- Control alien predators, which addresses control of introduced mammals to enhance nēnē populations;
- Continue captive propagation program, which describes techniques and priorities for the captive propagation and release of nēnē into the wild;
- Establish additional nēnē populations, which focuses on partnerships with private landowners;
- Address conflicts between nēnē and human activities, which includes potential management and relocation of nēnē that are in unsuitable areas;
- Identify new research needs and continue research, which describes general categories of research needed to better evaluate threats to nēnē and develop and evaluate management strategies to address these threats;
- Provide a public education and information program, which describes important outreach and education activities; and
- Validate recovery actions, which calls for formalizing the Nēnē Recovery Action Group and evaluating management and research projects to determine if recovery objectives have been met.

Newell's Shearwater and Hawaiian Petrel Recovery: A Five-year Action Plan (Holmes et al. 2011). This action plan provides specific recovery objectives for the ʻaʻo. Although the nature of the threats (e.g., mammalian predators, habitat degradation and loss) to this species has not changed appreciably since the recovery plan was issued in 1982, the severity of these threats (e.g., increased development) and thus the urgency of addressing them have increased as shearwater populations have declined. The recovery strategy for the ʻaʻo includes five components to reduce mortality, maintain or increase suitable nesting habitat, and to fill in gaps in our knowledge of the species:

1. Minimize adult/breeder mortality and maximize fledgling production by developing and implementing effective predator control methods in colonies;
2. Reduce the potential for collisions with power lines, towers, and other structures;
3. Protect existing colonies from degradation due to invasive plants and pigs;
4. Reduce fallout associated with lights; and
5. Improve monitoring methods, initiate studies to determine the effects of the tuna fishery on Newell's shearwater populations, and collect needed demographic data.

Interim Recovery Objectives include:

1. Implement predator control in at least two colonies and install ungulate fencing around at least two colonies;
2. Determine or estimate the number of adults that collide with power lines and structures;
3. Collaborate with the Kaua‘i Invasive Species Committee to identify priority areas where invasive alien plants are a problem and help develop effective techniques for their control and interdiction;
4. Encourage Kaua‘i County to adopt a light pollution ordinance, and shield all remaining lights around hotels, playing fields, shopping centers, and other areas determined to be a hazard to shearwaters;
5. Develop and implement effective monitoring techniques in at least two colonies that would facilitate the estimation of the effects of recovery actions;
6. Continue broad-scale monitoring to assess population-wide trends throughout Hawai‘i to better understand threats and guide recovery efforts;
7. Develop studies to address fishery-related questions and collect demographic data.

From these interim recovery objectives, the five-year action plan focuses on predator control, light attraction and collision, invasive plants and pigs, Save Our Shearwaters program, and monitoring.

Recovery Plan for the Hawaiian Monk Seal (*Monachus schauinslandi*) (NMFS 2007). The ‘īlio-holo-i-ka-uaua has the distinction of being the only endangered marine mammal whose entire species range–historic and current–lies within the United States. The majority of the population of seals now lies in the Northwestern Hawaiian Islands with six main breeding subpopulations. The species is also found in lower numbers in the main Hawaiian Islands where the population size and range both appear to be expanding. The main terrestrial habitat requirements include haul-out areas for pupping, nursing, molting, and resting. These are primarily sandy beaches, but virtually all substrates are used at various islands. The goal of this revised recovery plan is to assure the long-term viability of the ‘īlio-holo-i-ka-uaua in the wild, allowing initially for reclassification to threatened status and, ultimately, removal from the List of Endangered and Threatened Wildlife.

Recovery Plan for the Kaua‘i Plant Cluster (USFWS 1995). This plan covers 37 plant taxa, 34 of which are federally listed as endangered and 3 listed as threatened. The recovery actions identified in the plan include protecting current populations, controlling threats, and monitoring; expanding current populations; conducting research essential to conservation of the species; establishing new populations as needed to reach recovery objectives; validating and revising recovery objectives; and devising and implementing a public education program.

Recovery Plan for U.S. Pacific Populations of the Green Turtle (*Chelonia mydas*) (NMFS and USFWS 1998). The honu is listed as threatened throughout its Pacific Range, except for the endangered population nesting on the Pacific coast of Mexico, which is covered under the Recovery Plan for the East Pacific green turtle. By far, the most serious threat to these honu is from direct take of turtles and eggs, both within U.S. jurisdiction, and on shared stocks that are killed when they migrate out of U.S. jurisdiction. In Hawai‘i, honu populations appear to have a somewhat less dire status, probably due to effective protection at the primary nesting areas of the Northwestern Hawaiian Islands and better enforcement of regulations prohibiting take of the species. However, an increase in the incidence of the tumorous disease, fibropapillomatosis, in the Hawaiian honu

threatens to eliminate improvements in the status of the stock. Human development is also having an increasingly serious impact on nesting beaches.

Recovery Plan for the ʻŌpeʻapeʻa (Hawaiian Hoary Bat,* Lasiurus cinereus semotus*) (USFWS 1998). The ʻōpeʻapeʻa is the only native land mammal in the Hawaiian Islands. There is a general lack of historic and current data on this subspecies, and its present status is not well understood. The Service's recovery objective is delisting from the ESA, with the interim goals of determining present population status and downlisting to threatened status. Distribution and abundance of ʻōpeʻapeʻa will also provide information on specific roosting habitat associations and food habits. With basic information on the location of ʻōpeʻapeʻa and their resource needs, threats can then be identified and managed. Management actions that may be needed to address threats include protection of key roosting and foraging areas, particularly if ʻōpeʻapeʻa or their food resources depend on native vegetation. Predation, the potential impacts of pesticides to bats or their food resources, and other threats may also need to be addressed.

Kauaʻi Island-wide Draft Recovery Plan (USFWS in prep.): This draft recovery plan is being developed to incorporate all listed and candidate species on the island of Kauaʻi, including those in other recovery plans. In total, it will address 173 species. For multi-island species, this recovery plan will only address the recovery needs and actions for Kauaʻi populations. Recovery goals for Kauaʻi island endemic species will be developed in this recovery plan.

***Hawaiʻi's Comprehensive Wildlife Conservation Strategy (Mitchell et al. 2005)*.** The U.S. Congress mandated each State and Territory to develop a comprehensive wildlife conservation strategy (CWCS) in order to continue to receive State Wildlife Grants, which assist states with wildlife management. Hawaiʻi's CWCS reviews the status of the full range of the State's native terrestrial and aquatic species (over 10,000 of which are found nowhere else on Earth) and provides management recommendations for their continued conservation. Hawaiʻi's Species of Greatest Conservation Need include all native terrestrial animals, all endemic aquatic animals, additional indigenous aquatic animals identified as in need of conservation attention, a range of native plants identified as in need of conservation attention, and all identified endemic algae. This list includes a terrestrial mammal (1), birds (77), terrestrial invertebrates (~5,000), freshwater fishes (5), freshwater invertebrates (12), anchialine pond-associated fauna (20), marine mammals (26), marine reptiles (6), marine fishes (154), marine invertebrates (197), and flora (over 600).

U.S. Pacific Islands Regional Shorebird Conservation Plan (Engilis and Naughton 2004). Conservation and restoration of shorebird habitats is essential for the protection of endangered and declining shorebird populations. Wetlands, beach strand, coastal forests, and mangrove habitats are particularly vulnerable on Pacific islands due to increasing development pressures and already limited acreage. Monitoring and research needs include assessment of population sizes and trends; assessment of the timing and abundance of birds at key wintering and migration stopover sites; assessment of habitat use and requirements at wintering and migration areas; exploration of the geographic linkages between wintering, stopover, and breeding areas; and evaluation of habitat restoration and management techniques to meet the needs of resident and migratory species. Education and public outreach are critical components of this plan. Resource management agencies of Federal, Territorial, Commonwealth, and State governments will need to work together with military agencies, nongovernmental organizations, and the scientific community. On a larger scale, coordination at the international level will be key to the conservation of vulnerable species, both migratory and resident.

U.S. Fish and Wildlife Service Regional Seabird Conservation Plan (USFWS 2005). The purpose of this plan is to identify Service priorities for seabird management (maintenance, protection, enhancement, and restoration); threat management; inventory and monitoring; research; outreach and education; planning; and coordination. The most serious threats to seabirds identified in this regional plan involve invasive (nonnative) species, interactions with fisheries, oil and other pollution, habitat loss and degradation, human disturbance, and global climate change.

Kaua‘i Seabird Habitat Conservation Plan (KSHCP) (in prep.).The KSHCP is currently being developed by the Service and the State of Hawai‘i's Department of Land and Natural Resources Division of Forestry and Wildlife (DLNR-DOFAW) to provide interested businesses and agencies with a streamlined, cost-effective way to attain legal authorization and coverage for unavoidable incidental take of endangered and threatened seabirds on the island of Kaua‘i. While both the CCP and KSHCP planning efforts seek to benefit endangered Hawaiian seabirds through similar actions, it should be noted that the KSHCP is focused on mitigating the effects of current and future take of endangered seabirds.

North Shore Community Development Plan,1980. The North Shore Development Plan is intended as a statement of policy that reflects the community’s desires, intentions, and aspirations for the area. The last update was completed in 1980. The plan emphasizes preserving the rural atmosphere of the area and conserving land and water resources.

Kaua‘i General Plan (County of Kaua‘i 2000). The General Plan fulfills legal mandates of State law and the Charter of the County of Kaua‘i. More importantly, it provides guidance for land use regulations, the location and character of new development and facilities, and planning for County and State facilities and services. The General Plan states the County’s 20-year vision for Kaua‘i and sets policies for achieving that vision. The policies are intended to guide County decision-making by mapping the direction of future development; by describing what kind of future development is desirable; and by setting priorities for public improvements. The policies will guide the County in making revisions to land development regulations; in deciding on zone changes and development permits; and in setting strategies for capital improvements. The General Plan also establishes a framework and priorities for future community-level planning and long-range planning for public facilities.

Kīlauea Town Plan (County of Kaua‘i 2006). This plan was adopted as an amendment to the Kaua‘i General Plan. The plan addresses concerns related to agricultural lands, resident housing and services, and future expansion. Recommendations were made concerning regional and town form, housing development, and the town character.

State Comprehensive Outdoor Recreation Plan, update 2008 (DLNR 2009). In order to continue to receive Land and Water Conservation Fund support, states must prepare a State Comprehensive Outdoor Recreation Plan (SCORP). The SCORP is a tool for statewide outdoor recreation planning, leadership, and action. It is intended to guide Federal, State, County and private agencies in the planning, development, and management of Hawai‘i’s outdoor recreation resources. The SCORP directs LWCF grand funding into facilities that best meet the public’s outdoor recreation needs.

Statewide Pedestrian and Bicycle Master Plans. Though these plans have yet to be developed, several public meetings have already taken place on Kaua‘i to discuss possible routes and areas for pedestrian and bicycling.

1.8 Special Designation Lands

1.8.1 Important Bird Areas (IBA)

The Important Bird Areas (IBA) program is a global effort to identify the most important areas for maintaining bird populations and focusing conservation efforts on protecting these sites. Within the U.S., the program has been promoted and maintained by the American Bird Conservancy (ABC) and the National Audubon Society (NAS). The ABC is coordinating the identification of nationally significant IBAs while NAS is working to identify sites in individual states. The NAS is working within each state to identify a network of sites across the U.S. that provide critical habitat for birds. This effort recognizes that habitat loss and fragmentation are the most serious threats to birds across North America and around the world. By working through partnerships, principally the North American Bird Conservation Initiative, to identify those places that are critical to birds during some part of their life cycle (breeding, wintering, feeding, migrating), the effects that habitat loss and degradation have on bird populations could be minimized. The IBA program has become a key component of many bird conservation efforts. More information is available at http://www.audubon.org/bird/iba/index.html.

The goals of the IBA program are to identify the sites that are the most essential for long-term conservation of birds and to take action to ensure the conservation of these sites. An IBA is a site that provides essential habitat for one or more species of birds. The IBA selection process examines sites based on the presence and abundance of birds and/or the condition and quality of habitat. IBAs are chosen using standard biological criteria and expert ornithologists' review. All sites nominated as potential IBAs are rigorously evaluated to determine whether they meet the necessary qualifications. IBAs represent discrete sites, both aquatic and terrestrial, that are critically important to birds during their annual life cycle (e.g., breeding, migration, and/or wintering periods).

Kīlauea Point NWR is identified as an IBA because it regularly holds significant numbers of a globally threatened species, or other species of global conservation concern (criterion A1) and because the site is known or thought to support, on a regular basis, 1 percent or more of the global population of a congregatory seabird or terrestrial species simultaneously, or 5 percent over a season (criterion A4ii). The A4ii category applies to those species that are vulnerable as a consequence of their congregatory behavior at regularly used sites.

1.8.2 National Register of Historic Places

Established under the NHPA, the National Register includes over 77,000 districts, sites, buildings, structures, and objects that are significant in American history, architecture, archaeology, engineering, and culture. The register's entries were identified and documented in partnership with state, Federal, and tribal preservation programs. The documentation provided for each property consists of photographs, maps, and a registration form which provides a physical description of the place, information about its history and significance, and a bibliography. Documentation is now available online through the National Register Information System at http://www.nr.nps.gov. The Kīlauea Point Lighthouse Station is on the National Register of Historic Places.

1.9 Planning Process and Issue Identification

The CCP planning team evaluated the issues and concerns raised both by staff and the public during public scoping, as well as throughout the multi-year planning process. Issues are defined as matters of controversy, dispute, or general concern over resource management activities, the environment, land uses, or public use activities. Issues are important to the planning process because they identify topics to be addressed in the CCP, pinpoint the types of information to gather, and help define alternatives for the CCP. It is the Service's responsibility to focus planning and analysis on the major issues. Major issues typically suggest different actions or alternative solutions, are within the Refuge's jurisdiction, and have a positive or negative effect on the resource. Major issues will influence the decisions proposed in the draft CCP/EA. Key issues analyzed in the draft CCP/EA are presented below.

1.9.1 Planning Process

The core planning team for Kīlauea Point NWR consists of a project leader, deputy project leader, biologist, visitor services staff person, and conservation planner. The full list of core and extended team members and their roles is provided in Appendix I. The extended team assisted in the development of this draft CCP/EA, particularly in providing comments at key milestones.

The initial CCP planning process for the Complex began in 2007. Public scoping began in the fall of 2009 with a notice in the *Federal Register* (September 28, 2009), and public meetings and talk story sessions were held in Hanalei, Hulēʻia, Kīlauea, and Līhuʻe from October 2009–January 2010. In all, over 80 people participated. Public input was also solicited through planning updates distributed to our mailing list. Additionally, workshops/meetings with local, State, Federal agencies, community groups, Refuge users, nonprofits, and others were held. The comments and suggestions made through this process helped further develop and refine the management alternatives for the CCP, including the preferred alternative. They helped to identify the top priority species, groups, and communities for the Refuge. These priorities were called conservation targets and most of the biological emphasis of the draft CCP/EA is focused on protecting and restoring these species.

We are requesting public comments on this draft CCP/EA. Public comments will be considered by the planning team. More information on public involvement can be found in Appendix I.

1.9.2 Key Issues Addressed in the CCP

Wildlife and habitats. What is the most important ecological contribution the Refuge can make? How can we expand and improve habitat for priority species? What are our priority research and survey needs to support management? What can be done for non-priority species and habitat areas given limited personnel and resources?

Facilities and maintenance. What facilities and maintenance are needed to support greater Refuge management? Where should such facilities and maintenance be located?

Cultural/historic resources. How can cultural and historic resource management be improved? How can they be woven together with public interpretation?

Visitor services and wildlife-dependent recreation. What is the appropriate use and level of wildlife observation and photography, environmental education and interpretation, and recreational fishing?

Law enforcement. How can trespass, illegal activity, and human-caused disturbance to wildlife be managed more effectively given limited personnel?

1.9.3 Issues Outside the Scope of the CCP

While CCPs are comprehensive plans, no single plan can cover all issues. The planning team has compiled a list of issues which are currently considered to be outside the scope of this CCP or as actions considered but not developed (see Chapter 2 for further detail on these issues):

Kīlauea Town bypass. Kīlauea Town, through its plan development, has concluded a need for establishing a bypass road in order to alleviate traffic through the main part of town along Kīlauea Road. The role of the Refuge in securing such a bypass has been discussed with local officials. However, the lead for such an initiative would fall under the authority and jurisdiction of both the State Department of Transportation as well as the County. As such, this action would not be a Service-led initiative as it falls outside our jurisdiction and does not meet the primary Refuge System mission. However, given that 25 percent of traffic utilizing Kīlauea Road results from vehicles destined for the Refuge, we recognize the potential benefits a bypass may have for visitors to the Refuge and will continue to be engaged and involved with the Kīlauea Neighborhood Association (KNA) and other partners (e.g., private landowners), where appropriate, to discuss feasibility of a bypass if initiated by State or County agencies.

1.10 Refuge Vision and Goals

The following vision and goals for Kīlauea Point NWR were developed during the planning and public scoping process.

1.10.1 He nuʻukia no ka puʻuhonua (Refuge Vision)

Shrouded in a salty mist, the steep cliffs of an ancient volcano plunge into a pounding north swell as Kīlauea Point National Wildlife Refuge stands as an oasis where abundant seabirds blanket the pali and ride updrafts. Here a symphony of sounds reverberates—from the whinny of mōlī to a chorus of rattling squawks from thousands of ʻā. Nēnē nestle within thriving native plant communities that blanket the red soil throughout the Refuge. ʻĪlio-holo-i-ka-uaua and honu bask in tranquil solitude at the edge of the turquoise waters teeming with marine life.

Kau maila ka ʻehukai i ka pali kū o ka luapele, a papā mai ka nalu poʻi. Kū kilakila ʻo Kīlauea Point National Wildlife Refuge ma ke ano he kīpuka no ka manu o ka moana kūhohonu, a ma aneʻi lākou e kīkaha a kaʻaniu ai. Kūpinaʻi aʻe ka leo o ka mōlī, ua lau. Hauwalaʻau mai ka leo o ka ʻā, ua mano. Nonoho iho ka nēnē i ka nāhele ʻoiwi e uhi ana i ka lepo ʻulaʻula o neʻi. Lalala mehameha ka īlioholoikauaua a me ka honu ma kaʻe o ke kai papaʻu piha o ka iʻa.

The dynamic and awe-inspiring experiences of Kīlauea Point provide kamaʻāina and visitors alike a sense of place and lasting interconnectedness with the natural world. Interwoven with cultural heritage, environmental education links the island's keiki and the youth beyond with the Refuge's unique ecosystems and native wildlife. Through strong community support, the Kīlauea lighthouse

endures, telling its story, and remains a beacon promoting stewardship of the Refuge's resources for future generations.

Poina ʻole nēia wahi ke hoʻokipa ʻia e ke kamaʻāina, pau pū me ka malihini i ke ʻano o nā mea a lākou i ʻike ai, i laʻa me ka pilina ma waena o kō a uka, a kō a kai. ʻO ka nohona kanaka a me ke aloha ʻāina ke kahua o ka haʻawina e aʻo aku ai i ka poʻe ʻōpio, i moākaka ia mau mea i ka ʻike a kō lākou mau maka ma kēia mua aku. Ma o ke kākoʻo a ke kaiāulu, kū mau ka hale ipu kukui ʻo Kīlauea i lama kuhikuhi o ka mālama ʻāina no nā hanauna e hiki mai ana.

1.10.2 ʻO nā pahuhopu o ka puʻuhonua (Refuge Goals)

Refuge management goals are descriptive, open-ended, and often broad statements of desired future conditions that convey a purpose, but do not define measurable units. Goals must support the Refuge vision and describe the desired end result. The following are goals for Kīlauea Point NWR:

He mau manaʻo laulā nā pahuhopu no ke ʻano o ka nohona i kēia mua aku. Kākoʻo a hoʻākāka nā pahuhopu i ka nuʻukia o ka puʻuhonua. Ua helu ʻia lākou ma lalo nei:

Goal 1: Protect, enhance, and manage the coastal ecosystem to meet the life-history needs of migratory seabirds and threatened and endangered species.

ʻO ka pahuhopu 1: E mālama a hoʻomāhuahua i ka ʻaekai i paʻa ka nohona o ka manu o ka moana, pau pū me ka lāʻau ʻoiwi o ka ʻāina.

Goal 2: Restore and/or enhance and manage populations of migratory seabirds and threatened and endangered species.

ʻO ka pahuhopu 2: E hoʻola a mālama i nā pūʻulu manu o kēlā ʻano a kēia ʻano, pau pū me nā mea kākaʻikahi o ka ʻāina.

Goal 3: Gather scientific information (surveys, research, and assessments) to support adaptive management decisions.

ʻO ka pahuhopu 3: E ʻohi i ka ʻike hunehune a ka poʻe akeakamai i mōakāka ke ʻano o ka mālama pono ʻana i ka ʻāina.

Goal 4: Ensure that visitors and kamaʻāina of all ages and abilities feel welcome, enjoy a safe visit, and are provided high-quality opportunities for wildlife-dependent recreation which allows them to connect with, while having limited impacts to, the wildlife, habitats, and cultural and historic richness of the Refuge.

ʻO ka pahuhopu 4: E hoʻokipa pono i ka poʻe kamaʻāina, pau pū me ka poʻe malihini i hiki iā lākou ke "aloha aku, a aloha mai" i nā mea waiwai o nēia wahi.

Goal 5: Identify, protect, evaluate, and interpret the cultural (including historic) resources and heritage of the Refuge while consulting with Native Hawaiian organizations and preservation partners, and complying with historic preservation legislation.

‘O ka pahuhopu 5: E kuhikuhi, mālama, nānā, a a‘o aku me ka pono i nā waiwai ‘āina, pau pū me nā waiwai kanaka; ‘oiai e hoa‘oa‘o ana kahi ‘ahahui Hawai‘i a me nā ke‘ena ‘aupuni i ‘ole kākou e hū hewa aku.

Goal 6: Ensure that all visitors enjoy safe and well-maintained operations that contribute to a positive visitor experience.

‘O ka pahuhopu 6: Ponopono kō mākou hale, a mālama pono ‘ia ka po‘e e kipa mai ana me ke aloha.

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Chapter 2 Management Alternatives

USFWS

Chapter 2. Management Alternatives

2.1 Alternatives Development

During development of the alternatives for the draft CCP/EA, the Service reviewed and considered a variety of resource, social, economic, and organizational aspects important for managing the Refuge. These biological, physical, and socio-economic conditions are described more fully in Chapters 3, 4, and 5. As is appropriate for a national wildlife refuge, resource considerations were fundamental in designing alternatives. House Report 105-106 accompanying the Improvement Act states "…the fundamental mission of our System is wildlife conservation: wildlife and wildlife conservation must come first." Toward this end, the planning team reviewed relevant plans, studies, and past and current research to better understand ecosystem trends and the latest scientific recommendations for species and habitats.

Public involvement is an important part of the planning process. Local, State, and Federal agencies, community groups, Refuge users, nonprofit organizations, and others were contacted by Refuge staff to ascertain priorities and issues. Public scoping meetings and workshops were held during 2009–2010 and involved more than 80 people. We also provided planning updates throughout the development of this draft CCP/EA, which allowed for comment opportunities to assist with alternatives development. Further details of public involvement and participation can be found in Appendix I.

2.2 Actions Considered but not Developed

During development of the alternatives, the planning team considered the actions detailed below. All of these actions were ultimately eliminated from further consideration for the reasons provided.

Recreational hunting. Part of the Improvement Act identifies compatible hunting as a priority public use for consideration on national wildlife refuge lands. Though hunting has been discussed in the past, due to the endangered species present on the Refuge, recreational hunting is not a use that would align with the purposes of this Refuge and therefore is not compatible. Kīlauea Point NWR is not open to recreational hunting because our main management focus is providing habitat for endangered species. Hunting would cause unacceptable disturbance and potential take of these endangered animals and plants. Additionally, a Refuge hunt program would create public safety concerns due to an insufficient buffer acreage. Recreational hunting opportunities are allowed on other parts of the island such as State forest reserves.

Sunset viewing opportunities. In past discussions as well as during public scoping, residents expressed interest in having more opportunities to view the sunset from the Refuge. Suggestions included building a parking lot or providing more access via Crater Hill for sunset trail hikes. However, providing sunset viewing opportunities via the Refuge does not align with the mission of the Refuge System nor would it contribute to the fulfillment of Refuge purposes. Additionally, people are currently allowed to access Crater Hill during daytime hours via the Seacliff Plantation entrance gate. Sunset viewing opportunities are also provided elsewhere on the island and in areas that would not adversely impact wildlife or their habitat.

Co-locating a visitor welcome and orientation center at the proposed new Hanalei NWR overlook site. In 2004, the Service expanded the refuge acquisition boundary of Hanalei NWR by 6 acres (USFWS 2004a and 2004b) to accommodate parking and facilities for a new Hanalei Valley scenic overlook. The site, facility design, and operations were described in the final EA and Finding of No Significant Impact (FONSI) for the Hanalei Valley/Hanalei National Wildlife Refuge Scenic Stop developed by the State of Hawai‘i Department of Transportation (HDOT) and Federal Highway Administration (FHWA) (HDOT and FHWA 2003). Currently, the Service is continuing to work with willing landowners to acquire interests (fee title, conservation easements, or cooperative agreements) within the proposed new overlook site. Should land acquisition occur, the Service would work with other agencies, partners, the local community, and others on the design, construction, and management of any visitor-support facilities at this site.

The new Hanalei NWR overlook site is located approximately 7 miles, or 15 minutes driving time without traffic, west of Kīlauea Point NWR. Thus, visitors traveling from the east along Kūhiō Highway (State Route 56) would have to overshoot the Refuge to get to the visitor welcome and orientation center and then double back in order to get to the Refuge. In order to ensure that visitor access to the Refuge remains convenient and tied to a sense of place (e.g., proximal to the wildlife and habitats occurring on the Refuge), co-locating a visitor welcome and orientation center with opportunities at the new Hanalei overlook site was considered but not developed.

2.3 Alternatives Descriptions

2.3.1 Features Common to All Alternatives

All alternatives contain some common features. These are presented below to reduce the length and redundancy of the individual alternative descriptions.

Acquisition of Inholdings and Cooperative Agreements. Each refuge must be managed to fulfill the Refuge System mission as well as the specific purpose(s) for which the refuge was established. In order to protect high quality coastal and lowland areas (wetlands, coastal strand, aquatic habitats, and their associated uplands), contribute to the recovery of endangered or threatened species, support other native plants and animals, and enhance opportunities for compatible wildlife-dependent public use, the Service will continue to work with willing sellers and other partners to acquire interests (fee title, conservation easements, and /or cooperative agreements) in inholding lands within the approved Refuge boundary.

Under all alternatives, the Service will explore the possibility of working with the State to cooperatively manage the tidelands adjoining Kāhili Quarry through interagency cooperative agreement or other mechanisms. Cooperative management of this area would contribute to achieving the Service’s mission, the Refuge’s purposes, and would help meet several of our goals by allowing us to protect wildlife resources through oversight of public use activities and Refuge law enforcement.

Adaptive Management. Based on 522 Departmental Manual (DM) 1 (Adaptive Management Implementation), Refuge staff shall utilize adaptive management for conserving, protecting, and, where appropriate, restoring lands and resources. Within Title 43 of the Code of Federal Regulations (CFR) 46.30, adaptive management is defined as a system of management practices based upon

clearly identified outcomes, where monitoring evaluates whether management actions are achieving desired results (objectives). Adaptive management accounts for the fact that complete knowledge about fish, wildlife, plants, habitats, and the ecological processes supporting them may be lacking. Adaptive management emphasizes learning while doing based upon available scientific information and best professional judgment, considering site-specific biotic and abiotic factors on Refuge lands and waters. In the presence of accelerated climate change, adaptive management is an increasingly important management decision process. The Refuge will employ adaptive management as a standard operating procedure under all alternatives. Part of measuring the success of and adaptively managing the Refuge includes 5-year reviews and a 15-year revision of the CCP, which will be initiated by the Service and involve many of the same steps and engagement with partners and the public as the original CCP.

Appropriateness and Compatibility. Consistent with relevant laws, regulations, and policies, prior to allowing any public use of the Refuge (including commercial use), each use will first need to be found appropriate and determined compatible (16 U.S.C. 668dd-668ee, 50 CFR 25, 26, and 29; and 603 FW 1 and 2). The Service will make preliminary findings and determinations regarding the appropriateness and compatibility of each use included in each alternative. Prior to a signature on the decision document for the CCP and associated NEPA document, appropriateness findings and compatibility determinations will be finalized for each use included in the Service's proposed action. Appropriateness and compatibility are further discussed in Appendices A and B.

Climate Change. The Refuge will participate in and contribute to climate change assessment efforts, including those underway at a landscape scale. These efforts may include collaboration with the Pacific Islands Climate Change Cooperative (PICCC), which is a landscape conservation cooperative (LCC). The LCCs are formal science-management partnerships between the Service, Federal agencies, states, tribes, NGOs, universities, and other entities to address climate change and other biological stressors in an integrated fashion. LCCs provide science support, biological planning, conservation design, research, and design of inventory and monitoring programs. As needed, objectives and strategies will be adjusted to assist in enhancing Refuge resources' resiliency to climate change. The Refuge will also continue to pursue and engage in mechanisms to conserve energy in Refuge operations, including the use of fuel-efficient vehicles.

Cultural and Historic Resource Protection and Section 106 Compliance. Cultural and historic resources on refuges receive protection and consideration in accordance with Federal cultural resources laws, Executive orders, regulations, and policies and procedures established by the Department of the Interior (DOI) and the Service. Actions with the potential to affect cultural and historic resources will undergo a thorough review before being implemented, as is consistent with the requirements of cultural resource laws. Refuge management actions will support the State of Hawai‘i's vision statement "to promote the use and conservation of historic and cultural resources for the education, inspiration, pleasure and enrichment of the public in a spirit of stewardship and trusteeship for future generations" (DLNR HPD 2009). All ground-disturbing projects will undergo a review (including, but not limited to, archaeological and cultural surveys) under Section 106 of the National Historic Preservation Act (NHPA).

The Service will provide our Regional Historic Preservation Officer (RHPO) a description and location of projects and activities that affect ground and structures, including project requests from third parties. Information will also include any alternatives being considered. We would also

coordinate and consult with the State Historic Preservation Office (SHPO) and seek assistance from Native Hawaiians on issues related to cultural resources education and interpretation, special programs, and NHPA. Examples of projects identified in this CCP include, but are not limited to, fencing and building new maintenance and visitor services (VS) facilities, and acquisition of inholdings.

Native Hawaiians believe that the mana, or spiritual essence and power of a person, resides in the bones, their iwi. Unmarked Native Hawaiian burial sites have been exposed in the coastal strand/dunes area of the approved Refuge boundary but can be encountered almost anywhere. Care of inadvertently discovered iwi is an important issue for Native Hawaiians and the entire community in Hawai'i. The Service has the responsibility to care for the iwi with utmost respect for Hawaiian protocol, the laws of the state of Hawai'i, and all of the recognized cultural descendants. Strict protocols come into force whenever human skeletal remains are encountered inadvertently, through maintenance activities or through natural erosion.

When human remains are encountered, all work in the immediate area is stopped and the police are notified, as well as the DLNR. A qualified archaeologist then examines the burial context to assist in determining jurisdiction. If the remains appear to have been in place for less than 50 years, or appear to be a possible homicide victim or missing person, the local police secure the scene and investigate. If the remains appear to have been in place and interment for more than 50 years, they may be a burial. The DLNR, in consultation with the Service, the island burial council, and any identified descendants, determines whether the burial can safely remain in place where discovered or whether relocation may be needed.

Fishing. Fishing is one of six wildlife-dependent public uses that receives priority consideration in refuge planning when compatible with Refuge purposes and the Refuge System mission. Under all alternatives, Kīlauea Point NWR will remain open for recreational fishing per refuge-specific regulations for hunting and fishing, Hawai'i, 50 CFR 32.30. Fishing on the Refuge occurs in the ocean at Kāhili Quarry and in the estuary of Kīlauea River. Fishing will be allowed on a 24-hour basis in accordance with State regulations and include harvest via hook and line, throw net, spear, or shellfish gathering. Currently, fishing is not limited to any designated location, nor are related facilities provided. The Service proposes no major improvements (e.g., no asphalt or permanent paving) to Kāhili Quarry Road or Kāhili Quarry. See also Objective 4.6 for information on proposed new stipulations under the action alternatives regarding temporary shelters, portable camp stoves or barbeques, and dogs.

Traditional native Hawaiian fishing at Kīlauea (East) Cove will also remain open under all alternatives. See Appendix B for compatibility determinations.

Implementation Subject to Funding Availability. After the CCP is completed, actions will be implemented over a period of 15 years as funding becomes available. Draft project priorities and projected staffing/funding needs are in Appendix C, although special funding initiatives, unforeseeable management issues, and other budget issues will likely require adjustments to the implementation schedule in the future. The CCP will be reviewed at least every 5 years and updated as necessary.

Integrated Pest Management (IPM). In accordance with DOI and Service policies 517 DM 1 and 569 Fish and Wildlife (FW) 1 respectively, an IPM approach would be utilized, where practicable, to eradicate, control, or contain pest and invasive species (herein collectively referred to as pests) on the Refuge. IPM would involve using methods based upon effectiveness, cost, and minimal ecological disruption, which considers minimum potential effects to nontarget species and the Refuge environment. Pesticides may be used where physical, cultural, and biological methods, or combinations thereof, are impractical or incapable of providing adequate control, eradication, or containment. If a pesticide would be needed on Refuge lands or waters, the most specific (selective) chemical available for the target species would be used unless considerations of persistence or other environmental and/or biotic hazards would preclude it. In accordance with 517 DM 1, pesticide usage would be further restricted because only pesticides registered with the U.S. Environmental Protection Agency (EPA) in full compliance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and as provided in regulations, orders, or permits issued by EPA may be applied on lands and waters under Refuge jurisdiction.

Environmental harm by pest species would refer to a biologically substantial decrease in environmental quality as indicated by a variety of potential factors including declines in native species populations or communities, degraded habitat quality or long-term habitat loss, and/or altered ecological processes. Environmental harm may be a result of direct effects of pests on native species including preying and feeding on them; causing or vectoring diseases; preventing them from reproducing or killing their young; out-competing them for food, nutrients, light, nest sites, or other vital resources; or hybridizing with them so frequently that within a few generations few, if any, truly native individuals remain. Environmental harm also can be the result of an indirect effect of pest species. For example, decreased seabird use may result from pest plant infestations reducing the availability and/or abundance of suitable habitat for breeding.

Environmental harm may involve detrimental changes in ecological processes. For example, Guinea grass infestations can alter fire return intervals by displacing native species and communities of bunch grasses, forbs, and shrubs. Environmental harm may also cause or be associated with economic losses and damage to human, plant, and animal health. For example, invasions by fire-promoting grasses that alter entire plant and animal communities by eliminating or sharply reducing populations of many native plant and animal species can also greatly increase fire-fighting costs.

Predator control is aimed at minimizing entry of introduced predators to the Refuge using exclusion (e.g., hog wire fences), habitat modification (e.g., removal of trees used by cattle egrets for roosting), and control/eradication (eradicating or reducing and maintaining low numbers of rats, mice, cats, dogs, pigs, and mongooses if they are detected). Live trapping and use of bait stations (e.g., 0.005% diphacinone) will continue to be used to control rats and mice. These species are euthanized when live-trapped. Live traps are used to capture cats, dogs, and pigs on the Refuge.

When other methods are impractical, use of firearms and pellet guns are employed to humanely dispatch introduced predators and other pests such as pigs, chickens, and cattle egrets. Given the need to minimize stress on animals, gunshot at times is the most practical and logical method for wild or free-ranging animals. Personnel and public safety override any dispatching of animals by gunshot.

Shooting follows protocols for humane dispatch (AVMA 2007) and is only performed by highly skilled personnel trained and federally certified in the use of firearms. Predator and pest control will be conducted by Service personnel or contractors.

See Appendix G for the Refuge's IPM program documentation to manage pests for this CCP. Along with a more detailed discussion of IPM techniques, this documentation describes the selective use of pesticides for pest management on refuges, where necessary. Throughout the life of the CCP, most proposed pesticide uses on the Refuge would be evaluated for potential effects to biological resources and environmental quality. These potential effects would be documented in "Chemical Profiles" (see Appendix G). Pesticide uses with appropriate and practical best management practices (BMP) for habitat management as well as nursery/facilities maintenance would be approved for use on the Refuge where there likely would be only minor, temporary, and localized effects to species and environmental quality based upon non-exceedance of threshold values in Chemical Profiles. However, pesticides may be used on the Refuge where substantial effects to species and the environment are possible (exceed threshold values) in order to protect human health and safety (e.g., mosquito-borne disease).

Migratory Bird Protection and Conservation. Statute and policy at several levels mandate the protection and management of migratory bird populations at the Refuge. The primary Federal protective measure for these species is the Migratory Bird Treaty Act of 1918 (MBTA), which prohibits hunting, taking, capturing, killing, or selling of migratory bird species, and also fully protects eggs, nests, and feathers from collection or destruction. Additional directives from international treaties, domestic legislation, Executive orders, State law, and Service policy require the protection, monitoring, and assessment of migratory nongame birds, determination of the effects of environmental changes and human activities on migratory birds, and active protection of colonies, roosts, and adjacent waters for seabirds. At least 35 species of migratory birds, primarily seabirds, occur on or adjacent to the Refuge.

Participation in Planning and Review of Regional Development Activities. The Service will actively participate in planning and studies pertaining to future agricultural, industrial, and urban development, transportation, recreation, contamination, and other potential concerns that may affect Refuge resources. The Service will continue to cultivate working relationships with County, State, and Federal agencies, nongovernmental organizations, and community groups to stay abreast of current and potential developments. We will utilize outreach and education as needed to raise awareness of Refuge resources and dependence on the local environment.

Implementation of transportation strategies, in particular, will require coordination with Kaua‘i County, Kaua‘i Bus, Hawai‘i Department of Transportation, Federal Highways Administration, and other stakeholders (e.g., Kīlauea Neighborhood Association and the public). The transportation elements of the CCP should be compatible with the Kīlauea Town Plan, the Kaua‘i North Shore Development Plan, the County of Kaua‘i General Plan, the State Transportation Improvement Plan and Long-Range Transportation Plan (LRTP), the USFWS Region 1 LRTP, and other plans.

Partnerships. Partnerships are critical components in maintaining and continuing efforts to implement resource management improvements, such as restoring habitat for threatened and endangered species, or enhance recreational opportunities. These partnerships typically involve

joining forces with Federal, State, and local agencies, organizations, schools, and Refuge Friends groups.

Reevaluation of public use visitation days at the Kīlauea Point. Due to flat and declining budgets, starting in February 2014, the Service reduced the days that Kīlauea Point proper (hereafter refered to as the Point) is open to the general public from 7 to 5 days a week. The Refuge is closed each Sunday and Monday. After a trial period of 1 year, the visitation days will be reassessed to see if it would be possible to reopen on a 6- or 7-day a week schedule. However, closures will continue to be a management option depending upon the availability of staff and resources.

Refuge Revenue Sharing. Annual payments to local governments under the Refuge Revenue Sharing Act (16 U.S.C. 715s) would continue according to the established formula and subject to congressional appropriations.

Regulatory compliance. This draft CCP/EA provides descriptions of the affected environments and resources, potential environmental consequences of certain types of activities, and general themes for management alternatives. Consequently, this draft CCP/EA can be incorporated by reference into future proposals to avoid lengthy recital and repetitive information. However, since this draft CCP/EA is programmatic in many issue areas, it may not contain the necessary detail on every future action outlined to adequately present and evaluate all physical, biological, and socioeconomic impacts. Some of these details are dependent on funding and implementation schedules. Therefore, prior to implementation, all activities will undergo appropriate reviews and consultations, and permits and clearances will be secured, as necessary, to comply with legal and policy requirements. This includes appropriate evaluations and documentation under the National Environmental Policy Act (NEPA), evaluation and consultation required by Section 7 of the Endangered Species Act (ESA), and review and consultation required by Section 106 of the National Historic Preservation Act.

State Coordination. KNWRC will continue to coordinate with Hawaiʻi State agencies regarding areas of mutual interest.

Step-down Management Plans (SDMP). The CCP provides guidance in the form of goals, objectives, and strategies for several Refuge program areas, but may lack some of the specifics needed for implementation. Regardless of the alternative selected as the final management plan for the Refuge, several subsequent, or step-down, plans will be developed. For example, the CCP may note that signage is needed to accomplish a certain management objective. However, it will take a Refuge Sign Plan to specifically define design standards.

All step-down plans require appropriate NEPA compliance and implementation may require additional County, State, and Federal permits. Project-specific plans, with appropriate NEPA compliance, may be prepared outside of these step-down plans. The following SDMPs have been identified for the Refuge (implementation schedule can be found in Appendix C):

- Refuge Sign Plan;
- Facilities, Equipment, and Vehicle Maintenance Plan;
- Safety Plan;
- Visitor Services Plan (for entire KNWRC);
- Inventory and Monitoring Plan;

- Cultural/Historic Resource Management Plan;
- Master Site Plan;
- Wildland Fire Management Plan;
- Habitat Management Plan; and
- Plant Restoration Strategy.

Sustainability. For any projects that identify either new building or enhancements to existing structures or the transportation system, the Service will use, to the extent possible, sustainability measures such as alternative transportation options, reusing materials, utilizing renewable technology such as solar power, and acquiring goods and services in the most environmentally friendly way possible in order to minimize our footprint and effects to climate change as outlined in Executive Order 13514.

Threatened and Endangered Species Protection and Recovery. Protection of threatened and endangered species is common across all alternatives. The protection of federally listed species is mandated through the ESA, which provided establishment authority and was one of the purposes for this Refuge. It is also Service policy to give priority consideration to the protection, enhancement, and recovery of these species on national wildlife refuges. To ensure adequate protection, Section 7 of the ESA requires the Service to review all activities, programs, and projects occurring on lands and waters of refuges to determine if they may affect listed species or modify their designated critical habitat; this is known as an informal consultation. If the determination is that an action may affect and is likely to adversely affect a listed species or modify designated critical habitat, then we conduct a formal consultation and prepare a biological opinion, to identify those negative effects and the means to offset those effects.

Transportation Implementation Study. The Refuge has received funding from the Federal Transit Administration's Paul S. Sarbanes Transit in Parks Program to assist in planning for the implementation of the transportation components that emerge from the CCP. The study will provide recommendations on how to implement components, such as data collection, coordination with other entities, and as necessary, service planning for any proposed shuttle services.

Volunteer Opportunities. Volunteers are key components of successful management of public lands and are vital to refuge programs, plans, and projects, especially in times of static or declining budgets. Currently the Refuge makes extensive use of volunteers in habitat restoration and public use programs. In the future, successful implementation of native habitat restoration, survey and monitoring activities, and environmental education (EE) and interpretation programs will require the use of volunteers and partnerships.

Wilderness Review. The Service's CCP policy requires that a wilderness review be completed in all CCPs. If it is determined that the area meets the minimum requirements for wilderness, the process moves on to the wilderness study phase. The CCP planning team completed a wilderness inventory which can be found in Appendix D. This review concluded that the Refuge is not suitable for wilderness designation.

Wildlife and Habitat Management Review. The Improvement Act directs that each refuge shall be managed to fulfill the mission of the Refuge System and the specific purposes for which the refuge was established. Modifications are made to Refuge wildlife and habitat management programs based

on periodic informal or formal evaluations that ensure these programs are consistent with national, regional, ecoregional, and administrative policies and reflect consideration of current scientific knowledge. These evaluations provide feedback, determine if wildlife and habitat management goals and objectives are being met, and guide the Refuge in setting CCP priorities.

More formal evaluations, such as the wildlife and habitat management review, are conducted by Regional Office biological staff with refuge managers and biologists and a multi-disciplinary team of biologists and natural resources specialists. The Refuge conducted a habitat review in February 2013. In addition to a report summarizing the habitat review team's recommendations, the review will also inform development of the (1) Final Plant Restoration Strategy for KNWRC and (2) step-down Habitat Management Plan.

2.3.2 Summary of Alternatives

Each alternative describes a combination of management designed to achieve Refuge purposes, vision, and goals. These alternatives provide different ways to address and respond to management concerns, public and partner issues, and opportunities identified during the planning process. They also reflect the direction in the Refuge Administration Act, Service policies, and legal mandates outlined in Chapter 1. A summary of the key differences between the alternatives is presented in Table 2-1. A brief description as well as accompanying maps of each alternative follows.

Alternative A: No Action Alternative (Current Management)

Alternative A describes current management activities. This alternative assumes little to no change in current management programs (based on pre-existing initiatives at the Refuge) and is the baseline from which to compare the other alternatives.

Wildlife and Habitat. Management programs aimed at long-term protection and enhancement of migratory seabird populations and their habitats would continue. The Refuge currently supports six species of breeding seabirds including the threatened ʻaʻo, and at least 30 species of non-breeding migratory birds on or adjacent to the Refuge. As sea levels rise over the next century, protected areas on high islands will become increasingly important to seabirds that currently nest primarily on the low islands and atolls of the Northwestern Hawaiian Islands. In addition, the Refuge is protecting and enhancing habitat for the endangered nēnē population and enhancing native plant communities.

Current management activities include weed control and outplanting native plants by volunteers, mowing and weeding grassland-shrubland habitat for nēnē, and controlling introduced predators. Biological programs also include construction of a 7-acre predator-proof fence, enhancing and monitoring the threatened ʻaʻo population through social attraction and other devices, exploring with partners the feasibility of translocation techniques to support declining ʻaʻo populations, and banding and monitoring reproductive success and survival of seabirds and nēnē.

Public Use and Access. With an estimated 500,000 people annually visiting the Refuge, public use of this Refuge is high (4th highest in the entire Refuge System). A 100-year-old lighthouse once used by the U.S. Coast Guard and currently on the National Register of Historic Places is the number one attraction at this Refuge. A majority of activities offered revolve around wildlife observation and photography (at Kilauea Road Overlook (hereafter referred to as the Overlook), viewing scopes,

binoculars) and interpretation and EE. Various events are offered throughout the year such as Lighthouse Day, and National Wildlife Refuge Week. Interpretive guides and hikes are offered on a very limited basis. There is a visitor center (VC) with limited interpretive displays that also houses a bookstore run by the Kīlauea Point Natural History Association (KPNHA).

Current Refuge infrastructure cannot adequately support this high level of public use. As a result, there is traffic congestion at the Refuge entrance and inadequate access, parking, and EE and VC infrastructure to provide a quality visitor experience. Strategies already underway to improve public use include implementing recommendations by the Transportation Assistance Group, such as improving signage, improving traffic flow at the Overlook and on the Refuge, and testing the use of intelligent transportation systems, transportation demand management strategies, and parking management strategies to better manage traffic coming to the Refuge. We are also partnering with the Federal Highway Administration to improve safety and traffic flow at the existing parking lot.

The Kāhili Quarry area is currently open to wildlife-dependent uses (fishing, wildlife observation and photography) and as a general public access to off-Refuge areas (Kīlauea River, Kīlauea Bay, and Kāhili Beach) for boating and other stream, beach, and ocean uses (e.g., snorkeling, sunbathing, surfing, swimming, and walking, including dog walking).

Cultural and Historic Resources. The Lighthouse was recently restored, rededicated, and renamed in the National Register of Historic Places as the Daniel K. Inouye Kīlauea Point Lighthouse. A historic structures report was also completed for the Lighthouse Station and maintenance to keep structures intact is ongoing. A cultural interpretive guided trail walk to Mōkōlea Point is offered during National Wildlife Refuge Week. Historic interpretive events are offered during the same event as well on Lighthouse Day.

Maintenance/Facilities and Law Enforcement. The Refuge has a VC, historic buildings, walkways and other historic structures, interpretive displays/signs, pedestrian walkways, parking area, fences, gates, roads, and signs to maintain. However, there is no covered building or parking for large Refuge equipment and vehicles (e.g., maintenance baseyard). The Refuge has only two small storage areas for equipment and a native plant nursery. Strategies already underway are examining relocating certain maintenance and facilities function off the Point as well as enhancing existing maintenance and storage areas. Administrative facilities and staff offices are housed in the historic buildings, as well as one staff residence. KNWRC law enforcement personnel patrol all three Refuges comprising KNWRC.

Alternative B: Restore native ecosystems; maintain visitor center on the Point

The chief distinction of this alternative from Alternative A is increased protection and management of biological resources and developing cultural resource programs and partnerships. For public use and access, primary differences involve reorganizing uses of existing buildings as well as improving public parking, traffic flow, and visitor activities; all focused visitor services would remain on the Point.

Wildlife and Habitat. Management programs aimed at long-term protection and enhancement of migratory seabird and endangered nēnē populations and their habitats would be expanded to larger areas on Crater Hill and Mōkōlea Point, including exploring the expansion of or additions to

predator-proof fenced units. As noted above, breeding habitat for seabirds, free of introduced predators and well above sea level, is a pressing need in the Hawaiian Islands. In addition, native plant communities would be restored to provide recovery habitat for threatened and endangered coastal plants.

Management programs on the Point would continue to support native bird populations but there would be no major habitat improvements in an effort to keep potential conflicts within high visitor use areas manageable (e.g., habituation, breeding bird disturbance). Current management activities such as weed control and outplanting native plants by volunteers, mowing and weeding grassland-shrubland habitat for nēnē, and controlling introduced predators would continue. Priority research, inventories, monitoring, and other scientific assessments would support management objectives.

Public Use and Access. Due to high visitation, limited land available for public use on the Refuge, and impacts to endangered species, public use and access would focus on reconfiguring use of existing buildings (e.g., Quarters #1 (current VS offices) to bookstore, VC for either an EE facility or interpretation) and traffic flow patterns to improve public use opportunities. Strategies include offering an optional shuttle, providing public/tour bus stop, and bike parking at the Overlook; increasing public parking at the Overlook and the existing parking areas; and expanding the volunteer program.

Public access to the Kāhili Quarry area would remain open; however, there would be new stipulations for anglers on temporary shelters and portable stoves or self-contained barbeques. Additionally, visitors accessing adjacent off-Refuge areas (Kāhili Beach, Kīlauea Bay, and the Kīlauea River) would be limited to daylight hours only (6 a.m. to 5 p.m.). All dogs brought into the quarry area would be required to be to be leashed on a short (8-foot maximum) leash or kept in a secure, enclosed pen or crate at all times and would not be allowed to run free.

Cultural and Historic Resources. The emphasis for cultural and historic resources in this alternative would be to develop relationships and better partnerships with Native Hawaiian organizations, historical institutions, and other preservation partners to identify and prioritize resources to protect and manage. We would share information on methods of resource protections and preservation. This alternative also integrates cultural and historic resources into outreach, interpretation, and planning with a specific focus on the Kīlauea Point Light Station.

Maintenance/Facilities and Law Enforcement. Maintenance facilities would be improved or rebuilt within the existing footprint, while at the same time exploring opportunities to move some maintenance and facility needs off the Point (e.g., storage). This alternative would also remodel and relocate administrative and VS offices between Quarters #2 (current staff residence) and #3 (current administrative offices). Law enforcement would develop an enforcement monitoring system and more partnering, workshops, outreach, and training on law enforcement would be conducted for Refuge staff and volunteers, partners, and the community.

Alternative C: Restore native ecoysystems; build visitor center on Crater Hill

The chief distinction of this alternative from Alternative B is alternate transportation for public use, visitor access, and new facilities for visitation, orientation, and information dissemination. This alternative would also improve administrative and maintenance facilities.

The construction of a new visitor welcome and orientation center and maintenance facilities on Crater Hill would be associated with several actions that may need to occur prior to or in conjunction with the actual construction potentially including, but not limited to, the following: (1) completion of a transportation implementation study; (2) expansion of Refuge boundary to include Kīlauea Road; (3) acquiring land and easements; (4) redesigning Kīlauea Road for safe ingress–egress of pedestrians, cars, trucks, shuttle, and heavy equipment; (5) complete design of the new building and associated infrastructure; and (6) complete development of an associated transportation system. Within this draft CCP/EA, these actions are addressed at a conceptual level. Thus, more detailed planning, facility and transit design, and appropriate evaluation would be undertaken, including additional effects assessment in compliance with NEPA, evaluation and consultation under section 7 of ESA, and surveys and consultation under Section 106 of NHPA.

Wildlife and Habitat. Same as Alternative B. However, a welcome and orientation center and maintenance facilities would be constructed on the southwestern portion of Crater Hill. The approximately 3- to 4-acre footprint of the new facilities would fragment and reduce the quality and quantity of habitat for existing and future populations of endangered nēnē and seabirds.

Public Use and Access. The Service would focus on moving as much of the existing VS facilities off the Point to a new visitor welcome and orientation center on the Refuge (e.g., southwestern corner of Crater Hill). No private vehicles would be allowed past the current entrance gate. This alternative would also focus on using a shuttle system to provide public access to the Point and Overlook during open public hours, move the bookstore to the visitor welcome and orientation center, acquire and gate a portion of Kīlauea Road from the visitor welcome and orientation center, and provide guided interpretive hikes on Crater Hill.

Public use and access of Kāhili Quarry would be the same as Alternative B.

Cultural and Historic Resources. Same as Alternative B.

Maintenance/Facilities and Law Enforcement. A new maintenance baseyard (e.g., storage sheds, bays, pole barns, and nursery) would be built in the same area as the new visitor welcome and orientation center (e.g., southwestern corner of Crater Hill). KNWRC's main administrative offices would be co-located at the new visitor welcome and orientation center and Quarters #3 remodeled for basic administrative and volunteer offices. Law enforcement is the same as Alternative B.

Alternative D: Preferred – Restore native ecosystems; move visitor center off-Refuge (adjacent to or within 1 mile of approved Refuge boundary)

The chief distinction of this alternative from Alternative C is an off-Refuge visitor welcome and orientation center to facilitate public use, visitor access, information, and orientation. By being off the Refuge, it would open for potential habitat restoration the southwestern corner of Crater Hill not occupied by the visitor welcome and orientation center.

The construction of a new visitor welcome and orientation center and maintenance facilities within 1 mile of the Refuge boundary, under this preferred alternative, would be associated with several actions that would need to occur prior to or in conjunction with the actual construction. Those actions could include (1) completion of a transportation implementation study; (2) expansion of the Refuge

The construction of a new visitor welcome and orientation center and maintenance facilities within 1 mile of the Refuge boundary, under this preferred alternative, would be associated with several actions that would need to occur prior to or in conjunction with the actual construction. Those actions could include (1) completion of a transportation implementation study; (2) expansion of the Refuge boundary to encompass the new site; (3) land acquisition, easement, or interim lease; (4) complete design of the new building and associated infrastructure; and (5) complete development of an associated transportation system.

An alternative to off-Refuge land acquisition and construction of a new building would be to modify an existing facility or co-locate the Refuge welcome and orientation center with a partnering conservation organization located within 1 mile of the current Refuge boundary (e.g., in Kīlauea Town, near the proposed Kīlauea Town Bypass), as described in the site selection criteria listed under Objective 4.2, which would preclude several actions listed above.

Within this draft CCP/EA, these actions are addressed at a conceptual level. Thus, more detailed land acquisition planning, facility and transit design, and appropriate evaluation would be undertaken, including additional effects assessment in compliance with NEPA, evaluation and consultation under Section 7 of ESA, and surveys and consultation under Section 106 of NHPA.

Wildlife and Habitat. Same as Alternative B.

Public Use and Access. The Service would focus on moving as much of the VS off the Point to a new visitor welcome and orientation center off Refuge lands (adjacent to or within 1 mile). This offsite alternative could encompass many scenarios. The visitor welcome and orientation center could be located adjacent to the Refuge boundary or be within 1 mile of the Refuge (including in Kīlauea Town or on the main Kūhiō Highway). Depending on the location of the visitor welcome and orientation center, it could also connect to the bypass being considered by Kīlauea Town.

Similar to Alternative C, no private vehicles would be allowed past the current entrance gate. This alternative would also focus on using a shuttle system to provide public access to the Point and Overlook during open hours, move the bookstore to the new visitor welcome and orientation center, and provide more guided interpretive hikes on Crater Hill. If the visitor welcome and orientation center is adjacent to the Refuge, acquiring and gating a portion of Kīlauea Road from the visitor welcome and orientation center would only be considered if the center was adjacent to the Refuge boundary along that roadway.

Public use and access of Kāhili Quarry would be the same as Alternative B.

Cultural and Historic Resources. Same as Alternative B.

Maintenance/Facilities. The new maintenance baseyard (e.g., storage sheds, bays, pole barns, and nursery) would be off current Refuge lands. Depending on the location of the visitor welcome and orientation center (if adjacent to the Refuge), the new maintenance facilities would be co-located with it. However, if the visitor welcome and orientation center is on the outskirts of the 1-mile radius, the new maintenance baseyard may not be co-located with the visitor welcome and orientation center.

KNWRC's main administrative offices would be co-located at the visitor welcome and orientation center and Quarters #3 remodeled for basic administrative and volunteer offices. Law enforcement is the same as Alternative B.

Table 2-1 Summary of Alternatives by Issue.

Key Themes	Objectives	Alternative A (Current Management)	Alternative B (Restore Native Ecosystems; Visitor Center in Situ)	Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill)	Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby)
Coastal ecosystem	**1.1 Enhance coastal mixed woodland-grassland habitat for seabird breeding and roosting**	40–50 ac	97 ac		
	1.2 Enhance coastal grasslands for nēnē foraging, breeding, and roosting	27 ac	32–34 ac		
	1.3 Protect sea cliff and beach strand habitat	59 ac	59 ac		
	2.1 Restore/enhance breeding populations of ‘a‘o and other seabirds	Manage suitable habitat; sustain/expand current distribution of seabirds (e.g., through the use of social attraction)	Re-establish populations (e.g., determine feasibility of potential ‘a‘o chick translocation)		
	2.2 Restore/enhance native coastal plant communities (including endangered plants)	3–5 ac	10–30 ac		
Inventory and monitoring, research,	**3.1 Conduct high-priority inventory and monitoring**	Monitor birds and conduct inventories as needed	Re-evaluate, develop, and implement a prioritized inventory and monitoring program within regional framework		

and assessment	**(survey) activities**				
	3.2 Conduct high-priority research projects and scientific assessments	Conduct research and scientific assessments on priority species or issues	Develop a collaborative research program for priority research projects and scientific assessments that directly support management objectives		
Visitor Services	**4.1 Improve visitor access**	Improve traffic flow in the existing parking area and better delineate parking spaces	Same as Alt. A, ***except*** provide optional shuttle from the Overlook; increase public parking onsite; improve traffic flow at the Overlook (e.g., public/tour bus stop; shuttle stop; bike parking)	Institute mandatory shuttle (no private vehicles); acquire and gate portion of Kīlauea Road from new visitor welcome and orientation center; improve traffic flow at the Overlook (e.g., shuttle stop; bike parking)	Same as Alt. C ***except*** acquire and gate portion of Kīlauea Road from new visitor welcome and orientation center ***only if*** adjacent to Refuge
	4.2 Improve visitor information and orientation	Redesign and enhance Overlook to provide greater orientation and information; re-examine site layout and move some functions off the Point	Same as Alt. A, ***except*** remodel existing VC for either EE or new interpretive exhibits and displays while maintaining bookstore onsite	Establish new visitor welcome and orientation center on the Refuge at southwestern corner of Crater Hill	Same as Alt. C ***except*** establish new visitor welcome and orientation center off the Refuge (adjacent or within 1 mile)
	4.3 Enhance/ expand environmental interpretation	Continue to provide limited guided interpretive activities; expand opportunities to provide limited access to the interior of the Lighthouse;	In addition to Alt. A., remodel existing VC; explore converting current VS office (Quarters #1) to other functions; remodel	Same as Alt B ***except*** increase number of guided interpretive activities; offer guided interpretive hikes on Crater Hill; move bookstore to new visitor welcome and orientation center; expand Contact Station to allow for more scenic viewing	

		enhance partnerships	Contact Station	
	4.4 Enhance/ expand EE	Enhance partnerships; utilize interns and volunteers	In addition to Alt. A., develop Junior Ranger program; provide teacher workshops; convert an existing structure to designated EE facility/facilities	
	4.5 Enhance/ expand wildlife observation and photography	Continue to provide viewing scopes and binoculars; work with partners; identify closed areas	In addition to Alt. A., expand citizen science opportunities	Same as Alt. B ***except*** offer guided interpretive hikes on Crater Hill; expand opportunities (e.g., workshops, activities)
	4.6 Reduce wildlife disturbance, habitat degradation, and user conflict potential while increasing public safety at Kāhili Quarry	Continue to allow 24-hour fishing and general access to off-Refuge nonwildlife-dependent uses; maintain passable road to beach and shoreline; post boundary; replace existing fence; explore possibility of cooperatively managing tidelands with State	In addition to Alt. A, implement new stipulations including: - Allowing anglers to erect temporary shelters (protections from the sun and/or rain) in the quarry area during daylight hours only - Allowing anglers to bring and use portable stoves or self-contained barbeques (e.g., off-the-ground portable enclosed fires), but not build ground fires or fires in fire rings or pits - Allowing access to Kāhili Beach, Kīlauea Bay and the Kīlauea River through the Kāhili Quarry area from 6 a.m. to 5 p.m. daily - Requiring all dogs brought into the quarry area to be to be leashed on a short (8-foot maximum) leash or kept in a secure, enclosed pen or crate at all times and would not be allowed to run free	
	4.7 Enhance/ expand outreach	Conduct outreach through more activities and engagements with target audiences	In addition to Alt. A., encourage staff training and engagement	
	4.8 Enhance/ expand volunteer and Friends group opportunities	Continue coordination with KPNHA; improve volunteer materials	In addition to Alt. A, expand to at least 200 volunteers; develop program to focus on natural resource management; implement a training program; host at least two community work days per year	

Cultural and historic resources	**5.1 Implement a proactive cultural (including historic) resource management program**	Prepare cultural resource overview and conduct archival research and communication with Native Hawaiian organizations, historical institutions, and other preservation partners			
	5.2 Create and implement with partners a program for Kīlauea Point Light Station	Prepare a historic treatment plan and consult with historical societies and other preservation partners to develop interpretive media	Same as Alt A., ***except*** develop an outreach program		
Operations	**6.1 Replace, maintain, enhance visitor/ administrative/ maintenance facilities**	Enhance existing maintenance/ facility areas and provide protected area for machines/ vehicles; pursue offsite parking for staff and volunteers	Same as Alt A, ***except*** remodel existing maintenance/ facility areas; remodel and relocate administrative and VS offices to Quarters #2 and #3	Include administrative offices in new visitor welcome and orientation center; remodel Quarters #3 for basic administrative and volunteer offices; build new maintenance baseyard on the Refuge (e.g., southwestern corner of Crater Hill)	Same as Alt. C ***except*** build new maintenance baseyard off the Refuge
	6.2 Enhance law enforcement	Continue to work with partners and law enforcement to protect natural resources	Develop law enforcement monitoring system; develop outreach tools; provide workshops and training		

2.4 Goals, Objectives, and Strategies

Goals and objectives are the unifying elements of successful refuge management. They identify and focus management priorities, resolve issues, and link to refuge purposes, Service policy, and the Refuge System mission.

A CCP describes management actions that help bring a refuge closer to its vision. A vision broadly reflects the refuge purpose(s), the Refuge System mission and goals, other statutory requirements, and larger-scale plans as appropriate. Goals then define general targets in support of the vision, followed by objectives that direct effort into incremental and measurable steps toward achieving those goals. Strategies identify specific tools and actions to accomplish objectives.

The draft goals for the Refuge for the 15 years following completion of the CCP are presented on the following pages. Each goal is followed by the objectives that pertain to it. All objectives are for the lifetime of the CCP unless otherwise specified. Some objectives pertain to multiple goals and have simply been placed in the most appropriate spot. Similarly, some strategies pertain to multiple objectives. The goal order does not imply any priority in this CCP. Priority actions are identified in the staffing and funding analysis (see Appendix C).

Readers, please note the following:

- The objective statements as written apply to the Service's Preferred Alternative; and
- The objective statement indicates specific items (i.e., acreages) that vary in the other alternatives. How those items vary is displayed in the short table under each objective statement; as applicable, each other alternative shows substitute text for the item or items in italics.

Below each objective statement are the strategies that could be employed in order to accomplish the objectives. Note the following:

- Check marks (✓) alongside each strategy show which alternatives include that strategy; and
- If a column for a particular alternative does not include a check mark for a listed strategy, it means that strategy will not be used in that alternative.

Other symbols used in the following tables include:

~ Approximately
% Percent sign;
> Greater than;
< Less than;
≥ Greater than or equal to; and
≤ Less than or equal to.

2.4.1 Goal 1: Protect, enhance, and manage the coastal ecosystem to meet the life-history needs of migratory seabirds and threatened and endangered species.

Objective 1.1 Enhance and manage coastal mixed woodland-grassland habitat for seabird breeding and roosting.

Annually manage 97 acres and enhance 2–5 acres per year (within the 97 acres) mixed woodland-grassland habitat for seabird breeding and roosting with the following attributes:

- Safe flight corridors free of obstacles (e.g., pest trees, signs) and light hazards;
- Broad habitat characteristics of seabirds currently breeding on Refuge:
  - Large grasslands (<6 inch vegetation height) or open-canopy, open-understory woodlands next to open windward runways for take-off and landing (mōlī);
  - Substrates with rock and root crevices or good soil/root structure or sub-canopy layer for burrowing (‘ua‘u kani);
  - Hala/naupaka woodlands with an open understory or dense subcanopy layer (e.g., hala leaf litter) for burrowing (‘a‘o);
  - Rocky ledges and crevices of steep cliffs (koa‘e kea);
  - Open-understory woodlands, rock and root crevices (koa‘e ‘ula);
  - Large patches of woodlands >3.0 feet tall (‘ā); availability of small woody debris (‘ā)
- Minimal human disturbance in areas designated for seabird breeding (time varies by species); and
- Predation by introduced predators (e.g., dogs, cats, rats) zero for threatened ‘a‘o; ≤20 adults per year for ‘ua‘u kani; ≤1 adult per year for all other species.

Alternatives:	**Alt A (Current)**	**Alt B-D**
Total acreage annually managed	40–50	97
Strategies Applied to Achieve Objective:	**Alt A (Current)**	**Alt B-D**
a. Reduction in pest ironwood and other species by 2–5 acres/year in priority areas (e.g., obstacles to flight, limiting nesting)		✓
b. Mowing an additional 2–3 acres of grasslands per year to set back invasive shrub succession (<6 inch vegetation height)	✓	✓
c. Small-scale outplanting native plants (e.g., ‘āheahea, hala) that provide suitable habitat structure and function for seabirds		✓
d. Use IPM strategies including mechanical/physical (e.g., mowing, brush-cutting, excavation, prescribed fire), cultural, chemical (e.g., herbicides), biological, and other suitable techniques to control Christmasberry, lantana, ironwood, and other pest/undesirable plants (see Appendix G)	✓	✓
e. If insect threats (e.g., mosquitoes, ants, scale insects) to breeding seabirds are detected during monitoring, use IPM control techniques (e.g., removing potential breeding sites for mosquitoes, ant bait stations (e.g., Fipronil), approved biocontrols, hand removal of infected leaves, granular and spot-treating plants with insecticides (e.g., Sevin ®))	✓	✓
f. Ensure no obstacle or light hazards occur onsite; work with community (e.g., Town of Kīlauea, Department of Land and Natural Resources (DLNR)) to promote appropriate, bird-friendly lighting,	✓	✓

lighting including downward shielding, seasonal reduction in outdoor lighting, and window shades		
g. Complete public use closure around threatened ‘a‘o burrows	✓	✓
h. Partial public use access in designated public use areas (parking lot and trail to Lighthouse on the Point) and on Crater Hill for a limited number of guided interpretive hikes; complete closure in all other parts of the Refuge	✓	✓
i. Maintain or replace 2.7 miles of existing hogwire fencing (same as in Objective 1.2 and also includes Objective 4.6, strategy c)	✓	✓
j. Live-trapping, shooting, and bait stations to reduce predation on migratory birds by introduced vertebrate pests	✓	✓
k. With partners, install and maintain predator-proof fence east of Crater Hill (Nihoku Ecosystem Restoration Project; USFWS 2014)	✓	✓
l. Explore the possibility of expansion of or separate additions to the Nihoku Ecosystem Restoration Project predator-proof fence (e.g., adding fence panels)		✓

Rationale: Safe habitats for breeding and foraging are essential for all migratory seabirds using the Refuge. While most seabirds exhibit some flexibility in their habitat requirements, features of the plant community (species and structural characteristics) favor or limit populations. Thus, control or eradication of pest plants would be focused mainly on areas where they have a negative effect on seabird survival and reproduction. The Refuge consists of degraded coastal grasslands and woodlands (scrub, shrub, and forest) dominated by pest plants which require annual maintenance. For example, rapid growth of ironwood trees at the base of Mōlī Hill, creates obstacles within primary mōlī flight corridors. In 2010, a mōlī fledgling taking its first flight crashed into an ironwood tree and was grounded cliff-side for a day, an annual occurrence if ironwoods are not removed. In addition, when wind direction shifts, mōlī land from the west (versus north) where there is a large pest oleander patch obstructing this secondary flight corridor.

The Refuge would prioritize problem areas for pest control based on bird habitat requirements, human safety, and plant species’ aggressiveness, and enhance approximately 2–5 acres each year. Pest insect species can affect survival and reproduction of migratory seabirds by causing mortality through predation or parasitism, or by modifying habitat to make it less suitable. Ants can attack seabird chicks or pipping eggs and have short-term but widespread detrimental effects (Plentovich et al. 2008, USFWS 2005). Urban lights can disorient seabirds, particularly ‘a‘o fledglings making their first flights to sea. Subsequently, birds crash into vegetation or obstacles and die, get crushed by vehicles, or get killed by predatory animals (Ainley et al. 2007).

The total acreage managed for seabirds is estimated to be 97 acres where additional management activities include control of introduced predators and other pest species such as ants around ‘a‘o burrows, minimizing human disturbance during breeding, removing debris from artificial ‘a‘o and ‘ua‘u kani burrows prior to breeding season, and ensuring safe onsite flight corridors free of obstacles and light hazards.

Opportunities for restoring native habitats for seabirds exist when there is a high likelihood of restoring native-dominated plant communities (e.g., human-caused factors contributing to the spread of pest species have ceased, invasive competitors have been eradicated, or there is a commitment for long-term pest control). Translocation, propagation, and outplanting appropriate native plants to improve habitat for migratory seabird nesting. For example, ‘ā are known to nest on the native shrub ‘āheahea and use its foliage to line nests. Restoring native plant communities may also provide more stability within the

plant community to suppress new weed invasions. Small-scale outplantings would be conducted following recommendations in the draft Plant Restoration Strategy for KNWRC. The Plant Restoration Strategy would be finalized within 2 years of CCP completion.

Studies show that even passive human activities like birdwatching or photography could be harmful to some birds by altering normal feeding and breeding patterns. Birds are particularly wary of large groups, loud noises, and rapid movements. When people are present, birds may spend less time tending their young and more time on the lookout for danger, or may leave the area expending time and energy that could have been spent successfully foraging and raising young. Human disturbance of breeding birds could result in increased desertion of nests, reduced hatching success, and decreased chick survival (Dahlgren and Korschgen 1992, Staine and Burger 1994). Although effects on chick survival were not examined, a Refuge pilot study comparing ʻuaʻu kani chick stress hormone levels near and far from the Lighthouse Trail, which receives high visitor usage, found smaller chicks and elevated stress hormones (up to 100 times higher) in trailside chicks (Kitaysky et al. unpublished). Thus, stress affects animals in different ways (physical, physiological) and may not be expressed outwardly by changes in their behavior. Studies such as these could assist in determining whether or not human activities at the Refuge are affecting bird survival and reproduction (see Objective 3.2).

On the other hand, seabird viewing provides an opportunity for people to gain first-hand experience, learn about wildlife, and take an active interest in wildlife conservation. The Refuge is required to consider compatible public uses, particularly those that may provide long-term benefits for wildlife. Thus, the Refuge would continue to allow wildlife viewing in designated public use areas (parking lot and trail to Lighthouse) but continue to limit visitation hours to limit negative effects on breeding birds (e.g., 10:00 a.m.–4:00 p.m.) and prohibit entry to other areas of the Point, including the breeding areas of listed species. The Refuge would allow a limited number of guided interpretive hikes on Crater Hill. Hikes would be conducted outside the breeding season for endangered nēnē. Interpretive and other activities on Crater Hill would be compatible with the Refuge System mission and Refuge purpose, and be continually monitored and adapted to minimize negative effects on native wildlife. At this time we do not have specific guidelines for other species because sensitivity varies by species, life stage, and many other factors. Specific guidelines for minimizing disturbance to native birds would be developed in a step-down Visitor Services Plan depending on the alternative chosen (see further discussion in Objective 4.5 Rationale).

Monitoring migratory seabird populations and habitats is necessary to detect changes in excess of natural variation that might be attributed to human activities. Refuge activities such as biological monitoring, maintenance, vegetation management, and predator control would be timed to minimize disturbance on breeding birds. Such techniques for natural resources management activities include limiting the number of visits to once per week, minimizing physical contact with birds, moving slowly in colonies, keeping voices and noise levels low, and approaching birds tangentially (Carney and Sydeman 1999). See Appendix B for Compatibility Determinations.

The foremost threat to adult seabirds on land is introduced predators including cats, rats, mongooses, dogs, and barn owls. In the Pacific Region, cats and rats have been responsible for colony extirpations and range-wide population declines of numerous species (USFWS 2005). Seabird eggs and chicks are easy prey for pigs, mice, and introduced cattle egrets and unattended (or abandoned) eggs can be eaten by common mynah (Byrd et al. 1984), chickens and red-crested cardinals. Cats, rats, mongooses, dogs, and barn owls regularly prey on adult seabirds. In 2010 at the Refuge, >75 adult ʻuaʻu kani were found preyed upon by owls (compared with 5 in 2009), and carcass recoveries subsided after removal of 4 introduced barn owls. Also in 2010, dogs entering the Refuge at the unfenced end of Mōkōlea Point killed at least nine adult ʻuaʻu kani on the Refuge. Even when this number is low, such losses could

affect local populations because adult survival is an important factor regulating seabird populations. Thus, it is critical to control predators to reduce seabird mortality and increase reproductive success and survival, which would also benefit migratory waterfowl and shorebirds and endangered nēnē, and is important to achieve Refuge purposes.

In collaboration with several partners, including the American Bird Conservancy, the Kaua‘i Endangered Seabird Recovery Project (a Hawai‘i Division of Forestry and Wildlife and Pacific Cooperative Studies Unit effort), the National Fish and Wildlife Foundation, and others, construction of an approximately 2,400 foot long predator-proof fence around 7 acres of the Refuge slightly east of Crater Hill (i.e., the Nihoku Ecosystem Restoration Project) was completed in September 2014 (USFWS 2014). Under the action alternatives (B–D), the Service would explore the possibility of expansion of or separate additions to the Nihoku Ecosystem Restoration Project fence. It is hoped that the creation of predator-free refugia would improve nesting success for nēnē and mōlī, facilitate natural re-colonization by other seabirds such as the ka‘upu or ‘ou and support future plans to potentially translocate the threatened ‘a‘o and reintroduce rare and endangered plants.

Objective 1.2 Enhance and manage coastal grasslands habitat for nēnē foraging, breeding, and roosting.

Within 2 years, annually manage 32–34 acres and enhance 5–7 acres (within the 32–34 acres) of coastal grassland habitat for nēnē foraging, breeding, and roosting at Crater Hill and Mōkōlea Point with the following attributes:

- Mosaic of grassland and native shrublands including large contiguous patches (>3 acres) of Kikuyu-Spanish clover grasslands;
- Kikuyu-Spanish clover grasslands managed <4–6 inches vegetation height;
- 15–20% native-dominated shrublands (canopy >75% cover; e.g., naupaka (*Scaevola*) coastal dry shrubland);
- <10% cover of pest woody vegetation (e.g., lantana, Christmasberry, ironwood);
- Minimal human disturbance during the peak breeding season (approximately October–March); and
- Predation levels by introduced predators (e.g., dogs, cats, rats) ≤2 adult nēnē per year.

Alternatives:	**Alt A (Current)**	**Alt B–D**
Total acreage annually managed	27	32–34
Strategies Applied to Achieve Objective:	**Alt A (Current)**	**Alt B–D**
a. Mowing at a frequency to stimulate vigorous growth of grasses; maintain <4–6 inches tall	✓	✓
b. Rehabilitate and maintain irrigation system at Crater Hill for native plant establishment		✓
c. Enhance grasslands with native shrubland plant communities that provide suitable habitat structure and function for nēnē (e.g., naupaka, ‘akoko, nehe for nēnē food and cover)		✓
d. Use IPM strategies including mechanical/physical (e.g., mowing, brush-cutting, excavation, prescribed fire), cultural, chemical (e.g., herbicides), biological, and other suitable techniques to control lantana, Christmasberry, ironwood, and other pest/undesirable plants (see Appendix G)	✓	✓

e. Public use closures and Refuge activities would be timed to minimize disturbance on breeding birds	✓	✓
f. Maintain or replace 2.7 miles of existing hogwire fencing (same as in Objective 1.1 and also includes Objective 4.6, strategy c)	✓	✓
g. Live-trapping, shooting, and bait stations to reduce predation on migratory birds by introduced vertebrate pests	✓	✓

Rationale: Nēnē are browsing grazers of grasses, sedges, forbs, and shrubs and typically nest in edges of open-understory woodlands. No studies have been conducted on nēnē lowland foods or habitat use (see Objective 3.2). However, research conducted in mid-elevation Hawai‘i Island found nēnē fed mainly on cultivated grasses, and that legumes and grass leaves had more protein than berries and grass seeds; pasture grasses had more protein than shrubland grasses; mowed or livestock-grazed grasses had more protein than rank grasses; and breeding success was higher for nēnē with more grasses in their diet (Black et al. 1994). Birds selected forage with high water and protein content, which indicates high forage quality, such as the young shoots of a Kikuyu grass-Spanish clover grassland, and preferred sward-forming (turf-like growth) over bunch grasses, and short (2–4 inches) over tall grasses (Woog and Black 2001).

Currently, approximately 27 acres of Kikuyu grasslands are managed for nēnē at Crater Hill year-round. Kikuyu grass was introduced for cattle forage prior to acquisition by the Refuge. Removal of 5–7 acres of pest Christmasberry, lantana, and other aggressive weeds to open up existing historic Kikuyu grass-Spanish clover grasslands would increase habitat managed for nēnē to 32–34 acres total. Enhancement of these grasslands by planting patches of native shrublands to create a mosaic would provide additional food, cover, and close-proximity nesting, escape, and thermal cover. Although Kikuyu grass is considered an aggressive pest, the species originates in tropical Africa at elevations of 5,000–10,000 feet and appears to be less aggressive in the coastal zone. Currently, there are no known native grasslands that could be restored to provide the same nutrition as Kikuyu-Spanish clover grasslands.

In lieu of artificial water features for nēnē, the Refuge would improve mowing regimes to manage short grasslands with high moisture and enhance areas with native shrubs such as naupaka, which provide moisture in berries. Managed grasslands at Crater Hill also provide habitat for prospecting seabirds such as mōlī and stopover or wintering habitat for migratory waterfowl and shorebirds, including cackling goose, kōlea, and the candidate species kioea. Small-scale outplantings would be conducted following recommendations in the draft Plant Restoration Strategy for KNWRC.The Plant Restoration Strategy would be finalized within 2 years of CCP.

Nēnē eggs and goslings are vulnerable to introduced predators including rats, mongooses, dogs, cats, and pigs. Adult nēnē are vulnerable mainly to dogs and cats, especially during their synchronous molt of flight feathers, which renders birds flightless. It is critical to control predators to reduce mortality and increase reproductive success and survival. Controlling introduced predators would also benefit migratory seabirds, waterfowl, and shorebirds and is important to achieve the Refuge purpose (USFWS 2004c).

Objective 1.3 Protect sea cliff and beach strand habitat.

Protect approximately 59 acres of sea cliff and beach strand habitat for seabird breeding and roosting and ‘īlio-holo-i-kauaua basking year-round, with the following attributes:

- No signs of accelerated human-caused erosion;
- Minimal or no human disturbance year-round; and
- Seabird populations stable or increasing.

Alternatives:	**Alt A (Current)**	**Alt B–D**
Total acreage annually managed	59	59
Strategies Applied to Achieve Objective:	**Alt A (Current)**	**Alt B–D**
a. Conduct a road and trail assessment and analysis and identify problem areas (e.g., accelerated erosion, compaction) and solutions (e.g., water bars, erosion matting, re-vegetation) (Objective 3.2)	✓	✓
b. Stabilize areas of accelerated erosion identified in the road and trail assessment and analysis		✓
c. Design and implement a monitoring program for 1–2 indicator species (e.g., ʻā) to detect natural or anthropogenic variation in habitat conditions (Objective 3.1)		✓
d. Continue to support the National Oceanic and Atmospheric Administration and Department of Land and Natural Resources (DLNR)'s Marine Mammal Response Network	✓	✓
e. Public use closure	✓	✓
f. Implement additional stipulations to reduce wildlife disturbance and habitat degradation due to public use at Kāhili Quarry (Objective 4.6)		✓
Rationale: Sea cliff habitat is characterized by nearly-vertical or vertical cliff faces (>45% slope) with highly-erodible soils exposed to wind and sea. Given the vertical topography and unstable substrates of these areas, access is very difficult to hazardous. This area is important breeding habitat for ʻuaʻu kani, koaʻe ʻula, koaʻe kea, and ʻā and roosting habitat for ʻiwa, ʻā (brown boobies and red-footed boobies) and endangered nēnē. The beach strand habitat, consisting of small areas totaling approximately 8 acres of sand or gravel within or just above the tidal zone, provides protected basking habitat for the critically endangered ʻīlio-holo-i-kauaua and potentially the threatened honu and foraging habitat for migratory shorebirds such as ʻūlili, akekeke, kōlea, and marine fauna. Trespassing is a regular occurrence in several areas including unleashed pet dogs and the illegal harvest of firewood to build fires during fishing or illegal camping. Unleashed dogs impact endangered and migratory wildlife in both public and remote areas. In addition, trespassers have been caught scaling steep cliffsides to access remote surfing areas. The areas are closed to the general public and management would be limited to protection from the potentially devastating effects of human (e.g., crushing birds in underground burrows) and predator (e.g., dogs preying upon endangered nēnē goslings or ground-nesting seabirds) intrusion, conducting public education, and population and habitat monitoring.		

2.4.2 Goal 2: Restore and/or enhance and manage populations of migratory seabirds and threatened and endangered species.

Objective 2.1 Restore and enhance breeding populations of ʻaʻo and other seabirds.
Restore and enhance breeding populations of ʻaʻo and other seabirds on Crater Hill and Mōkōlea Point, with the following attributes: • Viable breeding populations; trends suggest stable or increasing population sizes and distributions; and • High genetic diversity.

Strategies Applied to Achieve Objective:	**Alt A (Current)**	**Alt B–D**
a. Continue to maintain ʻaʻo colony on the Point (NESH Hill), while increasingly putting emphasis for ʻaʻo recovery on Crater Hill/Mōkōlea Point areas (including the Nihoku Ecosystem Restoration Project area)	✓	✓
b. Manage suitable habitat for seabirds including a control of vertebrate and invertebrate pests and habitat-modifying plants, minimal human activity, and no flight or light hazards (Objective 1.1)	✓	✓
c. Re-establish populations of extirpated seabird species		✓
d. Provide a high-island refugium for seabird populations potentially displaced by climate change or other stressors		✓
e. Use social attraction techniques to enhance the ʻaʻo and other seabird populations; monitor for bird and predator responses to stimuli	✓	✓
f. With partners, determine feasibility of the Refuge as a potential ʻaʻo chick translocation site (Objective 3.2)		✓

Rationale: As habitat components are managed and threats are controlled, the Refuge could take on the role of passive or assisted restoration and enhancement of seabird populations. Many examples of successful conservation programs are based on the principle that populations can be restored to an area if limiting threats are removed (e.g., human disturbance, introduced predators). Re-colonization rates may be improved with chick translocation (Miskelly et al. 2009) or social attraction techniques which use sound or visual stimuli to modify behavior (Gummer 2003). However, there is evidence that colony establishment can occur faster at a considerably cheaper rate using fencing and social attraction versus fencing and chick translocations, and that chick translocations may be required at some locations but not others (Courtot et al. 2014, Sawyer 2014). Since 2007, two loudspeakers project ʻaʻo colony calls to attract prospecting birds to Kīlauea Point where they may have a higher chance of successful reproduction and long-term survival. Between 1978 and 1980, 65 and 25 ʻaʻo eggs were translocated from mountain habitats to the Refuge and Mokuʻaeʻae Island, respectively, and cross-fostered by ʻuaʻu kani (Byrd et al. 1984).

Currently, the Refuge supports at least 11 prospecting or breeding ʻaʻo pairs, some presumably the fledglings of the translocated eggs or their progeny. In partnership with the Kauaʻi Endangered Seabird Recovery Project, the ʻaʻo social attraction program would be expanded to select areas on Crater Hill and Mōkōlea Point. With partners, the Service would explore the feasibility of the Refuge as a potential ʻaʻo chick translocation site for mountain colonies in severe decline (USFWS 2011).

As discussed in Objective 1.1, seabird breeding habitat, free of introduced predators, is a pressing need in the Hawaiian Islands. ʻAʻo translocations may also increase genetic diversity at the Refuge. These techniques would be considered for other species of high conservation concern such as kaʻupu (black-footed albatross) (Arata et al. 2009).

Today's bird distributions may be uninformative about their pre-human distributions. Of 40–43 native bird species found at a Māhāʻulepū, Kauaʻi, fossil site, only about one-fourth occur in the vicinity today, one-fourth have been extirpated from Kauaʻi or its lowlands including ʻaʻo, and ʻuaʻu, and half are extinct (Burney et al. 2001). The Refuge currently supports six species of breeding seabirds. Lehua Islet, located just 19 miles west of Kauaʻi, is a 271-acre State seabird sanctuary comparable in size, elevation, and aspect to the Refuge. Lehua supports over 25,000 pairs of 8–12 breeding seabird species including kaʻupu, ʻā (brown booby), the candidate species ʻakeʻake (band-rumped storm petrel), Bulwer's petrel, and noio (Hawaiian noddy) (Vanderwerf et al. 2007), which are not known to breed at the Refuge. In addition, an estimated 90,000 pairs of 18 breeding seabird species, including Christmas

shearwater, endangered ʻuaʻu (Hawaiian petrel), noio kōhā (brown noddy), ʻewaʻewa (sooty tern), and pākalakala (grey-backed tern) breed on Kaʻula Rock, a 158-acre State seabird sanctuary located 54 miles southwest of Kauaʻi (Harrison 1990, Vanderwerf et al. 2007). Breeding populations of many of these species, now absent or rare on Kauaʻi, could be established or re-established using passive and assisted restoration techniques.

Climate change is one of the most serious threats to wildlife today. Scientists are already documenting the effects of global warming on low-lying islands through accelerated coastal erosion. Models predict an increase in the frequency and severity of droughts and storms. Rising sea levels are expected to disrupt habitat functions and eliminate terrestrial habitat on important seabird breeding areas such as Midway Atoll and Laysan Island, where elevations peak at 13 and 50 feet, respectively (Baker et al. 2006). As sea levels rise over the next century, protected areas on high islands including the Refuge will become increasingly important for seabirds that currently nest primarily on low islands and atolls of the Northwestern Hawaiian Islands (Arata et al. 2009, Young 2010).

Objective 2.2 Restore and/or enhance and manage native coastal plant communities including habitat for endangered plants.

Restore and/or enhance and manage 10–30 acres of native coastal plant communities (e.g., naupaka (*Scaevola*) coastal dry shrubland and/or ʻilima (*Sida*) coastal dry mixed shrub and grassland) on Crater Hill and Mōkōlea Point, with the following attributes:

- 15–20% native-dominated plant communities (canopy >75% cover; e.g., naupaka-dominated canopy with pohuehue locally dominant along seaward edges (naupaka shrubland); ʻilima-dominated dense canopy with ʻāheahea and pōpolo co-dominants (ʻilima shrubland));
- <10% cover of pest plants (e.g., lantana, koa haole, Christmasberry);
- Endangered plants (3–8 species) interplanted into existing matrix (e.g., dwarf naupaka, ʻohai, ʻawiwi); and
- Restoration enhances and has negligible negative effects on breeding bird populations.

Alternatives:	**Alt A (Current)**	**Alt B–D**
Total acreage annually managed	3–5	10–30
Strategies Applied to Achieve Objective:	**Alt A (Current)**	**Alt B–D**
a. Maintain the current onsite greenhouse while exploring options for creating an offsite greenhouse and/or partnerships to support outplanting of native plants that are from local seed sources and conditioned to the local environment		✓
b. Within 2 years, develop a Restoration Working Group (RWG) and finalize draft Plant Restoration Strategy for KNWRC		✓
c. Expand involvement of both volunteers and native plant organizations		✓
d. Work with RWG and others to implement Final Plant Restoration Strategy (e.g., plant propagation, restoration ecologist, site preparation, restoration and repatriation, site maintenance, monitoring, evaluation, adaptive management)		✓

e. Use IPM strategies including mechanical/physical (e.g., mowing, brush-cutting, excavation, prescribed fire), cultural, chemical (e.g., herbicides), biological, and other suitable techniques to control Christmasberry, lantana, ironwood, and other pest/undesirable plants (see Appendix G)		✓
f. IPM techniques to control pest insects (approved biocontrols, hand removal of infected leaves, granular and spot-treating plants with insecticides (e.g., Sevin ®))		✓
g. Restoration activities are timed and conducted to minimize disturbance to breeding birds	✓	✓

Rationale: The Refuge consists of degraded coastal and lowland, dry and mesic woodlands, grasslands, and mixed woodland-grassland plant communities. Over 30 native coastal and lowland plant species are appropriate for re-establishment. Of these species, approximately one-third would be established as dominant members of the communities, while the remaining two-thirds will be integrated as sub-dominants and associated species. Populations of eight species of endangered plants could be established within these restored habitats, thereby contributing to their Statewide recovery. Beginning in 1980, approximately 13 acres on the Point and portions of Crater Hill's west slope were restored with hala, ʻakoko, ʻilima, naupaka kahakai, ʻāheahea, and pohinahina. The Refuge has a small native plant nursery that is staffed largely by volunteers (Bruegmann and Castillo 1999).

With nearly 300 species of plants listed as threatened or endangered, nearly one-third of Hawaiʻi's remaining native flora is threatened with extinction. Over 100 species of plants now listed as threatened or endangered occur, or historically occurred, on the Island of Kauaʻi; 49 species are found only on Kauaʻi. Plants that grow in coastal shrublands and low elevation forests are particularly rare due to the long-term presence of humans and the negative effects of their actions, specifically, development, agriculture, fire, and the introduction of pest species. Only 11 percent of lowland mesic and dry native plant communities remain intact on Kauaʻi, compared to 22 percent for all of the Hawaiian Islands combined (The Nature Conservancy 1998). Thus, the Refuge could play a key role in recovery of listed plant species.

Finalization of the draft Plant Restoration Strategy for KNWRC would completed within the first 2 years of CCP implementation. The scope of the draft Plant Restoration Strategy includes 50 acres restored (fully functioning, stable plant communities) over 50 years (plant community restoration is a slow process). For the CCP, this translates to approximately 10 acres (in highly degraded sites) or 30 acres (in sites with native-dominant upper canopy) of restoration over 10–12 years. The term "restoration" is used in the context of rebuilding an ecological community comprised of predominantly native species including its form, function, and processes, while "enhancement" is used in the context of increasing or improving but not attempting to fully restore a former ecological state, based on our limited historical knowledge of the coastal and lowland plant communities of Kauaʻi. As stated in the draft Plant Restoration Strategy, achieving this level of restoration would require dedicated full-time staff and funding. Thus, implementation would be dependent on a Final Plant Restoration Strategy and partnerships to acquire and leverage restoration and maintenance funding (Bruegmann and Castillo 1999). Plant restoration activities would be timed to have minimal negative effects on breeding birds and be compatible with migratory seabird management and endangered wildlife recovery priorities.

2.4.3 Goal 3: Gather scientific information (surveys, research, and assessments) to support adaptive management decisions.

Objective 3.1 Conduct high-priority inventory and monitoring activities.

Conduct high-priority inventory and monitoring activities that evaluate resource management and public use activities to facilitate adaptive management. These activities contribute to the enhancement, protection, use, preservation, and management of wildlife populations and their habitats on and off Refuge lands. Specifically, they can be used to evaluate achievement of resource management objectives identified under Goals 1–2. These surveys have the following attributes:

- Data collection techniques would likely have minimal animal mortality or disturbance, minimal habitat destruction, and minimal long-term or cumulative impacts on resources of concern;
- Proper cleaning of investigator equipment and clothing as well as quarantine methods, where necessary, would minimize the potential spread or introduction of pest species and pathogens; and
- Projects will adhere to scientifically defensible protocols for data collection (e.g., sample size), where available and applicable.

The following is a list of priority activities to support resource management decisions on the Refuge:	Alt A (Current)	Alt B–D
a. Within 1 year, map type and status of all fences and gates		✓
b. Within first 2–3 years, re-evaluate, develop, or initiate Refuge-specific monitoring plans (protocols, sample designs, and databases) for high-priority taxa (e.g., listed, highly invasive, or indicator species, species/species groups of regional concern) within the regional Inventory and Monitoring (I&M) framework; work with U.S. Geological Survey (USGS) Biological Resources Discipline, universities, and other partners to develop efficient systems for synthesis, analysis, and reporting of Refuge monitoring data		✓
c. Within first 2 years, design and conduct a vegetation monitoring program that would allow for assessment in reaching habitat management objectives		✓
d. Within first 5 years, conduct a comprehensive inventory of plants, invertebrates, and vertebrates occurring at the Refuge. Use initial inventories as baseline data to assess past and future changes in plant and animal communities		✓
e. Monitor population size of all native breeding birds at least each decade and species of high conservation concern annually (e.g., ‘a‘o, mōlī, nēnē)		✓
f. Map soils, vegetation, and bird distributions	✓	✓
g. Conduct early detection and rapid response pest plant species and assessment; rank species to target for control		✓
h. Develop GIS layers to support biological goals and objectives and I&M program		✓
i. Monitor effects of visitor activities on wildlife and re-evaluate the program every 5 years		✓
j. Monitor seabird and nēnē populations and mortality and morbidity	✓	✓
k. Continue to partner with DLNR to conduct nēnē banding	✓	✓

l. Monitor response of pest species and habitat to management actions within an adaptive management framework		✓
m. With partners (e.g., Kaua‘i Endangered Seabird Recovery Project): - Conduct yearly auditory and visual surveys to detect new ‘a‘o breeding burrow or prospecting locations; - Monitor response of ‘a‘o and non-target species (e.g., owls) to social attractions; - Monitor burrow activity of two ‘a‘o pairs using PIT monitoring system; and - Band and monitor reproductive success and survival	✓	✓
n. In partnership with the Migratory Bird Program, DLNR, private landowners, and volunteers, conduct banding and monitoring reproductive success and survival of mōlī within regional demographic monitoring framework; formalize this partnership	✓	✓
o. Monitor sex structure and demography of the mōlī population using molecular or other techniques	✓	✓
p. With partners, such as the Pacific Islands Climate Change Cooperative, design and implement a climate change monitoring program compatible with, and complimentary to, other state and regional climate change monitoring programs, which would allow for detection of climate change impacts on Refuge resources (e.g., shifts in breeding phenology of target seabird species that may inform management)		✓
Rationale: The Administration Act requires us to ‘‘… monitor the status and trends of fish, wildlife, and plants in each refuge.’’ Surveys would be used primarily to evaluate resource response to assess progress toward achieving refuge management objectives (under Goals 1–2 in this CCP) derived from the Refuge System mission, refuge purpose(s), and maintenance of biological integrity, diversity, and environmental health (601 FW 3). Determining resource status and evaluating progress toward achieving objectives is essential to implementing adaptive management on Department of the Interior lands as required by policy (522 DM 1). Specifically, results of surveys would be used to refine management strategies, where necessary, over time in order to achieve resource objectives. Surveys would provide the best available scientific information to promote transparent decision-making processes for resource management over time on Refuge lands.		

Objective 3.2 Conduct and facilitate high-priority research projects and scientific assessments at the Refuge to directly support management objectives and guide management decisions.

Conduct high-priority research projects that provide the best science for habitat and wildlife management on and off Refuge. Scientific findings gained through these projects would expand knowledge regarding life-history needs of species and species groups as well as identify or refine habitat and wildlife management actions. Research also will reduce uncertainty regarding wildlife and habitat responses to Refuge management actions in order to achieve desired outcomes reflected in resource management objectives and to facilitate adaptive management (e.g., developing thresholds to better define “minimal human disturbance in areas designated for seabird breeding” in Obj. 1.1). These research projects have the following attributes:

- Focus wildlife population research on assessments of species-habitat relationships. Develop models that predict wildlife response to management;
- Design and conduct issue-driven research unlikely to be reliably addressed using long-term monitoring. Develop models that predict wildlife response to management;
- Promote Refuge research and science priorities within the broader scientific community.

Ensure that cooperative research focuses on meeting information needs identified in biological goals and objectives;

- Adhere to scientifically defensible protocols for data collection (e.g., sample size), where available and applicable, in order to develop the best science for resource management;
- Data collection techniques would have minimal animal mortality or disturbance, minimal habitat destruction, and minimal long-term or cumulative impacts on resources of concern;
- Use proper cleaning of investigator equipment and clothing as well as quarantine methods, where necessary, to minimize the potential spread or introduction of pest species and pathogens; and
- Present results in peer reviewed articles in scientific journals and publications or symposia.

Conduct scientific assessments to provide baseline information to expand knowledge regarding the status of Refuge resources to better inform resource management decisions. These scientific assessments will contribute to the development of Refuge resource objectives and they would also be used to facilitate habitat restoration through selection of appropriate habitat management strategies based upon site-specific conditions. These assessments have the following attributes:

- Use accepted standards, where available, for completion of assessment; and
- Scale and accuracy of assessments would be appropriate for development and implementation of Refuge habitat and wildlife management actions.

The following is a list of priority research to support resource management decisions on the Refuge:	**Alt A (Current)**	**Alt B–D**
a. Identify primary predators for each life stage of seabirds		✓
b. Identify effective control methods for primary predators (e.g., cats)		✓
c. With partners, determine feasibility of the Refuge as a potential ‘a‘o chick translocation site	✓	✓
d. With partners, evaluate effectiveness of the Pacific Missile Range Facility Bird-Aircraft Strike Hazard Program and Egg Swap Program including feasibility of alternate release sites for mōlī		✓
e. Investigate effects of visitor activities on survival and reproduction of priority bird species		✓
f. Develop survey methods to reliably estimate population size for species of high conservation concern		✓
g. Investigate the relative importance of causes of mortality (e.g., predators, disease, vehicle strikes) for nēnē and seabirds of concern		✓
h. With partners, conduct pollen core studies to reconstruct prehistoric vegetation composition		✓
i. Investigate status and distribution of ‘ōpe‘ape‘a; identify management priorities	✓	✓
j. Investigate status and distribution of endemic insects, particularly species of concern		✓
k. With partners, investigate breeding and foraging ecology of nēnē in lowlands		✓
l. Investigate daily and seasonal movements of nēnē		✓
m. Establish partnerships with other agencies, universities, and organizations to pursue collaborative research projects	✓	✓
n. Work with DLNR and other partners to conduct habitat assessments for Makapili Rock and Moku‘ae‘ae Island (both owned by State of Hawai‘i) which are located within 300 feet offshore of the Refuge		✓

o. Conduct a road and trail assessment and analysis and identify problem areas (e.g., excessive erosion, compaction) and solutions (e.g., water bars, erosion matting, re-vegetation)	✓	✓
Rationale: Research projects on Refuge lands would address a wide range of natural and cultural resource as well as public use management issues. Examples of research projects include habitat use and life-history requirements for specific species/species groups, practical methods for habitat management and restoration, extent and severity of environmental contaminants, techniques to control or eradicate pest species, effects of climate change on environmental conditions and associated habitat/wildlife response, identification and analyses of paleontological specimens, modeling of wildlife populations, and assessing response of habitat/wildlife to disturbance from public uses. Projects may be species-specific, Refuge-specific, or evaluate the relative contribution of the Refuge to larger landscape (ecoregion, region, flyway, national, international) issues and trends. Like monitoring, results of research projects would expand the best available scientific information and potentially reduce uncertainties to promote transparent decision-making processes for resource management over time on the Refuge. In combination with results of surveys, research would promote adaptive management on the Refuge. Scientific publications resulting from research on the Refuge will help increase the visibility of the Refuge System as a leader in the development of the best science for resource conservation and management. In accordance to the policy for implementing adaptive management on refuge lands (522 DM 1), appropriate and applicable environmental assessments are necessary to determine resource status, promote learning, and evaluate progress toward achieving objectives whenever using adaptive management. These assessments would provide fundamental information about biotic (e.g., vegetation data layer) as well as abiotic processes and conditions (e.g., soils, topography) that are necessary to ensure that implementation of on-the-ground resource management achieve resource management objectives identified under Goals 1–2.		

2.4.4 Goal 4: Ensure that visitors and kamaʻāina of all ages and abilities feel welcome, enjoy a safe visit, and are provided high-quality opportunities for wildlife-dependent recreation which allows them to connect with, while having limited impacts to, the wildlife, habitats, and cultural and historic richness of the Refuge.

Objective 4.1 Improve visitor access.				
Improve visitor access associated with the Refuge with the following attributes: • Enhance visitor safety and experiences to improve their connection to wildlife and habitats; • Integrate with other transportation plans and initiatives that share Refuge purposes and goals; • Promote sustainable transportation practices; and • Minimize human disturbance to biological resources.				
Strategies Applied to Achieve Objective:	**Alt A (Current)**	**Alt B**	**Alt C**	**Alt D**
Strategies specific to the overall Refuge				
a. Coordinate transportation network with existing public transport options (e.g., work	✓			

with the County for a bus stop closer to the Refuge)				
b. Continue to integrate Refuge planning efforts with Kīlauea Town planning efforts, including the bypass road and multi-use trail connecting the Refuge to town	✓			
c. Develop a data collection plan (e.g., better traffic and parking count, documenting "overage", accident and incident data,) that is updated and reviewed annually to continue to evaluate transportation network efficacy	✓			
Strategies specific to the Overlook and current entrance				
d. Within the first 5–10 years, implement recommendation from the Transportation Assistance Group (TAG), suggesting testing operational changes to determine their effectiveness in reducing congestion (e.g., change operating hours, charge differential fees, test parking reservation system, test variations of the "one-in, one-out" protocol, arrange transit demonstration service, implement "intelligent technologies" to better inform and manage congestion, work with the County on road easement/acquisition/ cooperative agreement)	✓			
e. Improve parking safety and efficiency (e.g., better delineate onsite public parking)	✓			
f. Increase parking capacity at Overlook		✓		
g. Continue to provide private vehicle access into Refuge	✓	✓		
h. Provide bicycle parking at Overlook		✓	✓	✓
i. Create area for public/tour bus drop-off and optional shuttle pick-up		✓		
j. Provide an ***optional shuttle*** into the Refuge from the scenic Overlook at the current Refuge entrance. Shuttle would be ***mandatory when Refuge parking at capacity***		✓		
k. Institute a ***mandatory shuttle which would prohibit private vehicles*** from traveling into the Refuge and would require all visitors to use a shuttle system from a visitor welcome and orientation center			✓	✓
l. Acquire and gate the portion of Kīlauea Road (a County road) from the new visitor welcome and orientation center to its terminus at the current Refuge entrance gate. Vehicular traffic beyond the new visitor welcome and orientation center would be limited to administrative,			✓	✓ (only if property adjacent to road)

emergency, and residential access when Refuge is open. When Refuge is closed, the road to the scenic Overlook is open				
Strategies specific to the Point				
m. Enhance public parking currently on Refuge (e.g., paving of gravel areas, restriping). Improve pedestrian and vehicle circulation.	✓	✓		
n. Remove parking currently on Refuge and renovate area for shuttle stop from the visitor welcome and orientation center. Improve pedestrian circulation			✓	✓

Rationale: The popularity of the Refuge generates operational, access, and safety issues, both at the Refuge and in the nearby Kīlauea Town. Most visitors drive to the Overlook and Point in a rental car, the main mode of transportation for all visitors on the island. During the peak winter season, visitors arriving during hours of high visitation may find the parking lot full and space limited in the temporary overflow parking area. The capacity of the Refuge's parking lots is the Refuge's limiting factor for visitation. If all parking is full, visitors are turned away.

There are two paved parking areas as well as two unpaved/unmarked gravel areas at the Point; these facilities can accommodate 51 vehicles total. The two paved parking areas are dead-ends and do not allow for through traffic. The parking in the gravel areas is also unmarked. Large tour buses (25 passenger or larger) are restricted from entering the Refuge. Due to the poor configuration and layout of the parking area, as well as the limited amount of space, Refuge rangers regularly spend a large portion of the peak visitation time of day directing traffic, parking cars, and moving traffic control signage. Intensive staff effort is needed to park and direct traffic in these situations.

Separate areas of grassland habitat are used for parking in overflow conditions and can accommodate approximately 20 vehicles. Refuge staff prefers not to use this area, particularly during the winter rainy season when it becomes very soft and muddy. When visitation exceeds parking capacity, including reasonable overflow limits, Refuge staff institutes a "one in, one out" system which generally requires two staff members. Alternately staff place a sign at the entrance gate to indicate that public entry into the Refuge is temporarily closed, but cannot let them know when they can return.

The current parking situation within the Refuge not only prevents Refuge staff from conducting other key duties (Refuge staff currently spend 2–3 hours a day addressing traffic issues), but also degrades the quality of wildlife habitat by periodically excluding endangered nēnē families from foraging, roosting, and brood-rearing resulting in movements of goslings to neighboring private properties were they are unprotected and at times unwelcome, contributing to human-wildlife conflicts. The situation also negatively impacts the visitor experience, and undermines the Service's ability to provide interpretation and EE (see rationale for Objectives 4.3 and 4.4). For additional discussion of transportation-related management challenges, see Chapter 5, Sections 5.3.3 and 5.3.4.

Several studies have been conducted regarding Refuge-related transportation issues including the Alternative Transportation Systems (ATS) study in 2006 (Parsons Brinkerhoff Quade and Douglas, Inc. 2006) and interagency TAG study in 2009 (TAG 2009). The ATS study evaluated the feasibility of five conceptual alternatives for dealing with transportation issues and the anticipated rise in island visitor numbers:

- No build, which would keep current status;
- Minor improvements, transportation system management, and transportation demand

management, which would include some physical or operational changes to increase effective capacity through improved management of parking resources or would redistribute demand to less busy times;

- Moderate improvements to increase capacity, which would include physical improvements such as additional paring and/or widening roads;
- Voluntary shuttle service with private vehicle access, which would institute a shuttle system from a new offsite welcom and orientation facility while continuing to allow private vehicles onto the Refuge; and
- Mandatory shuttle service, which would prohibit public parking beyond the entry gate at Kīlauea Point NWR and require all visitors to use a shuttle system from an offsite welcome and orientation facility.

The TAG study considered the recommendations of the 2006 ATS study and additionally provided a series of non-binding recommendations for the Refuge to consider. Common to all alternatives, in the near term, the Refuge would adopt an incremental approach and experiment with small-scale operational and infrastructure improvements based on TAG recommendations. Over the mid- to long-term, the mandatory shuttle service component of the Preferred Alternative would be further analyzed in conjunction with other proposals (e.g., new visitor welcome and orientation center) via SDMPs and/or other planning.

Objective 4.2 Improve visitor information and orientation.

Improve visitor information and orientation associated with the Refuge with the following attributes:

- Visitors are welcomed and are provided a safe experience;
- 75% of visitors can identify Kīlauea Point as a National Wildlife Refuge;
- Visitors are educated about access options while core staff functions are maintained; and
- Minimize human disturbance to biological resources.

Strategies Applied to Achieve Objective:	**Alt A (Current)**	**Alt B**	**Alt C**	**Alt D**
Strategies specific to the overall Refuge				
a. Develop a Refuge Sign Plan to better direct individuals, enhance orientation, and reduce impacts to wildlife within 3 years			✓	
b. Continue working with the Hawai‘i Department of Transportation and County of Kaua‘i on Refuge directional signage for Kūhiō Highway and through Kīlauea Town, and signage to reduce impacts to wildlife (e.g., nēnē crossing)			✓	
c. Identify and develop methods to provide greater information to visitors prior to entering the Refuge (e.g., volunteers at Overlook, cell phone audio tour at Overlook, AM radio station, rangers onboard shuttles to the Refuge, operating hours on highway signage)			✓	

d. Every 5 years, evaluate Refuge fees and conduct a visitor survey to evaluate existing programs as well as new programs under development, analyze current and potential Refuge visitor profiles, and explore visitation trends	✓			
e. Ensure public use facilities, interpretive materials, and programs are accessible to and usable by persons with various disabilities	✓			
Strategies specific to the Overlook and current entrance				
f. Redesign and enhance the scenic Overlook at the entrance to the Refuge to provide greater orientation and information, increased interpretation.	✓			
g. Establish a ***new onsite visitor welcome and orientation center on Crater Hill (~3–4 acres)*** which would include visitor contact, orientation and information, fee collection, restrooms, bookstore/retail, multipurpose room, outdoor spaces, administrative offices, private vehicle and tour bus parking, public bus stop, shuttle pick up/drop off and pedestrian trail to the Overlook			✓	
h. Establish a ***new offsite visitor welcome and orientation center on lands adjacent to or within 1 mile of the Refuge (~3–4 acres), including within Kīlauea Town,*** which would include the following: visitor contact, orientation and information, fee collection, restrooms, bookstore/retail, multipurpose room, outdoor spaces, administrative offices, private vehicle and tour bus parking, public bus stop, and shuttle pick up/drop off				✓
Strategies specific to the Point				
i. Continue to provide on an on-call basis golf carts to transport visitors who may need assistance getting to the VC or Lighthouse	✓			
j. Provide for greater site orientation	✓			
k. Re-examine the site layout at Kīlauea Point and evaluate non–site-dependent functions currently located there and ***move a limited number off the Point*** (e.g., maintenance functions, some administrative and equipment storage) to improve the visitor experience	✓	✓		
l. Remodel the existing VC, for either EE or new interpretive exhibits and displays. Continue to maintain bookstore operations on the Point (e.g., Quarters #1)		✓		

m. Re-examine the site layout at Kīlauea Point and evaluate non–site-dependent functions currently located there and ***move as many as is feasible and possible off the Point*** (e.g., bookstore, administrative and maintenance functions, equipment storage, fee collection, parking) to improve the visitor experience			✓	✓
n. Remodel the existing VC for either EE or new interpretive exhibits and displays. Maintain bookstore operations at the new visitor welcome and orientation center			✓	✓

Rationale: Directional signage on Kīlauea and Kolo Roads (both County roads) leading to the Refuge is limited with visitors regularly becoming lost in Kīlauea Town. The sign design also varies with green, brown, and even homemade signs directing the way. This signage also directs travelers to the Kīlauea Lighthouse and makes no reference to the Refuge on which the Lighthouse stands. For a majority of visitors, the trip to the Refuge is their first visit to a national wildlife refuge, and their first introduction to the Refuge System. Many visitors incorrectly believe the Refuge to be a National Park. Also, while many who live on the island are aware of the Kīlauea Lighthouse, they are not aware of the Refuge.

The configuration of the Overlook at the entrance to the Refuge at the end of Kīlauea Road, together with its constraints, poses challenges to orienting, informing, and guiding visitors clearly down to the Point. The current entrance experience is confusing and potentially unsafe for visitors. There is limited advance directional or orientation/information signs to help visitors understand how to access the Point and see the Lighthouse. Visitors who arrive by car typically park to see the view at the Overlook but are confused about whether or not they are supposed to drive or walk past the gate down into the Refuge. There are signs, however, they are not readily noticed by the visitor. It is also unclear to bicyclists whether or not they are allowed to ride their bicycles past the entrance gate.

After visitors exit their vehicle, there is a lack of information and signage to let them know where they can and cannot go. There are several buildings adjacent to the parking areas; however, the Lighthouse, restrooms, and VC are not visible from the parking lot. Therefore, visitors are often confused about how to get to these facilities, as well as the existing buildings and where they should go.

A new off-Refuge visitor welcome and orientation center would resolve many of these issues. It would serve as the gateway to the Refuge where visitors would park, be provided an orientation to the Refuge, and board their shuttles and/or start their interpretive, guided tours and hikes.

Since the siting and construction of a new visitor welcome and orientation center under alternatives C and D are conceptual and not site-specific, implementation would require additional compliance, involving site-specific effects analysis.

The location of the new visitor welcome and orientation center, as well as other facilities to support Refuge management (see Objectives 4.1 and 6.1), would likely be guided by a number of site selection criteria which may include, but would not be limited to the following:

- Reasonable cost.
- Availability at the time when the Refuge had adequate funds to move forward on such a large project.
- Within 1 mile of the existing established Refuge boundary.

- Consistency with local land use plans.
- Sufficient in size (at least three to four acres) to accommodate all needed facilities, including parking, shuttle access, and possibly maintenance building/yard.
- Existing facilities that could be modified to satisfy needs or a readily developable site.
- Good access to existing or planned roads (Kīlauea Road, Kūhiō Highway, or Kīlauea Town Bypass).
- Accessible by bus, bicycle, and walking.
- Existing parking area (including one that could accommodate shuttle buses) that could be shared with others or a site where such parking could be readily developed.
- Existing utilities (e.g., electricity, potable water, high-speed internet, and sewer).
- A relatively level site that would require minimal recontouring to accommodate the proposed facilities.
- A site that was or could readily be made secure.
- Building site would be located in an already developed or disturbed area.
- Co-location with another conservation organization (e.g., the U.S. National Oceanic and Atmospheric Administration's marine sanctuary discovery center on Kaua'i [NOAA 2011]) or another Federal, Hawai'i, or local public agency.
- Views of the Kīlauea Point Lighthouse, ocean, or mountains.
- Construction and management would have negligible negative effects on trust resources (e.g., Federally-listed species, migratory birds)
- Construction and management would not be anticipated to reduce the quality or quantity or fragment habitat for trust resources.

Through a subsequent planning effort, the Service would explore the benefits, costs, and impacts of each potential site, and work with the community to determine the ideal location, considering the needs of the Refuge and the intent of the Kīlauea Town Plan and other plans.

Objective 4.3 Enhance and expand environmental interpretation.

Improve interpretive opportunities associated with the Refuge. The program shall include the following attributes:

- Hawai'i's unique cultural heritage is woven throughout the interpretive experience;
- Visitors are exposed to at least one of the three interpretive themes:
  - *The National Wildlife Refuge System:* The Refuge, part of a legacy of lands, reserved by the people of the United States, where wildlife comes first.
  - *Seabirds & Native Coastal Plants:* The Refuge abounds with seabirds passing through the cycles of life and balancing on the edge of survival, while plant communities thrive in the harsh coastal environment.
  - *Kīlauea Point Light Station:* The Kīlauea Point Light Station has marked the passage of Kaua'i's history . . . it was once a beacon calling to those crossing the vast expanses of the Pacific; now it calls upon all of us to protect the Native Hawaiian ecosystem.
- 90% of visitors understand that Kīlauea Point is part of a system of lands administered and managed by the Service for wildlife and plant conservation;
- 80% of visitors can name at least two seabird species that uses the Refuge during some part of their life history and at least one native plant;
- 70% of visitors understand that the Kīlauea Lighthouse played a prominent role in trans-Pacific navigation; and
- Minimize human disturbance to biological resources.

Strategies Applied to Achieve Objective:	**Alt A (Current)**	**Alt B**	**Alt C**	**Alt D**
a. Within 5 years, prepare an interpretive chapter of the KNWRC Visitor Service Plan	✓	✓	✓	✓
b. Develop orientation materials and/or train Service staff, volunteers, partners and tour operators to ensure understanding of the significant resources and messages that the interpretive program should be addressing	✓	✓	✓	✓
c. Develop exhibit themes, including interpretive exhibits and associated media at the VC and other visitor contact points, and/or observation viewpoints	✓	✓	✓	✓
d. Explore options to provide greater flexibility in interpretive exhibits and signage to allow for seasonal depictions (e.g., detachable interpretive panels.)	✓	✓	✓	✓
e. Expand opportunities to provide limited access to the interior of the Lighthouse	✓	✓	✓	✓
f. Explore possibilities for increasing the frequency of lighting of the Lighthouse (currently once per year)	✓	✓	✓	✓
g. Expand current and new partnerships to maximize effectiveness and efficiency of interpretive programs	✓	✓	✓	✓
h. Continue to evaluate items sold in the bookstore to ensure they reinforce key messages and the mission and goals of the Service. Include interpretive messaging whenever possible	✓	✓	✓	✓
i. Regularly evaluate visitor perceptions of resources and interpretive programming (e.g., informal discussion, observations by staff)	✓	✓	✓	✓
j. Develop methodologies that will be used for future evaluation of existing interpretive programs and new ones under development	✓	✓	✓	✓
k. Every 5–10 years, conduct an analysis of visitation trends and their implications for interpretation	✓	✓	✓	✓
l. Continue to provide guided interpretive activities as staff is available	✓	✓	✓	✓
m. Remodel the VC for interpretative displays (or EE facility, see Objective 4.4)			✓	✓
n. Increase the number of guided interpretive activities to at least 1 per day	✓	✓	✓	✓

o. Remodel the Contact Station (radio beacon building) to provide expanded interpretation and/or scenic view		✓	✓ (expand scenic view)	✓ (expand scenic view)
p. Explore the restoration and conversion of one of the former lighthouse keeper's homes (Quarters #1) to house other functions		✓ (bookstore)	✓ (living history site; bookstore offsite)	✓ (living history site; bookstore offsite)
q. Offer a limited number (2 times/week) of guided interpretive hikes to Crater Hill designed (location of trail, timing, group size) to have negligible negative effects on breeding birds yet provide a quality experience for visitors (see Objective 4.5)			✓	✓

Rationale: As one of the Service's priority public uses, environmental interpretation is an important management activity for the Refuge. Interpretation is a communication process that forges emotional and intellectual connections, by providing opportunities for visitors to make their own connection to the resources. Messages and stories are often delivered through guided interpreters, self-guided interpretive panels, interpretive exhibits, printed materials, interpretive art, and electronic media.

The visitor is first welcomed to the Refuge at the fee collection booth. The ranger on duty assists in orienting visitors, answering their questions, informing them about wildlife activity that day, and advising the visitor of Refuge services offered at the VC and Contact Station, such as free binoculars for loan while on Refuge, and docent interpretive services. Volunteers are the primary means of personal interpretation on the Refuge. Between 2010 and 2013, the number of volunteers ranged from 103–115 annually, providing between 6,410 and 8,523 hours of service per year (USFWS 2014). The majority of these hours were dedicated to the VS program. Volunteers help visitors use the viewing scopes and binoculars, identify species, point out and provide information about wildlife behavior, and provide interpretation about the Lighthouse, the Refuge, and its resources. Under optimum conditions, there are at least two volunteers on duty, with one volunteer operating an on-call golf cart to help visitors who may need assistance getting from the parking lot to the VC or Lighthouse. The Point, as well as the area surrounding the Lighthouse, is almost entirely staffed by volunteers.

The Refuge has a number of interpretive panels around the Point highlighting native and nonnative plants and wildlife. Some of the panels were done at different times, using different styles, approaches and materials. These panels are appealing, of a good size, and are well-placed to be visible but not obtrusive. The most recent panels were completed in 1999. The panels are permanent and are in place year-round. Wildlife at the Refuge is seasonal. For example, whales and albatross are found in the winter months. Thus, this can cause some confusion for the visitor.

In 1987, Congressional funding provided for the design and construction of an EE Center. Today, the main floor of this facility serves as the VC and houses interpretive exhibits as well as a bookstore operated by KPNHA. When entering the Center, people are often expecting to see exhibits relating to the Kīlauea Point Light Station or the wildlife at the Refuge. However, some of the exhibits are only tangentially related or fully irrelevant to the site. This may prove disorienting to the visitor who may have expectations of finding information regarding the Refuge. In addition, the exhibits are badly worn. They are out of date and interpretive messaging for children is lacking.

Over the years the interpretive exhibits have been expanded upon by the KPNHA bookstore operations and the building has moved away from its primary intended function of education. In a survey conducted by the U.S. Geological Survey, it was noted that visitors did not expect to see a bookstore where they had anticipated interpretive exhibits (Sexton et al. 2011). The VC has become cluttered and is often very crowded. The design of the VC building itself is also out of context with the historic nature of the Kīlauea Point Light Station. The building requires a high level of routine maintenance.

The Contact Station is located at the tip of the Kīlauea Point Peninsula. Currently, the building contains an interpretive display on the history of Kīlauea Lighthouse, a desk staffed by volunteer docents, binoculars for loan, as well as an area to sit and watch a video about the Refuge. It also provides a place for visitors to escape from the rain, wind, or warm tropical sun. The building was originally designed to house radio equipment associated with the Lighthouse so it has a small number of windows, not allowing one to take in the expansive coastal views.

One of the most popular and notable features of the Refuge is the historic Kīlauea Lighthouse, which was list on the National Register of Historic Places in 1979. Since restoration, visits into the Lighthouse are only possible on a guided tour. Since Lighthouse Day (the first Saturday in May) in 2014, the Refuge started offering guided tours weekly, dependent upon staff and volunteers availability. Guided tours require temporary modifications of the interior and an intensive staff and volunteer effort. Overall, the frequency of opportunities for the public to experience the interior of the Lighthouse on guided tours is variable; tours may in the future occur more frequently or less frequently than once per week depending upon the availability of staff and volunteers.

As a primary host to visitors of Hawai‘i, the Refuge has the responsibility to learn about and interpret Hawai‘i’s unique culture as well as its evolution into modern society. Sharing the ancient beliefs and practices, cultural histories, traditional stories, chants, place names, and geographic divisions, as well as relaying the fact that the Refuge Complex continues to support the perpetuation of traditional cultural practices such as taro farming at Hanalei NWR and access for fishing at Kīlauea (East) Cove are a few ways that Kīlauea Point NWR is incorporating Hawai‘i’s culture into our environmental interpretation.

Objective 4.4 Enhance and expand environmental education.

Provide a high-quality EE program associated with the Refuge for at least 2,000 students annually. This program should emphasize the natural and cultural history of the Refuge, as well as the role and importance of national wildlife refuges. The EE program should include the following attributes:

- Focus on students in the pre-kindergarten and elementary grades on the Island of Kaua‘i;
- Tier to (or achieves) formal education standards (State, national);
- Incorporate measurable learning objectives and utilizes audience-appropriate curricula;
- Support and complements the Service mission, as well as the Refuge’s purposes and goals;
- Support the Service’s “Connecting People with Nature” emphasis; and
- Minimize human disturbance to biological resources.

Strategies Applied to Achieve Objective:	Alt A (Current)	Alt B	Alt C	Alt D
a. Utilize interns and volunteers to assist in facilitating the EE program (schedule school groups, develop curriculum, make presentations, conducts visits)		✓		
b. Continue to partner with KPNHA to provide		✓		

support for the Refuge's EE program, including school bus funding				
c. Enhance current partnerships and explore new partnerships to maximize the effectiveness and efficiency of the EE program by working with groups of similar interest or with shared goals	✓			
d. Increase or enhance the partnerships with local, State and national EE organizations (e.g., Hawai'i Environmental Education Alliance (HEEA), North American Association for Environmental Education (NAAEE). Continue participation in Statewide natural resource interpretation and EE initiatives	✓			
e. Annually disseminate current EE program guidelines and activities offered to all educators within the target audience		✓		
f. Ensure EE programs are accessible to and usable by children of various abilities. Utilize special teaching approaches, equipment, or care as necessary	✓			
g. On a yearly basis, define and measure results of all EE programs and modify current programs as needed to maximize the effectiveness of future efforts	✓			
h. Review the Refuge's EE programs on a regular basis with a focus group of those involved with education at the pre-K and elementary level to ensure programs are addressing the identified environmental, educational, and community needs		✓	✓	✓
i. Update curricula and materials as necessary to ensure that programs support and complement the Service's mission and current initiatives, as well as the Refuge's purposes and goals		✓	✓	✓
j. Develop a multifaceted Junior Ranger program to reach all ages of young visitors to the Refuge		✓	✓	✓
k. Design and implement a training program that provides regular training for staff, volunteers, and other presenters or educators to ensure a highly qualified and trained cadre		✓	✓	✓
l. Work with partners to provide teacher training workshops, and explore opportunities to introduce the KNWRC's EE program in pre-service (teacher certification) training at Kaua'i Community College		✓	✓	✓

m. Maintain the KNWRC's Website to promote current educational opportunities, post curricula, and other learning resources		✓	✓	✓
n. Re-examine the site layout of Kīlauea Point to improve the facilitation of EE. Convert an existing structure to a designated facility/facilities for EE		✓	✓	✓ (not Quarters #2)

Rationale: As one of the Service's priority public uses, EE is an important management activity for the Refuge. EE plays a key role in encouraging current and future generations to engage in environmentally responsible behavior like supporting the protection of habitat for wildlife through the National Wildlife Refuge System. With the assistance of interns and volunteers, the Refuge conducts EE programs throughout the year with the greatest number of students visiting January–May. Between 2010 and 2013, education participants involved in on- and offsite EE programs ranged from 7,200 to 12,032 (USFWS 2014). Due to the wide variety of age groups which the EE program currently serves (toddlers through college students) and the wide variety of subjects which the Refuge staff is asked to teach, the staff is often responding to individual requests and scrambling to create a new program for each one. By partnering with others to develop and implement a standards-compliant Refuge-based curriculum for all ages and abilities, the Refuge would be able to reach more students and community groups with a goal of developing an aware and environmentally literate citizenry. The Refuge would also conduct trainings and outreach (e.g., through the website) for staff, volunteers, teachers, and other educators in order to promote the EE program. KPNHA provides funding for bus transportation for schools that visit the Refuge, which is a significant contribution to the EE program and would continue into future.

The winding, narrow, and steep Refuge entrance road causes complications for EE programming, as the road cannot safely accommodate a school bus and regular visitor traffic at the same time. Because of this, school groups participating in EE programs generally arrive at the Refuge at 8:30 a.m., before the Refuge opens, which requires accommodation from staff. This way they can easily maneuver the roadway and have adequate room to park. The children also have the Point to themselves and are not distracted by the large number of visitors. However, the grassy areas where buses park is nēnē habitat and when the Refuge receives a heavy rain, these parking areas become muddy and soft. Although most school groups try to leave before 10:00 a.m., they often leave after the Refuge has opened, which then requires a minimum of two staff to assist in safely getting the children through the busy parking lot to their bus, as well as to stop traffic to allow the bus to exit the Refuge. By departing at 10:00 a.m., this leaves only 1 hour for the EE program given loading, unloading, restroom breaks, etc., which does not lend itself to a high-quality EE program.

Given the small time window during which EE is offered (8:30 a.m. to 10:00 a.m.) many schools on the west, south, and even east side of the island are unable to make it to the Refuge during this timeframe given the time it takes to travel to the Refuge. Only 7% of Kaua'i's public and charter school students (K-12) are within a 20-minute drive of the Refuge. For a majority, 68%, it is at least a 40-minute drive to get to the Refuge and for nearly 30% it takes more than an hour. Consequently, the strategies under Objective 4.1 would facilitate EE programming by improving access and logistics.

In 1987, Congressional funding provided for the design and construction of an EE Center. Today, the main floor of this facility serves as the VC and houses the bookstore operated by KPNHA. The bottom floor of the VC has a multi-purpose room. This multi-purpose room also serves as the Refuge's meeting room, volunteer meetings and trainings, as well as KPNHA staff and board meetings. It is also

frequently utilized by KPNHA to receive, sort, tag, and organize their merchandise. The limited amount of large indoor space on the Refuge leads to room conflicts. Also, the size of the multi-purpose room is often insufficient for EE programs. As such, the Contact Station adjacent to the Lighthouse is frequently used for EE, but staff often find they are racing to pack up their EE supplies and reorganize the room as visitors begin arriving at the Refuge. From 1997 to 2007, a portion of the bottom floor also provided office space for the Refuge's EE Specialist. It currently provides office space for three KPNHA staff members, and storage for KPNHA supplies and merchandise. Converting an existing structure to a designated facility/facilities for EE would alleviate the room conflicts and space issues.

Objective 4.5 Enhance and expand wildlife observation and photography.

Visitors are provided compatible opportunities to participate in wildlife photography and observation with the following attributes:

- Minimum of 75% of visitors identify the Refuge as a place for premier wildlife viewing and photography on Kaua‘i;
- High diversity of native wildlife species (seabirds, nēnē, marine mammals, turtles); and
- Minimize human disturbance to biological resources.

Strategies Applied to Achieve Objective:	Alt A (Current)	Alt B	Alt C	Alt D
a. Continue to provide free viewing scopes as well as binoculars for loan, and expand the program to include quality field identification guides for loan			✓	
b. Continue to work with KPNHA to provide wildlife viewing tools and books for purchase			✓	
c. Continue to work with existing partners and explore new partnership opportunities to provide a variety of quality opportunities for wildlife observation and photography (e.g., photography and wildlife art workshops)			✓	
d. Provide current and accurate information online and onsite including wildlife checklists for both avid and casual wildlife watchers, Refuge maps, seasonal highlights, sightings, migration information, and wildlife counts			✓	
e. Promote wildlife observation and photography opportunities through brochures, news releases, displays, and special events. Include messages on good wildlife observation and photography practices to minimize disturbance			✓	
f. Clearly identify closed areas and direct visitors to comparable alternative sites both on- or off-Refuge			✓	

g. Promote the Refuge's designation as an Important Bird Area (IBA) by the Audubon Society and explore further designation of the Refuge as an IBA by the American Bird Conservancy	✓			
h. Work with the Hawai‘i Department of Transportation and the County of Kaua‘i to incorporate the international binocular symbol on direction signs to identify the Refuge as a watchable wildlife location	✓			
i. Expand program offerings, workshops, activities, and exhibits used to teach and enhance wildlife viewing skills and ethics		✓	✓	✓
j. Increase compatible opportunities for up-close and personal viewing of wildlife (e.g., remote cameras, observation/photo blinds, guided ranger and/or volunteer led hikes)		✓	✓	✓
k. Expand citizen science opportunities (e.g., Christmas Bird Count)		✓	✓	✓
l. Increase staff visibility among wildlife clubs/organizations (e.g., engage at meetings, conferences, and/or events, participate in listservs, host field trips or other events)		✓	✓	✓
m. Offer guided interpretive hikes 2 times/week to Crater Hill designed (location of trail, timing, group size) to have negligible negative effects on breeding birds yet provide a quality experience for visitors			✓	✓

Rationale: Observation and photography of wildlife and nature promote public understanding and appreciation for the Refuge's natural resources. The Refuge is one of the best accessible locations in the main Hawaiian Islands for viewing and photographing wildlife as it has a high diversity of breeding birds at one location. Six to eight species of seabirds, as well as Hawai‘i's State bird, the nēnē, can readily be seen by the majority of visitors. The sheer number of birds, as well as their proximity, makes for an extremely high-quality viewing and photography experience. The National Oceanic Atmospheric Administration (NOAA) also administers the Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS) in the waters surrounding the Refuge, and endangered koholā (humpback whales) are readily seen offshore and photographed from December to April. Groups of nai‘a (spinner dolphins), ‘īlio-holo-i-ka-uaua (Hawaiian monk seal), and honu (green sea turtle) can also be seen from the Point.

While the best viewing opportunities are on the Kīlauea Point Peninsula, additional opportunities are provided at the Overlook at the entrance to the Refuge, as well as on Crater Hill and Kāhili Quarry. They also provide a different perspective than is provided from the peninsula. As discussed previously, the current configuration of the Overlook together with the site's constraints pose challenges to orienting and informing visitors.

The Refuge receives regular inquiries about the reinstitution of Crater Hill hikes from both visitors and the community. Refuge staff recognize the value of Crater Hill for wildlife observation and photography and the unique experience it provides. However, these hikes were suspended in 2003 due

to concerns over disturbance to active burrows of breeding ‘ua‘u kani and a colony of nesting ‘ā at levels that likely affected bird survival and reproduction. In addition, the lack of personnel to adequately maintain trails and maintain a state of preparedness for emergency situations was a liability issue for the Refuge. Consequently, the use was at that time deemed incompatible with the Refuge System mission and Refuge purposes.

In the CCP’s draft Compatibility Determination for wildlife observation and photography (Appendix B), access to trails at Crater Hill for wildlife observation and photography was determined to be compatible when performed under certain stipulations, including a required Refuge staff or trained volunteer guide, minimum age, maximum group size, and limited frequency. With the exception of special, free hikes during National Wildlife Refuge Week, reservations would be required and adults (16 years or older) would be charged a moderate fee to join these hikes. The Service would assess erosion and compaction on trails, and wildlife effects of visitation (e.g., disturbance and crushing of burrows) on Crater Hill and elsewhere, and develop solutions to any problems. If monitoring reveals that levels of use or associated impacts exceed those envisioned in the Compatibility Determination, the use will be re-evaluated and modified to ensure it remains compatible or terminated if found not compatible.

In the future, in addition to enhancing and expanding opportunities for wildlife observation and photography, the Refuge would seek to better promote the opportunities. Currently, general information about the wildlife is provided on the Refuge’s Website; however, it does not include information such as current highlights, sightings, or wildlife counts. A wildlife checklist is offered onsite, but is directed at avid wildlife watchers. Viewing scopes are set up in multiple locations around the Point and binoculars are provided for loan in order to enhance wildlife viewing; however, other options such as remote cameras, observation/photo blinds, guided ranger and/or volunteer led hikes would be explored to broaden the types of offerings available.

Objective 4.6 Reduce wildlife disturbance, habitat degradation, and user conflict potential while increasing public safety for visitors to Kāhili Quarry.

Visitors at Kāhili Quarry are provided opportunities to participate in wildlife-dependent uses (fishing, wildlife photography and observation) and have access to adjacent off-Refuge areas (Kāhili Beach, Kīlauea Bay, and the Kīlauea River) for boating, and other stream, beach, and ocean uses such as snorkeling, sun bathing, surfing, swimming, and walking, including dog walking, with the following attributes:

- Minimize human disturbance to biological resources and
- Enhancevisitor safety.

Strategies Applied to Achieve Objective:	Alt A (Current)	Alt B	Alt C	Alt D
a. Work with Kīlauea community to maintain a passable road to the beach and shoreline			✓	
b. Post jurisdictional boundary, as appropriate, within the quarry area			✓	
c. Explore the possibility of cooperatively managing tidelands with the State			✓	

d. Replace the existing fence with a predator-resistant fence in a modified alignment for approximately 600 feet, following the base of vegetation growing down the cliffs defining Mōkōlea Point	✓	
e. Anglers would be allowed to erect temporary shelters (protections from the sun and rain) in the quarry area during daylight hours only		✓
f. Anglers would be allowed to bring and use portable stoves or self-contained barbeques (e.g., off-the-ground portable enclosed fires), but not build ground fires or fires in fire rings or pits		✓
g. General public access to Kāhili Beach, Kīlauea Bay, and the Kīlauea River through the Kāhili Quarry area would be allowing from 6 a.m. to 5 p.m. daily		✓
h. All dogs brought into the quarry area would be required to be to be leashed on a short (8-foot maximum) leash or kept in a secure, enclosed pen or crate at all times and would not be allowed to run free		✓

Rationale: The Kāhili Quarry area, located on the south side of Mōkōlea Point, shows signs of many years of heavy public use, including vehicle use. The area has several fire pits, trash, and abandoned motor vehicles. At the south end of the area, between the unimproved dirt and gravel road and the Kīlauea River, there are cleared areas that have been used for camping and a small boat slide. The area has also been occasionally used by squatters.

Access to the Kāhili Quarry area is either by motor vehicle, foot, horse, or bicycle down Kāhili Quarry Road, a rough, unimproved dirt and gravel road; by boat from the ocean or across Kīlauea River; or by wading or swimming across Kīlauea River. The Refuge owns a small portion of Kāhili Quarry Road from the Refuge boundary to the end of a parking area near the estuary of Kīlauea River. Under all alternatives, the Service would continue to work with the Kīlauea community to maintain a passable road to the beach and shoreline; however, no major improvements (e.g., no asphalt or permanent paving) to Kāhili Quarry Road or Kāhili Quarry are proposed. The Service would post its jurisdictional boundary, as appropriate, within the quarry area. The Service would also explore the possibility of working with the State to cooperatively manage the tidelands adjoining Kāhili Quarry through interagency cooperative agreement or other mechanisms. Cooperative management of this area would contribute to achieving the Service's mission, Refuge's purposes, and would help meet several of our goals by allowing us to protect wildlife resources through oversightof public use activities and Refuge law enforcement.

A predator-resistant fence would be constructed to replace the existing fence would be in a modified alignment for approximately 600 feet, following the base of vegetation growing down the cliffs defining Mōkōlea Point. It is hoped that the new fence would reduce the potential for wildlife and habitat impacts from both trespassing humans and nonnative predators, such as free-roaming dogs.

Under all alternatives, fishing on the Refuge occurring in the ocean at Kāhili Quarry and in the estuary of Kīlauea River would continue to be allowed on a 24-hour basis in accordance with State regulations

(see also Section 2.3.1). However, to discourage illegal camping or squatting, anglers would be allowed to erect temporary shelters (protections from the sun and rain) in the quarry area during daylight hours only. Also, to prevent adverse impacts to habitat due to open fires, only portable, self-contained camp stoves or barbeques would be allowed for preparing food.

Public access to off-Refuge areas (Kīlauea River, Kīlauea Bay, and Kāhili Beach) through the Kāhili Quarry area of the Refuge for fishing, boating, and other stream, beach, and ocean uses (e.g., snorkeling, sunbathing, surfing, swimming, and walking, including dog walking) would continue to be allowed under all alternatives. However, to reduce potential impacts to nocturnal seabirds such as ʻuaʻu kani and the threatened ʻaʻo, general public access (for nonwildlife-dependent uses) would be limited to 6 a.m. to 5 p.m. daily. These limited hours would reduce the number of night-time visitors to the Kāhili Quarry area, lowering the likelihood for illegal activities at night, which present threats to natural resources and public safety.

Dogs would be allowed at Kāhili Quarry in association with fishing or access to off-Refuge areas (Kīlauea River, Kīlauea Bay, and Kāhili Beach); however, all dogs must be on a short leash (8 feet or less) or in a secure, enclosed pen or crate at all times. Free-roaming dogs can harass, injure, or kill wildlife. On Kauaʻi, free-roaming dogs have killed shearwaters and mōlī at nesting colonies, sometimes in large numbers in a single incident (Hawaii Department of Land and Natural Resources 2013a and 2013b).

Other stipulations required to ensure the compatibility of uses at Kāhili Quarry are enumerated in Appendix B, Compatibility Determinations.

There is also a separate, but overlapping, nonexclusive access easement in favor of Seacliff Plantation (formerly the Pali Moana Corporation) for beach access, parking, and emergency and maintenance operations over and across Kāhili Quarry Road. This access, intended solely for use by the named party in the easement, is subject to reasonable rules and regulations for the protection of wildlife, including those mentioned above.

Objective 4.7 Enhance and expand outreach.

Enhance and expand outreach associated with the Refuge with the following attributes:

- Support the Refuge's goals and fosters public awareness of the Service and its mission;
- Convey and reinforce the following message across all Refuge programs:
  "The Service helps Americans conserve and enjoy the outdoors";
- Incorporate outreach goals, designates target audiences and identifies key messages;
- Provide consistent and timely information to decision makers, community leaders and the public; and
- Focus on improving and building long-term relationships with our partners and the community.

Strategies Applied to Achieve Objective:	Alt A (Current)	Alt B	Alt C	Alt D
a. Identify key themes and messages that support Refuge goals and related local, regional, and national conservation priorities (e.g., ʻaʻo conservation, avian disease, predator threats)			✓	
b. Identify target audiences, including community, political, economic and social			✓	

leaders, conservation groups, resource users, the news media, and other Federal, State, and local agencies	
c. Explore various outreach tools, including new media technology, and strategies to reach each of the individual target audiences	✓
d. Invite elected officials and their staff to an annual site visit and face-to-face meeting at the Refuge	✓
e. Provide the news media with accurate and current information which meets their deadline needs	✓
f. Provide media with at least one Refuge related story a year	✓
g. Partner with offsite opportunities (e.g., organizations, initiatives, programs, special events) to maximize outreach effectiveness and efficiency. Incorporate Refuge messages when there is a high potential of reaching target audiences. Meet regularly to discuss common challenges and collaborative opportunities	✓
h. Review current and potential onsite special events. Determine at least two annual events with goals that best reach the target audience, deliver key messages, and strengthen our connection with the community	✓
i. Increase visibility in the community via various outreach tools (e.g., Kīlauea Neighborhood Association established communications efforts, radio segments, evening lectures, workshops, presentations at meetings)	✓
j. Ensure outreach and information programs are accessible to and usable by persons with various disabilities	✓
k. Review all existing and potential publications to determine whether they meet the Service's and the Refuge's communication needs, are effectively distributed, and meet graphic standards. Revise or eliminate as necessary	✓
l. Monitor and evaluate results of outreach by obtaining feedback from the targeted audience to determine whether they comprehend the outreach message. Modify current programs as needed to maximize the effectiveness of future efforts	✓
m. Engage all staff in regular face-to-face visits with organizational opinion leaders and decision-makers	✓

n. Encourage employees to join professional organizations and community organizations to enhance Service professionalism and support		✓
o. On a regular basis, evaluate all outreach products. Keep a detailed list of what products are produced, how many are distributed, and document when and where they are used		✓
p. Provide staff with opportunities for outreach training (e.g., outreach basics, building community support, working with news media, congressional operations)		✓

Rationale: The mission of the Service is, "working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people." As reflected in the first three words, the Service acknowledges that it cannot effectively carry out its enormous natural resource management mission single-handedly. Thus, outreach is needed to enlist the support of a wide range of publics by improving communications with them. The fundamental purpose of Service outreach is to build understanding, trust, and support from a variety of groups by helping the various publics understand who the Service is, what we do, and why we do it.

Most of the Refuge's current outreach efforts have been conducted on an ad hoc basis to meet the needs of an individual event or program. While this has resulted in favorable results in some individual instances, its overall effect has been a "scattershot" approach to communications. Existing resources dedicated to outreach are limited. Refuge staff often notes that the public confuses the Service with State wildlife agencies and the National Park Service. Anecdotal evidence suggests that most are not aware of who the Service is, while an even greater number are not aware of what the Service does or why it does this work. Messages describing how the Service is different from other government agencies, how national wildlife refuges are different from other public lands and why the Service's work is important to people are currently absent.

Studies show that people believe information received from peers and community authority figures (kūpuna, teachers, ministers, etc.) more than they do newspapers and sources outside the community (Rogers 2003). Therefore, as part of improving relations with the community, connections with these individuals need to be maintained. In addition to the community, there are several other key publics, and there are a variety of reasons why they are important to include in outreach. All of the Service publics are constituents of elected officials and good communication with elected officials is essential for the Service to be effective and responsive to the American public.

Conservation groups have a great interest in resource management, and their support or lack of it influences other publics. Businesses, both small and large, can be a source of funding or support through partnerships. Other Federal agencies, as well as State and local governments, can help give momentum to Service initiatives, and their support can enhance a project's likelihood of success. Finally, the news media can directly influence virtually all other publics. Each of these different publics can have a significant bearing on how or whether the Service accomplishes its mission and the Refuge achieve its goals.

Objective 4.8 Enhance and expand volunteer and Friends group opportunities.

Improve volunteer and Friends group opportunities associated with the Refuge with the following attributes:

- Provide effective training and program management;

- Support and complement the Service mission and current initiatives;
- Increase visibility and foster conservation;
- Support a variety of Refuge programs/activities and increase their effectiveness; and
- Encourage community involvement and strengthen relationships.

Strategies Applied to Achieve Objective:	**Alt A (Current)**	**Alt B**	**Alt C**	**Alt D**
a. Develop a general orientation packet and orientation checklist that provides new volunteers, interns, KPNHA staff, and board members with general information on the Service and the Refuge			✓	
b. Regularly review and update handbooks and training materials to ensure they are current, and support and complement the Service's current initiatives, as well as the Refuge's purposes and goals			✓	
c. Expand efforts and explore various tools and strategies to provide effective, up-to-date and accurate communication to volunteers, interns and KPNHA staff			✓	
d. Regularly recognize volunteers, interns, as well as KPNHA for their contributions			✓	
e. Continue coordination with KPNHA through consistent and regular communication and regular attendance at meetings and events			✓	
f. Review and amend, as necessary, the KPNHA Cooperative Agreement/Memorandum of Understanding			✓	
g. Enhance and expand existing volunteer/intern program (complete needs assessment and create new position descriptions for volunteers and interns, recruit, and train) to a corps of at least 200 volunteers and interns in order to support a greater variety of Refuge programs			✓	
h. Develop a volunteer program that combines resource management (e.g., pest control, plant restoration) with interpretation (e.g., guided hike and birding on Crater Hill)			✓	
i. Expand current and new partnerships to maximize volunteer/intern recruitment and training efforts, as well as the effectiveness and efficiency of the program			✓	

j. Design and implement a training program, including a training manual, that provides regularly scheduled training for volunteers, interns, and KPNHA staff for all Refuge program areas, not just VS		✓
k. Every 5 years, obtain feedback and suggestions from volunteers and interns through a feedback form, survey, or other instrument		✓
l. Provide an orientation for Refuge staff on how to effectively work with volunteers and interns		✓
m. Host at least 2 community work days per year (e.g., National Public Lands Day, Martin Luther King Day of Service, National Volunteer Week) that reach at least 100 people annually		✓
n. Strengthen coordination with KPNHA through an annual whole-day planning meeting to develop an action plan for the upcoming year which includes goals, benchmarks, roles, timelines, implementation strategies, and evaluation needs		✓
o. Strengthen coordination withKPNHA to implement relevant CCP-related goals, objectives, and strategies to ensure a clear, shared vision which meets the Refuge's purpose		✓
Rationale: Staff recognize that the volunteer program is a critical part of the Refuge workforce, and that it benefits all programs and goals and strengthens community relations. This is especially true in times of static or declining budgets. Due to the limited number of staff, the Refuge relies on assistance from Refuge volunteers and its partnership with KPNHA, a Refuge Friends Group, to provide visitor services such as interpretation and environmental education and habitat management (e.g., native plant restoration, banding birds, controlling introduced predators, and monitoring). Annually, volunteers contribute as many hours as more than 4.5 full-time employees. For more information on the volunteer program, see Chapter 5, Section 5.3.2. In the future, successful implementation of Refuge programs will require the use of partnerships, including expanding work with KPNHA and recruiting, training, and retaining more volunteers.		

2.4.5 Goal 5: Identify, protect, evaluate, and interpret the cultural (including historic) resources and heritage of the Refuge while consulting with Native Hawaiian organizations and preservation partners, and complying with historic preservation legislation.

Objective 5.1 Implement a proactive cultural resource management program that focuses on meeting the requirements of the National Historic Preservation Act and related legislation, including consultation, identification, inventory, evaluation, and protection of cultural resources.		
Strategies Applied to Achieve Objective:	**Alt A (Current)**	**Alt B–D**
a. Comply with Section 106 of the NHPA when conducting ground-disturbing activities. Identify cultural resources that coincide with	✓	✓

existing and planned roads, facilities, public use areas, and habitat projects. Consult with Native Hawaiian organizations and interested parties. Evaluate cultural resources for eligibility to the National Register of Historic Places. Avoid or mitigate impacts as necessary		
b. Develop and maintain liaison with Native Hawaiian organizations, historical institutions, and other preservation partners for research, interpretation, and protection of cultural resources	✓	✓
c. Conduct archival research and communication with Native Hawaiian organizations, kūpuna, communities, and institutions to document the stories, occupation, and land use history of the Refuge	✓	✓
d. Prepare a cultural resource overview of the Refuge and step-down management plan by compiling a library of pertinent cultural resource sites, surveys, historical documents, maps, GIS files and prepare a report that presents this information within 4 years of CCP completion	✓	✓
e. Conduct a field inventory and evaluation of cultural resources identified and predicted by the archival research and communication program described above in concert with the information provided by the cultural resources overview	✓	✓
f. Establish a Refuge-specific protocol for handling discoveries of human remains, burial objects, sacred objects, and objects of cultural patrimony in accordance with the Native American Graves Protection and Repatriation Act of 1990, and in partnership with Native Hawaiian organizations within 1 year of CCP completion	✓	✓
g. Orient and train staff to recognize and be sensitive to cultural resources	✓	✓
h. Investigate and evaluate nomination of the Refuge as a Traditional Cultural Property (TCP)		✓
Rationale: Cultural resources are irreplaceable and essential elements of Hawai‘i’s heritage. The National Historic Protection Act of 1966, Archaeological Resource Protection Act of 1979, and the Native American Graves Protection and Repatriation Act of 1990, and related legislation, require the Service to implement the kind of program described under this objective. The National Register of Historic Places contains a wide range of historic property types, reflecting the diversity of the Nation’s history and culture. Traditional Cultural Properties provide a "historic property" framework in order to consider intangible resources (places) of a culture, typically without structured or stated boundaries. A TCP can be defined generally as one that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that are rooted in that community’s history, and are important in maintaining the continuing cultural identity of the community (Parker 1998).		

Objective 5.2 Create and implement, in cooperation with preservation partners, a program to maintain, restore, reuse, and interpret the Kīlauea Point Light Station.		
Strategies Applied to Achieve Objective:	**Alt A (Current)**	**Alt B–D**
a. Prepare or update historic structure reports for each element of the Kīlauea Point Light Station (within 3 years of CCP completion)	✓	✓

b. Prepare a historic structure treatment plan that addresses the needs, priorities, costs, and schedule for maintenance, restoration, and reuse of each element of the Kīlauea Point Light Station (within 5 years of CCP completion)	✓	✓
c. Consult with historical societies, and other preservation partners to identify and prepare interpretive media (e.g., pamphlets, signs, exhibits) that relates the story of the Kīlauea Point Light Station for visitors	✓	✓
d. Develop an outreach program and materials so that cultural resource messages become part of events in the area, including the State's Archaeology Month, National Wildlife Refuge Week, and appropriate local festivals		✓
Rationale: The Kīlauea Point Light Station is nationally significant for its associations with maritime history and U.S. military history as well as for its unique architectural characteristics. The Kīlauea Point Light Station lens is one of only seven second-order classical Fresnel lenses still remaining in its original position in the United States. In addition to the Lighthouse, the station's compound maintains excellent integrity with the three lava rock bungalow-style keepers' cottages, an oil storage building, a landing, and other support facilities such as the derrick at Kīlauea Point. The Lighthouse station is open to the public and is one of the most visited sites on Kaua'i, drawing more than an estimated 500,000 visitors a year. The Station is compromised by the corrosive effects of salt water decaying metals, crumbling concrete, and trapped moisture. Current restoration efforts were completed in 2013. The Refuge offers cultural and historic activities related to the Kīlauea Point Light Station.		

2.4.6 Goal 6: Ensure that all visitors enjoy safe and well-maintained operations that contribute to a positive visitor experience.

Objective 6.1 Maintain, enhance, and replace visitor, administrative, and maintenance facilities.

To fulfill Executive Order 13514 to reduce greenhouse gas emissions and meet agency reduction targets by 2020, relocate, modify, and replace infrastructure to become energy neutral through (1) utilization of alternative energy sources for vehicles and structures; (2) conserving water; and (3) reducing waste, with the following attributes:

- Through its facilities, the Refuge would promote visitor and employee safety, health and well-being and provide a range of choices to experience the Refuge and its wildlife; and
- The design and placement of Refuge facilities would be responsive to Kaua'i's setting. They would blend with and be fully integrated into these unique natural and cultural settings. Refuge facilities would be environmentally responsible and should protect wildlife, topographical features, scenic viewsheds, hydrologic systems, and the night sky.

Strategies Applied to Achieve Objective:	Alt A (Current)	Alt B	Alt C	Alt D
a. Enhance/rebuild existing maintenance/facility areas on the Point to expand storage and provide covered, protected area for machines/vehicles	✓	✓ (rebuild)		
b. Remodel and relocate main Administrative and VS offices to Quarters #2 and #3		✓		
c. Pursue offsite parking for identified staff and volunteers	✓	✓		

d. Include main administrative offices with new onsite or offsite visitor welcome and orientation center			✓	✓
e. Develop new maintenance baseyard (storage sheds, bays, pole barns, nursery)			✓ (on the Refuge, same area as visitor welcome and orientation center)	✓ (off the Refuge)
f. Remodel Quarters #3 for basic administrative and volunteer offices			✓	✓

Rationale: Currently the Refuge has two storage sheds, about 17 by 25 feet, and a native plant nursery, approximately 24 by 30 feet with a perforated and mesh style roof. There is no covered maintenance facility for equipment and vehicles at the Refuge (maintenance baseyard). Due to the coastal marine environment, high humidity, and heavy winds that carry up salt spray from the surf below, degradation of equipment, vehicles, and facilities is accelerated and consistently exceeds normally acceptable mainland standards for maintenance costs and schedules. Vehicle maintenance, in particular, needs constant attention with rust and deterioration occurring within just a few years. In addition, the distance needed to transport supplies and equipment between Refuges often substantially adds to the cost of conducting Refuge management activities (heavy equipment used for the Refuge is transported from Hanalei NWR due to lack of covered storage at the Refuge). The historical designation of several buildings prevents modification to the extent needed to serve as office, maintenance, equipment and vehicle storage spaces. Additionally, given the nesting nēnē and ʻaʻo, acres to build such new structures on the Point are unavailable.

In the future, Refuge facilities would demonstrate models of sustainability in the built environment through cohesive integration of building, site, and landscape. Facilities should be as resistant as possible to hurricanes and salt spray, employ highly efficient electrical and mechanical systems, use environmentally responsible materials, alternative energy sources, and other materials to fit within the community, reduce environmental effects, and reduce long-term-maintenance costs.

Public facility improvements would be designed to connect visitors to the natural habitats and wildlife of the Refuge. Visitor needs would be identified and facilities would follow universal design standards serving a range of cultures, ages, and abilities. Refuge facilities would exhibit lasting value, including a consideration for life-cycle costs to achieve a cost effective, quality built environment. Whole life costing would be applied during the design process considering maintenance, operational, and disposal costs.

Facility design would display a visual character that is recognizable as those of the Service and the Refuge System. Display of wildlife images, the Service shield, and Refuge System's Blue Goose, and repetition of materials, colors, and design elements would contribute to branding and strengthening the Service's image.

Construction would also follow designated building guidelines (as identified in the North Shore development plan and Kīlauea Town Plan) such as height requirements (less than 25 feet in height).

Objective 6.2 Enhance law enforcement.

Enhance law enforcement for operational capabilities and public safety with the following attributes:

- Compliance on Special Use Permits (SUPs) achieved;
- Refuge laws enforced; and
- Minimize human disturbance to biological resources.

Strategies Applied to Achieve Objective:	Alt A (Current)	Alt B–D
a. Continue to work with partners and other law enforcement agencies to protect natural resources, eliminate criminal activity (including trespassing, access by dogs), and disturbance to sensitive areas	✓	✓
b. Explore concurrent jurisdiction with the State of Hawai‘i		✓
c. Ensure the Refuge Sign Plan developed integrates law enforcement signage (boundary/fence markings, public safety, Refuge regulations)		✓
d. Develop a law enforcement monitoring system (including SUPs) that is reviewed and updated, at a minimum, annually		✓
e. Develop outreach tools (e.g., brochures, Website) specifically for Refuge protection and safety issues and identify methods for circulation		✓
f. Provide law enforcement expertise at workshops, community/partner meetings, and public talk opportunities		✓
g. Provide annual training to non-law enforcement Refuge staff and volunteers on law enforcement incident reporting, monitoring, and procedures		✓

Rationale: Most law enforcement issues at the Refuge revolve around improved education of Refuge users and visitors to reduce impacts on biological resources. Examples include vehicle and nēnē impacts, loose dogs on Refuge lands, proximity to wildlife which can lead to distress or habituation, and trespass.

Fish and wildlife law enforcement issues on lands and waters of the Refuge are under the jurisdiction of the Service law enforcement officers. Their roles are to conduct and document law enforcement incidents and coordinate and meet with Refuge staff as well as law enforcement partners. Primary laws and regulations enforced include, but are not limited to:

- Administration Act;
- Lacey Act;
- Archaeological Resource Protection Act;
- Endangered Species Act;
- Migratory Bird Treaty Act;
- Marine Mammal Protection Act; and
- Code of Federal Regulations.

Zone and Refuge officers are also empowered to enforce laws as authorized. Activities could include issuing traffic citations and warrants for arrest as they relate to drugs, trespass, hunting, fishing, and the taking of wildlife on Federal lands and, in some instances, boating safety related to refuges.

The Refuge would establish a program to monitor compliance with the stipulations enumerated within compatibility determinations (Appendix B). Violation of any of these stipulations could result in temporary or permanent withdrawal of official permission to continue this use on the Refuge by

appropriate Refuge personnel. Special Use Permits (SUPs) could be revoked by the Refuge Manager with 30-days written notice of noncompliance with these stipulations.

Service officers often partner with other law enforcement agencies such as the Division of Conservation and Resources Enforcement-DLNR and other law enforcement agencies.

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Figure 2-1. Biological Management Alternative A, Kīlauea Point NWR.

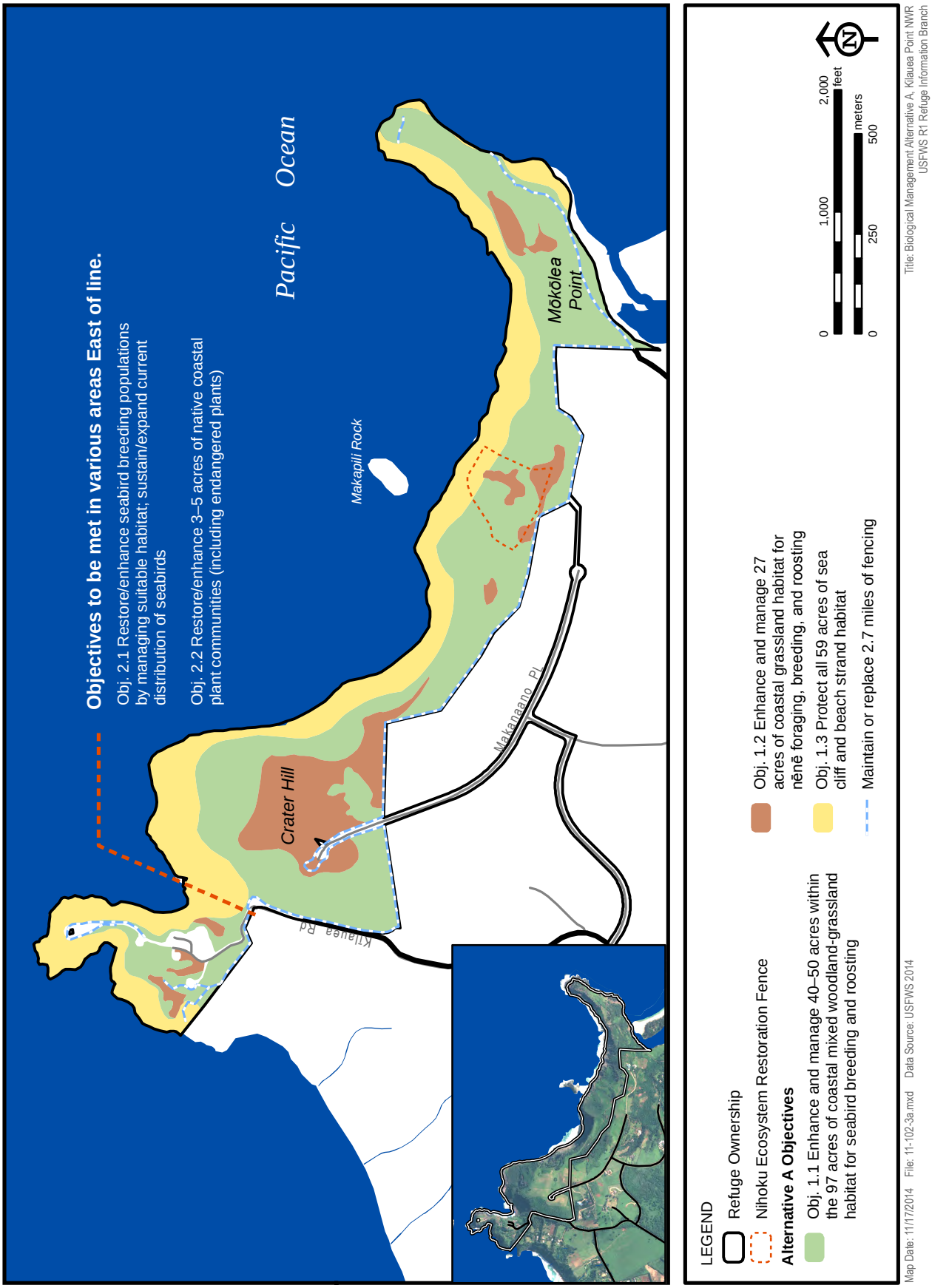


Figure 2-2. Biological Management Alternatives B–D, Kīlauea Point NWR.

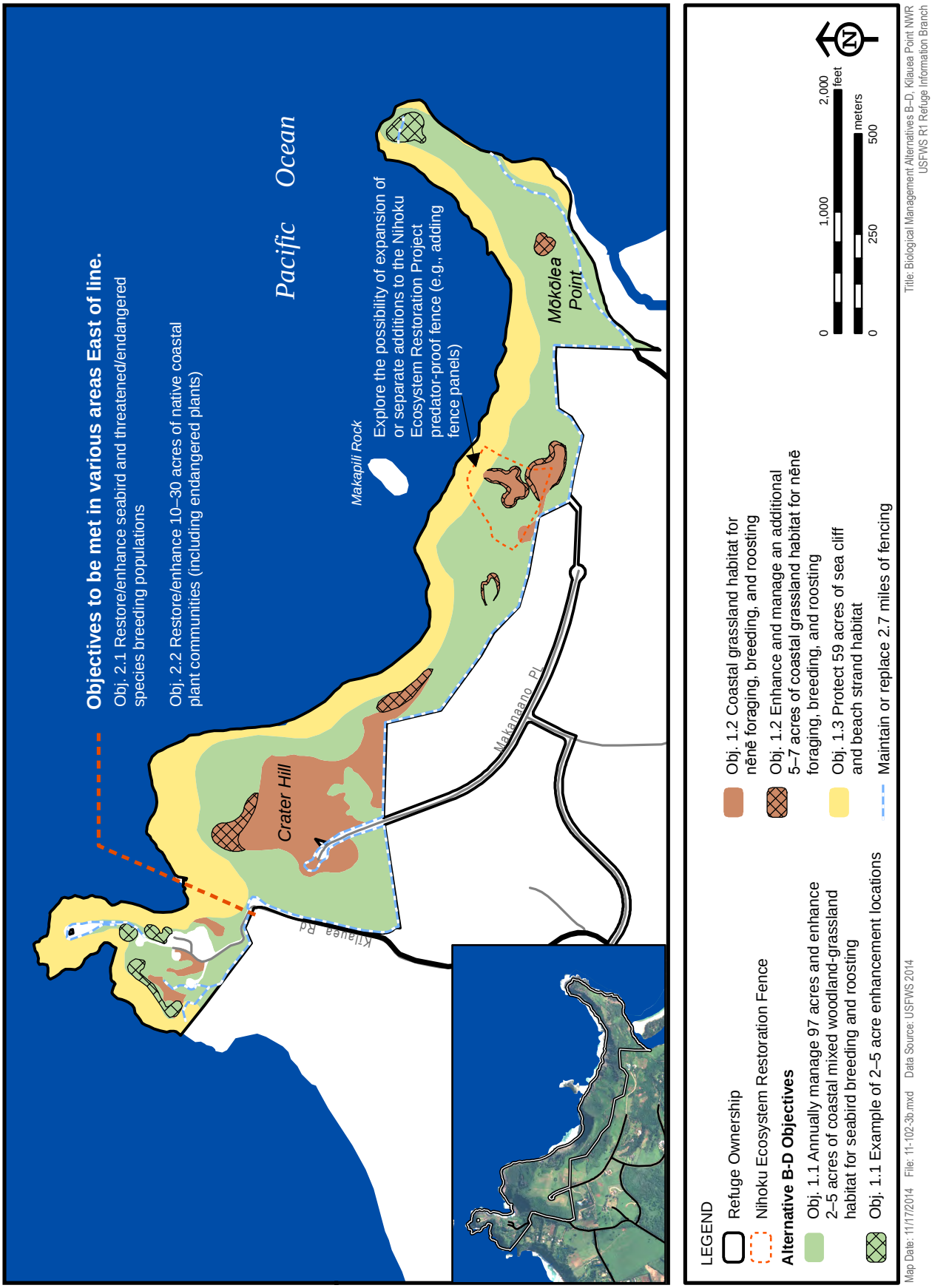
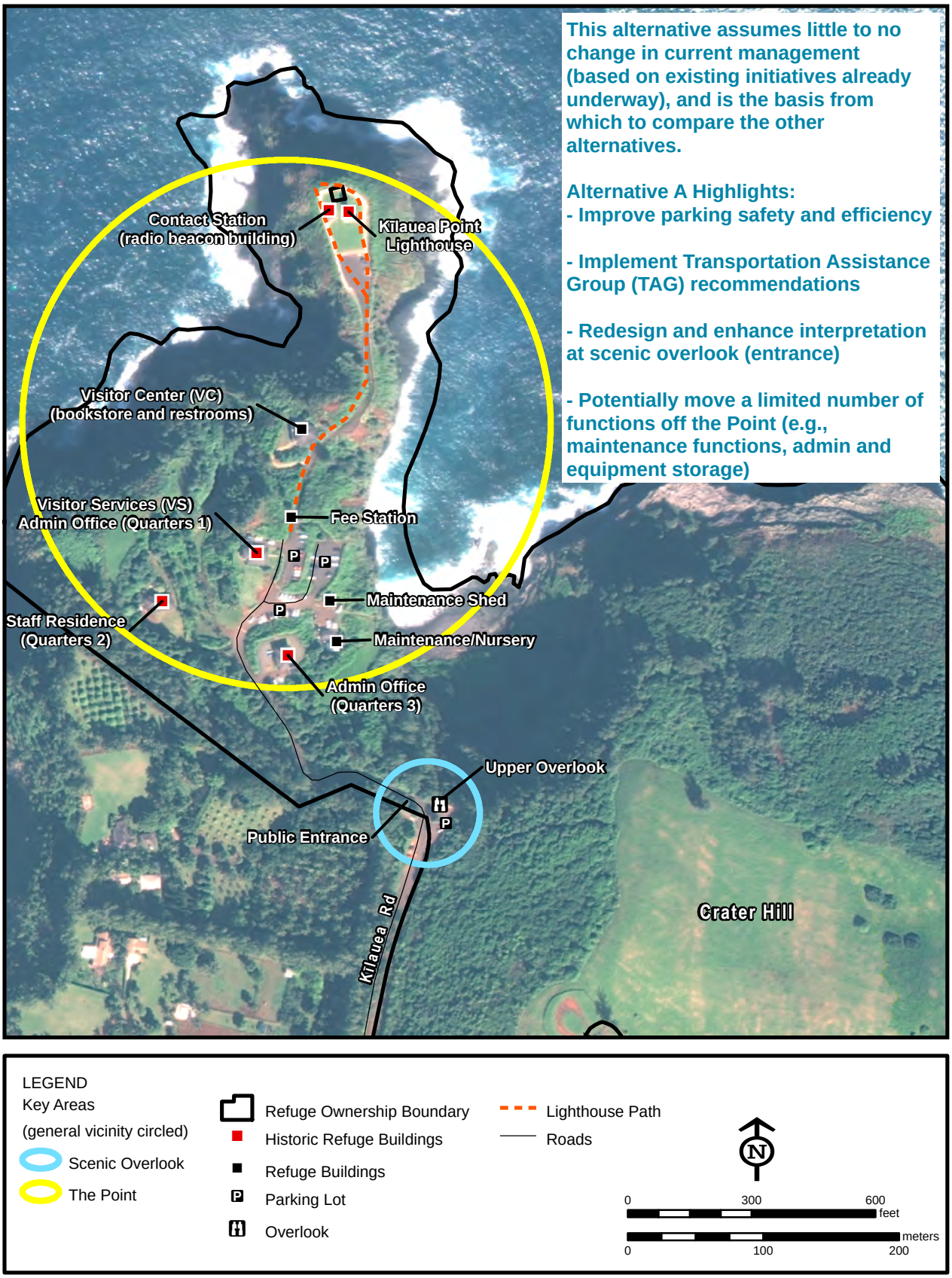


Figure 2-3. Public Use and Maintenance/Facilities Alternative A, Kīlauea Point NWR.



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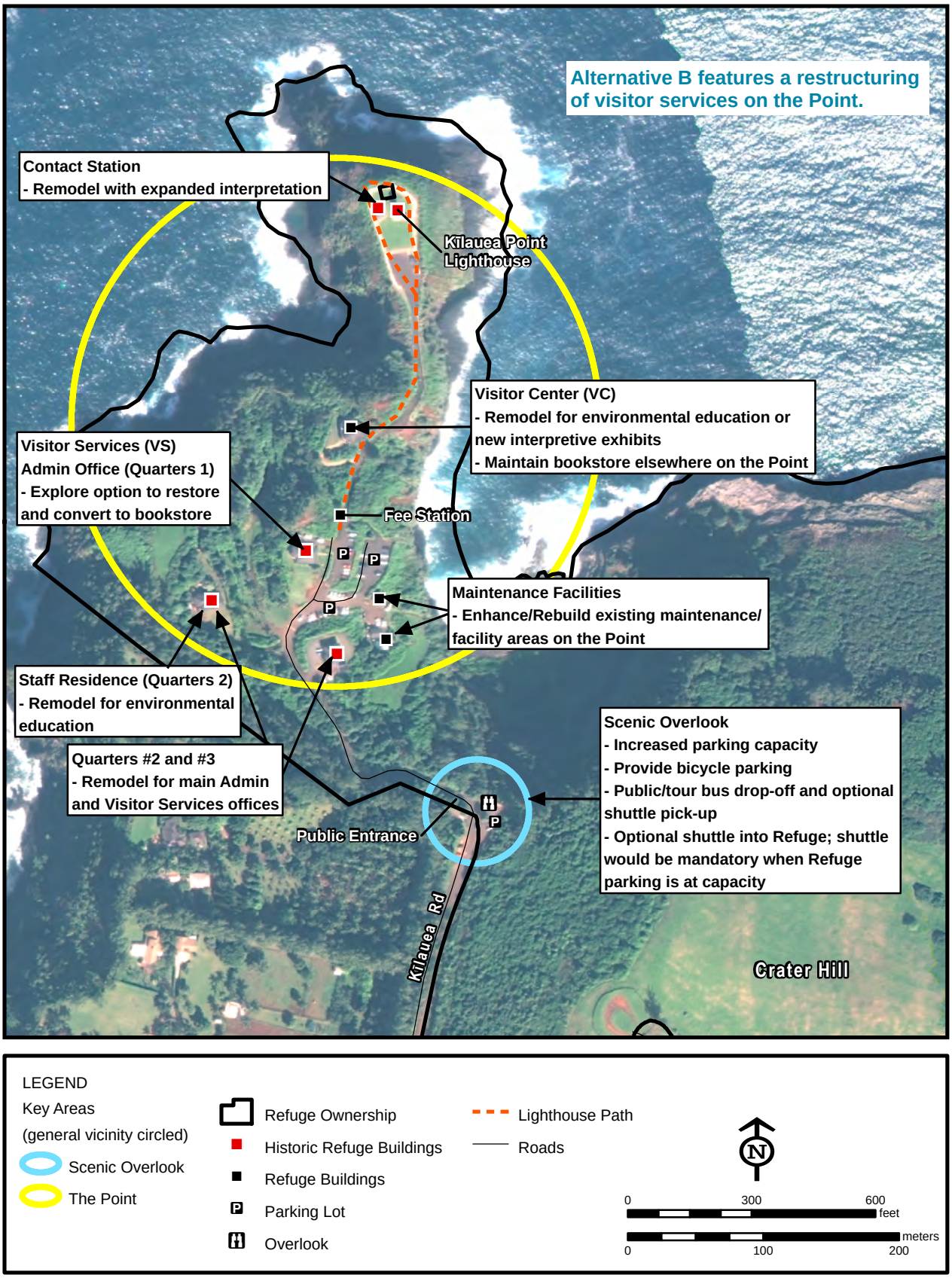
Data: USFWS 2014, DigitalGlobe 2010

Title: Public Use and Maintenance/Facilities Alternative A
USFWS R1 Refuge Information Branch

Figure 2-4. Public Use and Maintenance/Facilities Alternative B, Kīlauea Point NWR.



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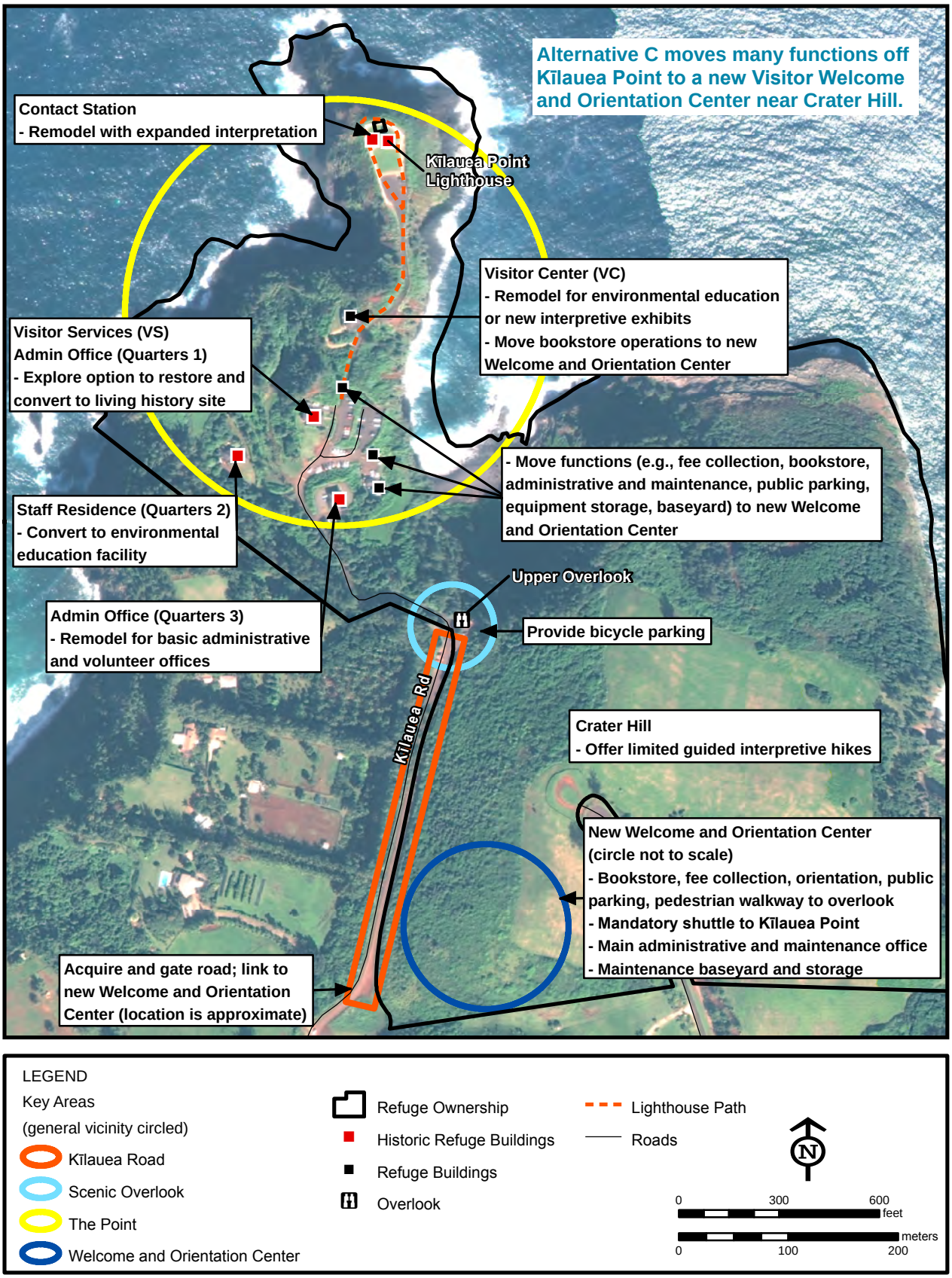
USFWS R1 Refuge Information Branch

Figure 2-5. Public Use and Maintenance/Facilities Alternative C, Kīlauea Point NWR.



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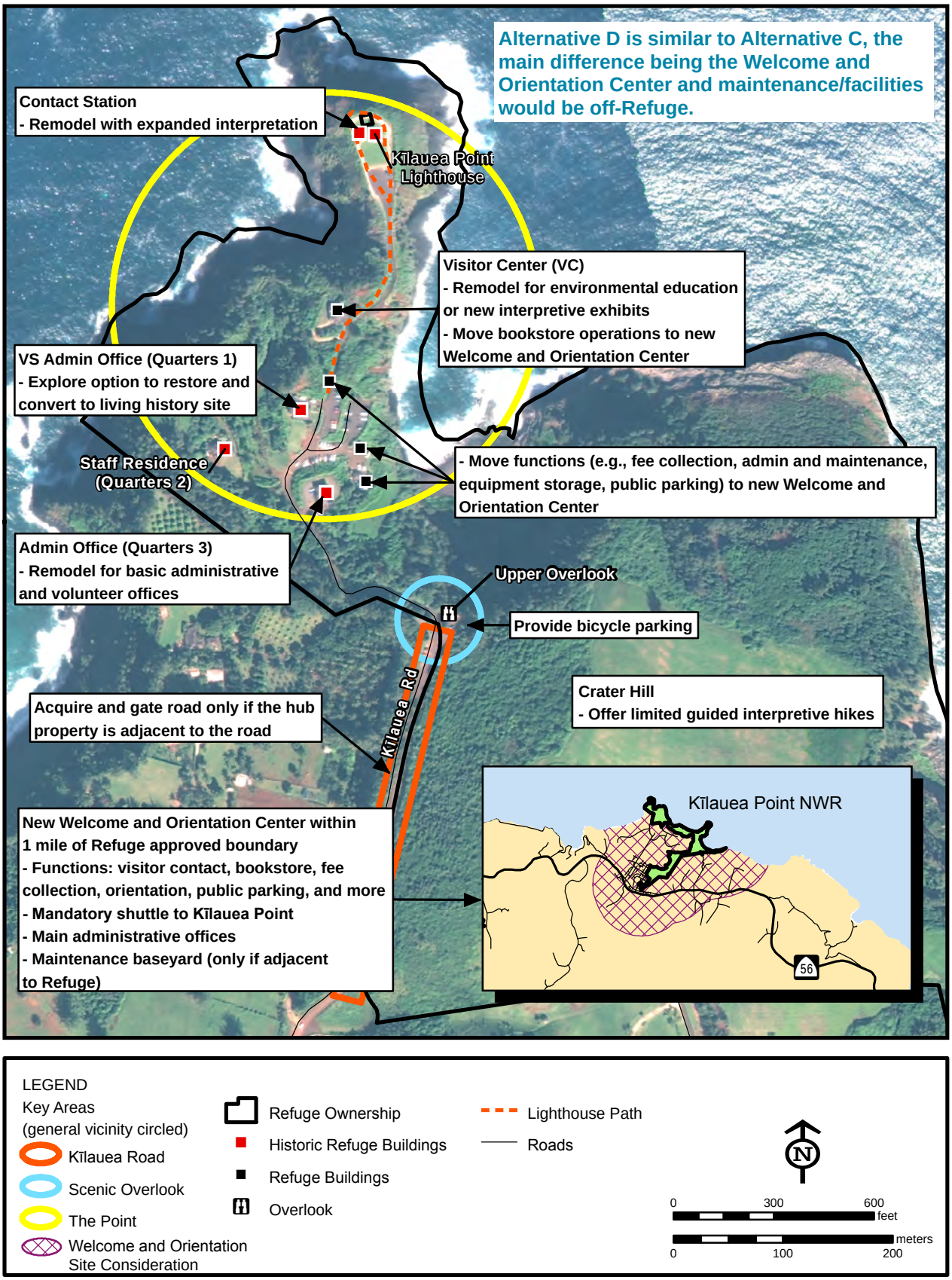
Title: Public Use and Maintenance/Facilities Alternative C
USFWS R1 Refuge Information Branch

Figure 2-6. Public Use and Maintenance/Facilities Alternative D, Kīlauea Point NWR.



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Title: Public Use and Maintenance/Facilities Alternative D
USFWS R1 Refuge Information Branch

Chapter 3
Physical Environment

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Chapter 3. Physical Environment

The Hawaiian Archipelago is the world's most isolated group of islands, lying approximately 2,400 miles southwest of San Francisco, CA. Apart from Niʻihau, the island of Kauaʻi is the oldest and northernmost island of the eight main Hawaiian Islands in the Hawaiian Archipelago. Located 103 miles northwest of Honolulu, Kauaʻi is near the middle of the Pacific Ocean and south of the Tropic of Cancer. Commonly referred to as "The Garden Isle," Kauaʻi Island is characterized by its lush, green environment and high average rainfall. Kauaʻi is approximately 550 square miles and is approximately 30 miles in diameter. A 75-mile coastal state highway circumnavigates nearly the entire island (USFWS 1989). A 2-mile County road (Kīlauea Road) connects the Refuge to the Kuhio Highway, state route 56. The Refuge is situated in the mokuʻaina (district) of Koʻolau near Kīlauea Town (Hawaiʻi Department of Education 2001). The Daniel K. Inouye Kīlauea Point Lighthouse is situated on the northernmost point in the Hawaiian Island chain.

3.1 Climate

3.1.1 General Climate

Climatic conditions on the island of Kauaʻi are dominated by northeasterly tradewinds approximately 70 percent of the year. Tradewinds bring warm, tropical, moisture-laden air to Kauaʻi. As a result of the steep topography, the northern and eastern (windward) sides of Kauaʻi have heavier rainfall than the drier south and west (leeward) sides. Traditionally, only two seasons were recognized in Hawaiʻi: *kau*— the warm season occurring from May to October that is characterized by northeast winds and an overhead sun, and *hoʻoilo*— the cold season, occurring from October to April and characterized by cooler temperatures, rain, variable winds and a lower sun (Seimers 2009, Juvik and Juvik 1998). Temperatures during the winter months on Kauaʻi range from 65 ºF to 81 ºF. Summer temperatures range from 72 ºF to 88 ºF (USFWS 2007). Average annual air temperature is approximately 73 ºF (Berg et al. 1997).

Prevailing ocean currents surrounding the island influence weather patterns by moderating the surface air temperatures as a result of differential heat absorption and advection of heat. Ocean currents in the Hawaiian Islands are moderated by the North Pacific anticyclone, a clockwise gyre that extends from the tropics to the North Pacific (Juvik and Juvik 1998, Lau and Mink 2006). Storm-generated ocean swells are common throughout the year. The north and west shores are pounded by fierce North Pacific winter storms.

Kīlauea Point NWR is directly exposed to the northeast tradewinds. A variable 10–20 mile-per-hour (mph) tradewind blows across the Refuge during most of the year. During strong wind conditions, which are not uncommon, the winds increase to 20–35 mph (USFWS 1989).

Rainfall in the main Hawaiian Islands averages 75–90 inches a year. However, extreme variation in rainfall across the islands is a result of orographic lifting. The wide range of rainfall patterns results in a diversity of environmental settings, ranging from rain forests (more than 100 inches) to mesic forests (50–100 inches) to semiarid deserts (less than 50 inches). As tradewinds drive the warm, moist air up on the windward side of an island, the air is cooled. On Kauaʻi, air is forced up the steep slopes of Mount Waiʻaleʻale and its highest peak, Kawaikini (Blay and Seimers 2004). As air rises and cools, it cannot hold as much moisture and condensation and so precipitation occurs.

Often referred to as one of the wettest places on Earth, the plateau of Kaua‘i reaches elevations of 5,148 feet at Wai‘ale‘ale and 5,243 feet at Kawaikini and is directly exposed to tradewinds ascending abruptly over precipitous pali (cliffs). Average annual rainfall at Wai‘ale‘ale is 444 inches (Juvik and Juvik 1998). Water drains across the Olokele Plateau into the Alaka‘i Swamp. The rain shadow effect is demonstrated by the dry, semi-arid, leeward, west side of the island (Blay and Seimers 2004). Average rainfall for Waimea Town on Kaua‘i’s west side is 12–15 inches per year. In contrast, Kīlauea Town receives an average of 50–60 inches per year (USFWS 2007). Average annual rainfall at Kīlauea Point is 67.4 inches with the highest rainfall occurring November to March and the least amount of rainfall in the summer months (USFWS 1989). The Kīlauea area historically has experienced periods of exceptional rainfall. The most extreme instance of record occurred in Kīlauea during the storm of January 24–25, 1956. The Kīlauea Sugar Plantation Office recorded over 38 inches of rain in a 24-hour period (NCDC 2001).

On Kaua‘i, there are differences between winter and summer rainfall. About 58 percent of rain typically falls during the 6 months between November and April, the remaining 42 percent between May and October (USFWS 2005).

There are four classes of disturbances that create major storms: cold fronts, low pressure systems, true tropical storms, and instances of severe weather attributed to low pressure systems in the upper atmosphere (NCDC 2001).

Long periods of rainfall in the winter are a result of Kona storms or low pressure systems from the west (Seimers 2009). Cold fronts associated with low pressure systems move north of the Hawaiian Islands in the prevailing westerly winds between October and April. This results in severe cloud cover, heavy rains, and occasional thunderstorms. Because of its northwesterly location, Kaua‘i receives more cold front storms than the other islands and can receive up to 20 cold fronts per year (NCDC 2001, Juvik and Juvik 1998).

Episodic oceanic and atmospheric events such as the El Niño/Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO) also influence climate in the islands during specific intervals. In El Niño years, average sea surface temperatures in the central and eastern equatorial Pacific Ocean are warmer than average and the easterly trade winds in the tropical Pacific are weakened. La Niña is characterized by the opposite—cooler than average sea surface temperatures and stronger than normal easterly trade winds. These changes in the wind and ocean circulation can have global impacts to weather events. ENSO usually results in light tradewinds and drier conditions in the western Pacific (Duffy 1993). During previous ENSO years in Hawai‘i, average rainfall has dropped below historical averages (Chu and Chen 2005).

Like ENSO, PDO is characterized by changes in sea surface temperature, sea level pressure, and wind patterns. PDO is described as being in one of two phases: warm (positive) and cool (negative). During a warm phase, sea surface temperatures near the equator and along the coast of North America are warmer, while in the central north Pacific they are cooler. During a cool phase, the patterns are opposite. Within Hawai‘i, winter rainfall is negatively correlated with PDO (i.e., warm phase PDO winters tend to be warmer and drier than average while cool phase PDO winters tend to be cooler and wetter than average) (Chu and Chen 2005). A single warm or cool PDO phase lasts 20–30 years. The triggering cause of PDO phase shift is not understood.

Hurricanes are not uncommon in the Hawaiian Islands. In 1950, Hurricane Hiki was the first recorded hurricane in Hawai‘i and passed within 150 miles northeast of Kaua‘i. Kīlauea Lighthouse recorded sustained windspeed of 68 mph. In 1987, Hurricane Nina passed the northern coast of Kaua‘i, and in 1959, Hurricane Dot had the highest wind gust recorded of 103 mph at Kīlauea Lighthouse (Wilson 1980). Two recent hurricanes caused damage to the Refuge. Winds of over 90 mph were registered from Hurricane Iwa in 1982 (USFWS 1989). The eye of Hurricane ‘Iniki passed directly over Kaua‘i on September 11, 1992. With 145 mph winds, Hurricane ‘Iniki was classified as a Category 4 hurricane on the Saffir-Simpson scale (NCDC 2001). It was the most devastating hurricane recorded in Hawai‘i’s history (Juvik and Juvik 1998). Though no major wildlife losses were recorded (with the exception of some shearwater chicks and young boobies), infrastructure was significantly damaged or destroyed. This included damage to the Kīlauea Lighthouse lens room and Fresnel lens, office building, two residences and detached garages, visitor center, environmental education building, and maintenance buildings. Additionally restored native coastal vegetation on Kīlauea Point was washed or blown away. The Refuge was closed to the general public from 1992 to 1994 as a result.

3.1.2 Climate Change

The terms “climate” and “climate change” are defined by the Intergovernmental Panel on Climate Change (IPCC). The term “climate” refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007). The term “climate change” thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (Ibid).

The greenhouse effect is a natural process by which greenhouse gases (GHG) such as water vapor (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), and ozone (O_3) absorb infrared radiation emitted by Earth's surface, by the atmosphere itself, and by clouds. These gases also trap heat within the surface-troposphere system (IPCC 2007), heating Earth's surface and the lower atmosphere. CO_2 is produced in the largest quantities, accounting for more than half of the current impact on Earth’s climate.

There is consensus in the scientific community that Earth’s climate has been rapidly changing and that changes in atmospheric composition are the primary drivers (Bierbaum et al. 2007, USGCRP 2009, EPA 2012). Although climate variations are well documented in Earth’s history, even in relatively recent geologic time, the current warming trend differs from shifts earlier in geologic time in two ways. First, this climate change appears to be driven primarily by human economic activities, such as deforestation and the burning of fossil fuels, which results in a higher concentration of atmospheric GHG. Second, atmospheric CO_2 and other GHG, levels of which are strongly correlated with Earth’s temperature, are now higher than at any time during the last 800,000 years (USGCRP 2009). Prior to the start of the Industrial Revolution in 1750, the amount of CO_2 in the atmosphere was about 280 parts per million (ppm). As of January 2014, atmospheric CO_2 was approximately 397.8 ppm (NOAA 2014).

Results of scientific analyses presented by the IPCC show that most of the observed increase in global average temperature since the mid-20th century cannot be explained by natural variability in climate, and is “very likely” (defined by the IPCC as 90 percent or higher probability) due to the

observed increase in GHG concentrations in the atmosphere as a result of human activities, particularly carbon dioxide emissions from use of fossil fuels (IPCC 2007, Solomon et al. 2007). According to the Fourth Assessment Report by the IPCC, global temperatures on Earth's surface have increased by 1.33 °F over the last 100 years. This warming trend has accelerated within the last 50 years, increasing by 0.23 °F each decade. Global ocean temperatures to a depth of almost 2,300 feet have also increased, rising by 0.18 °F between 1961 and 2003 (Solomon et al. 2007).

Global climate models offer a variety of projections based on different emission scenarios. Projected increases in global average surface temperature range from 1.1 ºF to 7.2 ºF by 2100, relative to 1980–1999 levels (IPCC 2007). However, IPCC is considered to be a relatively conservative source of climate change projections (Watson 2010, Scherer 2012). Pursuant to the assessment of the U.S. Global Climate Research Program, global average temperature is projected to increase 2.0 ºF to 11.5 ºF by 2100.

Climate Change in Hawai‘i

The global climate system affects regional and local-scale climate conditions in the Pacific Islands, including Hawai‘i. Detailed in the following sections, projected impacts to the region encompassing the Refuge include shifting rainfall patterns, changing frequencies and intensities of storms and drought, decreasing baseflow in streams, rising air and ocean temperatures, rising sea levels, and changing ocean chemistry (Leong et al. 2014). Small island groups are particularly vulnerable to climate change, sea level rise (SLR), and extreme events. The following characteristics contribute to this vulnerability: small emergent land area compared to the large expanses of surrounding ocean, limited natural resources, high susceptibility to natural disasters, and inadequate funds to mitigate impacts (IPCC 2007, Mimura et al. 2007). Thus, Hawai‘i is considered to have a limited capacity to adapt to future climate changes.

Atmospheric Events and Precipitation

Precipitation in Hawai‘i, which includes sea level precipitation and the added orographic effects, shows a steady and significant decline of about 15 percent over the last 15–20 years (Diaz et al. 2005, Chu and Chen 2005). These data are also supported by a steady decline in stream flow beginning in the early 1940s (Oki 2004). However, rain intensity (the type of rainfall that contributes to stream overflow and flooding and is not beneficial for aquifer replenishment) has increased by approximately 12 percent from 1958 to 2007 (Fletcher 2010).

The impact of climate change on water resources is dependent on shifts in precipitation amounts, evaporation rates, storms, and atmospheric processes such as ENSO and PDO. Based on the evidence of the history of ENSO and PDO events, it is likely that these cycles will continue far into the future. However, the potential influence of anthropogenic climate change on ENSO and PDO is unknown. While ENSO events have increased in intensity and frequency over the past decades, some longer-term records have not shown a direct link to climate change and do not predict significant changes in ENSO; however, a majority of climate forecasts do suggest an evolution toward more "El Niño-like" patterns. Most climate projections suggest that this trend is likely to increase rapidly in the next 50 years. Alternatively, other models predict more "La Niña-like" conditions in the Hawaiian Islands (Walther et al. 2002, Buddemeier et al. 2004, Timm 2008).

The exact impact of climate change on water resources is difficult to predict due to spatial variability. On a global scale, mean precipitation is anticipated to increase. Current climate models project that tropical Pacific and high latitude areas will experience increasing precipitation amounts, while precipitation is likely to decrease in most subtropical regions such as Hawai‘i.

Lack of rain could lower the amount of freshwater lens recharge and decrease available water supplies. Reduced rainfall or increased evaporation will cause a corresponding increase in the demand for residential, commercial, and agricultural water (Giambelluca et al. 1996, Solomon et al. 2007, Parry et al. 2007). Global climate modeling projects that net precipitation at sea level near the Hawaiian Islands will decrease in winter by about 4–6 percent near the Hawaiian Islands, with no significant change during summer (IPCC 2007). Downscaling output from global climate models suggest that wet-season (winter) precipitation will decrease by 5–10 percent, while dry-season (summer) precipitation will increase by about 5 percent by the end of the century under a moderate emissions scenario (Timm and Diaz 2009).

Most climate projections suggest that more intense wind speeds and precipitation amounts will accompany more frequent tropical typhoons/cyclones and increased tropical sea surface temperatures in the next 50 years. The intensity of tropical cyclones is likely to increase by 10–20 percent in the Pacific region when atmospheric levels of CO_2 reach double preindustrial levels (McCarthy et al. 2001). One model projects a doubling of the frequency of rainfall events of 4 inches per day and a 15–18 percent increase in rainfall intensity over large areas of the Pacific.

Rising Temperatures

A study examining temperature trends over an 88-year period (1919–2006) based on measurements from 21 temperature stations within Hawai‘i showed a long-term increase in temperature and an accelerated rate of increase in the last few decades (0.08 °F/decade for the full record versus about 0.3 °F/decade since 1975) (Giambelluca et al. 2008). In general, warming trends are lower for summer (May–October) and higher for winter (November–April), compared with the annual trends. Additionally, as with the annual trends, warming in both seasons has been greater for high elevation (i.e., greater than 0.5 miles or 800 meters above sea level) stations and for the most recent period. Temperature variation appears to have been tightly coupled to PDO, perhaps through regional sea surface temperature (SST) variation; however, since 1975, the air temperature trend has risen at a faster rate than can be explained by PDO and local SST trends.

These temperature fluctuations have the potential to impact precipitation and existing moisture zones which can influence forest structure composition. A change in forest structure could impact how well vegetation collects water from the atmosphere and during rainfalls and how much of this water gets infiltrated through the ground into aquifers and streams.

Sea Level Rise

According to the IPCC, the oceans are now absorbing more than 80 percent of the heat added to Earth’s climate system. This absorption has caused average global ocean temperatures to increase and seawater to expand. Additionally, the transfer of water mass from the land to the ocean from the heating and melting of ice-sheets, ice caps, and alpine glaciers also influences ocean levels. Scientific evidence suggests that the current, accelerated rate of global change began between the mid-1800s and 1900s (Church and White 2006, Jevrejeva et al. 2008, Church and White 2011). Based on

satellite altimeter measurements, the rate of globally averaged SLR since the early 1990s has been estimated to be 0.134 ± 0.016 inches per year (Nerem et al. 2010). This is twice the estimated rate for the 20th century as a whole based on tide-gauge reconstructions (reviewed by Bindoff et al. 2007). Sea-level projections using semi-empirical models based on statistical relationships between observed SLR and global temperature, coupled with projections of future global temperature, yield estimates of global SLR ranging from roughly 3 to 5 feet by 2100 (Rahmstorf 2007, Vermeer and Rahmstorf 2009, Grinsted et al. 2010).

Near Pacific Island ecosystems, local SLR is influenced by the rate and extent of global SLR, as well as changes in episodic events, such as ENSO, PDO, and storm-related conditions (Marra et al. 2012). Topography and exposure to normal and storm swell produce localized differences. Furthermore, it is important to note that shoreline sea levels are historically and currently influenced by isostatic tectonic changes as the islands move with the Pacific Plate, which are not due to global changes in sea level. Thus, sea level change in the Pacific is highly variable due to geologic uplift (Michener et al. 1997, Carter et al 2001).

Sea level around the Hawaiian Islands is rising by 6 to 14 inches per century (EPA 1998, Giambelluca 2008). The University of Hawai‘i Sea Level Center has estimated that between 1905 and 2006 mean sea level rose about 0.0417 inches per year. A similar estimate was derived from shallow core measurements of a fringing reef crest at Hanauma Bay, which concluded that O‘ahu is subsiding at a rate of 0.0394–0.0787 inches per year. Although most of this rise is due to isostatic sinking of the tectonic plate, global warming induced sea level increases have the potential to intensify this rise (Nakiboglu et al. 1983, Caccamise et al. 2005).

Globally, the potential for wetland loss due to inundation has been estimated at 22 percent, of which 70 percent is due directly to SLR and other human factors. It is estimated that a rise of about 1.5 feet in sea level could lead to the loss of 50 percent of North American coastal wetlands. Inundation effects include changes in wetland communities, salinization of freshwater areas, movement of species, increased vulnerability of stressed species to disease, and changes in soil composition (Bedoya et al. 2008).

Ecological Responses to Climate Change

Evidence suggests that recent climatic changes have affected a broad range of individual species and populations in both the marine and terrestrial environment. Organisms have responded by changes in phenology (timing of seasonal activities) and physiology, range and distribution, community composition and interaction, and ecosystem structure and dynamics. For example, paleoecological studies have shown that the distribution of vegetation is highly influenced by climate. The reproductive physiology and population dynamics of amphibians and reptiles are highly influenced by environmental conditions such as temperature and humidity. For example, whether a sea turtle is male or female is determined by the temperature of the nest environment; thus, higher temperatures could result in a higher female-to-male ratio. In addition, increases in atmospheric temperatures during seabird nesting seasons could have an effect on seabirds and waterbirds through increased heat stress leading to mortality or inundation of breeding sites due to SLR or storm surge (Duffy 1993, Walther et al. 2002, Baker et al. 2006, Young et al. 2012).

Warming has caused species to shift toward the poles or higher altitudes and changes in climatic conditions can alter community composition. Increases in CO_2 levels can impact plant photosynthetic

rates, reduce water stress, decrease nutrient content, and lower herbivore weights. Climate change can increase the loss of species. Some of the characteristics that make species vulnerable include small population sizes, restricted or patchy ranges, occurrences at either high or low-lying areas, with limited climatic ranges, and narrow or specific habitat requirements—all characteristics of endangered species in Hawai‘i. Although there is uncertainty regarding these trajectories, it is probable that there will be ecological consequences (Vitousek 1994, Walther et al. 2002, Ehleringer et al. 2002).

The Hawaiian Islands were recognized in a report as one of ten places to save for endangered species in light of climate change (ESC 2011). Climate change has the potential to influence two important ecological issues in the State of Hawai‘i: endangered species and pest species. Species decline has resulted from habitat loss, introduced diseases, and impacts from pest species. Changes in climate will add an additional threat to the survival of these species. For example, warmer night temperatures can increase the rate of respiration for native vegetation, resulting in greater competition from pest plants. Furthermore, climate change may enhance existing pest species issues because alterations in the environment may increase the dispersal ability of flora or fauna. Species response to climate change will depend on the life history, distribution, dispersal ability, and reproduction requirements of the species (DBEDT and DOH 1998, Middleton 2006, Giambelluca 2008).

The Service is supporting regional Landscape Conservation Cooperatives. These cooperatives are public-private partnerships that recognize conservation challenges transcend political and jurisdictional boundaries and require a more networked approach to conservation—holistic, collaborative, adaptive, and grounded in science to ensure the sustainability of America’s land, water, wildlife, and cultural resources. The local version of these Landscape Conservation Cooperatives is the Pacific Islands Climate Change Cooperative (PICCC), headquartered in Honolulu, Hawai‘i, and working across the Pacific. The PICCC was established in 2010 to assist those who manage native species, island ecosystems, and key cultural resources in adapting their management to climate change for the continuing benefit of the people of the Pacific Islands. The PICCC steering committee consists of more than 25 Federal, State, private, indigenous, and nongovernmental conservation organizations and academic institutions, forming a cooperative partnership that determines the overall organizational vision, mission, and goals.

At the Refuge, climate change could, among other things, reduce the areal extent of beaches, including the small and secluded beach in the Kīlauea (East) Cove which is used by foraging shorebirds (e.g., ‘ulili, ‘akekeke, and kōlea), roosting seabirds (e.g., ‘iwa and ‘ā [brown boobies and red-footed boobies]), and by ‘īlio-holo-i-ka-uaua and honu as a haul-out site for resting and potentially for pupping and/or nesting; and, in the Kāhili Quarry area, by Refuge visitors for recreation. There may also be effects on Refuge vegetation communities and the wildlife they support; on the near-shore ocean environment which supports marine life preyed upon by Refuge sea and shore birds, and enjoyed by Refuge visitors; and on the waterway that drains to the ocean through Kīlauea River and adjacent riparian and wetland habitats. Additionally, high-island refuges like Kilauea Point could become increasingly important to sea and shore birds if the areal extent of their breeding, foraging, loafing, and other habitats on low-islands in the mid-Pacific Ocean are reduced or displaced as a result of sea-level rise.

Additionally, national wildlife refuges will be exploring options for more effective engagement with visitors on this topic. The 2010–2011 National Visitor Survey collected information about visitors’ levels of personal involvement in climate change as it relates to fish, wildlife, and their habitats, and

the visitors' beliefs regarding this topic (Sexton et al. 2011). Items draw from the "Six Americas" framework for understanding public sentiment toward climate change (Leiserowitz, Maibach, and Roser-Renouf 2008) and from literature on climate change message frames (e.g., Nisbet 2009). Such information provides a baseline for understanding visitor perceptions of climate change within the context of fish and wildlife conservation that can further inform related communication and outreach strategies.

For Kīlauea Point NWR, the majority of visitors believe the following regarding climate change as it relates to fish, wildlife, and their habitats:

- Future generations will benefit if we address climate change effects;
- It is important to consider the economic benefits to local communities when addressing climate change effects; and
- We can improve our quality of life if we address the effects of climate change.

The majority of visitors do *not* believe:

- There has been too much emphasis on the catastrophic effects of climate change.

Forty-two percent of visitors indicated that their experience would be enhanced if Kīlauea Point NWR provided information about how they could help address the effects of climate change on fish, wildlife, and their habitats. Framing the information in a way that resonates most with visitors may result in a more engaged public who will support strategies aimed at alleviating climate change pressures (Sexton et al. 2011).

3.2 Hydrology

The hydrologic processes that occur in the Hawaiian Islands are unique compared to continental landmasses or temperate zones. Drainage basins are typically small and streams are characterized by steep longitudinal profiles and numerous waterfalls (Lau and Mink 2006).

Rainfall contributes roughly 2.88 million gallons per day (mgd) to the water budget of Kaua‘i Island (County of Kaua‘i 2001). This rainwater recharges two vital water resources: groundwater and surface water.

Groundwater, which occurs beneath the surface, is the primary water resource in Hawai‘i. The major fresh groundwater systems are freshwater-lens or dike-impounded systems, which are below the water tables (USGS 2000). Groundwater can occur as a thin basal lens, as well as high-level aquifers where freshwater does not float on seawater (Juvik and Juvik 1998).

Surface water is water flowing in stream channels, lakes, ponds, or wetlands. This water originates from precipitation (e.g., direct rainfall, fog drip), surface runoff derived from rainfall, and groundwater seepage. Streams are classified as intermittent or perennial based on flow conditions. Perennial streams are streams that have continuous flow all year, whereas intermittent streams are those which normally cease flowing during certain times of the year. The longest flowing stream on Kaua‘i is the Waimea River/Po‘omau Stream, a perennial stream which flows 19.5 miles. Perennial streams, which are generally sustained by groundwater in aquifers, are usually restricted to the windward sides of islands that receive more rain (Juvik and Juvik 1998).

Prior to European settlement, water was controlled by the konohiki (headman) as part of the ahupua‘a system. Water was considered sacred; it was a gift from Kane I ka wai ola (Procreator in

the water of life), and delivered by Lono makua (the Rain Provider). The wai (water) was "life" for the farmer as it was necessary for kalo (taro), which was grown in the streams, valleys and springs.

Today, the use of water resources in the Hawaiian Islands is regulated by the State Water Code, Chapter 174C, and governed by the State Commission on Water Resource Management (CWRM). This agency issues permits to regulate the use of surface and ground water. Between 1988 and 1989, water users in Hawaiʻi were required to register their water sources and declare their water uses to CWRM (CWRM 1992). A water right is a legal entitlement to use a certain amount of water from a particular source for a beneficial use. Outside designated water management areas landowners have the right to "reasonable use" of underlying groundwater and riparian water, providing it does not harm the uses of other users (Miike 2004). Specific water rights for descendants of Native Hawaiians who inhabited the Hawaiian Islands prior to 1778 are discussed in Section §174C-101 of the State Water Code.

The Refuge is located in the Kīlauea watershed, which is a little over 8,000 acres. There are no hydrological features (e.g., streams, tributaries, ponds, lakes, groundwater) on the fee-owned areas of the Refuge. However, in the non–fee-owned and adjacent areas of the Refuge, there are several streams and freshwater ponds. To the east is Kīlauea River, a perennial stream that is 4 miles long and empties out to Kīlauea Bay via Kāhili Beach (also known as Rock Quarry Beach). It begins as two main streams coming off the Kamoʻokoa Ridge and from Mount Namahana (Halualanai and Puʻu Ka Ele streams) and converges southwest of the Refuge to become Kīlauea River. This river has an average flow of 8.21 cubic feet per second (USFWS 2007). There are also two waterfalls along the river makai (ocean side) of Kūhiō Highway. Intermittent tributaries run off Kīlauea River and include Kaluamakua and Wailapa. Additional intermittent streams to the east include Kulihaili and Pīlaʻa. To the west of the Refuge, Niu is categorized as a nonperennial stream, while Puʻukumu is a perennial stream and has a stream gage (USGS station number 16097900). Along the northern boundary of the Refuge are coastal waters, which are State-owned and managed. According to the State Department of Health's water quality classification, the coastal waters directly below the Refuge are classified as Marine Waters Class A (EPA 1988):

> It is the objective of this class of waters that their use for recreational purposes and aesthetic enjoyment be protected. Any other use shall be permitted as long as it is compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation in and on these waters. These waters shall not act as receiving waters for any discharge which has not received the best degree of treatment or control compatible with the criteria established for this class.

According to the Federal Emergency Management Agency's Flood Insurance Rate Maps, Refuge lands and surrounding areas are zoned X, which is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No based flood elevations or depths are shown within this zone. The Kīlauea River is in both Zones AE and VE; however, the Refuge sits well above this. Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. The 34- to 36-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone. Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the flood insurance studies by detailed

methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone (DLNR 2011).

3.3 Topography and Bathymetry

The Kīlauea River Valley provides drainage for the nearby mountains, mainly Kamoʻokoa ridge. The fee-owned part of the Refuge is higher in elevation, with the highest point on Crater Hill at 568 feet, as indicated by the USGS marker. Kīlauea Town itself is a flat plain.

3.4 Geology and Geomorphology

Kauaʻi, which is approximately 550 square miles, consists of a single great shield volcano that is deeply eroded and partly veneered from much later volcanic activity. The shield volcano was created by the extrusion from lava of the Waimea Canyon Volcanic Series during the late Pliocene Epoch. Following the cessation of the main volcanic-building event, there was renewed volcanic activity with the extrusion of the post-erosional Kōloa Volcanic Series. Rocks of the Kōloa Volcanic Series are generally characterized as thick flows of dense basalt extruded from dozens of vents and are associated with pyroclastic materials that form low cinder cones at the vent (Blay and Siemers 2004). Kauaʻi is unique among Hawaiian volcanoes because it lacks an obvious rift zone and also has a large caldera complex with a graben (depressed block of land bordered by parallel faults) (Juvik and Juvik 1998). Kauaʻi is also the oldest of the main Hawaiian Islands, with substrates aging from 3.8 to 5.6 million years.

Kīlauea Point is a volcanic cone complex that was formed later, during the vents of Kōloa volcanics (3.65–0.52 million years ago). It is the remnant of the former Kīlauea volcanic vent that last erupted about 500,000 years ago. Two islands, both formerly portions of this volcanic crater, lie off the coast (Mokuʻaeʻae and Makapili). Crater Hill is the highest peak, rising 568 feet from sea level. Due to coastal erosion, only about one-third of the Kīlauea volcano complex still exists, but at one time probably had a diameter of at least 1.2 miles (Blay and Siemers 2004). The east (Mōkōlea Point) and west flanks drop away approximately 200 feet. Slopes range from 10–70 percent (USFWS 1989).

According to the Kauaʻi County General Plan, the Refuge is also considered an important land form according to its heritage resources map.

3.5 Soils

The soils of Kīlauea Point and the adjoining Crater Hill consist primarily of Līhuʻe Silty Clay. Mōkōlea Point, Makapilli Rock, and the ocean cliff surrounding Kīlauea Point are exposed bedrock consisting of basalt and andesite. The soil type (Līhuʻe-Puhi association) is deep, nearly level to steep, well-drained soils that have a fine textured or moderately fine textured subsoil (Foote 1972). Adjacent areas to the Refuge are comprised primarily of oxisols (Līhuʻe-Puhi association, which make up about 12 percent of the island), which contain no more than 10 percent weatherable minerals, and low cation exchange capacity. Oxisols are always a red or yellowish color, due to the high concentration of iron (III) and aluminum oxides and hydroxides. In addition, they also contain quartz and kaolin, plus small amounts of other clay minerals and organic matter (Hue et al. 2010). The elevation of the Līhuʻe-Puhi soil association ranges from near sea level to 800 feet. Areas along the coast as well as bordering Kīlauea River are categorized as rough mountainous land, rough

broken land, rock outcrop association (which makes up 50 percent of the island). Such soils are well-drained to excessively drained, very steep to precipitous lands of mountains and gulches. The elevation of this soil association ranges from near sea level to 5,170 feet (Foote 1972).

Kīlauea town and the surrounding area have a history of agriculture (e.g., ranching, sugar plantation). These uses may have impacted present day soils (e.g., chemicals, soil composition). For instance, in the 1920s, Kīlauea Sugar Company planted ironwood to prevent wind erosion and stop the salt air from abrading cultivated crops. Introduction of this new vegetation type to the area may or may not have affected soils (USFWS 1989).

3.6 Fire

Unlike the continental United States where fire can play a large role in ecosystem function and species adaptations, fire is a relatively infrequent disturbance regime in Hawaiian ecosystems. The two primary sources of natural fires are lava flows and lightning strikes (Mueller-Dombois and Lamoureux 1967, Mueller-Dombois 1981, Smith and Tunison 1992). Most ecologists agree that natural fire has not played a significant ecological or evolutionary role in most Hawaiian ecosystems. Most native vegetation is not conducive to fire spread, producing low fuel loads and/or litter of relatively low flammability. When fires did occur, they probably did not spread quickly or extensively due to the patchiness inherent in native habitats. While fires certainly occurred, they were not a formative force in the distribution or type of vegetation found in native Hawaiian habitats. However, early Polynesians used fire to clear much of the native forests of Hawaiʻi for agricultural purposes. In the past 200 years, a vast array of nonnative plants and animals have been imported and released into the Hawaiian landscape. The contemporary fire regime in the alien dry grasslands is one of moderate intensity, high frequency (less than 35 years) stand replacement fires that perpetuate the dominant grasses. Under this fire regime, burns are typically complete with little patchiness except under low fire intensity weather conditions, where rock outcrops limit fuel loading, or where fires burn into mixed fuels or another vegetation type. With very few exceptions, fires in these systems benefit alien species and exclude natives. No native species has ever been shown to successfully compete with alien grasses after successive fires.

Most of the vegetation at KPNWR is degraded coastal woodlands (scrub, shrub, and forest) with large open areas of grass. Due to the mild climate, the vegetation on and adjacent to the Refuge experiences a year-round growing season. The exposed nature and strong winds of many areas on the Refuge increase chances of wildfire onsite.

A Cooperative Fire Protection Agreement between the Kauaʻi County Fire Department and the KNWRC was established for initial attack, suppression, and mop-up of wildfires within Refuge lands on Kauaʻi. No prescribed burning has occurred on the Refuge; only small piles of vegetation debris have been burned.

The KNWRC has a Wildland Fire Management Plan that was completed in 2004. Small-scale prescribed burns might be occasionally necessary as a method of disposal of woody debris. Prescribed burns would also require individual burn prescriptions. A Hawaiʻi State Department of Health (HDOH) burn permit may also be necessary for each prescribed burn to minimize effects on air quality. The prescribed fire season is expected to be from September to February. Conditions for the permit would exclude specified time periods (“no-burn” days) as broadcast by the National Weather Service.

3.7 Environmental Contaminants

In 2011, a contaminants assessment was conducted for the Refuge, and it concluded that no major contaminant issues existed at that time (USFWS 2011). Historically, however, contaminants did exist on the Refuge. Built in 1913 as a navigational aid for commercial shipping between Hawai‘i and Asia, Kīlauea Lighthouse guided ships and boats safely along Kaua’i’s rugged north shore for 62 years. The lighthouse contains a unique Fresnel lens that weighs about 4.5 tons and was designed to “float” on mercury and pressurized air. In 1998 a mercury leak was discovered by a maintenance worker while chipping rust off the ceiling between the second and third floors. In October 1998 the mercury was cleaned by a hazmat team and properly disposed of. A follow up inspection showed that mercury was no longer present in the clean-up zone or surrounding areas (Paglinawan 1998).

A Formerly Used Defense Site (FUDS) exists on the Refuge but should no longer be a source of contaminants. Previous records, studies, and interviews indicate the Kīlauea Radar Station was constructed by the U.S. Army Corps of Engineers shortly after the outbreak of World War II between 1941and 1942. Records indicate that the station was one of three radar installations located on the island of Kaua‘i. The station was constructed on the highest point of the Crater Hill parcel and included two tunnels (one for radio and one for radio operations), an electrical generation plant, and a 200-foot radar tower. Records indicate after the war, former landowner Kīlauea Plantation used one of the tunnels as a storage area for explosives. An underground tank used to hold petroleum products was removed from the site (Dept. of the Army 1991).

An internal Service environmental compliance audit report was performed in August 2010 for KPNWR. The purpose of the audit was to assess compliance status with Federal, State, and local environmental regulations. This also included compliance with all DOI and Service policies, Executive orders, and any other applicable requirements. Eight findings related to some management categories (hazardous, toxic, pesticide, petroleum/oil/lubricants) were identified for corrective action (mostly related to improving storage, labeling, and training).

3.8 Air Quality

Due to the tradewinds experienced year-round on Kaua‘i, as well as the low population and development on the island, air quality is not considered a problem. However, due to an active volcano on the island of Hawai‘i, air quality is periodically affected by vog (volcanic smog) depending on the eruption and prevailing winds, although Kaua‘i is the least impacted, being farthest away from Hawai‘i Island. The HDOH, which began monitoring activities in 1957, manages several air quality monitoring stations found on O‘ahu, Maui, and Hawai‘i Islands. These stations monitor pollutants to assess air quality compliance with State and Federal standards (standards can be found at http://hawaii.gov/health/environmental/air/cab/index.html, link “Federal and State Ambient Air Quality Standards).

Air quality regulations in the U.S. are based on a set of air quality standards, which are the National Ambient Air Quality Standards. These standards are set to protect the public health and welfare and determine if areas are in attainment or nonattainment. HDOH monitors carbon monoxide, hydrogen sulfide, nitrogen dioxide, ozone, fine particulate matter (10 and 2.5 micrometers), lead, and sulfur dioxide. Only O‘ahu, Maui, and Hawai‘i Islands are monitored for these pollutants. There is a monitoring station on Kaua‘i, but it is a special purpose monitoring station, located at Niumalu, that

monitors specifically for cruise ship emissions. This station was made operational in 2010. A previous monitoring station was also located in Līhu‘e, but only monitored for particulate matter 10 and was closed in 2007 (Kihara pers. comm. 2011).

Air quality concerns on Kaua‘i center on the west side, where a major power generation facility and most of the large-scale agriculture and military facilities are found. The Air Quality Index (based on measuring ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide) for Hawai‘i is considered to be satisfactory with air pollution posing little to no risk. In 2009, the State was in attainment of all National Ambient Air Quality Standards (excluding exceedances due to volcanic activity). A 5-year trend analysis of ambient air quality shows that, with the exception of particulate matter 10 (due to fireworks and construction activities), recorded pollutants are well below both State and Federal standards (DOH 2010).

Additional air quality-related emissions involve GHG. In 2007, it was estimated that approximately 24,270,000 metric tons of GHG emissions were produced in Hawai‘i, with transportation and electric power comprising 88 percent of the total emissions. Kaua‘i contributed 3 percent to the total State emissions, with a majority of this 3 percent composed of the transportation and electric power sectors (DBEDT 2008). These estimates do not include fuels that were exported, used on international aircraft or ship operations, or used by the military in the State. Additionally, Hawai‘i is developing means to reduce its GHG emissions. In 2007, the State of Hawai‘i enacted Act 234, which set a goal to reduce GHG emissions to 1990 levels by 2020.

An internal Service environmental compliance audit report was performed in August 2010 for Kīlauea Point NWR. The purpose of the audit was to assess compliance status with respect to Federal, State, and local environmental regulations. This included compliance with all DOI and Service policies, Executive orders, and any other applicable requirements. The August 2010 audit showed no major findings of violations of air emissions management.

3.9 Water Quality

On Refuge-owned lands, there are no hydrological features, so water quality is not assessed. However, Kīlauea River (which runs through the boundary of the Refuge on non-Refuge owned lands) is listed on the EPA 303(d) List of Impaired Waters for turbidity (HDOH 2008).

Heavy rainfalls are a factor for water quality because during such floods and storms, debris and sediments are washed downriver.

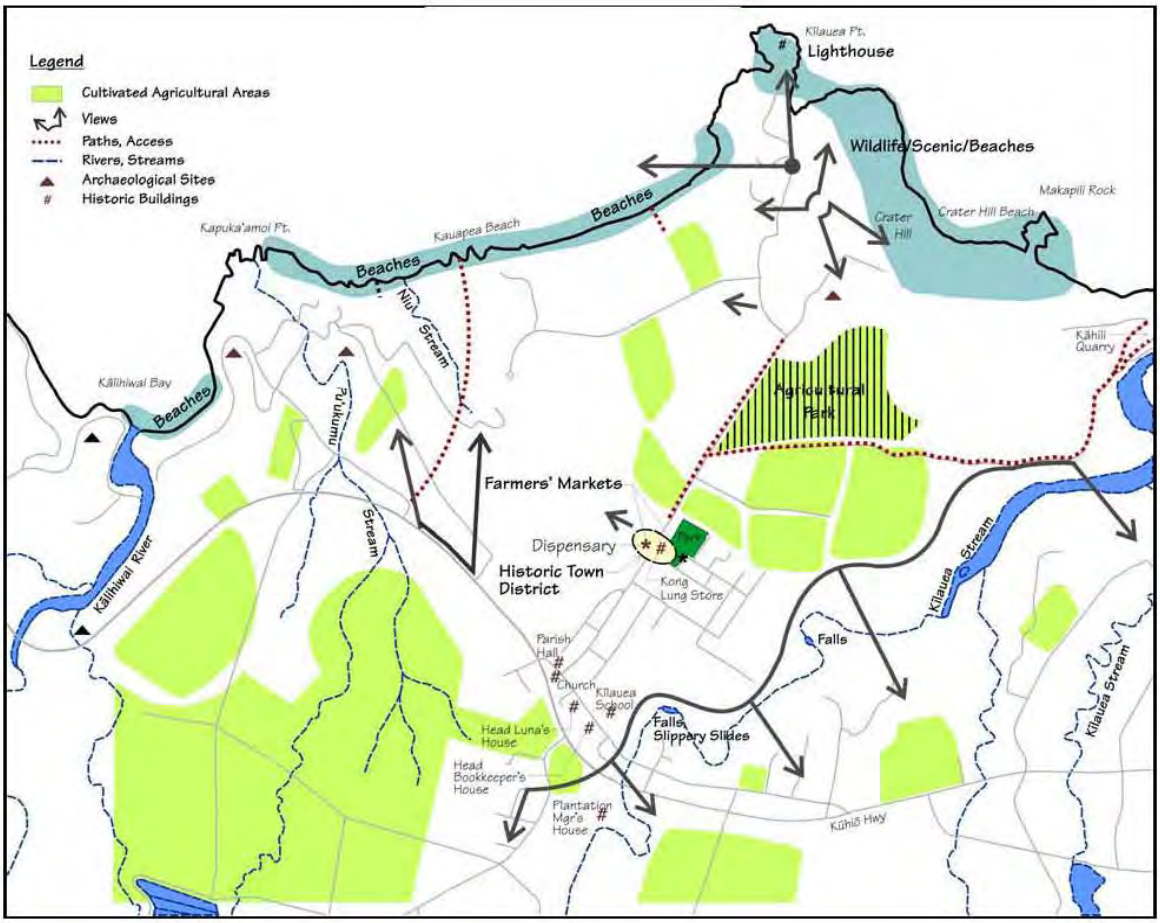
An internal Service environmental compliance audit report was performed in August 2010 for Kīlauea Point NWR. The purpose of the audit was to assess compliance status with respect to Federal, State, and local environmental regulations. This also included compliance with all DOI and Service policies, Executive orders, and any other applicable requirements. The August 2010 audit showed no major findings of violations of water quality management.

3.10 Visual Quality

The dramatic views of the coastline from the areas open to the public on the Refuge are commonly photographed by visitors. The lighthouse and the peninsula on which it stands are also commonly photographed sites (both from the ground and aerially) with images often used for tourism and sight-seeing/attractions related purposes.

The Kīlauea town plan also identifies views as part of Kīlauea's assets (Figure 3-1) and a desire to retain Kīlauea's rural charm and scenic landscapes.

Figure 3-1. Kīlauea Assets Map (County of Kaua'i 2006).



3.11 Surrounding Land Uses

Under the State Land Use Law (Act 187), Hawai'i Revised Statute Chapter 205, all lands in the State are classified into four districts: Agriculture, Rural, Conservation, and Urban. Conservation Districts, under the jurisdiction of the Hawai'i Department of Land and Natural Resources, are further divided into five subzones: Protective, Limited, Resource, General, and Special (Hawai'i Administration Rules, Title 13, Chapter 5). The other three districts are under the jurisdiction of the counties.

Most of the land in the Kīlauea area is private property, with some County (about 95 acres) and few State (a little over 4 acres) properties. Lands to the south of the Refuge are part of Kīlauea town, which includes residential areas, schools, a County park, and commercial properties (e.g., stores, restaurants, markets). Areas of Kīlauea (lands west, south, and east of the Refuge) include high-end properties with large residential estates priced in the millions. Most of Kīlauea is zoned as agriculture with Kīlauea town proper (or commercial core) zoned Urban. Within the larger Kīlauea area are orchard operations to small farms specializing in organic produce (County of Kaua‘i 2006). Most of the Kīlauea area is identified as prime agricultural land under the State’s agricultural lands of importance.

Areas directly along the coast are zoned Conservation. Areas on and adjacent to the Refuge are also zoned as special management areas under the Coastal Zone Management Program (see figures in Chapter 1 for location maps and Chapter 5 for further information on towns). The Kaua‘i Public Land Trust (which is now part of the Hawaiian Islands Land Trust) also owns lands, for the purpose of conservation, within the Refuge boundary.

Within the expanded Refuge boundary, adjacent waterways (e.g., Kīlauea River) provide recreation (e.g., fishing, kayaking) and a beach area (Kāhili) that is used for picnicking, swimming, surfing, etc. The Hawai‘i Department of Land and Natural Resources manages the fisheries and aquatic resources in the Kīlauea River.

The coastal waters around the Refuge are also part of the Humpback Whale National Marine Sanctuary which is jointly administered by the State and NOAA. Directly north and to the west of Moku‘ae‘ae Rock/Sea Stack is a State marine managed area (bottomfish restricted fishing area).

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Chapter 4
Refuge Biology and Habitats

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Chapter 4. Refuge Biology and Habitats

This chapter addresses the biological resources and habitats of Kīlauea Point NWR; however, it is not an exhaustive overview of all species and habitats occurring within the Refuge. The chapter begins with a discussion of biological integrity; we then focus on the presentation of pertinent background information for the priority resources of concern and other benefitting species designated under the CCP. Background information includes descriptions, locations, conditions, trends, key ecological attributes, and threats (stresses and sources of stress) to the habitats and/or associated resources of concern. The information presented was used to develop goals and objectives for the CCP (see Chapter 2).

4.1 Biological Integrity, Diversity, and Environmental Health

The Improvement Act directs the Service to ensure that the biological integrity, diversity, and environmental health (BIDEH) of the Refuge System is maintained for the benefit of present and future generations of Americans. The Service's policy on BIDEH (601 FW 3) also provides guidance for consideration and protection of the broad spectrum of fish, wildlife, and habitat resources found on refuges and associated ecosystems that represent BIDEH on each refuge. The Refuge Administration Act, as amended by the Improvement Act, clearly establishes that wildlife conservation is the singular Refuge System mission. House Report 105-106 accompanying the Improvement Act states "…the fundamental mission of our System is wildlife conservation: wildlife and wildlife conservation must come first." BIDEH is a critical component of wildlife conservation.

BIDEH policy defines *biological integrity* as "the biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms, and communities." *Biological diversity* is defined as "the variety of life and its processes, including the variety of living organisms, the genetic differences among them, and communities and ecosystems in which they occur." *Environmental health* is defined as the "composition, structure, and functioning of soil, water, air, and other abiotic features comparable with historic conditions, including the natural abiotic processes that shape the environment." In simplistic terms, elements of BIDEH are represented by native fish, wildlife, plants, and their habitats, as well as those ecological processes that support them.

Biological integrity lies along a continuum from a completely natural system to a biological system extensively altered by considerable human impacts to the landscape. No modern landscape retains complete BIDEH. However, we strive to prevent the further loss of natural biological features and processes. Maintaining or restoring biological integrity is not the same as maximizing biological diversity. Maintaining biological integrity may entail managing for a single species or community at some refuges and combinations of species or communities at other refuges. Maintaining critical habitat for a specific endangered species, even though it may reduce biological diversity at the refuge scale, helps maintain biological integrity and diversity at the ecosystem or national landscape scale.

Historically, migratory and nonmigratory native birds and native coastal plant communities may have thrived in the Kīlauea Point area in some or most years and on multiple islands on much larger landscapes. This is supported by fossil and subfossil records of species in lowlands, previously thought to be restricted to higher elevations or other islands, including, ʻaʻo, ʻuaʻu, and nēnē (Burney et al. 2001). Native coastal ecosystems are among the most threatened ecosystems in the Hawaiian

Islands due to the long-term presence of humans and the negative effects of their actions—specifically, development, agriculture, fire, and the introduction of invasive species. Therefore, to conserve native plant and animal populations at larger landscape scales to support long-term regional conservation goals, we may manage habitats at the Refuge to maintain higher densities of native species than those that may have occurred historically at the Refuge level because of loss and degradation of surrounding habitat.

On refuges, we typically focus our evaluations of biological diversity at the refuge scale; however, these refuge evaluations can contribute to assessments at larger landscape scales. We strive to maintain populations of breeding individuals that are genetically viable and functional. Evaluations of biological diversity begin with population surveys and studies of flora and fauna. The Refuge System's focus is on native species and natural communities such as those found under historical conditions.

We evaluate environmental health by examining the extent to which environmental composition, structure, and function have been altered from historic conditions. Environmental composition refers to abiotic components, such as air, water, and soils, all of which are generally interwoven with biotic components (e.g., decomposers live in soils). Environmental structure refers to the organization of abiotic components, such as atmospheric layering, aquifer structure, and topography. Environmental function refers to the processes undergone by abiotic components, such as wind, tidal regimes, evaporation, and erosion. A diversity of abiotic composition, structure, and function tends to support a diversity of biological composition, structure, and function.

We strive to manage in a holistic manner the combination of BIDEH. We balance all three by considering refuge purposes, Refuge System mission, and landscape scales. Where practical, we support the return of extirpated native species in the context of surrounding landscapes. The elements of BIDEH for Kīlauea Point NWR are summarized in Table 4.1 below.

Table 4-1. Biological Integrity, Diversity, and Environmental Health.

Habitats	Historic habitat attributes	Historic natural processes responsible for these conditions	Current limiting factors
Coastal mixed woodland-grassland	Native-dominated coastal dry-mesic shrubland, mixed shrub and grassland, and mixed shrubland and forest communities with <45° slope. *Potential conservation species: nēnē, pueo, seabirds including mōlī, ka‘upu, ‘a‘o, and rare native coastal plant communities supporting threatened and endangered plants and endemic insects.*	Shallow, well-drained, highly erodible, saline, phosphorus-rich soils (e.g., guano); wind and water erosion; low annual precipitation; and grazing (geese).	Invasive species: ironwood, Christmasberry, lantana, haole koa, introduced mammalian and avian predators and scavengers and insect pests; ungulate rooting and grazing; climate change; human development; vehicular and human traffic.

Sea cliff	Native-dominated coastal dry-mesic shrubland, mixed shrub and grassland, and mixed shrubland and forest communities with >45° slope. *Potential conservation species: seabirds including ʻiwa, ʻā, ʻuaʻu kani, koaʻe kea and rare native coastal plant communities supporting threatened and endangered plants and endemic insects.*	Shallow, well-drained, highly erodible, saline, phosphorus-rich soils; wind, wave, and water erosion; and low annual precipitation.	Invasive species: ironwood, Christmasberry, lantana, haole koa, introduced mammalian and avian predators and scavengers and insect pests; climate change; human development; human trespass
Beach strand	Bare sand, gravel, or rock within or just above the tidal zone; sparsely vegetated by native- dominated coastal dry herbland and mixed communities. *Potential conservation species: ʻilio-holo-i-ka-uaua, honu, migratory shorebirds, ʻiwa, ʻā, and rare native coastal plant communities.*	Well-drained, sandy to rocky substrates; wind and water erosion; wave inundation; saline environment; low annual precipitation.	Invasive species: ironwood, Christmasberry, lantana, haole koa, introduced mammalian and avian predators and scavengers and insect pests; climate change; human trespass

4.2 Priority Resources of Concern

4.2.1 Analysis of Resources of Concern

In identifying resources of concern (ROCs), the team followed the process outlined in the Service's draft Identifying Refuge Resources of Concern and Management Priorities: A Handbook (USFWS 2010). As defined in the Service's Policy on Habitat Management Plans (620 FW 1), ROCs are:

> "all plant and/or animal species, species groups, or communities specifically identified in refuge purpose(s), System mission, or international, national, regional, state, or ecosystem conservation plans or acts. For example, waterfowl and shorebirds are a resource of concern on a refuge whose purpose is to protect 'migrating waterfowl and shorebirds.' Federal or State threatened and endangered species on that same refuge are also a resource of concern under terms of the respective endangered species acts (620 FW 1.4G)…"

Habitats or plant communities are ROCs when they are specifically identified in refuge purposes, when they support species or species groups identified in refuge purposes, when they support Refuge System ROCs, and/or when they are important in the maintenance or restoration of BIDEH.

As a result of this information gathering and review process, a comprehensive list of potential resources of concern was developed (Appendix E).

4.2.2 Selection of Priority Resources of Concern

Early in the planning process, the planning team cooperatively identified ROCs for the Refuge. Negative features of the landscape, such as invasive plants, may demand a large part of the Refuge management effort, but are not designated as ROCs. The step-by-step process to prioritize ROCs and management priorities for a refuge are displayed in Figure 4-1. The team then selected priority ROCs from the ROC list. The main criteria for selecting priority ROCs included the following requirements:

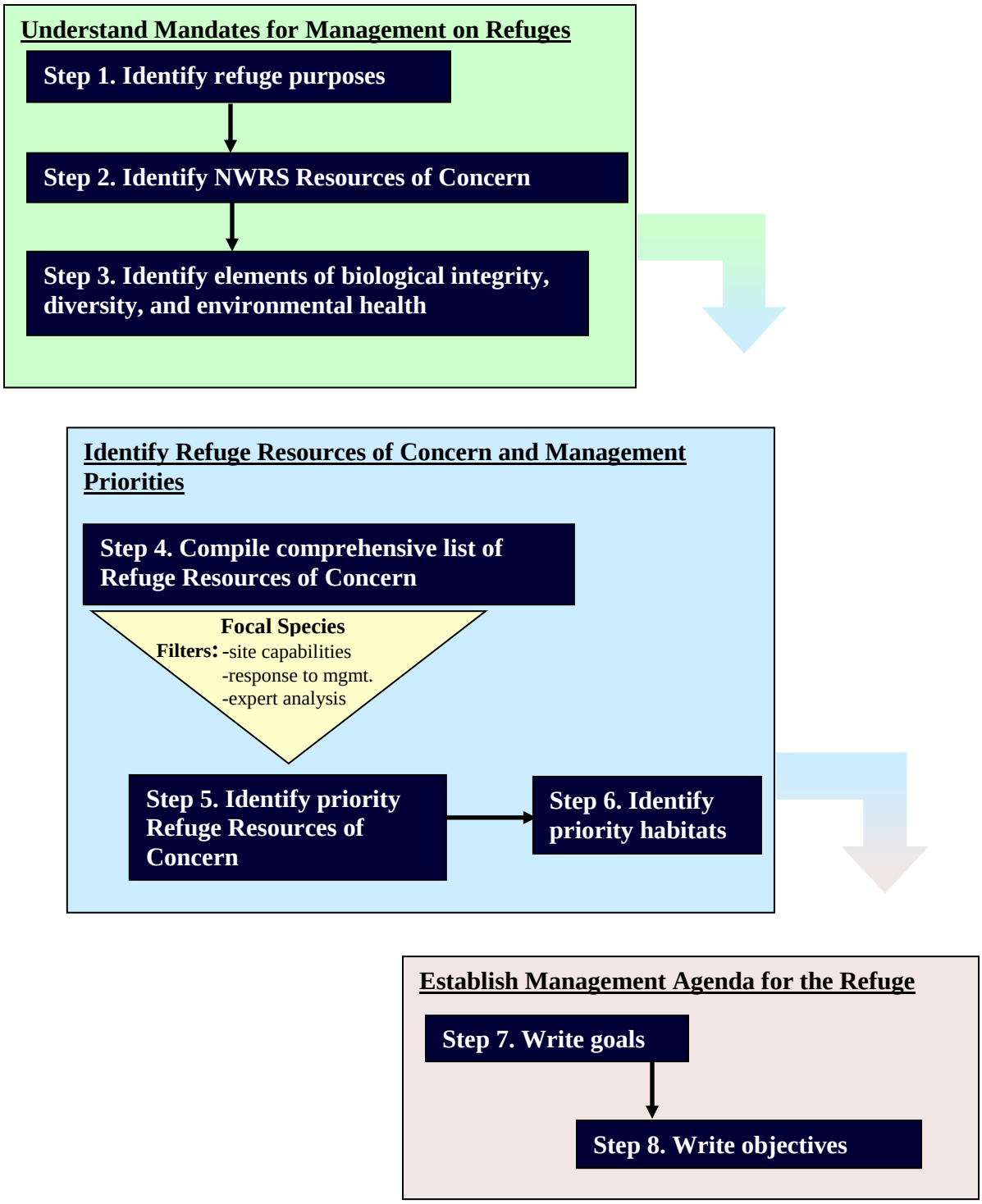
- The resource must be reflective of the Refuge's establishing purposes and the Refuge System mission;
- The resource must include the main natural habitat types found at the Refuge;
- The resource must be recommended as a conservation priority in the Wildlife and Habitat Management Review; or
- The resource must be federally or state-listed, a candidate for listing, or a species of concern.

Other criteria that were considered in the selection of priority ROCs included the following:

- Species groups and/or Refuge features of special management concern;
- Species contributing to the BIDEH of the ecosystem;
- Species where it is feasible to estimate abundance and distribution (needed for future monitoring and adaptive management).

In developing its listing of priority ROCs, the planning team selected not only species mentioned in establishing documents for the Refuge, but also species that captured the ecological attributes of habitats required by larger suites of species. The ecological attributes of habitats should meet the life history requirements of ROCs, and are therefore important to sustain the long-term viability of the priority ROC and other benefitting species. Ecological attributes of habitats include vegetation structure, species composition, age class, patch size, and contiguity with other habitats; hydrologic regime; and disturbance events. These provide measurable indicators that strongly correlate with the ability of a habitat to support a given species. Tables listing the desired conditions for habitat types found on the Refuge incorporate "desired" conditions that were based on scientific literature review and team members' professional judgment. These desired conditions for specific ecological attributes were then used to help design habitat goals and objectives, as presented in Chapter 2. However, not all ecological attributes or indicators were deemed ultimately feasible or necessary to design an objective around. Other factors, such as the Refuge's ability to reasonably influence or measure certain indicators, played a role in determining the ultimate parameters chosen for each habitat objective. Thus, ecological attributes should be viewed as a step in the planning process.

Figure 4-1. Overview of the process to prioritize resources of concern and management priorities for a refuge (USFWS 2010)



Limiting factors were also considered in developing objectives. A limiting factor is a threat to, or an impairment or degradation of, the natural processes responsible for creating and maintaining plant and animal communities. In developing objectives and strategies, the team gave priority to mitigating or abating limiting factors that presented high risk to ROCs. In many cases, limiting factors occur on a regional or landscape scale and are beyond the control of individual refuges. Therefore, objectives and strategies may seek to mimic, rather than restore, natural processes. For example, mowing may be used to maintain a desirable vegetation structure, when restoring native grassland communities may be impractical. Through the consideration of BIDEH, the Refuge will provide for or maintain all appropriate native habitats and species. Refuge management priorities may change over time, and because the CCP is designed to be a living, flexible document, changes will be made at appropriate times.

In the following sections, information is provided on the ecological processes of formation and maintenance, regional distribution, condition and threats, key species supported, and management activities for each priority ROC. A similar analysis is presented for focal resources following the analysis for Priority ROCs.

Tables describing focal resources associated with a particular habitat type are included at the end of each Priority ROC section in this chapter. Definitions for the column headings are as follows:

- **Focal Resources:** Species or species groups selected as representatives or indicators for the overall condition of the priority ROC. In situations where the conservation target may include a broad variety of habitat structures and plant associations, several different conservation focal resources may be listed. In addition, species with specific “niche” ecological requirements may be listed as a focal resource. Management will be focused on attaining conditions required by the focal resource. Other species utilizing the associated habitat type will generally be expected to benefit as a result of management for the focal resource.
- **Habitat Type:** The priority resource of concern utilized by the focal resource.
- **Desired Habitat Characteristics:** The specific and measurable habitat attributes considered feasible on the Refuge and necessary to support the focal resource.
- **Life History Requirement:** The general season of use for the focal resource.
- **Other Benefiting Species:** Other species that are expected to benefit from management for the selected focal resource. The list is not comprehensive.

Table 4-2 identifies the priority resources of concern for Kīlauea Point NWR. As native species are referenced by their Hawaiian names, Appendix K contains a list of all scientific, English, and Hawaiian names.

Table 4-2. Priority Resources of Concern

Focal Resources	Habitat Type	Habitat Structure	Life History Requirements	Other Benefiting Species
Mōlī/kaʻupu (albatrosses)	Coastal mixed woodland-grassland	Variable. Large windward sandy, grassy, or shrubby areas with open runways for take-off and landing.	Breeding, prospecting	ʻUaʻu kani, nēnē, koaʻe ʻula, ʻā, ʻiwa, kōlea and other shorebirds, associated native plant and insect communities
ʻAʻo/ʻuaʻu kani (shearwaters)	Coastal mixed woodland-grassland and sea cliff	Substrates with good soil or root structure, or sub-canopy layer for burrowing, rock and root crevices, with open flight corridors.	Breeding, prospecting	Nēnē, koaʻe ʻula, koaʻe kea, ʻa, ʻiwa, ʻou, associated native plant and insect communities
ʻĀ/ʻiwa (red-footed booby and frigatebird)	Coastal mixed woodland-grassland, sea cliff, and beach strand	Variable. Woody vegetation >1.5–3 ft tall	Breeding, roosting, prospecting	Koaʻe ʻula, koaʻe kea, ʻa, ʻiwa, ʻou, ʻaʻo, ʻuaʻu kani, associated native plant and insect communities
Nēnē/pueo	Coastal mixed woodland-grassland, sea cliff	Sward-forming grass-legume mix with high moisture content, managed <6 inches tall. Shrublands with an open understory, forage value, adjacent to grasslands.	Breeding, roosting, foraging	ʻUaʻu kani, koaʻe ʻula, mōlī, kaʻupu, kōlea, kioea, and other shorebirds, associated native plant and insect communities

Focal Resources	Habitat Type	Habitat Structure	Life History Requirements	Other Benefiting Species
‘Ilio-holo-i-ka-uaua/ honu	Beach strand	Protected, un-vegetated, or sparsely vegetated beaches with little to no human activity.	Hauling out and nursing (‘ilio-holo-i-ka-uaua), basking (honu)	Migratory shorebirds, ‘iwa, ‘ā, and rare native coastal plant communities.

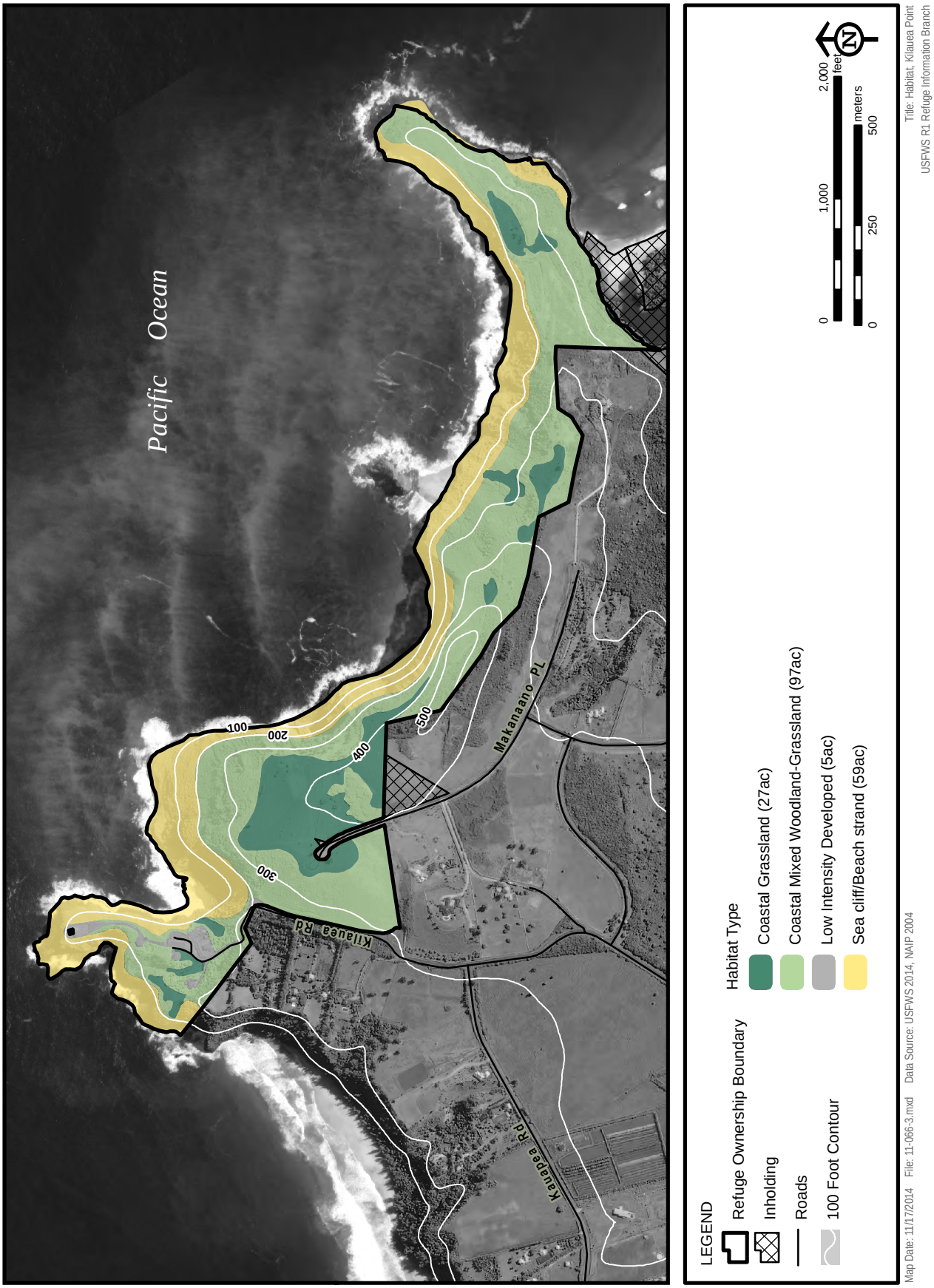
4.3 Primary Habitats

Plants that grow in the coastal zone and low elevation forests are rare in Hawai‘i as a result of development, agriculture, fire, and the introduction of pest species. Only 11 percent of lowland mesic and dry native plant communities remain intact on Kaua‘i, compared to 22 percent for all of the Hawaiian Islands combined.

Coastal habitats are designated as lands between sea level and 1,500 feet in elevation that are typically vegetated with salt-tolerant species and dispersed by wind, currents, and waves, but less capable of terrestrial migration. Strand species are highly influenced by the sea due to their location on the shoreline and adjacent areas. Strand environments can be harsh due to salt spray, constant wind, low rainfall, intense sunlight, high evaporation, high temperatures, and unstable sands. As a result, strand plants have developed a variety of adaptations to deal with these conditions, including moist stems, prostrate growth forms, thick cuticles, and small leaves that are succulent, hairy, or rosette. Because of these harsh conditions, species diversity is usually low in this habitat (Char and Balakrishna 1979, Tabata 1980, Wagner et al. 1999).

The Refuge consists of three primary habitats: coastal mixed woodland-grassland, sea cliff, and beach strand (Figure 4-2). Threats to these habitats include introduced mammalian predators and insect pests, invasive plants, ungulate rooting and grazing, climate change, human development, unregulated vehicular and human traffic, and trespassers.

Figure 4-2. Habitat, Kīlauea Point NWR.



The back sides of maps are blank to improve readability.

4.3.1 Coastal Mixed Woodland-Grassland

The coastal mixed woodland-grassland habitat consists of flats and bluffs with a <45° slope dominated by low-growing trees and shrubs and perennial herbs adapted for salt, wind, and low precipitation. The area contains shallow, well-drained, highly erodible, saline, phosphorus-rich soils. This habitat type is found along the entire length of the Refuge. Historically, this habitat probably consisted of native-dominated coast dry-mesic shrubland, mixed shrub and grassland, and mixed shrubland and forest communities. Currently, this area is important breeding habitat for all six species of breeding seabirds on the Refuge (mōlī, ʻuaʻu kani, ʻaʻo, koaʻe ʻula, koaʻe kea, ʻā), breeding and flocking habitat for endangered nēnē, wintering or stopover habitat for migratory shorebirds, and probably foraging and breeding habitat for pueo. Woody vegetation is dominated by ironwood, Christmasberry, and haole koa intermixed with patches of hala, naupaka kahakai, ʻakoko, ʻilima, pōhinahina, and pāʻūohiʻiaka. Grasslands are dominated by introduced species such as Kikuyu grass, Guinea grass, and lantana. These are areas that were historically grazed by livestock and now serve as managed grasslands for nēnē. The coastal mixed woodland-grassland habitat has the greatest potential to be stabilized, restored, and managed to benefit native plant and animal communities, including threatened and endangered species.

4.3.2 Sea Cliff

Sea cliff habitat is characterized by nearly vertical or vertical cliff faces with >45° slope and rocky, shallow, highly erodible substrates exposed to wind, rain, and sea. This habitat type is found along the coastline of the Refuge. Historically, this habitat probably consisted of native-dominated coastal dry-mesic shrubland, mixed shrub and grassland, and mixed shrubland and forest communities. Given the vertical topography and substrate of these areas, access is very difficult to hazardous. Because of its steep topography, the area appears to provide a refugium for seabirds and other native species from large mammalian predators and human disturbance. Currently, this area is important breeding habitat for ʻuaʻu kani, koaʻe ʻula, koaʻe kea, and ʻā and roosting habitat for ʻiwa, ʻā (brown boobies and red-footed boobies) and endangered nēnē. The sea cliffs are sparsely vegetated with ironwood, Christmasberry, and lantana with patches of hala, naupaka kahakai, ʻakoko, ʻilima, and pōhinahina.

4.3.3 Beach Strand

Beach strand habitat, consisting of small areas of sand, gravel, or rock within or just above the tidal zone, provides protected basking habitat for the critically endangered ʻīlio-holo-i-kauaua and potentially the threatened honu, foraging habitat for migratory shorebirds such as ʻūlili, akekeke, kōlea, and marine fauna, and roosting habitat for ʻiwa and ʻā (brown boobies and red-footed boobies). Beach strand communities are strongly influenced by the marine environment including wind and water erosion, wave inundation, and salt spray. Historically, this habitat probably consisted of native-dominated coastal dry herbland and mixed communities. Currently, vegetation is sparse, but consists of low shrubs and perennial herbs, such as naupaka kahakai, ʻilima, and other prostrate native vegetation such as pōhinahina. Invasive species found in this environment include ironwood, Christmasberry, lantana, and haole koa. This habitat type is most vulnerable to climate change because of its low elevation.

4.4 Threatened and Endangered and Other Native Wildlife

4.4.1 ‘A‘o (*Puffinus auricularis newelli*) or Newell’s Shearwater

‘A‘o is a threatened endemic subspecies of the nominate species, the Townsend’s Shearwater of the eastern Pacific. It is a medium-sized shearwater, dark, sooty black above with a white belly, throat, and underwings. When compared to ‘ua‘u kani, it has shorter, broader wings and a shorter body and tail. Its flight pattern is distinctive with rapid stiff wing beats interspersed with glides versus the banking and gliding of ‘ua‘u kani. ‘A‘o is a pelagic bird that forages over deep waters east and south of Hawai‘i following predatory fish, particularly yellowfin tuna that chase squid and other prey to the ocean surface (Joyce et al. 2010). The total population of ‘a‘o is estimated to be 84,000 birds, including 14,600 breeding pairs (Ainley et al. 1997). From 1983 to 2008, there has been an alarming 75 percent decline in population indices (Day et al. 2003). Probable causes of the decline include predation by introduced predators, habitat loss and degradation, urbanization including collisions with powerlines, and attraction to urban lights and subsequent disorientation and fallout, and natural catastrophes (Ainley et al. 1997).

At least 90 percent of the subspecies breeds from April to November on Kaua‘i (Ainley et al. 1997), with the remainder breeding on Hawai‘i, Maui, and Moloka‘i. Age at first breeding is six years old. A single egg is laid in a burrow or on the ground in most years. The incubation and chick-rearing period is 62 and 92 days, respectively. Most ‘a‘o breed in steep mountainsides of Kaua‘i in ‘ōhi‘a forest with an uluhe fern-thicket understory. However, between 1978 and 1980, 65 and 25 ‘a‘o eggs were translocated to Kīlauea Point and Moku‘ae‘ae Island, respectively, and cross-fostered by ‘ua‘u kani pairs. Seventy-nine percent of these eggs hatched and ninety-four percent of the chicks fledged (Byrd et al. 1984). The current breeding habitat at Kīlauea Point is characterized by open-canopy hala forest with a naupaka understory, which supports at least 11 breeding or prospecting pairs, some presumably the fledglings of the translocated eggs or their progeny. Between 2002 and 2012, 2–5 chicks probably fledged each year from the Refuge. Three chicks hatched and banded on-Refuge in 1997, 2006, and 2009 have returned as successful breeders or prospectors.

4.4.2 Nēnē (*Branta sandvicensis*) or Hawaiian Goose

The endangered nēnē is a member of the waterfowl family (Anatidae) and closely related to the Canada Goose. Though similar in appearance, the gander is usually slightly larger than the goose. It is light gray-brown with a mostly black head, cream-colored neck with distinctive dark furrows, and black tail and feet. Nēnē are browsing grazers, eating the leaves, seeds, fruits, and flowers of grasses, sedges, forbs, and shrubs (Banko et al. 1999). In the 1950s, the nēnē population declined to about 30 birds on Hawai‘i because of introduced predators, overhunting, and habitat loss. In 2011, there were an estimated 2,457–2,547 nēnē on four islands, including growing numbers on Kaua‘i, which supports 1,421–1,511 birds, or 59 percent of the state population (USFWS unpubl.).

Nearly all birds are the result of an aggressive captive propagation and release program which was initiated by the Territorial government in 1949. This program is credited with bringing nēnē back from the brink of extinction; however, despite a comeback, nēnē still face major obstacles on the road to recovery. Current threats include depredation by introduced predators, inadequate nutrition, lack of suitable lowland habitat, human-related disturbance and mortality, behavioral problems, lack of genetic diversity, and disease (USFWS 2004).

Habitat types frequently used by nēnē at Kīlauea Point NWR include grasslands dominated by introduced species (e.g., saltgrass, Kikuyu grass), open-understory shrublands (e.g., naupaka, haole koa), and sea cliffs. Nēnē build nests on the ground usually under woody and herbaceous plants with an open canopy. Nesting habitats range widely but generally are associated with woody vegetation. Species composition varies by availability; for instance, in highlands native shrubs (e.g., ʻaʻaliʻi, ʻōhelo, pūkiawe, small ʻōhiʻa) predominate, but in lowlands on Kauaʻi both native (e.g., naupaka, pōhinahina) and nonnative (e.g., lantana, Christmasberry, koa haole, Guinea grass) plants are used.

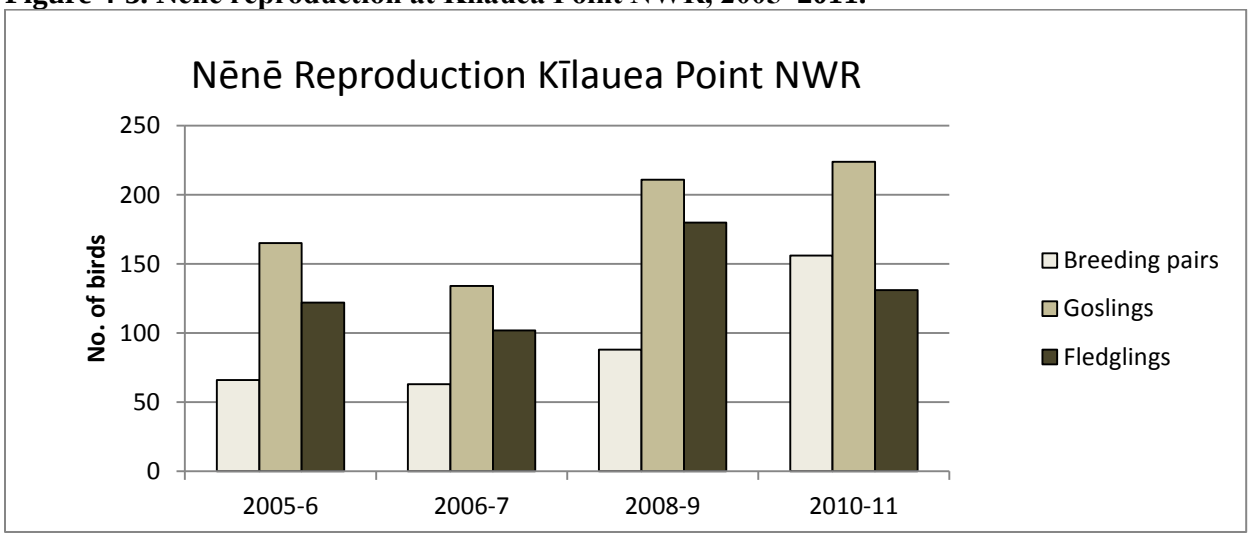
Nēnē mate for life. The average clutch size is 3 eggs (range 1–6), incubation is usually 30 days (range 29–32), and goslings fledge at 10–14 weeks (Banko et al. 1999). Breeding occurs mainly October to March and molting March to June, which is when adults become flightless for 4 to 6 weeks while they grow new flight feathers. During this period, they become secretive, and are extremely vulnerable to attacks by introduced predators. During the rest of the year, from June to September, nēnē disperse or flock with other family groups in nonbreeding areas where young nēnē have opportunities to find mates. Historically, nēnē are believed to have bred and molted in the lowlands during the winter and to have moved to higher elevations in the summer. Today, birds move daily between feeding and roosting areas and seasonally between breeding and nonbreeding areas, but altitudinal patterns are less apparent (USFWS 2004).

Nēnē are browsing grazers, eating the leaves, seeds, fruits, and flowers of grasses, sedges, forbs, and shrubs (Banko et al. 1999), and occasionally climb into or perch in bushes to reach berries (e.g., naupaka, māmaki). In many areas nēnē feed on cultivated grasses. In mid-elevation Hawaiʻi, birds select forage with high water and protein content such as the young shoots of a Kikuyu grass–Spanish clover grassland. They prefer sward-forming (turf-like growth) over bunch grasses and short (2–4 inches) over tall grasses and use grasslands less during drought (Woog and Black 2001).

In partnership with the DLNR and USFWS Ecological Service, 38 nēnē were reintroduced to Crater Hill on the Refuge between 1991 and 1994. By 2002, the population was estimated to be 238 birds (USFWS 2004). In 2011, the population estimate for Hanalei, Princeville, and Kīlauea Point was 791–811 birds.

In 2010, the average number of nēnē during the breeding season (Oct–May) and flocking season (Jun–Sep) was 82 and 158, respectively, with a high count of 214 birds in July. During the 2010–2011 breeding season, the Refuge supported a minimum of 156 nēnē breeding pairs, 224 goslings, and 131 fledglings. Of 105 located nests, 85 (81 percent) hatched at least 1 egg. Of 298 eggs of located nests, 215 (72.2 percent) hatched. Of these 215 goslings, 91 (42.3 percent) fledged. However, the fledging rate is biased low because of the difficulty in collecting reliable gosling data on unhabituated, more secretive birds at Crater Hill and Mōkōlea Point.

Figure 4-3. Nēnē reproduction at Kīlauea Point NWR, 2005–2011.



4.4.3 ʻŌpeʻapeʻa (*Lasiurus cinereus semotus*) or Hawaiian hoary bat

ʻŌpeʻapeʻa is a medium-sized member of the vesper bat family (Vespertillionidae) which consists of nocturnal, mostly insect-eating bats. It is an endemic and endangered subspecies of the North American hoary bat, a solitary tree-rooster. The ʻōpeʻapeʻa is Hawaiʻi's only native terrestrial mammal. Males and females have a wingspan of about 1 foot, and females are typically larger than males. Both sexes have brown and gray fur. Individual hairs are tipped or frosted with white; "hoary" means frosted. The Hawaiian name refers to a half taro leaf or canoe sail shape; these being similar to the shape of the bat. Fur color, frosted or reddish, may be related to location or age.

Theʻōpeʻapeʻa is a major predator of night-flying insects such as moths, beetles, and termites. Bats forage in open and wooded landscapes and linear habitats such windbreaks and riparian zones, and roost in trees with dense foliage and with open access for launching into flight. Females are believed to give birth to twins May to August and rear pups May to September. Pups fledge from about July to September, which is a critical time in the reproductive cycle (Menard 2001, Bonaccorso et al. 2008). The population size is unknown. Resident populations occur on Kauaʻi, Maui, and Hawaiʻi, and possibly other main islands, with the highest abundance on Kauaʻi and Hawaiʻi.

Threats are largely unknown but may include roost disturbance, introduced predators, obstacles to flight (e.g., barbed wire fences, vehicles), and pesticides (USFWS 1998). In fall of 2010, a single ʻōpeʻapeʻa was sighted flying over Crater Hill at sunset on a calm evening (USFWS unpubl.). Occurrence frequency is unknown; however, forested edges near Kāhili Beach and Kīlauea River mouth likely provide suitable habitat (C. Pinzari pers. comm. USGS, 2010).

4.4.4 ʻIlio-holo-i-ka-uaua (*Monachus schauinslandi*) or Hawaiian monk seal

The ʻilio-holo-i-ka-uaua or Hawaiian monk seal is among the most critically endangered mammals in the world. Approximately 1,200 seals remain today with the majority in the Northwestern Hawaiian Islands (NWHI), but there is a small and potentially growing population of seals in the main Hawaiian Islands (MHI) where a 2005 survey documented 76 individuals. Its Hawaiian name means "the dog that runs in the rough seas." Seals frequently haul out on shorelines to rest and molt and

females may haul out on shore for up to 7 weeks to give birth and nurse their pups. Pups and moms stay ashore until weaned. Gestation is approximately 1 year and pupping occurs in late winter and spring.

‘Ilio-holo-i-ka-uaua can live up to 25 years. They feed on reef fishes, he‘e (octopus), squid, and lobsters down to depths of 1,000 feet. Food seems to be a limiting factor for population growth at this time. ‘Ilio-holo-i-ka-uaua are usually solitary except when on preferred beaches when they may be close together and interact. Populations have been decreasing recently in the NWHI, possibly due to sea levels rising above some islands, competition for food resources, and predation on pups. Terrestrial habitat is used about one-third of the time and requirements include haul-out areas for pupping, nursing, and resting, primarily on sandy beaches, but virtually all substrates are used. Beachside vegetation is used for protection from wind and rain. ‘Ilio-holo-i-ka-uaua are particularly vulnerable to climate change because of their limited global range and breeding distributions which are restricted primarily to the low-lying NWHI (Reynolds et al. 2012).

Conflicts and interactions with a variety of ocean and beach users are becoming more frequent and significant in the MHI. Dogs have attacked ‘ilio-holo-i-ka-uaua and carry diseases that are potentially lethal to the critically endangered seal, such as canine distemper virus. Human disturbance, especially of mothers with pups, may be a threat. Guidelines recommend people remain 50 yards from ‘ilio-holo-i-ka-uaua and other marine mammals. ‘Ilio-holo-i-ka-uaua can be observed during most months of the year at the Refuge, most often in the cove below the Kīlauea Road Overlook.

4.4.5 Pueo (*Asio flammeus sandwichensis*) or Hawaiian Short-eared Owl

The pueo is an endemic subspecies of the short-eared owl. The adult is brown and buffy white and ventrally streaked with darker brown. The eyes are yellow and the bill is black. Unlike most owls, pueo are diurnal, though nocturnal or crepuscular activity has been documented. Pueo are commonly seen hovering or soaring over open areas. It is listed by the State of Hawai‘i as an endangered species on the island of O‘ahu.

The pueo is found on all the MHI from sea level to 8,000 feet elevation. There have been no surveys to estimate the pueo population. The species was widespread at the end of the 19th century but is thought to be declining (Mostello 1996, Mitchell et al. 2005). Pueo occupy a variety of habitats, including wet and dry forests, but are most common in open habitats such as grasslands, shrublands, and montane parklands, including urban areas and those actively managed for conservation (Mitchell et al. 2005). Their relatively recent establishment on Hawai‘i (<1,200 years) may have been tied to the rats that Polynesians brought to the islands. In Hawai‘i, pellet analyses indicate that rodents, birds, and insects are their most common prey. Birds depredated by pueo have included passerines, seabirds, and shorebirds.

Little is known about the breeding biology of the ground-nesting pueo, but nests have been found throughout the year. Nests are constructed by females and are composed of simple scrapes in the ground lined with grasses and feather down. Females also perform all incubating and brooding, while males feed females and defend nests. The young may fledge from nests on foot before they are able to fly, and they depend on their parents for approximately 2 months (Mitchell et al. 2005). Pueo can be sighted roosting on and soaring over Crater Hill and Mōkōlea Point. Little is known about Hawai‘i’s only native owl.

Similar to other native Hawaiian birds, loss and degradation of habitat, predation by mammals, and disease threaten pueo. Pueo appear particularly sensitive to habitat loss and fragmentation, as they require relatively large tracts of grassland and are ground nesters. Ground nesters are more susceptible to the increased predation pressure that is typical within fragmented habitats and near rural developments (Wiggins et al. 2006). These nesting habits make them increasingly vulnerable to predation by rats, cats, and Indian mongooses (Mostello 1996, Mitchell et al. 2005).

Mortality of pueo on Kaua‘i has been attributed to the “sick owl syndrome,” which may be related to pesticide poisoning or food shortages. They may be vulnerable to the ingestion of poisoned rodents. However, in the one study conducted, there was no evidence that organochlorine, organophosphorus, or carbamate pesticides caused mortality in pueo. Other causes of death on Maui, O‘ahu, and Kaua‘i have been attributed to trauma (apparently vehicular collisions), emaciation, and infectious disease (pasteurellosis; Work and Hale 1996). However, their persistence in lowland, nonnative, and rangeland habitats suggests that they may be less vulnerable to extinction than other native birds, especially because they may be resistant to avian malaria and avian pox (Mitchell et al. 2005).

4.4.6 Honu (*Chelonia mydas*) or Green Turtle

Honu, also known as the green turtle, is a large sea turtle of the family Cheloniidae. Honu may be seen in waters adjacent to the Refuge. Mature males are distinguished from females by their longer, thicker tails.

Historically, honu most likely inhabited the waters around the all Hawaiian Islands. Today, they still live and forage around all the Hawaiian Islands. Honu are most often found in shallow, protected, or semi-protected water around coral reefs and coastal areas. These habitats contain critical foraging areas consisting of sea grasses and algae and they provide some shelter from predators such as tiger sharks. However, although nesting occurs on all islands, 90 percent occurs on French Frigate Shoals of the NWHI. Evidence shows that Hawaiian turtles migrate only throughout the 1,500-mile expanse of the Hawaiian Archipelago, and so make up a discrete population. Post-hatchlings and juveniles live in pelagic waters, but little is known of their specific distribution.

Little information exists on the feeding behavior of post-hatchlings and juveniles living in pelagic habitats, but most likely they are exclusively carnivorous (e.g., soft-bodied invertebrates, jellyfish, and fish eggs). Subadult and adult turtles residing in nearshore benthic environments are almost completely herbivorous, feeding primarily on select macroalgae and sea grasses. The common name “green sea turtle” is derived from the color of their body fat, which is green from the limu (algae) they eat. Adult honu can weigh up to 500 pounds and are often found living near coral reefs and rocky shorelines where limu is plentiful. Hawaiian honu display slow growth rates, even compared to other populations, with an average annual growth rate of approximately ½-2 inches per year. Turtles often reach sexual maturity at 35–40 years (Mitchell et al. 2005).

Threats to honu include the tumor disease Fibropapilloma; alien seaweeds that displace important foraging, resting, and cleaning habitats of the turtles; indirect take of adult and juvenile turtles as fisheries bycatch; predation, particularly of hatchlings in the open ocean; impacts from snorkeling and other human recreational activities; marine debris that entangles turtles or is ingested by them; and the loss or degradation of foraging habitats along coastal areas due to development, sedimentation, soil erosion, or sewage; nest predation; and boat collisions. Honu can be observed offshore during most months of the year at the Refuge.

4.5 Breeding Seabirds

4.5.1 Mōlī (*Phoebastria immutabilis*) or Laysan Albatross

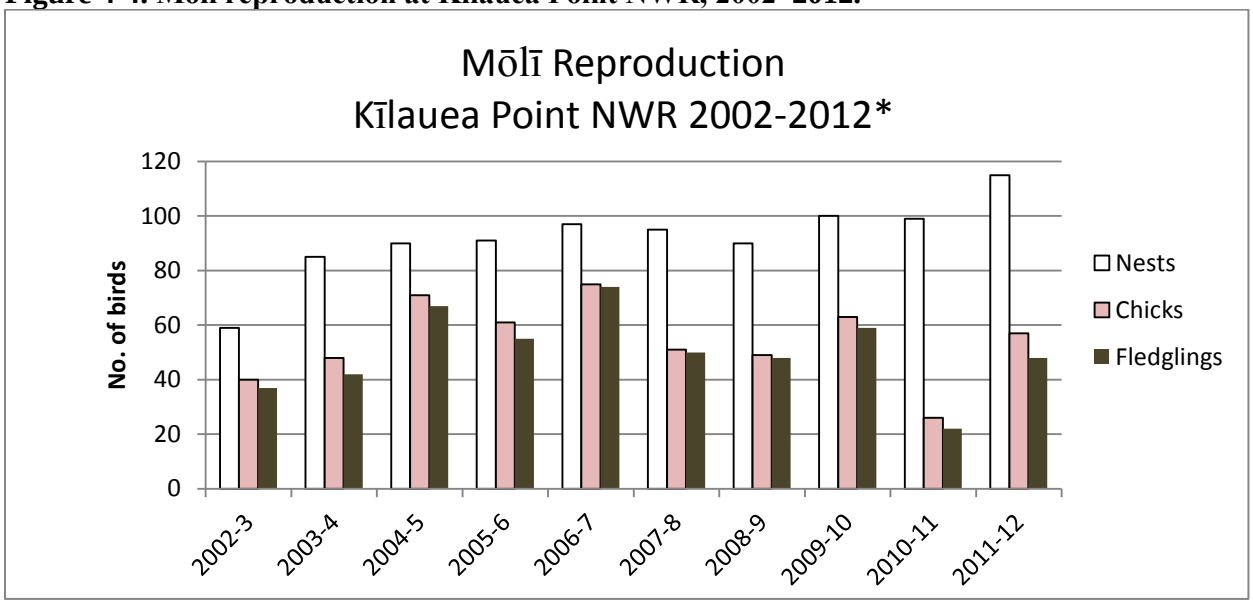
The mōlī or Laysan albatross is a large seabird (Family: Diomedeidae) whose breeding range is centered in the NWHI. Adults are sexually monomorphic and mostly white with black wings and tail; the upperwings are entirely dark, and the underwings are mostly white with variable amounts of black especially along leading and trailing edges. The bill is pink with a gray, hooked tip; legs and feet are light pink. Mōlī are accomplished fliers using dynamic soaring to cover great distances; they mainly feed at night and often far from their breeding colony (1,100 miles; 1,770 km). In Hawai‘i, their diet consists primarily of squid, deep-water crustaceans, fish, and flying fish eggs (Awkerman et al. 2009).

Like most seabirds, mōlī breed in colonies, have long-term pair bonds and high site fidelity, lay only one egg per season, and both parents participate in all aspects of raising young. Pairs engage in long, noisy, ritualized courtship dances. Typically they select nest sites close to vegetation and nests vary from a scrape to a ring-like structure composed of sand, vegetation, and debris. Eggs are laid between November and December and chicks fledge in July; no post-fledgling care is provided by parents. Young birds do not return to land until their third year after fledging. These birds do not breed, but dance, build nests, and prospect for mates. Birds first breed between 8 and 9 years old, and the oldest known individual is currently 63 years old (Awkerman et al. 2009; USFWS unpubl.).
Mōlī breed throughout the NWHI and on the MHI of Kaua‘i and O‘ahu and Lehua Island off Ni‘ihau. Outside of Hawai‘i, mōlī breed on islands off Japan and Mexico. Outside the breeding season, mōlī disperse widely throughout the North Pacific (Young et al. 2009a). In the Hawaiian Archipelago, the population is estimated at more than 590,000 pairs with largest colonies occurring on Midway Atoll (441,000 pairs) and Laysan (145,000 pairs). Total population of all MHI colonies is less than 500 pairs; worldwide population is estimated at 630,000 breeding pairs (Arata et al. 2009).

Historical threats include feather and egg harvesting and military operations on Midway Atoll in the NWHI. Current threats to mōlī include bycatch in fisheries operations, contaminants ingestion, sea level rise in the NWHI, and predation on breeding colonies in the MHI. Mōlī are vulnerable to climate change because of their limited global range and breeding distributions which are predominantly located in the low-lying NWHI (Reynolds et al. 2012).

The first three mōlī chicks fledged from Mōlī Hill on the Refuge in 1986 (KPNHA 1986). Currently, mōlī are found in the densest concentrations on Mōlī Hill (55 breeding pairs in 2011–2012 season), and the rest are distributed on the eastern third of the Refuge towards Mōkōlea Point for a total of 115 pairs in the 2011–2012 season. From 2002–2012 the number of breeding pairs appears to be steadily increasing each year as a result of predator control, natural recruitment, and immigration from other breeding sites; the number of chicks and fledglings appears to be stable or slightly decreasing. Over the past decade, the Refuge has fledged 50 mōlī per year, on average.

Figure 4-4. Mōlī reproduction at Kīlauea Point NWR, 2002–2012.



*Includes supplemental eggs. The Pacific Range Missile Facility's BASH program, 2005-2012.

4.5.2 ʻUaʻu kani (*Puffinus pacificus*) or Wedge-tailed Shearwater

The ʻuaʻu kani or wedge-tailed shearwater is a large, abundant seabird (Family: Procellaridae) that produces a variety of wails and moans that inspired this bird's Hawaiian name, which means "calling or moaning petrel." Individuals have long sleek wings, a wedge-shaped tail, and a hooked bill. ʻUaʻu kani are polymorphic, having two color phases, dark or light, and sexes are similar; approximately 90 percent of the birds breeding in Hawaiʻi are light-phase. Light-phase adults are grayish brown above with white underparts except for dark trailing edges of wings and tail. Dark-phase adults are uniformly sooty brown. Flight is similar to that of albatross but wings flap with greater frequency (Whittow 1997).

ʻUaʻu kani often forage in large, mixed species flocks associated with schools of large predatory fishes (such as ahi and mahi mahi) which drive smaller prey species to the surface. ʻUaʻu kani use a variety of foraging techniques: most frequently they plunge their heads into water while on the wing, they seize prey will sitting on the water, and often they follow fishing vessels. In Hawaiʻi, their diet primarily consists of larval goatfish, flyingfish, squirrelfish, and flying squid. Like most seabirds, ʻuaʻu kani breed in their natal colonies, form long-term pair bonds, have high site fidelity, lay only one egg per season, and both parents participate in all aspects of raising young. ʻUaʻu kani nest in excavated burrows or rock crevices or under vegetation.

In Hawaiʻi, breeding is synchronous, and most eggs are laid in June with most young fledging in November. Birds first breed at four years, and the oldest known individual was 29 years old (Whittow 1997). At the Refuge, ʻuaʻu kani typically arrive in late February and early March. The first eggs are laid in early June, with peak laying in mid-June, and most egg laying completed by the end of June. Hatching begins in late July with most chicks hatched by mid-August. Fledging begins in early November peaking in mid- to late November. The average incubation period onsite is 53 days, and nestling period is 103–115 days (Byrd et al. 1983).

Ua‘u kani breed on low, flat islands and sand spits with little or no vegetation, but also excavate burrows on the slopes of extinct volcanoes and in old volcanic craters. Burrows require firm soil or plant roots to stabilize loose soil; generally nesting habitat is devoid of tall woody plants. In locations where nest sites are scarce or the ground is too hard to excavate burrows, individuals will nest in rock crevices or above ground. ‘Ua‘u kani breed throughout the NHWI and on offshore islets of most of the MHI. Outside Hawai‘i, ‘ua‘u kani breed on islands throughout the tropical and subtropical Indian and Pacific oceans.

Outside the breeding season, ‘ua‘u kani migrate to the eastern Pacific. In Hawai‘i, population is estimated at 270,000 breeding pairs, with approximately 210,000 of those occurring in the NWHI. The population in the MHI is estimated at between 40,000 and 60,000 breeding pairs with the largest colonies occurring on the offshore islands of Mānana (10,000–20,000 pairs), Moku Loa (10,000–20,000 pairs), Lehua (23,000 pairs), Kīlauea Point NWR (ca. 10,000 pairs), and Ka‘ula (1,500–2,500 pairs). Smaller populations occur on Moku Manu, Moku‘auia, Kāpapa, Molokini, Mōkapu Peninsula, and Ka‘ena Point Natural Area Reserve on O‘ahu. Worldwide population is estimated at over one million breeding pairs (USFWS 2005b).

Threats to ua‘u kani include food reduction through overfishing of the large predatory fishes (ahi) that bring their prey to the surface, depredation by introduced predators in MHI breeding colonies, light attraction, and human disturbance. A pilot study on stress hormone levels and chick sizes in relation to their proximity to the Refuge’s lighthouse trail suggested ‘ua‘u kani chicks near the trail (e.g., <12 feet) may be exposed to higher chronic levels stress from visitation (Kitaysky et al. 2004). In 2010 at the Refuge, more than 75 adult ‘ua‘u kani were found preyed upon by owls (compared with about 5 in 2009), and carcass recoveries subsided after removal of 4 introduced barn owls (USFWS unpubl.). Ongoing losses from depredation could affect local populations because adult survival is an important factor regulating seabird populations.

Ua‘u kani is the most abundant bird species on the Refuge with dense concentrations on Mōlī Hill, near the lighthouse, Crater Hill, and Mōkōlea Point, where habitat is suitable. Byrd et al. (1983) estimated that between 1978 and 1981, 520 fledglings from 700 breeding pairs fledged annually from the accessible 10–45 degree slopes of Kīlauea Point peninsula. In 2004, average hatching success of 10 plots was 73 percent (range 20–100 percent) and nest density was 0.36 nests per square yard (range 0.09–0.86) (Zaun 2004). Although the number of breeders and prospectors is unknown, the Refuge probably supports roughly 8,000–15,000 breeding pairs.

4.5.3 Koa‘e kea (*Phaethon lepturus*) or White-tailed Tropicbird

Koa‘e kea are mostly white birds with a pair of narrow, elongated inner tail feathers. Male and female birds are similar in appearance. The adult is 29 inches long from bill to end of tail, and the tail is about about half that length. Its wingspan is 37 inches, and the bird weighs 11 ounces. The feathers are mostly white, but it has black markings on the upper wings, and a black eye-stripe. It has a long white tail with a black stripe on top and a decurved bill that is usually yellow. Variations in bill color include yellowish-green, orange, and red-orange. It has short legs and its feet are webbed. Since legs of the tropicbird are set far back on its body, it is a good swimmer, but awkward on land (Lee and Walsh-McGehee 1998).

Koa‘e kea usually forage alone, but occasionally with conspecifics, most often far from land and will often follow ships. Koa‘e kea captures prey by plunge-diving from 50–65 feet above the water. Their

diet is poorly known, but includes flyingfish and is likely similar to koaʻe ula. Koaʻe kea breed in colonies, and pairs remain together for years. At the beginning of the breeding season, pairs engage in complex aerial displays. Nests are placed in hard to reach locations on cliffs, as well as in caves and tree hollows; nests have little if any material. In Hawaiʻi, breeding occurs March through October and a single egg is laid per season. Both parents incubate the egg, and brood and feed the chick. No post-fledging care is provided. Based on few data, age at first breeding is likely after fourth year; no data on longevity has been collected (Lee and Walsh-McGehee 1998).

In Hawaiʻi, the population is estimated at 1,800 breeding pairs with most occurring in the MHI. The worldwide population is estimated at less than 200,000 breeding pairs. Threats to koaʻe kea are primarily predation on the breeding colonies (USFWS 2005b).

Koaʻe kea can be observed at the Refuge year-round, but appear to be less common in the winter. Nesting appears to be year-round, but peaks occur from March to October. In 2005, four nests were monitored on the Refuge, all four were in rock crevices on steep-sided cliff faces, and only one was accessible. Chicks successfully fledged from two nests and the outcome of the other two was unknown (Zaun 2005).

4.5.4 Koaʻe ʻula (*Phaethon rubricauda*) or Red-tailed Tropicbird

The koaʻe ʻula or red-tailed tropicbird is a showy, white seabird (Family: Phaethontidae) related to boobies and frigatebirds. Adult males and females are mostly white, although they develop a pale pinkish wash when breeding, except for a partial black eye ring and short eye line, black flanks, and black shafts of outer primaries; both sexes have long, narrow, tail feathers with red shafts. Koaʻe ʻula have large red bills; legs and feet are very small. Flight is characterized by strong flapping interspersed with gliding, and koaʻe ʻula are capable of flying long distances. Koaʻe ʻula usually forage alone, but occasionally with other species, most often far from land and will often follow ships. Koaʻe ʻula capture prey by plunge-diving. In Hawaiʻi, their diet is mainly composed of flyingfish, but also includes squid, mackerel scads, dolphinfish, truncated sunfish, and balloonfish (Schreiber and Schreiber 1993).

Koaʻe ʻula breed mainly on oceanic islands and coral atolls with shrubs, including naupaka and beach heliotrope (*Tournefortia argentea*). Koaʻe ʻula nest on the ground, generally in inconspicuous places such as under vegetation or in cliff crevices. Koaʻe ʻula breed in colonies and pairs remain together for years. At the beginning of the breeding season, pairs engage in complex aerial displays. Nests are placed on the ground, and generally are a simple scrape lined with some vegetation. In Hawaiʻi, breeding can occur throughout the year, but most breeding occurs between February and June. A single egg is laid per season, and both parents incubate the egg, and brood and feed the chick. The incubation period is 39–51 days, and the nestling period is 73–123 days. No post-fledgling care is provided. Age at first breeding is between 2 and 4 years, and the oldest known individual was 23 years old (Schreiber and Schreiber 1993).

Koaʻe ʻula breed throughout the NWHI and at a limited number of sites on MHI, mostly on offshore islets. Outside of Hawaiʻi, koaʻe ʻula breed on oceanic islands in the Indian and Pacific oceans. Outside the breeding season, adults are solitary and pelagic, and their range is poorly known. In Hawaiʻi, population is estimated at between 9,000 and 12,000 breeding pairs, with the largest populations occurring on Midway Atoll and Laysan. The worldwide population is estimated at

17,000 to 21,000 breeding pairs, with the majority residing in the Pacific Ocean. Primary threats include predation on the breeding colonies (USFWS 2005b).

Koa‘e ‘ula can be observed at the Refuge year-round, but are more common February to September. Nesting generally occurs from March to August, and birds nest in rock crevices and on benches on steep cliff faces and windswept slopes and under woody vegetation such as naupaka. In 2005, 191 nests were monitored on the Refuge; of these, 145 nests were accessible on flats and slopes of Kīlauea Point, Crater Hill, and Mōkōlea Point. The dates for egg-laying spanned approximately March 8 to August 18. The dates for chick fledging ranged approximately July 9 to November 13. Hatching success and fledging success was 77 percent and 81 percent, respectively. Mate fidelity and nest site fidelity for years 2004–2005 was 85 percent and 76 percent, respectively (Zaun 2005).

4.5.5 ‘Ā (*Sula sula*) or Red-footed Booby

The ‘ā or red-footed booby is the smallest booby (Family: Sulidae), and has a pantropical distribution. Individuals have long pointed wings and a relatively long, wedge-shaped tail. Several color phases exist, ranging from all brown to all white; almost all Hawaiian birds are white. Adult male and females are overall white, except for brownish black primary and secondary wing feathers; females are larger than males. Feet and legs are orange to red, bill bluish except for base of lower mandible which is pinkish, and facial skin around bill ranges from pink to red and blue. Flight is characterized by strong flapping interspersed with gliding and they may glide for long distances depending on wind conditions (Schreiber et al. 1996).

‘Ā forage alone or in mixed species feeding flocks, generally feeding farther from land than their congeners. ‘Ā capture prey by plunge-diving generally from 13 to 26 feet over the water. In Hawai‘i, their diet is mainly composed of flying fish and squid, but also includes mackerel, scads, saury, and anchovies (Schreiber et al. 1996).

‘Ā breed on small islands or islets, both on low-lying coralline sand islands and high volcanic islands. They tend to nest in bushes or trees, including beach naupaka and beach heliotrope. They will occasionally nest on deserted man-made structures, on bare ground, or on low piles of vegetation. ‘Ā build nests of twigs, grass, and other vegetation. ‘Ā breed in colonies ranging from 10 to 10,000 pairs, and pairs generally retain mates throughout several breeding seasons. In Hawai‘i, breeding season is synchronous, but can occur throughout the year. Egg laying peaks in February through April, and most young fledge by September. Both parents incubate egg, and brood and feed chick. Adults continue to feed young up to 4 months after fledging. Birds first breed at 3 to 4 years of age and the oldest known individual was 22 years old (Schreiber et al. 1996).

‘Ā breed throughout the NWHI and at a limited number of sites on MHI, including Kīlauea Point NWR, the cliffs of Ulupa‘u Head at the Kāne‘ohe Bay Marine Corps Base on O‘ahu, and offshore islets including Moku Manu and Lehua. Outside of Hawai‘i, ‘ā breed on islands in the tropical waters of the Pacific, Indian, and Atlantic oceans, Caribbean Sea, and seas north of Australia. Little is known about the movements of the ‘ā outside nesting season, but birds in Hawai‘i appear to disperse eastward and move between islands (USFWS 2005b).

Threats include poaching of eggs, chicks, and adults for food, degradation of habitat from human development of coastal zones and introduced sheep, goats, and pigs, and disturbance at nest sites. ‘Ā have been described as sensitive to human activities, including eco-tourism (Burger and Gochfeld

1993). This species may tolerate short-term, infrequent human disturbance, but typically does not breed in proximity to humans (Schreiber et al. 1996). Up until the mid-1960s, hundreds of ʻā nested around Kīlauea Point peninsula (by the lighthouse), and it is suspected that the colony shifted to its current Crater Hill location because of threats from large mammalian predators (G. Smith, pers. comm). Kīlauea Point peninsula has been free of large mammalian predator for about two decades, however, the ʻā have not returned to nest there.

In Hawaiʻi, the population is estimated at between 7,000 and 10,500 breeding pairs. The worldwide population is estimated at less than 300,000 breeding pairs, with the majority residing in the eastern Pacific (USFWS 2005b). ʻĀ occur year-round at the Refuge, but breeding has been documented only between the months of February and October. Currently, breeding occurs only on the windward slopes of Crater Hill where birds build nests in ironwood and Christmasberry trees. Between 2004 and 2008, the Refuge supported an annual average of 1,882 breeding pairs of ʻā.

Table 4-3. Spring surveys of ʻā breeding pairs, Kīlauea Point NWR (USFWS files)

	Crater Hill			
Survey date	West	Central	East	Total
5/07/2004	1214	350	250	1814
5/18/2005	1422	209	133	1764
5/24/2006	1866	360	310	2536
5/22/2008	1243	65	107	1415
Average (SD)				1882 (470.6)

ʻĀ at the Refuge in 1964 adjacent to the lighthouse. Gary Smith

4.6 Other Seabirds

Other nonbreeding seabirds that use the Refuge for roosting and prospecting include kaʻupu (black-footed albatross, *Phoebastria nigripes*), ʻā (brown booby, *Sula leucogaster*) and ʻiwa (great frigatebird, *Fregata minor*).

Ka'upu are closely related to mōlī, and are approximately the same size, but with a dark chocolate brown coloring throughout the body, and small amounts of white around the bill, eye, and around the tail. The species has a federal status as a "bird of conservation concern" and State of Hawaiʻi status of threatened, and was recently petitioned but declined for federal listing. The world breeding

population is estimated at 61,700 pairs, with a trend that is stable in the long-term and declining in the short-term (Naughton et al. 2007). More recent analyses identify ka'upu as particularly vulnerable to climate change because of their limited global range and breeding distributions which are restricted primarily to the low-lying NWHI (Reynolds et al. 2012). They primarily visit the Refuge in February where they can be seen flying offshore or landing on Moku‘ae‘ae.

Similarly, ‘ā (brown booby), are also closely related to ‘ā (red-footed booby) and are occasionally spotted roosting on the Refuge, and fly by frequently. These ‘ā are all brown on top and on their breasts, and have contrasting white coloration underneath and yellow feet. Unlike red-footed boobies though, brown boobies nest on the ground on relatively flat surfaces. This species is very susceptible to human disturbance and will flush from their nests easily.

‘Iwa are large, graceful seabirds related to tropicbirds and boobies that are almost entirely black with varying amounts of white underneath on females and juveniles. Males have a large, red gular pouch which they inflate for courtship displays. ‘Iwa can be recognized from other seabirds on the Refuge by their large size, deeply forked tail, long bill and tendency to harass and chase both species of ‘ā in an attempt to steal their food. They can be found roosting along the sea cliffs of Crater Hill and Mōkōlea Point in addition to being frequent aerial visitors of the Refuge.

4.7 Migratory Waterfowl and Shorebirds

For hundreds of thousands of years, migratory waterfowl, shorebirds, and other waterbirds have wintered on the Hawaiian Islands from September to May. Of the nearly 30 species of migratory ducks and geese using the islands, the most common winter migrants observed on the Refuge include cackling geese, snow geese, and white-fronted geese. Of the approximately 50 species of migratory shorebirds that have been recorded in the Hawaiian Islands (Pyle and Pyle 2009), the most common shorebirds on the Refuge are kōlea (Pacific golden-plovers), ‘akekeke (ruddy turnstones), and ‘ulili (wandering tattlers), and occasionally hunakai (sanderlings) and kioea (bristle-thighed curlews).

Shorebirds primarily utilize wetlands and tidal flats; however, estuaries and uplands are also important habitats. Golf courses on O‘ahu support an estimated 1,900 kōlea during the winter, and this species has even been observed roosting on urban rooftops (Engilis and Naughton 2004). On the Refuge, short-grass habitat and shorelines are used by shorebirds, with kōlea being the most abundant.

The Pacific Islands region functions as an essential migratory habitat for maintaining global shorebird populations. The Service developed the U.S. Pacific Islands Regional Shorebird Conservation Plan over concerns of declining shorebird populations and loss of habitat. Threats to shorebirds in the Pacific Islands include habitat loss, nonnative plants, nonnative animals (e.g., predation, disease, competition), human disturbance, and environmental contaminants. Population estimates and conservation status for shorebirds are provided in Table 4-4. The kōlea is the most common shorebird in the Pacific Islands region, with Hawai‘i supporting a substantial portion of the Alaskan breeding population during winter. The kioea is the only migratory species that exclusively winters in the Pacific. Thus, the Pacific Islands region is considered to be a critical area for supporting hemispheric populations of both these species (Engilis and Naughton 2004).

Table 4-4. Shorebirds of primary conservation importance in the Pacific islands region (Engilis and Naughton 2004).

Species	Hawai‘i Winter Population	Regional Trend	Conservation Category
Kōlea	15,000–20,000	Unknown	High Concern
Ae‘o	1,200–1,600	Unknown	Highly Imperiled
Kioea	800	Unknown	High Concern
‘Ulili	1,000	Unknown	Moderate Concern
‘Akekeke	5,000–7,000	Unknown	Low Concern

4.8 Threatened and Endangered Plants

With nearly 300 species of plants listed as threatened or endangered, nearly one-third of Hawai‘i’s remaining native flora is threatened with extinction. Over 100 species of plants now listed as threatened or endangered occur, or historically occurred, on the island of Kaua‘i; 49 species are found only on Kaua‘i. Plants that grow in coastal shrublands and low elevation forests are particularly rare due to the long-term presence of humans and the negative effects of their actions, specifically, development, agriculture, fire, and the introduction of pest species. Only 11 percent of lowland mesic and dry native plant communities remain intact on Kaua‘i, compared to 22 percent for all of the Hawaiian Islands combined (The Nature Conservancy 1998).

Small numbers of the following listed species have been introduced on the Refuge.

4.8.1 Pokulakalaka (*Munroidendron racemosum*)

Munroidendron racemosum, commonly known as pokulakalaka, is a monotypic genus and an extremely rare flowering plant in the Araliaceae or ginseng family. It is endemic to Kaua‘i, and occurs in coastal mesic and mixed mesic forests from 390 to 1,300 feet, typically on exposed cliffs and ridges. It is primarily found in three locations on Kaua‘i: Nounou Mountain, Napali cliffs, and Ha‘upu Ridge near Nawilili Bay. Pokulakalaka is a 25-foot tall tree with a straight trunk and spreading branches. It has smooth, gray bark. The 12-inch long leaves are made up of many oval leaflets, each of which is over 3 inches long. These trees drop most of their leaves during their summer blooming season. The small, pale yellow flowers hang in long, loose bunches (Wagner et al. 1999). Flowering season for pokulakalaka is variable, having been observed in both spring and fall, and fruits mature in about 75 days. Self-pollination is assumed to occur since isolated individuals have produced viable seeds. Pollinators have not been observed, but insect pollination is likely. Dispersal mechanisms are unknown (USFWS 1995).

Threats to pokulakalaka include competition with pest plant species, such as kukui, guava, lantana, and koa haole. Other threats include habitat degradation by feral goats, fire, and fruit depredation by rats. Because each naturally occurring population of this species contains only a small number of individuals, the species is also under threat of extinction from catastrophic events, such as landslides or hurricanes.

4.8.2 Alula (*Brighamia insignis*)

Brighamia insignis, commonly known as ʻōlulu or alula in Hawaiian, or colloquially as cabbage on a stick, is a critically endangered species of Hawaiian lobelioid in the bellflower family, Campanulaceae. It is native to the islands of Kauaʻi and Niʻihau and is found on sea cliffs on the Napali Coast and Haʻupu Ridge. This short-lived perennial species is a member of a unique endemic Hawaiian genus with only one other species. In 1994, the Service reported 5 populations totaling 45 to 65 individuals, and listed the plant as an endangered species.

Alula is a potentially branched plant with a succulent stem that is bulbous at the bottom and tapers toward the top, ending in a compact rosette of fleshy leaves. The stem is usually 3.3–6.6 feet in height, but can reach 16 feet. The plant blooms from September through November. It has clusters of fragrant yellow flowers in groups of three to eight in the leaf axils and the fruit is a capsule 0.51 to 0.75 inches long containing numerous seeds.

Alula is found at elevations from sea level to 1,570 feet in mesic shrublands and dry forests that receive less than 67 inches of annual rainfall. It grows on rocky ledges with little soil and steep sea cliffs. Its only pollinator was a now-extinct sphingid moth. This has made it all but impossible for alula to reproduce on its own. Therefore, individuals only produce seed when artificially pollinated by humans who go to great lengths (e.g., rappelling over steep cliff edges) to exchange pollen among plants and to collect seeds that can be grown and stored in botanical gardens and seed banks. Despite its rarity in the wild, it is not hard to cultivate in a nursery, and it has come into use as a novel ornamental plant.

4.8.3 Dwarf Naupaka (*Scaevola coriacea*)

Scaevola coriacea, the dwarf naupaka, is a species of flowering plant in the Goodenia family, Goodeniaceae, that is endemic to Hawaiʻi. It is a low, flat-lying perennial herb. Its older stems are somewhat woody, and the succulent leaves are oval-shaped, relatively far apart, and smooth or somewhat scaly with rounded tips. Flowers occur in branched inflorescences from the point of leaf attachment in groups of one to three.

Dwarf naupaka usually occurs in relatively hot dry coastal sites on low, consolidated sand dunes near sea level (Wagner et al. 1999). This species is salt-tolerant, relatively long-lived, and flowers year-round. Currently, dwarf naupaka exists naturally only on Maui and two offshore islets. Historically, it could be found on six islands and has since been outplanted on several other main islands. The total population is less than 300 plants, making dwarf naupaka an endangered species. Threats to dwarf naupaka include human development, livestock grazing, and pest plants.

4.8.4 Lo’ulu (*Pritchardia aylmer-robinsonii*)

Pritchardia aylmer-robinsonii is a fan-leaved tree about 23–50 feet tall with a trunk approximately 8–12 inches in diameter. The upper and lower leaf surfaces are green and hairless, and leaf segments are rather thin and drooping. The lower surfaces of the petiole and the leaf ribs are covered with dense, tan wool. The branched, hairless flower clusters are located among the leaves and are no longer than the petioles. Each flower is composed of a cup-shaped, three-lobed calyx, three petals, six stamens, and a three-lobed stigma. The spherical, hard, black fruit is 0.7–0.8 inches in diameter. This species is distinguished from others of the genus by the thin leaf texture and drooping leaf

segments, the tan woolly hairs on the underside of the petiole and the leaf blade base, the stout hairless flower clusters that do not extend beyond the fan-shaped leaves, and the smaller spherical fruit (Read and Hodel 1990).

Historically, this species of lo‘ulu was found at three sites in the eastern and central portions of the island of Ni‘ihau. Trees were found on Kaali Cliff and in Mokouia and Haao Valleys at elevations between 230 and 890 feet. The most recent observations indicate two plants still remain on Kaali Cliff. Originally a component of the Coastal Dry Forest, this species now occurs only in a rugged and steep area where it receives some protection from grazing animals (Read and Hodel 1990).

Hawaiian land practices prior to European contact probably destroyed most of the forest on Ni‘ihau. Grazing animals were introduced to the island beginning in the 1700s. Cattle, goats, sheep, and pigs have decreased available habitat for lo‘ulu as well as directly damaging trees, seedlings, and seeds (Wagner et al. 1999).

Although approximately 200 immature individuals have been cultivated on Ni‘ihau and Kaua‘i, extinction from naturally occurring events or reduced reproductive vigor due to the small number of reproductive plants are major threats. Because palms take many years to mature, it is not known whether the immature plants now in cultivation are capable of reproducing and sustaining a viable population. Roof rats are a threat to this species since they eat the seeds of some lo‘ulu species (Wagner et al. 1999).

4.8.5 Lo‘ulu (*P. napaliensis*)

Pritchardia napaliensis,or lo‘ulu (the common name for all plants in this genus) is a species of palm tree that is endemic to the island of Kaua‘i. It inhabits gulch slopes in coastal mesic forests on the Nā Pali coastline, especially in the vicinity of Ho‘oluu Valley. *P. napaliensis* reaches a height of 13–20 feet and has a trunk diameter of 7.1–7.9 inches. As with *P. aylmer-robinsonii*, feral ungulate browsing, seed depredation by rats, erosion, and habitat destruction are all threats.

4.9 Native Plant Communities

Native Hawaiian plants arrived to the archipelago via natural means such as wind, water, or birds. According to Wagner et al. (1999), the native Hawaiian flora is composed of roughly 956 species within 87 families. Approximately 89 percent of these species are endemic (found only in Hawai‘i), while the remainder are indigenous (naturally found in Hawai‘i and elsewhere). Since their establishment, native Hawaiian plant communities have greatly declined since humans arrived in the islands. Few native plants have escaped the impacts of urbanization and agriculture on the coastal and lowland habitats. As a result, recent surveys conclude that 75 percent of the native plant communities in these habitats are considered to be rare. Coastal alterations, such as agriculture, residential developments, recreational parks, military installations, golf courses, and roads have permanently displaced much of the native flora.

Over 30 native coastal and lowland plant species are appropriate for re-establishment at the Refuge, in addition to those already existing. Of these species, approximately one-third could be established as dominant members of the communities, while the remaining two-thirds would be integrated as sub-dominants and associated species. Populations of eight species of endangered plants could be established within these restored habitats, thereby contributing to their statewide recovery. Beginning

in 1980, approximately 13 acres on the Point and portions of Crater Hill's west slope were restored with hala, ʻakoko, ʻilima, naupaka kahakai, ʻāweoweo, and pōhinahina, which are now the dominant native plant communities on the Refuge.

4.9.1 Naupaka Kahakai (*Scaevola sericea)* or Beach Naupaka

Naupaka is an indigenous shrub that grows from 3–10 feet tall along coasts throughout the tropical Pacific and Indian oceans. It has bright green succulent leaves and fragrant white flowers that appear to have split in half with five petals remaining on one side. As a dominant member of the coastal mixed woodland-grassland habitat, naupaka provides cover and nesting substrate for native birds, most notably as nesting sites for two listed species, nēnē and ʻaʻo. It is abundant and naturally occurring on the Refuge. It has also been outplanted on the Refuge. This species is the only nonendemic naupaka, and the only one to produce white fruit in the Hawaiian Islands. The pulpy marble-sized fruits tolerate salt water and float on the ocean currents for dispersal to other islands and are a food source for nēnē. Mixed with salt, the fruit or root bark of naupaka kahakai was used for cuts, skin diseases, and wounds.

4.9.2 ʻIlima (*Sida fallax*) or Yellow Ilima

A common native species found in Hawaiian coastal areas, ʻilima have yellow-orange flowers with five petals. The ground-hugging plant has heart-shaped, one-inch-long slivery-green leaves. Individual plants of this species vary greatly in height, density of hairs, leaf size and shape, and flower color and size. The Refuge anticipates expansion of the species into additional areas of the Refuge as projects to remove pest plants for habitat restoration are implemented.

The yellow ʻilima is the official flower of the island of Oʻahu; about 1,000 blooms are used to create a single lei. Hawaiians also used the plant for medicinal properties. Pregnant women consumed its juice and flowers prior to giving birth. The root bark mixed with the plant's blooms was used as an asthma remedy (Walther 2004).

4.9.3 Hala (*Pandanus tectorius*) or Screw-pine

Hala is a small tree growing 20–30 feet in height and from 15–35 feet in diameter. The trunk is stout and the branches grow at wide angles to it. It has distinctive long, blade-like leaves (lau hala) about 2 inches wide and over 2 feet long. Most varieties have spines along the edges and on the midribs of the leaves. The leaves are spirally arranged toward the ends of the branches and leave a spiral pattern on the trunk when they fall. These trees develop aerial prop roots (ule hala) at the base of the trunk and sometimes along the branches. It occurs in coastal sites and on the low elevation slopes of mesic valleys further inland to 2,000 feet elevation. Hala has been identified as a potential roosting site for ʻōpeʻapeʻa. On the Refuge, hala leaf litter and debris immediately under mature trees serve as nesting sites for ʻaʻo.

Female hala produce a large, segmented fruit somewhat resembling a pineapple. Male trees produce large clusters of tiny, fragrant flowers surrounded by white to cream-colored bracts. There are four types of hala based on color of fruit: common hala is yellow, hala ʻula is orange, hala lihilihi ʻula is red fading to yellow, and hala pia is small and pale yellow. Men from Kahuku were identified by lei of the orange hala fruit which they wore by order of their chief when they left their ahupuaʻa (Wilcox 1975, Hensley et al. 1997, Wagner et al. 1999).

4.9.4 ‘Akoko (*Chamaesyce celastroides*)

Chamaesyce celastroides is by far the most variable and widespread of all Hawaiian ‘akoko and is separated into eight varieties (Wagner et al. 1999), two of which occur on the Refuge. It grows as a shrub or small tree that has compact lateral branches and grows in coastal dry shrublands on windward talus slopes at an elevation of 30 to 2,100 feet. Its flowers can be found tucked close or in the leaf axis. It has been observed flowering and fruiting throughout the year, probably in response to precipitation. Fruits mature in 3 to 4 weeks and plants live from 5 to 10 years.

The varieties found on the Refuge exist on windswept cliffs and ledges above the ocean on Ni‘ihau, Ka‘ula Islet, Kaua‘i (Kīlauea Point), Moloka‘i, and Kaho‘olawe. Threats to this plant include competition with alien plants, fire, and negative effects of recreational activities. ‘Akoko is common throughout the Refuge and can be found in all habitat types.

4.9.5 Pōhinahina (*Vitex rotundifolia*)

Pōhinahina is a sprawling shrub that is 8 feet in diameter and 6 inches to 2 feet tall, but reaching 4 feet in height and 12 feet in width when protected from wind and salt spray. The round leaves are gray-green to silvery and 1–2 inches long and have a sage-like aroma when crushed. The 1-inch flowers are bluish purple and are produced in small clusters at the ends of the branches throughout the year. The round fruits are about 1/4 inch in diameter and bluish purple to black when ripe. Pōhinahina is a widespread strand plant; its natural range spans from China, Taiwan, and Japan south to Malaysia, India, Sri Lanka, Mauritius, Australia, Pacific Islands, and Hawai‘i. In Hawai‘i, pōhinahina grows along the coast on sandy beaches, dunes, and rocky shorelines. It occurs naturally up to elevations of 50 feet on all the main islands except Kaho‘olawe, but it can grow at higher elevations. It is drought and salt spray tolerant and spreads by runners, and as a result, it is a popular ornamental plant in Hawai‘i.

4.10 Invasive Species

For the purpose of this CCP, “invasive” is a subset of nonnative species. An invasive species is defined as a species whose migration and growth within a new range is causing detrimental effects on the native biota in that range. Mammals, amphibians, invertebrates, and plants can all be considered invasive. These species become invasive because their population and growth are no longer balanced by natural predators or biological processes that kept them in balance in their native ecosystems. In the absence of these restraints, invasive species have the potential to compete with native species for limited resources, alter or destroy habitats, shift ecological relationships, and transmit diseases.

Invasive species are one of the most serious problems in conserving and managing natural resources. In particular, the ecological integrity of Pacific Island environments is greatly threatened by invasive species. Hawai‘i, which existed in isolation for millions of years, is an exceptionally ideal environment for invasive species. Most native species lost their natural defense mechanisms and are more vulnerable to introduced species (Meffe and Carroll 1997, National Invasive Species Council 2008).

4.10.1 Mammals

Rat (*Rattus* spp.)

Three nonnative rat species are found throughout the Hawaiian Islands. Polynesian rats arrived from the central Pacific approximately 1,500 years ago with the Polynesians who settled Hawai‘i; Norway rats reached the Hawaiian Islands after the arrival of Captain Cook in the 1770s; and black or roof rats most likely arrived in the 1870s. It is estimated that these three species have populated nearly 82 percent of the major islands and island chains throughout the globe. Black and Polynesian rats have a large distribution and can be found from sea level to 10,000 feet. Norway rats are restricted to areas below 6,000 feet. Polynesian rats and Norway rats nest exclusively in terrestrial habitats, while black rats are arboreal nesters. This nesting difference may contribute to a larger population of black rats in Hawai‘i due to the presence of nonarboreal mongoose predators (Tomich 1986, Tobin and Sugihara 1992, Hays and Conant 2007).

Globally, introduced *Rattus* species have caused the decline, extirpation, or extinction of numerous insular bird species. In the main Hawaiian Islands, Atkinson (1977) suggested that black rats caused the accelerated decline or extinction of many native forest birds between 1870 and 1930. Polynesian rats are speculated to have been a contributing factor in the large-scale extinctions of Hawaiian bird species during Polynesian settlement prior to European contact. Rats continue to be a major threat to waterbirds, seabirds, and forest birds in the Hawaiian Islands. All three species of introduced rats in Hawai‘i are known predators of eggs, nestlings, young, and occasionally adults of endangered waterbirds, seabirds, migratory shorebirds, and forest birds. Ground- and burrow-nesting seabirds are particularly vulnerable to rat predation, even by the arboreal black rat. Rats also consume plants, insects, mollusks, herpetofauna, and other invertebrates. Because these species are also eaten by birds, a reduction in these populations may indirectly affect avian populations (Olson and James 1982, USFWS 2004, 2005a, 2005b, Mitchell et al. 2005).

The use of snap traps and ground-based application of diphacinone rodenticide to control rats in the main Hawaiian Islands has shown a positive effect in native bird survival (VanderWerf 2008). Using these two treatments, rodent abundance dropped 58–90 percent within one month of treatments for 3 years in a row at Hakalau Forest NWR on the island of Hawai‘i. The estimated cost for a 247-acre (1 km^2) grid was $7,000 in year one and $2,000 per year in years two and three (Nelson et al. 2002). At the Refuge, rats are controlled year-round through the use of live-trapping and rodenticides approved for conservation of endangered species (e.g., 0.005 percent diphacinone) in tamper-proof bait stations concentrated in key management areas, such as high density nesting habitat for endangered birds. There are 40–80 bait stations on the Refuge, bait stations are replenished every 2 weeks, and the amount of bait used is recorded and reported. Applicators of rodenticides operate under the State Department of Agriculture’s Pesticide Applicator Certification Program.

Cat (*Felis catus*)

Cats in the United States kill more than one million birds per day on average (Dauphine and Cooper 2011) and are recognized by the Union for Conservation of Nature as one of the “world’s worst” invasive species (Lowe et al. 2000). Cats have a universally damaging effect on island forest birds, breeding seabirds, resident waterbirds, and migratory shorebirds and waterfowl (Smucker et al. 2000, USFWS 2004, 2005a, 2005b, Mitchell et al. 2005). Cats are found on all the main Hawaiian Islands from sea level to 10,000 feet. Food habits of feral cats in Hawai‘i include insects, centipedes, marine

crustaceans, lizards, mice, rats, bird eggs, birds (young and adults), ʻōpeʻapeʻa, grasses, and seeds. Cats have a universally damaging effect on insular forest birds and nesting seabirds. In Hawaiʻi, cats can prey on waterbirds, migratory shorebirds, nesting seabirds, and forest birds (Smucker et al. 2000, USFWS 2004, USFWS 2005a, Mitchell et al. 2005).

On remote lands of Mauna Kea on the island of Hawaiʻi, feral cats prey on about 11 percent of endangered palila nests (finch-billed Hawaiian honeycreeper) annually, and radio-collared male cats can range up to 8 square miles. Cats are most active at night when birds are roosting or incubating eggs and more vulnerable to predation (Hess 2011). In addition, cats are reservoirs of diseases that can be transmitted to birds and other mammals, including humans. Felids including feral and domestic cats are the definitive hosts for an infectious parasite called *Toxoplasmosis gondii*, which reproduces in cat intestines and is shed in cat feces. *T. gondii* has been linked to deaths of ʻā (red-footed booby), endangered nēnē, critically endangered ʻalalā (Hawaiian crow) (Work et al. 2000, 2002), and critically endangered ʻīlio-holo-i-kauaua on the coast of Kauaʻi (Honnold et al. 2005).

There are many "managed" feral cat colonies on Oʻahu with 19,786 feral cats sterilized and released between 1993 and 2002. Cat colonies near seabird colonies have been very detrimental to nesting birds with the loss of adult and chicks of uaʻu kani on Maui and Oʻahu (Smith et al. 2002, Young et al. 2009b). There is ongoing evidence of cats threatening and/or killing mōlī, ʻuaʻu kani, threatened ʻaʻo, and endangered nēnē. In 2009, a cat was captured on video attacking a nēnē nest (USFWS unpubl.). There is an ongoing influx of feral cats, particularly from Kāhili Beach southeast of the Refuge. Due to the threats adjacent to the Refuge and the presence of free-roaming cats across Kauaʻi, cat control is conducted year-round.

Cats captured with collars and domesticated behavior are transported to the Kauaʻi Humane Society. Feral cats are controlled using live-trapping and euthanasia or shooting. Trap cycles last from 2–7 days with 15–25 traps active on a bi-monthly basis. In addition, cats are trapped opportunistically when there are fresh carcasses of endangered or migratory birds showing evidence of cat depredation or there are other detections of cats in the area. Shooting follows protocols for humane dispatch (AVMA 2007) and is only performed by highly skilled personnel trained and federally certified in the safe use of firearms. Trapping success varies widely depending on many factors (e.g., cat's condition, food availability, methods, techniques). From November 2006 to July 2007, 16 cats (2,419 trap nights) were removed from KNWRC. From December 2007 to April 2008, 11 cats (79 trap nights) were removed from Kīlauea Point NWR. From 2007 to 2010, 129 feral cats were removed from KNWRC, with a high of 81 feral cats removed in 2008 (USFWS unpubl.).

Dog (*Canis lupus familiaris*)

The dog is a domesticated form of the gray wolf, a member of the Canidae family of the order Carnivora. Abandoned, escaped, or pet dogs allowed to run loose can cause great harm to native species and ecosystems. Dogs have caused terrible damage to native ground-nesting seabird colonies. In 2008, almost 90 ʻuaʻu kani birds were killed by a pack of dogs at the Kahuku Golf Course and in 2006, dogs killed nearly 180 ʻuaʻu kani chicks at Kaʻena Point, both sites on Oʻahu. Dogs typically attack a large number of birds in a single incident by grabbing and shaking the birds around with their mouths and leaving them for dead before heading to another nest or burrow. Dog entry through the perimeter hogwire fence surrounding portions of the Refuge may occur through holes from vandalism or degradation, allowing sporadic and random dog presence within the Refuge. In 2010, dogs entering the Refuge at the unfenced end of Mōkōlea Point killed at least nine adult ʻuaʻu kani

on the Refuge. In 2014, 26 mōlī were killed by dogs on unfenced private lands on Kauai's North Shore.

Small Indian mongoose (*Herpestes javanicus*)

The Indian mongoose was intentionally introduced to numerous island ecosystems during the 1800s and 1900s and has since expanded to large portions of Asia, Africa, Europe, Oceania, and the Americas. In 1883, the species was introduced to the main Hawaiian Islands as a biocontrol agent against rats in sugarcane fields. The mongoose inhabits all habitat types from sea level to nearly 10,000 feet on the islands of Hawaiʻi, Maui, Oʻahu, and Molokaʻi. In other areas of the world, mongooses appear to avoid wet areas; however, in Hawaiʻi, dense populations of mongooses are concentrated in wet habitats. The mean home range of a female in Hawaiʻi is approximately 3.5 acres, and the main reproductive period occurs February through August. The high density of mongooses in the Hawaiian Islands is due to abundant food and the lack of natural predators (Tomich 1986, Hays and Conant 2007).

Mongooses are voracious omnivores, consuming insects, reptiles, mammals, amphibians, crabs, plants, and birds. In Hawaiʻi, mongooses are diurnal predators that primarily eat invertebrates and small mammals, as well as plants, birds, reptiles, and amphibians. They are a major threat to any ground-dwelling and -nesting species in Hawaiʻi. These mammals are known to eat eggs, young, and adults of endangered Hawaiian birds, various seabirds, and migratory shorebirds. In addition, mongooses are known to consume young sea turtles (Mitchell et al. 2005, Hays and Conant 2007).

Until recent years, Kauaʻi was thought to be mongoose-free. On May 23 and June 29, 2012, two live mongooses were captured in Līhue and Nāwiwili Port, confirming presence of mongooses on Kauaʻi. Previously, the only hard evidence of mongooses on the island was a Kalaheo roadkill in 1976 of a lactating female. Other evidence included 160 credible sightings including more than 70 within the last 10 years with sightings concentrated near Nāwiwili Port and Port Allen. Credible mongoose sightings occurred in 2012–2013 all over Kauaʻi, from Polihale to Lihuʻe to Kīlauea, indicating that mongoose could eventually be detected within the Refuge.

Mongooses have been detrimental to native ground-nesting birds on other Hawaiian Islands, and the effects are expected to be even more detrimental on Kauaʻi, as the island is the last stronghold for several endangered species. The Refuge will continue to work in partnership with the Kauaʻi Invasive Species Committee and DLNR to gain information on the status and control and, if possible, eradicate or contain mongooses.

Feral pig (*Sus scrofa*)

Feral pigs that occur in Hawaiʻi are likely to be hybrids descended from two ancestral types introduced on separate occasions. Polynesians first brought pigs to the islands as a food source around 1,500 years ago. Captain Cook subsequently brought European pigs to the islands in 1778 (Tomich 1986). Pigs descended from European strains were generally larger, more fecund, and more nomadic than their Polynesian counterparts (Van Driesche and Van Driesche 2000). Although pigs have been eradicated from numerous islands worldwide, these animals remain highly abundant in Hawaiian island ecosystems (Courchamp et al. 2003, Cruz et al. 2005) and occupy every main island in the Hawaiian archipelago (Tomich 1986). Pigs are long and narrow in shape and predominately black in color and are generally hairy. They measure 3.5–4.5 feet in length and average 2 feet in

height. Pigs are elusive animals. They have been reported to be highly active in the early morning and late afternoon in tropical climates (Diong 1982). The reproductive potential of pigs contributes to their invasive potential. These animals are polyestrous meaning that adult females have more than one estrus cycle (21 days) in a breeding season. Pregnancy can occur year-round with peaks between January and March. The average sow in Hawaiʻi has 1.1 litters per year (Caley 1997). Reproductive rates peak between 2 and 4 years, but breeding has occurred by 10-month-old sows (Hess et al. 2006).

Pigs are an omnivorous species that consume fruits, seeds, plant material, invertebrates, and opportunistically, the eggs and young of ground-nesting birds. In Hawaiʻi, pigs consume and damage plant material in both wet and dry habitats and in agricultural and natural areas. They root and trample native vegetation, digging up the soil for earthworms, as well as underground plant parts such as rhizomes and tubers. Pigs act as vectors for invasive plant species, dispersing alien plants such as strawberry guava and banana poka (LaRosa 1992, Stone et al. 1992). Other ecosystem effects can be attributed to pig activity. Rooting and compaction can deplete the soil of needed oxygen (Van Driesche and Van Driesche 2000). The behavior of pigs causes erosion of cliff and stream banks. As a result, the quality of both fresh and brackish water system can be degraded. Since the Refuge is fenced, it is usually free of pigs. However, breaches in the aging perimeter fences may result in the need for periodic pig trapping.

4.10.2 Birds

Cattle egret (*Bubulcus ibis*)

Cattle egrets were introduced to Hawaiʻi from Florida in 1959. The release was sponsored by local ranchers and the Hawaiʻi State Board of Agriculture to control pasture insects. Nearly 150 birds were released on all the main islands except Kahoʻolawe. After one year, successful breeding was recorded on Oʻahu, where egrets were quick to establish. On Kauaʻi, egret numbers remained low until 1975, when the population exploded. By 1982, Kauaʻi had 3 active roost sites totaling approximately 8,000 birds, including a rookery of 4,000 birds at Crater Hill in Kīlauea. By the mid-1980s cattle egrets were well-established on five of the main islands.

Cattle egrets are highly adaptable, and generally found foraging in grasslands and shallow wetlands, but will also feed in roadside ditches and landfills. Roosts in the Hawaiian Islands are usually on level lowland areas near water bodies, often in trees less than 30 feet high. It is the only species in the family Ardeidae (Herons) that can breed at 1 year. Reproduction in the Hawaiian Islands occurs year-round. Clutch size averages three eggs (range 2–6); (Paton et al. 1986), chicks, known as "branchers," begin wandering on branches at 14–21 days and fledge at 25–30 days. Some birds in Hawaiʻi may breed twice per year (Telfair 2006).

Cattle egrets are opportunistic feeders. In addition to pest insects, they consume a variety of native and nonnative invertebrates and small vertebrates such as fishes, skinks, frogs, beneficial insects, and seabird and endangered Hawaiian waterbird chicks (USFWS 2005a). Cattle egrets are the subject of localized control at airports to avert bird strikes and at wildlife sanctuaries to protect endangered species (Paton et al. 1986). From 2007 to 2010, 291 cattle egrets were removed from KNWRC, an average of about 100 individuals per year (USFWS unpubl.). Techniques for cattle egret removal including shooting and hazing and are regulated under the Migratory Bird Treaty Act and Migratory Bird Depredation permits.

Barn Owls (*Tyto alba*)

The barn owl native to North America is found throughout the main Hawaiian Islands, including offshore islets such as Lehua near Kaua‘i, where they were introduced in 1958 for rodent control. They have light grey underparts with numerous fine dark lines and scattered pale spots on the feathers. There are buff markings on wings and back. Feathering on the lower legs may be sparse. The heart-shaped facial disc is white with a brownish edge, with brown marks at the front of the eyes, which have a black iris. Its beak is off-white and the feet are yellowish-white to brownish. Males and females are similar in size and color; females and juveniles are generally more densely spotted. Barn owls can be distinguished from pueo by their primarily nocturnal habits, rounder faces, and lighter coloring.

In their native environment, barn owls specialize in hunting small ground mammals, and the vast majority of their food consists of small rodents. However, in the Hawaiian Islands they are known to be serious predators of seabirds, including the endangered ‘a‘o, in addition to other seabird species, such as ‘ua‘u kani. On the Refuge, barn owls have been documented killing ‘a‘o, ‘ua‘u, and large numbers of ‘ua‘u kani. Because barn owls will breed at any time during the year, and depending on food supply, they can reproduce up to 2 times per year, they are able to increase rapidly in a relatively short period of time. Barn owls likely compete with the native pueo for introduced rats and mice and could potentially be limiting their population. Techniques for barn owl removal including trapping and shooting and are regulated under the Migratory Bird Treaty Act and Migratory Bird Depredation permits.

4.10.3 Amphibians

Nonnative amphibians also have a negative effect on native Hawaiian species. Recent radio transmitter studies at James Campbell NWR on O‘ahu (Eizenga USFWS unpubl.) provide conclusive evidence that introduced bullfrogs (*Rana catesbeiana*) are key predators of Hawaiian waterbird chicks. While evidence of native bird depredation by cane toads has not been documented, it is possible given the species behavior that they do on occasion eat native ground-nesting birds or their chicks.

Cane toad (*Bufo marinus*)

Cane toads, or Pacific giant toads, which are native to Latin America, have a broad geographic range that includes a majority of the Pacific region. The toads were brought to the Hawaiian Islands in 1932 to control insect pests. The adults require only water for breeding, which results in thousands of eggs per mating occurrence. Cane toads are active at night and primarily feed on cockroaches, crickets, grasshoppers, grubs, earthworms, slugs, spiders, centipedes, and snails. In addition, these highly invasive amphibians could be a potential predator of eggs and young of ground-nesting birds (Yamamoto and Tagawa 2000, Kishinami 2001).

Coqui (*Eleutherodactylus coqui*)

Coqui frogs, which are native to Puerto Rico, were accidentally introduced to the Hawaiian Islands in the late 1980s through eggs or frogs in nursery plants. They are small, nocturnally active, brown frogs approximately 1 inch in length. Their habitat includes moist leaf bases of foliage and leaf litter from the coastal zone to 4,000 feet elevation or higher. Coqui are a human health and quality of life

nuisance because of the male's loud, high-pitched, two-note call "co-kee," heard primarily at night. They eat large number of small insects, in native and nonnative habitats, posing a threat to native insects and insectivores (Kishinami 2001). Coqui have occurred on five of the main Hawaiian Islands including the Island of Kaua'i. In 2001, a breeding population was discovered in Lawai, but after extensive eradication efforts by the Kaua'i Invasive Species Committee (KISC) and partners, Kaua'i was declared "coqui-free" in June 2012. Coqui are not known to occur on the Refuge. However, in May 2014 KISC responded to a report of coqui on the northshore of Kaua'i (KISC 2014).

4.10.4 Invertebrates

Although the Hawaiian Islands support a large number of native invertebrates, a wide array of nonnative invertebrates has invaded Hawaiian ecosystems. While numerous species exist on the Refuge, the only group documented to be a threat to native wildlife is ants.

Ants

Hawai'i is one of the few places on Earth believed to lack any native ant species. Today, at least 47 ant species in 7 subfamilies and 24 genera have become established. Ants are a growing concern since they can have negative effects on native and endangered plants and animals. Ants are also implicated in having negative effects on native and endangered plants by farming scales and other insect pests. Ants are known to attack, injure, or kill young birds. The Service is currently studying the efficacy of various baits and approved toxins on pest ants on O'ahu and Johnston Atoll.

On offshore islets on O'ahu and on Kure Atoll, several species of ants have been documented to harass and potentially kill nesting seabird chicks, primarily 'ua'u kani chicks, by attacking their mucus membranes, removing their down, eating the webbing off their feet, and irritating the chicks so much that they leave their burrows and become separated from their parents (Plentovich et al. 2009).

At the Refuge, long-legged ants (*Anoplolepis gracilipes*) have been observed on koa'e 'ula adults with watery, irritated, swollen eyes. Long-legged ants subdue their prey by spraying formic acid. Ants have also been observed attacking koa'e 'ula chicks to the point where they lose their down and part of the webbing on their feet. Chick foot injuries are typical of those caused by big-headed ants (*Pheidole megacephala*) (Zaun 2005).

4.10.5 Plants

Invasive species are recognized as a major threat to native ecosystems and to the survival of threatened and endangered species. At the ecosystem level, invasive plants have been shown to be capable of changing fire regimes, altering nutrient cycling patterns, and modifying the surface runoff of water. Invasive plants can physically displace native species, and/or supersede them by competition for water, nutrients, or other limited resources. Nonnative plants can also be vectors and hosts for introduced pests and diseases to which the native species lack natural defenses. Furthermore, compared to native plants, nonnative plants lack their natural enemies in the introduced range, which again gives them a competitive edge over native species. Invasive plants are also reported to be faster growing and can therefore easily and quickly colonize, establish, and displace native species (Vitousek 1990, D'Antonio and Vitousek 1992, Blossey and Notzold 1995).

Almost half the flora of the Hawaiian Islands is composed of naturalized nonnative plants, approximately 1,100 species. Invasive plants are successful in island ecosystems due to a multitude of traits. According to Staples et al. (2000), invasive plants in Hawaiʻi share the following biological and reproductive characteristics:

- Adaptable to and capable of thriving in different habitats
- Tolerant of variable conditions (such as light, temperature, moisture)
- Fast-growing
- Tolerant of disturbance
- Easily dispersible to new localities by seeds, fruits, spores, or vegetative parts
- Produce small seeds/spores early in life
- Long reproductive periods
- Dispersed by animals and with no special germination requirements

The control and eradication of pest plants has been the top priority of natural resource managers in Hawaiʻi. In the wetland habitats of the Refuge, invasive plant species can drastically reduce the value of wetland habitat to native species. Nonnative species out-compete more desirable plant species here, as well as smother open water and mudflat habitats. In addition, the high biomass characteristic of invasive grasses produces a high amount of fuel for fire and become threats to nearby residential, commercial, and military land uses. In Hawaiʻi, plants grow year-round; thus, the Service has a full-time task of maintaining the habitat by nonnative plant control. At Kīlauea Point NWR, a combination of control techniques are employed for invasive plant removal including chemical, mechanical (hand and tractor), and water level manipulations.

California grass (*Urochloa mutica*)

California grass (Family–Poaceae) is a sprawling perennial with culms up to 20 feet long and rooting at the nodes. Stolons and leaf sheaths are densely hairy. It occurs pantropically as a pasture grass and its native range is unknown, although it is suspected to have originated in sub-Saharan Africa. California grass occurs in aquatic environments such as the openings of wet forests, marshes, and other open water areas. It is also known to invade drier, disturbed areas. It is reported to be well-adapted to a wide range of soil conditions (sandy to clay) and tolerates moderate shade but prefers full sun (Wagner et al. 1999).

Monotypic stand of California grass USFWS

In Hawaiʻi, California grass occurs between sea level and 3,445 feet on the five main Hawaiian Islands. The grass can form monotypic stands reaching 5 feet in height, with rooting runners up to 18 feet in length. Throughout the state it has been reported to grow in a wide range of moisture conditions. It grows prolifically in wet swampy habitats, but it can also withstand severe drought. The Hawaiʻi-Pacific Weed Risk Assessment is a research project conducted by University of Hawaiʻi and the USDA Forest Service (USFS) to identify plants that pose a high risk in Hawaiʻi and other Pacific Islands. The assessment score of 12 for California grass reflects its invasion potential. It also designates the species as H (Hawaiʻi), meaning the species is “documented to cause significant ecological or economic harm in Hawaiʻi” (Motooka et al. 2003). Techniques used to control California grass on

the Refuges include an integrated system of mowing, disking, tilling, hand-pulling, and application of herbicides.

Pluchea spp

Pluchea spp. (Family–Asteraceae) is comprised of two shrub species in Hawai‘i—Indian fleabane (*P. indica*) and sourbush (*P. carolinensis*)—and a hybrid species. *Pluchea indica* readily hybridizes with *P. carolinensis* to form the intermediate plant *P.* x *fosbergii*. The leaves of this hybrid species are usually more similar to *P. indica*, while the inflorescence more closely resembles *P. carolinensis*. *P.* x *fosbergii* can be found where the two species occur together (Wagner et al. 1999).

P. carolinensis is an erect, aromatic shrub native to parts of North and South America. The species has naturalized in Hawai‘i, Guam, Taiwan, Africa, and other tropical and Pacific areas. It can grow in poor soil conditions; however, it cannot withstand shade and severe competition from brush and grass. In dry habitats, the fast-growing shrub can form thickets. In Hawai‘i, *P. carolinensis* has spread to all the main islands since its arrival in the 1930s. This shrub is able to grow in a wide array of habitats, ranging in distribution from dry coastal areas to open forests at 2,953 feet elevation. The plant seeds prolifically and the seeds are easily dispersed by wind (Mueller-Dombois and Fosberg 1998, Wagner et al. 1999).

Pluchea will out-compete native plants on the Refuge, reducing forage and nesting habitats for birds. *Pluchea* tend to harbor huge nests of paper wasps, which are a hazard to Refuge staff and the public. Techniques used to control *Pluchea* spp. on the Refuges include an integrated system of manual removal and application of herbicides.

Christmasberry (*Schinus terebinthifolius)*

Christmasberry is an aggressive, rapidly spreading plant native to Argentina, Brazil, and Paraguay. It can grow as a tree or shrub up to 23 feet in height. Christmasberry has become naturalized in mesic, disturbed, and coastal areas throughout the Hawaiian Islands, where it can form dense thickets on steep slopes (Wagner et al. 1999).

Christmasberry is considered a pioneer species because it quickly colonizes disturbed areas. The invasive attributes of Christmasberry include a large number of fruits, bird dispersal, and a tolerance to shade, fire, and drought. Furthermore, the species is believed to have allelopathic properties, which increases its competitive ability with neighboring plants (Hight et al. 2003). Due to these characteristics, this species is recognized as a noxious weed by the Hawai‘i Department of Agriculture.

Three biocontrol insects have been released in the Hawaiian Islands to control this species. This includes a seed-feeding beetle in 1960, a leaf-rolling moth in 1954–1956, and a stem-galling moth in 1961–1962 (Hight et al. 2003). An accidentally introduced seed-feeding wasp has also been found attacking seeds of Christmasberry. A foliage-feeding sawfly was tested as a potential biological control agent for Christmasberry; however, this species was not introduced due to its risk to the native ‘ohe kukuluae‘o (*Reynoldsia sandwicensis*) (Hight et al. 2003).

Kikuyu Grass (*Pennisetum clandestinum*)

Kikuyu grass is a fast-growing grass species that forms mats and spreads by rhizomes and stolons. It was introduced to Hawai'i for cattle forage. Kikuyu grass is native to eastern Africa, but has spread throughout the tropics and subtropics (Holm et al. 1972). It occurs primarily in cool fertile areas (Scowcroft and Jeffrey 1999) between sea level and 6,600 feet elevation. It propagates vegetatively because the small, inflorescences rarely produce seeds (Holm et al. 1972). It is shade-tolerant, and the root morphology may also be altered in shaded areas (USFWS 1996).

Kikuyu grass is a particular management concern in many habitats because the species forms dense mats, preventing the establishment of native seedlings. It competes with native seedlings for nutrients, light, and water (Scowcroft 1992), it increases the frequency and intensity of fire (Smith and Tunison 1992), and has been reported to possess allelopathic substances (Smith 1985). For these reasons, it is a federally listed noxious weed, and according to the USFS and DOFAW it is considered a high-risk weed species for creating ecological and economic harm in Hawai'i.

Although Kikuyu grass is considered an aggressive pest, the species appears to be less aggressive in the coastal zone and provides valuable forage habitat for nēnē on the Refuge. Currently, there are no known native grasslands that could be restored to provide the same nutrition as Kikuyu-legume grasslands. Approximately 27 acres of Kikuyu grasslands are managed for nēnē at Crater Hill year-round.

Ironwood (*Casuarina equisetifolia)*

Ironwood is native to the tropical and subtropical seacoasts from Malaysia to Australia, Micronesia, Melanesia, the Philippine Islands, and Polynesia, but is not native to the Hawaiian Islands. The common name refers to any of a number of closely related species that have also been called "she-oak," or "beefwood." The tree reaches heights of 80 to 100 feet and diameters up to 18 inches. The wood is dark brown, very tough and dense, and grows rapidly.

Ironwood was first introduced to Hawai'i on the island of on Kaua'i in 1882. More than 70,000 trees were planted on the forest reserves of the island and many others were planted on private lands for windbreaks and in depleted soils or sandy areas requiring a salt-tolerant tree. Since that time, ironwood has not only spread to all the main Hawaiian Islands, but has also established on some of the small atolls in the NWHI.

At the Refuge, it is a common weed and poses a threat to native plants and seabirds. For example, rapid growth of ironwood trees at the base of Mōlī Hill creates obstacles within primary mōlī flight corridors. In 2010, a mōlī fledgling taking its first flight crashed into an ironwood tree and was grounded cliff-side for a day, an annual occurrence if ironwoods are not maintained. As a result, ironwood is controlled on the Refuge in key areas using chainsaws, handsaws, herbicides and, rarely, heavy equipment.

Haole Koa (*Leucaena leucocephala*)

Koa haole, haole koa (foreign koa), or leucaena, is a vigorous shrub or small tree native to southeastern Mexico. This naturalized deciduous species is characterized by twice pinnate leaves with numerous small gray green leaflets, many flowers in whitish round balls 3⁄4–1 inch across the

spreading threadlike stamens, and many clustered dark brown flat pods. It is a rapidly growing small tree 20–30 feet tall and 4 inches in trunk diameter

This species was unknown in Hawai‘i in 1864, but reported as frequent 20 years later. It is reported that seeds were broadcast from airplanes to provide a charcoal source. It is now an abundant weed in the dry lowlands throughout Hawai‘i and will form dense thickets in lowlands and lower mountain slopes to 2,500 feet altitude.

Haole koa is common throughout the Refuge, but is found in highest concentration in Crater Hill and Mōkōlea Point where it can crowd out nesting seabirds. As a result, haole koa is controlled on the Refuge in key areas using power or hand tools and herbicides.

Lantana (*Lantana camara)*

Lantana is a perennial, erect or prostrate shrub growing to 6 feet or more in height. Leaves are ovate in shape, oppositely arranged, commonly 6 inches long and 2.5 inches wide. Lantana reproduces vegetatively and via seed, flowers are produced year-round and are able to self- and cross-pollinate. Lantana is an extremely prolific seed producer with approximately 12,000 fruits per plant.

Lantana is a thorny shrub and noxious weed native to the West Indies that was brought to Hawai’i as an ornamental plant for gardens. It can form an impenetrable thicket which crowds out other plants and is dispersed by pest and frugivorous birds. It is capable of surviving all but the hottest fires, regenerating from basal shoots. Allelopathic substances are produced by shoots and roots. Lantana is found up to 1,970 feet on all islands, principally in dry areas, but has also infested both mesic and wet habitats as well. Lantana is found throughout the Refuge. It is controlled using power or hand tools and herbicides.

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Chapter 5
Social and Economic Environment

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Chapter 5. Social and Economic Environment

5.1 Cultural Resources

5.1.1 Introduction

Archaeological and other cultural resources are important components of our Nation's heritage. The Service is committed to protecting valuable evidence of plant, animal, and human interactions with each other and the landscape over time. These may include previously recorded or yet undocumented historic, cultural, archaeological, and paleontological resources as well as traditional cultural properties and the historic built environment. Protection of cultural resources is legally mandated under numerous Federal laws and regulations. Foremost among these are the National Historic Preservation Act (NHPA) of 1966 as amended, the Antiquities Act, the Archaeological Resources Protection Act (ARPA) as amended, and the Native American Graves Protection and Repatriation Act (NAGPRA).

Permanent settlements of the Hawaiian Islands by Polynesians are recorded as early as the 7th century Common Era (C.E.); however, initial discovery and colonization may have occurred even three to four centuries earlier. Testaments to these settlements include remnants of heiau (temple sites), burial sites, terraces which supported agriculture (e.g., irrigated cultivation of kalo), stone-lined water ditches (ʻauwai), and stone-walled fish ponds (loko kuapā). It is estimated that prior to the arrival of British explorer Captain James Cook in 1778, the Native Hawaiian population numbered from 250,000–1,000,000, with most settlements established below 3,000 feet.

Hawaiian pre-contact history is divided into four main periods: the Colonization Period (300–600 C.E.), the Developmental Period (600–1100), the Expansion Period (1100–1650), and the Proto-Historic Period (1650–1795). The latter two periods are when Native Hawaiian culture is thought to have developed with the ahupuaʻa system of land divisions as well as hierarchical social structures where chiefs (aliʻi) and commoners and kapu (taboo) systems were instituted.

After the arrival of Cook, changes in Native Hawaiian culture and society occurred with increased Western contact through trade, leading to the depletion of sandalwood, diseases such as cholera and syphilis which decimated Native Hawaiian populations, and acquisition of firearms, which helped King Kamehameha unite the Hawaiian Islands. Between 1795 and 1893, there was a transition where Native Hawaiian monarchies governed and ruled the islands; the religious and kapu systems continued until 1819. Other changes during this time period included the arrival of missionaries in 1820, which lead to the conversion of many Native Hawaiians to Christianity, the building of churches, and the banning of traditional art forms such as hula as well as displacement of traditional religious and kapu systems. The growth of whaling also lead to an influx of migrant workers; trade; agricultural commodities such as cattle and chickens; and local cultivation of potatoes, onions, beans, and other vegetables and fruits. Other countries were also present during this time period, from Russia to England.

One of the greatest changes during this time was the transformation of the land tenure system from a traditional, communal system to that of a Western system under the Māhele of 1848. Title to lands in Hawaiʻi were divided between the konohiki (Konohiki (chief) Lands—1,619,000 acres), King Kamehameha III (Crown Lands—984,000 acres), and the Hawaiian government (Government

Lands—1,523,000 acres). All these lands, however, were subject to the rights of native tenants, an effort to continue the traditional Hawaiian land tenure system. Native tenants, under the Kuleana Act of 1850, could petition the Land Commission for fee simple title to these lands if they could prove they had occupied and improved it (Garovoy 2005). However, few Native Hawaiians claimed their kuleana. This, along with a sale of government lands between 1850 and1860, resulted in Native Hawaiians losing much of their lands to foreigners, who could now hold land in fee. The Native Hawaiian monarchy was changed to a constitutional monarchy in which a partly elected legislature and set of ministers carried out government business. This resulted in a shift of government from Native Hawaiian to Euro-American control. However, during King David Kalākaua's reign (1874–1891), there was a brief resurgence of Native Hawaiian culture with a Hawaiian language newspaper created, the hula and its music brought back and performed in public, as well as the building of ʻIolani Palace.

As whaling declined in the 1860s, sugar became the dominant industry, leading to a large influx of Asian immigrants and further displacement of Native Hawaiians, who had been employed as plantation workers. The first major sugar plantation was established on Kauaʻi in 1835. Princeville Plantation was established in the late 1860s. Large-scale systematic growing of coffee on Kauaʻi also began from 1835 to 1845. The economics and dominance of the sugar industry lead to political discord and eventual overthrow of the Native Hawaiian monarchy. In 1898, Hawaiʻi became a U.S. territory, partly for its strategic location with respect to Asia. Hawaiʻi continued to be a plantation society, along with some ranching, up until World War II (WWII), with pineapple joining sugar as a plantation commodity. During this time, the government and economy were ruled mainly by five major business corporations. The early 1900s also saw the building up of military in Hawaiʻi. After the bombing of Pearl Harbor in 1941 and U.S. entry into WWII, changes in Hawaiʻi resulted in Japanese-Americans entering politics, the rise of the labor unions, and a shift in government from the Republican Party to the Democratic Party. When Hawaiʻi became a state in 1959, the Admissions Act required the 1921 Hawaiian Homes Act, which set aside 200,000 acres that once belonged to the Hawaiian kingdom to lease land to Native Hawaiians, be included in the State Constitution. Since statehood, the local economy has been dominated by tourism, military, and a waning agricultural sector; the sugar and pineapple plantations began their declines in the 1950s–60s.

The late 1960s saw a revival of Native Hawaiian culture with the return of traditional hula and music. The creation and launching of the Polynesian voyaging canoe Hōkūleʻa was another major milestone in this revival of Native Hawaiian culture. The 1980s saw an increase of Native Hawaiian organizations and calls for sovereignty with the establishment of Native Hawaiian language-focused schools and the Office of Hawaiian Affairs (Juvik and Juvik 1998).

5.1.2 Kīlauea Point NWR

Kīlauea has a history steeped in the plantation days of old Hawaiʻi and World War II. It is also an area rich with stories of Pele (the volcano goddess), who had fallen in love with Lohiʻau, a chief of Hāʻena. She came to the area to find a home for them, but encountered her sisters. One variation of the story has her meeting them on Kīlauea Crater and turning them into stones out of jealously of their beauty. There is also a story related to the Menehune and Mokuʻaeʻae Island in which a bridge between the island and the mainland was never completed because they were unable to finish laying rocks in the channel in one night (Wichman 1998). Native Hawaiians consider biological resources also as cultural resources. Many of the native species found in Hawaiʻi are linked with traditional stories, sayings, and chants dating back to the creation chant Kumulipo. One example of this is the

‘iwa, which is known for its beauty, resourcefulness, and ability to soar high. This trait makes it also a symbol of vigilance. Praise for a graceful person is often compared to that of an ‘iwa’s flight. Additionally, many native wildlife are also linked with deities and family genealogies.

The name Kīlauea is Hawaiian and means “rising vapor clouds”, which describes the clouds of sea mist along the north coast. The Refuge lies in the ahupuaʻa of Kīlauea and Kāhili. The surrounding ahupuaʻa include Namahana, Kalihiwai, Kalihikai, Waiakalua, and Pīlaʻa. During the talk story session for Kīlauea held in November 2009, families with cultural ties to the area who were historically konohiki for fishing in the Kalihiwai ahupuaʻa, told of fishermen who would look from Crater Hill to spot fish and to plan for their fishing. Families with cultural ties still practice traditional Native Hawaiian fishing at Kīlauea Point. The lighthouse was also used by community members to find bearing from both the ocean and mountains for safe return.

During the mid- to late 1400s, Kīlauea, under Mano-ka-lani-pō (an aliʻi nui or high chief), was opened up for agriculture. He created the ahupuaʻa for the island (the Refuge is in the mokuʻaina of Koʻolau). By the time of the Māhele in 1848, feral cattle, which had been introduced by Captain George Vancouver to Kauaʻi in 1791, had multiplied and were causing much damage (Wichman 1998). In the late 1870s, Kīlauea Sugar Plantation Company was started and Kīlauea Town grew to support many of its functions. Though small compared to other sugar plantations, at its peak, it employed 400 people and brought a mix of European, American, and Asian people into the local community (in contrast, an 1847 census identified the area’s resident population at 240 (Aiken 1988)). It was also innovative, being one of the earliest to experiment with using trains to transport sugarcane. Tracks went to a landing on the Kīlauea Bay side of Mōkōlea Point and were used until 1942, using gasoline tractors instead of steam plows, and utilizing machines to clean sugarcane. A rock quarry was also established at Mōkōlea for road building and construction (used until 1979).

The company came to an end in the early 1970s and with this came an era of real estate development. However, opposition from the Kauaʻi County government and residents left land owner C. Brewer (who acquired controlling interest of the company in 1948) with no sales of its land surrounding Kīlauea Town until the passage in 1973 of the Comprehensive Zoning Ordinance (Kauaʻi General Plan) which clarified criteria for land sales. The zoning tried to encourage resident farmers by combining agricultural and housing use and discourage resort development and urban sprawl. However, gentleman estates still developed. Many of the former employees of the sugar plantation company were provided opportunities to buy their houses or land and gained employment through other agricultural ventures that emerged. The rise of Princeville also provided opportunities (Wilcox 1981). Several buildings in Kīlauea related to the sugar company are listed on the National Register of Historic Places and include the Kīlauea Plantation Bookkeeper’s House, Kīlauea Plantation Head Luna’s House, Kīlauea Plantation Manager’s House, and the Kong Lung Store. Kīlauea School is also registered.

With the coming of WWII, Kīlauea’s history moved from agriculture to military occupation. The current Christ Memorial Church’s Parish Hall (used as a community hall) was occupied by the U.S. Army (Wilcox 1981). The Kīlauea Radar Station was constructed by the U.S. Army Corps of Engineers between 1941 and 1942 and was managed by the U.S. Army until the end of the war. It was considered a top secret site during the war and was one of three radar installations located on the island of Kauaʻi that helped to detect planes and submarines. The Radar Station was constructed on the highest point of the Crater Hill and included two tunnels (one for radio and one for radio operations), an electrical generation plant, and a 200-foot radar tower (Dept. of the Army 1991).

After its closure, the land was transferred to the Kīlauea Sugar Plantation Company (which used one of the tunnels to store explosives). The Crater Hill area was historically used as pasture land for cattle and grazing continued until the early 1980s; a slaughter house and dairy had even been constructed at the base of the hill (operations continued until WWII). It was sold to Seacliff Plantation, which then sold it to the Refuge. Today, via SUPs, the site has telecommunication antennas for the County of Kaua‘i Civil Defense and Police Department, State of Hawai‘i Department of Transportation and Health, and a radio station. In 1988, the Refuge sought designation of this radar station as a National Historic Landmark; however, no designation has been made (Department of the Army 1991).

In January 1863, a former American whaler named Charles Titcomb purchased the entire ahupua‘a of Kīlauea, amounting to approximately 3,016 acres, under Royal Patent 2896 (signed by Kamehameha IV) for $2,500. This land grant included the present Refuge. Titcomb founded the Kīlauea Sugar Plantation Company and cleared these lands for sugarcane. He also had a ranching operation. The Kīlauea River Valley was not planted with sugarcane (only relatively flat areas were under cultivation); however, stone walls found in the valley indicate that kalo and possibly rice were grown there in earlier times (Aiken 1988). Landings were also constructed at Kāhili (or Rock Quarry) to assist with transportation of goods and people. A nearby quarry was also developed for use by the company.

Kīlauea Point (31 acres) was purchased from C. Brewer and Company by the U.S. Coast Guard to build a lighthouse as a navigational aide for the growing commercial maritime trade between Hawai‘i and Asia. Given that the Point is the northernmost tip of the main Hawaiian Island, this lighthouse could be seen for miles. Construction began in 1912 on the lighthouse and keeper’s quarters. On May 1, 1913, the 56-foot tall lighthouse officially started its use (celebrated with a lū‘au and shark shoot). Local visitors were welcomed to the site to view the technological wonder of the lighthouse. The former keepers estimated that 20 people per week visited the Point, but after Statehood, visitation increased with hotel and airline development. The lighthouse gained national recognition in June 1927 when it aided the first trans-Pacific flight from California to Hawai‘i by the U.S. Army, thereby encouraging development of commercial trans-oceanic airline service and military flights to remote regions. In 1976, the Service reached an agreement with the U.S. Coast Guard which allowed use of the 33-acre light station site for Service administrative facilities. Lighthouse use continued until 1976, at which point the U.S. Coast Guard installed an automated electronic beacon. Visitation at this time was recorded at 84,000 people annually.

In 1974, the lighthouse was placed on the Hawai‘i Register of Historic Places, and then in 1979 placed on the National Register of Historic Places. It is also listed in Kaua‘i County’s historic resources inventory. The National Register was later amended to include additional primary structures as part of the Kīlauea Point Light Station (e.g., keeper’s quarters, two assistant keeper’s quarters, oil house, landing station, derrick site, engine room, volcanic stone retaining wall, and stone stairway/moorings), three cisterns, water storage tank, storage shed/garage (Northwest Heritage Consultants 2006). The lighthouse’s second-order Fresnel lens, made in France, is one of 22 believed to exist in the U.S (and one of only seven that remain in lighthouses). The Light Station is also considered a historic district. The lighthouse itself is one of only eight surviving reinforced concrete lighthouse towers in the U.S. before 1916 concrete standards were published.

In 1985 the land was transferred to the Service and became a national wildlife refuge. Through the years, several of these structures have undergone restoration and renovation, including the radio beacon building, keeper’s quarters, and lighthouse (particularly after Hurricane Iniki in 1992). Since

2010, the lighthouse has been undergoing restoration work which has included repairs to the unique cast iron roof and lantern assembly, removal of interior and exterior coatings, repairs to the concrete tower, removal of concrete blocks from where windows were formerly located, installation of new windows, corbels, and doors, and repair of the Fresnel lens, and the inclusion of additional safety measures. This restoration work, at a little over $2 million dollars, has been supported mostly by grants and fundraising done by Kīlauea Point Natural History Association (KPNHA) as well as Congressionally appropriated funding. On May 4, 2013, the lighthouse was renamed the Daniel K. Inouye Kīlauea Point Lighthouse to honor the late U.S. Senator from Hawaiʻi who had championed and provided funds for the restoration work.

Previous archaeological research

In 1987, William K. Kikuchi surveyed the present grounds of the Refuge and areas of proposed extension. Considering the significance to native Hawaiians of seabird nesting colonies found within the Refuge, Kikuchi extended the limits of his survey to search for associated cultural features or material. Surface remains of historic structures associated with Kīlauea Lighthouse are described, and limited subsurface testing was performed, but Kikuchi found no evidence of remains related to native Hawaiian culture (Kikuchi 1987).

Xamanek Researches (Fredericksen and Fredericksen 1989) surveyed areas including Crater Hill and Mōkōlea Point. Land use and history of tenure is documented well, followed by detailed descriptions of historic structural remains related to the transport and loading of sugar at Mōkōlea Point, a World War II-era radar installation on Crater Hill, and Kīlauea Lighthouse. Although archaeological evidence of native Hawaiian exploitation of seabird colonies was one object of the survey, no such remains were observed.

As part of the environmental assessment done for the Refuge's boundary expansion (USFWS 2007), a records search was conducted at the State of Hawaiʻi Historic Preservation Office located in Honolulu in May 2005. The search included a review of all recorded prehistoric and historic archaeological sites within a quarter-mile radius of the proposed expansion area. The file search showed that four cultural resource surveys (1996, 1997, 2000, 2001) had been completed, resulting in the recordation of nine cultural resources and notation of three sites recorded in 1928 and 1929. Of the 12 cultural resource sites, one site, a possible burial, was located within the expansion area. Three sites that are in closest proximity to, but outside of the expansion area, included a historic burial site and agricultural complexes.

Previously recorded sites in closest proximity to the 2007 boundary expansion area included a historic burial site, agricultural sites, and a heiau, as described below. The earliest archaeological study was conducted by T.G. Thrum in 1906; it focused on Kauaʻi heiau sites. The Kipapa Heiau, was recorded in 1928–1929 by W.C. Bennett and is described as follows: "Kipapa Heiau was situated on the end of the first bluff east of Kīlauea River in Kāhili section." It was described by Thrum as "A large heiau of some 300 by over 100 feet in size, paved, walls 5 feet high, standing in cane field in partial ruins." Since that time, stones have been removed. This site is located outside the proposed expansion area, to the east. According to information cited from personal communication in the cultural resource survey report by Burgett et al. (2000), the Kipapa Heiau was reportedly destroyed.

Of the four cultural resource survey reports, the survey conducted by Burgett et al. (2000) recorded three sites that are also located outside but in proximity to the expansion area. These sites include:

- A large pre-contact and early post-contact dryland agricultural site located on the slopes above Kīlauea River. Features were studied and described. Based on subsurface testing, no significant cultural deposits were observed, and thus no further work was deemed necessary.
- A possible burial identified by the landowner. The exact location of the site is unknown, but is suggested by the landowner to be located near the base of a slope of a natural bench.
- A late prehistoric/early historic agricultural site consisting of berms separating the remnants of pond fields that were once used for the cultivation of taro and rice. If development is to occur within this site, data recovery (i.e., subsurface auguring) to locate pond field deposits and surface mapping of extant features was recommended.

A preliminary records search by the State Historic Preservation Officer (SHPO) found no sites currently listed in the National Register of Historic Sites in the expansion area. A site visit was conducted with the SHPO on May 11, 2005, on Parcel 3, a 162-acre parcel known as "Kīlauea Falls Ranch." According to the SHPO, very little is known about the historical uses of this parcel. No extensive archaeological surveys have been conducted in the study area because extensive development has never been proposed. One house site and adjacent loʻi kalo terraces were identified in a lowland portion of Parcel 3. An associated ditch may be present but no clear rock lining of a ditch was observed. Other loʻi terraces most likely exist at higher elevations in the large valley on the southwestern end of the parcel, but no surveys have been performed to confirm (USFWS 2007). Maps identifying these parcels and related cultural resources can be found within the 2007 Land Conservation Plan and Environmental Assessment (USFWS 2007).

Cultural Surveys Hawaiʻi, Inc., carried out studies for Kīlauea Falls Ranch on the west side of Kīlauea River (also known as Kāhili Stream) (Shideler et al. 2007 and 2008). A total of 62 features were identified within a total of 5 sites. Four of these five sites are primarily or exclusively agricultural terraces. The only exception at these four sites was interpreted as a temporary habitation related to the agricultural terraces. The inventory survey (Shideler et al. 2008) concluded that the approximately 60–70 inches of annual rainfall within that project area made cultivation possible without irrigation. While Shideler et al. concluded that there may well have been pre-contact ponded field (loʻi) taro cultivation along the flood plain, the vagaries of hurricane, tsunami, and flood may have made such planting down by the river precarious. It was suggested that cultivation up on the steep slope may have been more secure. The propensity of the Kīlauea/Kāhili Stream to flood may have encouraged development on the steep slope. Particularly relevant in the Kīlauea Falls Ranch study was the documentation of a dense cluster of 55 archaeological features including 53 soil-retaining terraces and two possible habitation areas.

In 2013, a systematic pedestrian survey was completed within the approximately 6.67-acre Nihoku Ecosystem Restoration project area at Crater Hill. No surface cultural resources were observed during the survey (Hammatt and Shideler 2013).

The 1980 North Shore Development Plan Update (which includes Kīlauea) identified additional historic and scenic features:

- Kauapea Beach;
- Crater Hill;

- Kīlauea River Estuary and Bay;
- Kīlauea Slippery Slides;
- Kīlauea Episcopal Church;
- Kīlauea Language School;
- Old Hospital Building and Dispensary;
- Old Plantation Office Building;
- Plantation stone houses;
- Kapinao Heiau; and
- Mountains behind Kīlauea.

5.2 Refuge Facilities

Facilities described are those that support visitor services, law enforcement, administration, maintenance, and biological management at the Refuge. Historic structures and facilities managed by the Refuge were also described in the previous section.

Located 23 miles north of Līhuʻe and 2 miles north of the town of Kīlauea, the Refuge lies at the end of Kīlauea Road, a narrow County Road that ends in a cul-de-sac (turnaround). This area (hereafter also referred to as the Overlook) has six paved, painted parking stalls as well as information displays about the native wildlife and plants that can be seen in the area. Approximately 20 additional vehicles can be accommodated along a dirt/gravel section of Kīlauea Road that visitors often use as impromptu parking (Figure 5-1).

The public entrance to the Refuge is controlled by a large metal automatic gate, which allows entrance to the public portion of Kīlauea Point NWR. During a 1-year trial period starting February 2014, Kīlauea Point proper (hereafter also referred to as the Point) is open to the general public 5 days a week, from Tuesday to Saturday, with an entrance fee of $5.00 per person. After the trial period is completed, the visitation days will be reassessed to see if it is possible to reopen on a 6 or 7 day a week schedule. Upon entering the Refuge, vehicles (no pedestrians allowed) descend a steep, narrow (16 feet in width), curving, paved road (0.21 miles) that leads directly to two paved parking lots and two gravel areas, which can accommodate up to 51 vehicles and 15-passenger vans. Large tour buses (25 passenger or larger) are restricted from entering the Refuge. Visitors then walk up to the main area of the Point, where a paved walkway leads them to a fee booth, a visitor center built in 1988 (which houses limited interpretive and educational displays as well as a bookstore, meeting room, minimal storage, and restrooms), and out to the Point, with the historic lighthouse and oil shed, and radio beacon building which has been converted to an interpretive site with informational displays and video. Associated with the radio beacon building, there is a garage (nonhistorical) that stores golf carts used to transport people with disabilities and supplies. Throughout this area, viewing scopes for the public to enjoy views of the seabirds, whales, and coastline and interpretive panels are available.

Two of the historic keeper’s quarters are used as administrative offices for staff. The associated garages are used as storage for supplies. The third quarter, which also has an attached garage (nonhistorical), is currently used as staff residence to provide onsite presence when the Refuge is closed. There is limited parking for staff and volunteers and limited covered areas to protect these and Refuge vehicles from the harsh sea salt and winds.

There is also a small nursery (24x30 feet) used for growing native plants used in outplanting and restoration projects. Another storage shed, built after Hurricane Iniki, is also used to protect an electric vehicle, as a workshop, and maintenance storage.

The Refuge's maintenance facilities are located in an extremely corrosive environment due to being prominently exposed on the cliff and subject to the northeasterly trade winds and sea spray from heavy wave action (especially in the winter months). This salty environment makes most exposed metals rust at an accelerated pace. Vehicles, heavy equipment, tractor implements, outdoor fixtures on buildings, and other equipment with exposed metal do not remain functioning for more than a few years without extensive rust buildup, making repairs expensive and time consuming.

Though the two existing small maintenance facilities provide limited maintenance capability and provide cover for small equipment including grounds maintenance and other small tools, it is insufficient for larger Refuge equipment needed for Refuge management. Examples include vehicles, tractors, and tractor implements (mower decks, boom axe, grinder heads, herbicide sprayers, etc.). The lack of this equipment onsite greatly hampers the effectiveness of Refuge operations.

The Refuge maintains 2.7 miles of boundary, protective, and guard rail fencing. There are also gates that are tied into some of the fencing. At least 35 percent of this fencing is in need of replacement due to rotting posts, rusting mesh, and falling gates. Fifty percent of the fence also needs to be surveyed with the remaining 15 percent relocated for firebreak purposes and to deter trespass. Fence maintenance and assessments are critical as fences serve as the main deterrent against wildlife threats such as predators and trespass. Regular maintenance ensures the fence is intact and any issues discovered addressed quickly (e.g., holes cut in the fence, birds which might inadvertently get caught).

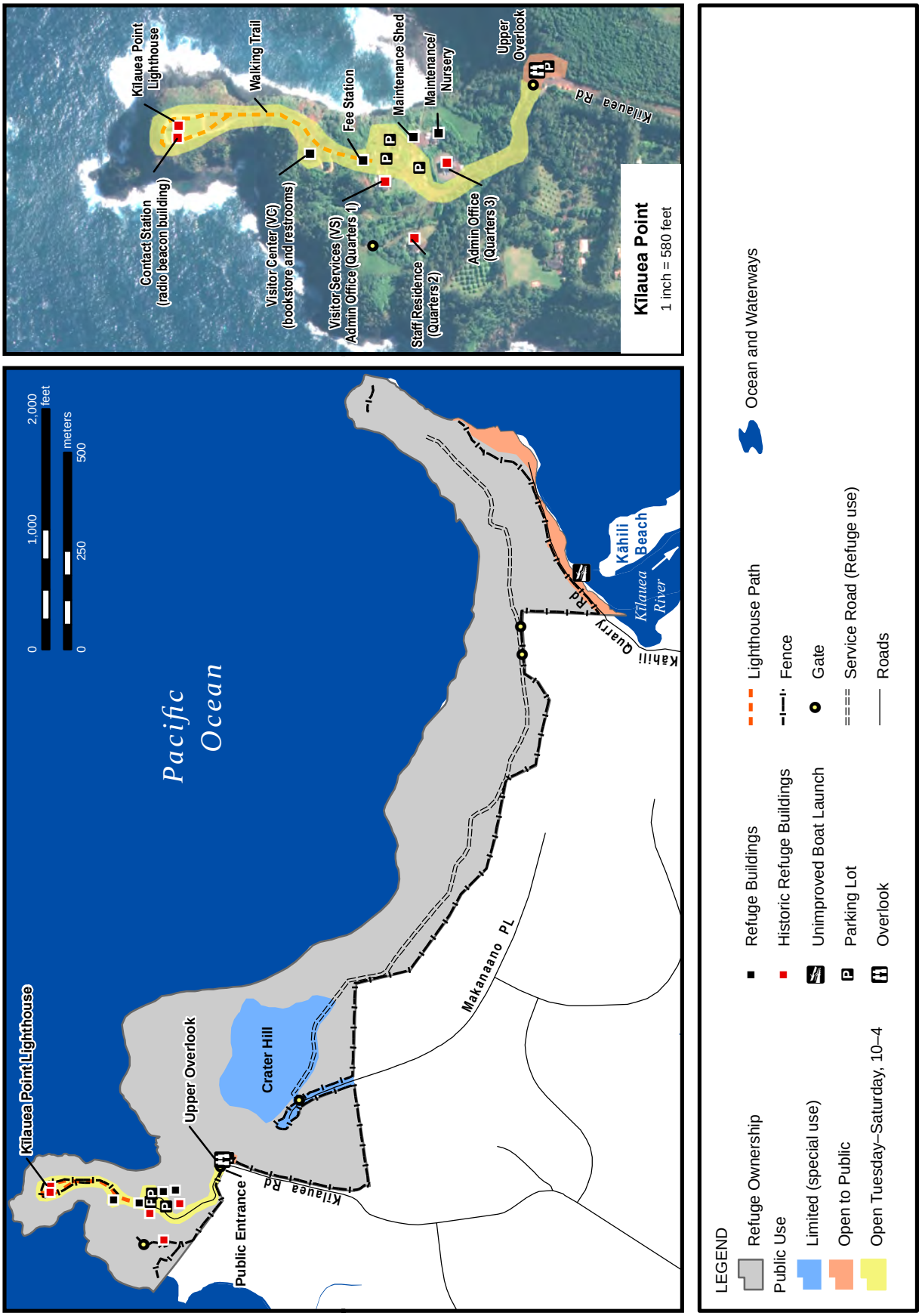
Additionally, in collaboration with several partners including the American Bird Conservancy, the Kaua‘i Endangered Seabird Recovery Project (a Hawai‘i Division of Forestry and Wildlife and Pacific Cooperative Studies Unit effort), the National Fish and Wildlife Foundation, and others, construction of an approximately 2,400-feet-long predator-proof fence around 7 acres of the Refuge slightly east of Crater Hill is scheduled to begin in summer 2014.

At Crater Hill to Mōkōlea Point, there are partially cemented or dirt roads used for management in these areas which are closed to the general public. A portion of Kāhili Quarry Road is owned by the Refuge and open to the public.

The majority of the visitor services related signage is located at the Point and Overlook. There are also boundary signs which mark the Refuge boundary.

Other infrastructure which supports Refuge facilities and management includes water storage tanks and distribution systems, septic systems, and power distribution lines/systems.

Figure 5-1. Public Use and Maintenance and Facilities, Kīlauea Point NWR.



The back sides of maps are blank to improve readability.

5.3 Public Use Overview

5.3.1 Visitation Trends

The Refuge is one of over 560 refuges in the U.S. and is the fourth most visited Refuge in the Refuge System. The Refuge is often prominently featured in visitor guidebooks and publications geared toward tourism (e.g., drive guides, visitor maps, airline in-flight guide videos, rental car agency videos). It is estimated that one-third of visitors to Kaua‘i go to the Refuge (PB 2004), and it is it the 8th most visited attraction in the state. Between 2007 and 2013, Refuge visitation ranged from 388,000 to 500,600 with a peak of 500,600 in 2010. These numbers account for visitors who may stop at the Refuge entrance Overlook as well as pay the entrance fee.

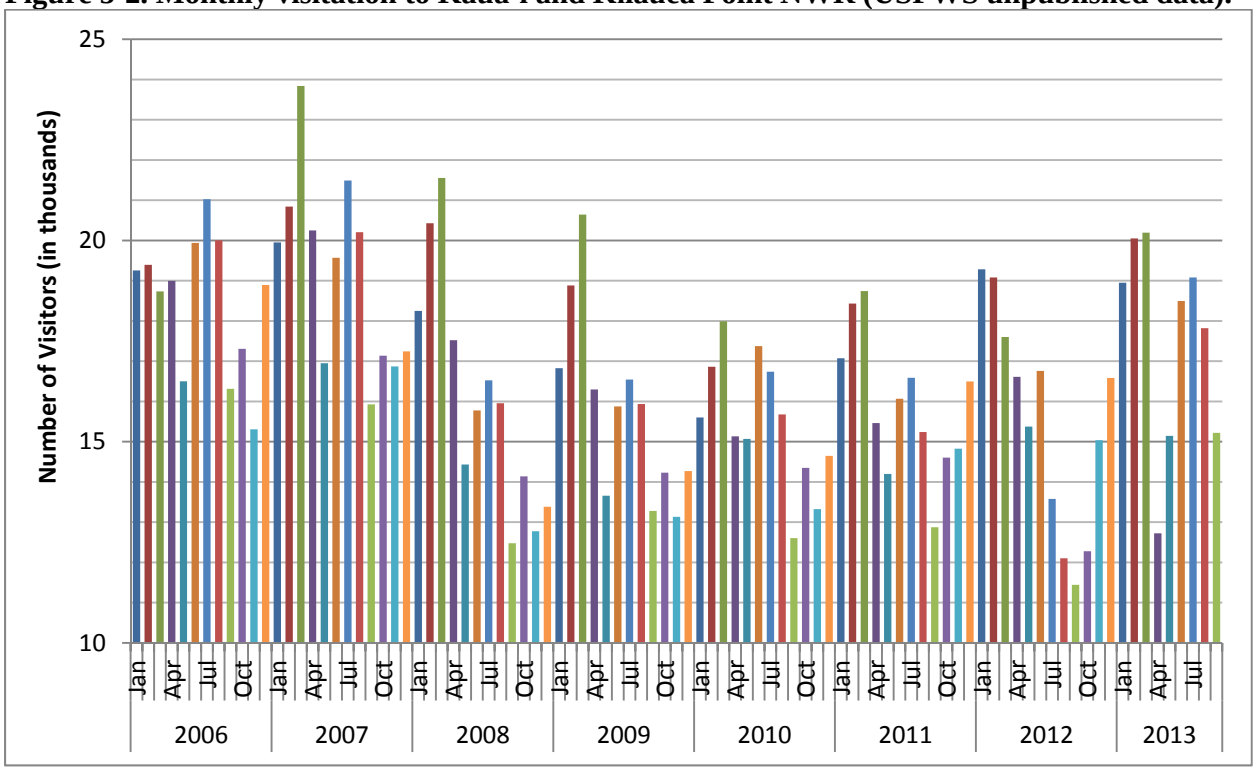
In addition to the Point itself (which is less than 10 acres), right outside the entrance gate is the Overlook, which is open to the general public at all times and is a popular scenic stop for visitors to the island. The area to the north of the lauhala tree to the coast is owned by the Refuge, while the area heading south up Kīlauea Road is owned by the County.

Areas not open to the general public include Crater Hill and Mōkōlea Point. Access to these areas is limited in order to protect breeding populations of endangered and migratory birds and other sensitive natural resources as well as for safety reasons. Access to these areas is by SUP or through special events such as those held during National Wildlife Refuge week. The number of special events hosted on- and offsite range between 4 and 9 annually with participants ranging from 3,909–6,300 per year during 2007–2011.

Visitation to Kīlauea Point NWR is related to total visitation to the island of Kaua‘i. Tourism on the island is sensitive to global macro-economic conditions and natural disaster events. Over the analysis period, annual visitation to Kaua‘i peaked in 2007 at about 1.3 million visitors. As a result of the global economic downturn, annual visitor arrivals to the island decreased by 20.6 percent from their peak in 2007 to about 1.0 million arrivals in 2008. Annual visitation to Kīlauea Point also peaked in 2007 at 230,300 visits, and fell by 16.1 percent to 193,200 visits in 2008.

Refuge visitation is also subject to seasonal fluctuations. Figure 5-2 shows monthly visitation to Kīlauea Point NWR for the period being October 2005 and ending September 2013. With the exception of 2006, when June, July, and August were peak visitation months, the peak season at the Refuge is generally January to March.

Figure 5-2. Monthly visitation to Kaua‘i and Kīlauea Point NWR (USFWS unpublished data).



According to a traffic, visitor, and parking study (TVP study) done in 2004, peak times for utilization of the Refuge were between 10 a.m. to 2 p.m. every day, with the parking overflowing between 11 a.m. and 1 p.m. The estimated daily number of vehicles coming down to the Point parking area was 225 during peak visitation. This number is projected to increase to 260 by 2015 and 300 by 2025 under a mid-range growth rate scenario. The Overlook experiences its busiest times at 9:30–10 a.m. and 4–4:30 p.m. (the average visitor spends only 7 minutes at the Overlook (PB 2004)). Visitation seems to increase when cruise ships dock at Līhu‘e and vehicle occupancy is higher in the summer than the spring. However, seasonal variability in visitation is not large compared to similar destination on the mainland, with visitation peaking in winter, spring, and summer and declining 17 percent in the fall (PB 2004). There is only parking capacity for 51 vehicles on the Point. From 2010 to 2013, the visitor center averaged about 189,963 visitors per year (USFWS 2014).

Due to flat and declining budgets, starting in February 2014, the Service reduced the days that Kīlauea Point proper is opened to the general public from 7 to 5 days a week. The Refuge is closed each Sunday and Monday. Visitors are able to visit the Refuge from 10 a.m. to 4 p.m. on Tuesday–Saturday, except on Federal holidays, with an entrance fee of $5.00 per person. After a trial period of 1 year, the visitation days will be reassessed to see if it would be possible to reopen on a 6 or 7 day a week schedule. The visitation trend from data collected from February through May 2014 shows that Tuesday is the highest visitation day, followed by Thursday and Wednesday.

With the passage of the Emergency Wetlands Resources Act of 1986, entrance fees were charged for the first time at the Refuge in 1987 at a rate of $2.00 when the Refuge was opened Monday–Friday from 10 a.m. to 4 p.m. Previously, entrance was free. A fee booth was constructed and three rangers recruited and trained to manage the fee program. In the first year of the program, close to 300,000

people visited the Refuge and $143,762 was collected (some people had free entry through the various passports program).

The Federal Lands Recreation Enhancement Act (FLREA), passed in December 2004, authorizes the Service permanent fee authority for 10 years to collect entrance fees, expanded amenity recreation fees, and special recreation permit fees through December 7, 2014. Per the act, not less than 80 percent of the recreation fees and site-specific agency pass revenues collected at a specific unit or areas of Federal land management agency shall remain available for expenditure, without further appropriation, until expended at that unit or area. Use of fee revenues at a specific site or area can only be used for (1) repair, maintenance, and facility enhancement related directly to visitor enjoyment, visitor access, and health and safety; (2) interpretation, visitor information, visitor service, visitor needs assessments, and signs; (3) habitat restoration directly related to wildlife-dependent recreation that is limited to hunting, fishing, wildlife observation, or photography; (4) law enforcement related to public use and recreation; (5) direct operating or capital costs associated with the recreation fee program; and (6) a fee management agreement or a visitor reservation service. No fees can be used for biological monitoring on threatened and endangered species.

In Fiscal Year 2013, $647,735 in fee revenues were collected at the fee booth with 201,571 visitors. These fees are used to help support visitor services management of the Refuge and include repairs of interpretive exhibits and signage, maintenance of facilities, safety repairs, publication of brochures, and restoration of historic structures.

5.3.2 Volunteer Program

Due to the limited number of staff, the Refuge relies on assistance from Refuge volunteers and its partnership with the KPNHA, a Refuge Friends Group, to provide visitor services such as interpretation and environmental education and habitat management (e.g., native plant restoration, banding birds, controlling introduced predators, and monitoring).

The volunteer program at Kīlauea Point began in 1984, a year prior to the site's designation as a national wildlife refuge. Staff recognizes that the volunteer program is a critical part of the Refuge workforce and that it benefits all programs and goals and strengthens community relations. Between 2010 and 2013, the number of volunteers ranged from 103–115, providing between 6,410 and 8,523 hours of service (USFWS 2014). In 1988, it should be noted that 21,923 volunteer hours were recorded.

In the Refuge's early years, volunteers were heavily involved in the habitat restoration effort, participated in biological studies, conducted most of the environmental education (EE) programs, and staffed the KPNHA bookstore before salespeople were hired. A volunteer letter-writing campaign was influential in having Crater Hill acreage donated to the Refuge in 1988, and the volunteer program received "Take Pride in America" awards in 1987, 1989, and 1992. The Point, as well as the area surrounding the Lighthouse, is staffed almost entirely by volunteers.

From 1984 to 1989, volunteers who interacted with the public were required to attend an annual 8- to 10-week training. Volunteers would gather once a week for sessions conducted by Service personnel and local experts. Sessions were pertinent to the Refuge and included such topics as orientation to the Service, Hawaiian seabirds, wildlife of the surrounding ocean, and the historic Kīlauea Lighthouse. Between 1989 and 2002 (excluding 1993 and 1994 when the Refuge was due to the 1992 Hurricane

‘Iniki), only two similar, formal volunteer training courses were conducted. The 1997 sessions were taped, resulting in a collection of training videos in the Refuge library. The annual training was initiated again in 2003.

The majority of Refuge volunteers are retired persons who live on Kaua‘i’s North Shore. Most possess college degrees and professional skills. Approximately 50 percent of volunteers live on the island year round, while the other 50 percent live on island for several weeks or months out of the year. Therefore, there is a definite seasonal availability of Refuge volunteers. The greatest number of volunteers is seen during January–March when “snowbird” volunteers are plentiful, while the least number of volunteers are seen in the summer as the “snowbird” volunteers have yet to return and any student volunteers have gone back to school. With 50 percent of volunteers arriving and departing the island at different times, this presents challenges in getting all volunteers back “up to speed” and causes scheduling to be time consuming. Filling gaps in volunteer coverage fall to Refuge staff and/or interns.

In 2001, a Volunteer/EE Coordinator position was created, of which 40 percent of the position’s time was devoted to volunteer management and coordination. Prior to this, volunteer coordination duties were assumed as collateral responsibilities by various Refuge staff members. In 2004, the additional responsibilities of overseeing the daily operations of the Refuge’s VS and fee programs, as well as supervising the Refuge ranger staff were added to the position, leaving even less time for management and coordination of the volunteer program and its 140+ volunteers. The volunteer handbook needs to be overhauled. There is no training manual, and regular volunteer meetings and training have been impacted by the limited amount of staffing currently devoted to daily and ever changing volunteer management and coordination.

Refuge Friends organizations are private, independent, nonprofits formed primarily by private citizen volunteers. The Friends organization affiliated with the Refuge is the KPNHA, which was established in 1984 to meet the Refuge’s commitment to volunteers. The Friends organization was the first in the Service’s Pacific Region. The initial step was to recruit a board with an interest in the Service’s conservation objectives, and with expertise and organizational ability.

A second objective was to find board members who reflected the ethnic diversity of the islands. The Service was very fortunate in assembling the first board which eventually carried the initial ideas into fruition. The board was composed of the dean of Kaua‘i Community College, principal of Kīlauea and Hanalei Elementary Schools, Kaua‘i Prosecuting Attorney, editor of the Garden Island Newspaper, a member of the County of Kaua‘i Department of Economic Development, general manager of the Sheraton Coconut Beach Hotel and a Refuge volunteer, formerly with the Denver Zoo. The board worked to develop suitable by-laws for the organization which they named the Kīlauea Point Natural History Association. Once the by-laws were drawn up the organization petitioned the State of Hawai‘i for recognition as a non-profit corporation. Once confirmed the organization petitioned the Internal Revenue Service for status as a 501(c)(3), Non-Profit Educational Corporation. After attaining this status, the organization entered into agreement with the Service for use of a portion (approximately one-third or 300 square feet) of the current Contact Station for retail sales. The decision was made to try and develop a volunteer group which would assist with start of the sales outlet.

The most fortunate aspect of this plan was the volunteer program, which far exceeded Refuge expectations and to this day contributes significantly to Refuge programs. To raise additional capital,

a membership program was initiated. A portion of the Contact Station was remodeled. Due to the limitation of space and the board's desire to keep the inventory simple, post cards, natural history publications and map were the first items carried. A year later, t-shirts were added. The first day's sales were $30.00. Fiscal year 1984 sales indicated a gross volume of $10,958. By 1987, it had reached $42,791.

Early KPNHA projects included publishing of a quarterly newsletter, *Kīlauea Pointers*, supplying binoculars and spotting scopes for visitors, hosting an annual Christmas Sale, developing and publishing three to four issues of *Hawai'i Nature Focus* (a publication for school-aged children) per year, and hosting the annual volunteer awards picnic. In 1988, the Association published a 114-page book commemorating the 75th anniversary of the Kīlauea Lighthouse. In 1994, retail operations moved into the VC and over the years continued to expand. KPNHA hired its first business manager in 1996. The title changed to executive director in 2006. A bookstore manager was hired in 1997.

Today, KPNHA has 2 full time employees and a variable number of part-time employees (typically at least 3). The bottom floor of the VC provides office space for 3 of KPNHA's 8 staff members, and storage for KPNHA supplies and merchandise. Recent accomplishments include leading a $1 million capital campaign to fully restore the nearly 100-year-old Kīlauea Lighthouse. KPNHA averages 90 members a year. Although the number of members in FY10 dropped to 52, dues and donations received from these members to KPNHA's general fund are the highest in the organization's history. The reduction in membership can be explained by some individuals donating instead to the Lighthouse restoration. Bookstore sales reached a high of $508,000 in 2008, but have dropped in recent years due to the economic decline.

5.3.3 Visitation and Visitor Experience

Two visitor surveys conducted in 2003–2004 and in 2010–2011 at Kīlauea Point NWR provide a detailed overview of visitor demographics, trip characteristics, experience, and opinions about Refuge services, facilities, and recreational opportunities. The first study (Sexton et al. 2005) was conducted in support of an Alternative Transportation Study (ATS) conducted for the Refuge (Parsons Brinckerhoff 2006). The objectives of this survey were to better understand visitor trip characteristics and experience, visitor perceptions on access and transportation options, and visitor valuation of the Refuge and services provided.

The second study (USGS Data Series 643) was conducted as part of the National Wildlife Refuge Visitor Survey (Sexton et al. 2011). This standardized survey was conducted on 53 refuges across the country in order to provide refuge managers, planners, and visitor services specialists with reliable baseline data about refuge visitors and their experiences. The survey was conducted to provide information both at a national level *and* at a field station level to more effectively manage visitor services and facilities across the System as well as to inform site-specific management and planning decisions such as CCPs, Visitor Services step-down plans, and transportation plans. Detail on sampling design, response rates, and sample sizes for each survey can be found in the respective reports.

Nearly all visitors to Kīlauea Point NWR are nonlocal (i.e., not from the island of Kaua'i), from the United States, and most were families. In the 2003–2004 study, the majority of visitors to Kīlauea Point NWR spend their time at visitor attractions on the North Shore on the day they visit the Refuge. The next most frequent trip pattern is a trip that includes stops on the North Shore and East Side

(south of Kīlauea Point NWR to Lihue). About half of visitors went to three or fewer attractions on the island on the day they visited the Refuge. Nearly all visited Kīlauea Point NWR first, second or third, with half visiting the Refuge first. Other popular stops included Hanalei Bay, Kē ʻē Beach State Park, and Hāʻena Beach State Park.

The largest incidence of travel mode used by visitors while on Kauaʻi is rental vehicle only, followed by a combination of walking and rental vehicle, or a combination of walking, boat, and rental vehicle. Nearly all visitors drive a private vehicle (rental car) to the Refuge (though private tours and taxis are also utilized). There is no public transit option available. Currently there is one fixed route from Lihue to Hanalei serving Kīlauea town on approximately 1 hour headways, from 6:30 a.m. to 10 p.m., Monday thru Friday, and 2-hour headways on Saturdays and holidays. The last stop in Kīlauea is in the downtown, commercial shop area, about 1.5 miles from the Kīlauea Point NWR Overlook. The buses do accommodate bicycles. Kauaʻi Bus does not currently have specific plans to expand service beyond downtown Kīlauea. However, in previous Kīlauea Town planning efforts Kauaʻi Bus has indicated consideration of installing a transit center or more permanent bus stop infrastructure within the downtown area.

Visitors first learned about the Refuge from signs on the highway and friends and relatives. Specific information sources most used to learn about the Refuge include travel guidebooks and visitor brochures. Key information sources used by visitors to find their way to Kīlauea Point NWR include signs on the highway, a road atlas or highway map, or previous knowledge.

Visitors are a nearly equal mix of male and female with an average age around 57 for males and 53 for females. Visitors have, on average, four years of college or technical school. The median level of income is $100,000–$149,000/year. Most are first-time visitors to Kīlauea Point NWR and typically their visit is an incidental or one of other equal reasons for visiting Kauaʻi. Visitors spend an average of 2 hours at the Refuge, with the largest number of visitors spending 1 hour (compared to 26 minutes in 1988). About half of visitors to Kīlauea Point NWR have been to at least one other national wildlife refuge in the past year. Visitors participate in a variety of activities at the Refuge; the top three activities are photography, bird watching, and wildlife observation. The scenic overlooks, viewing the historic lighthouse, and viewing native seabirds and whales are important to their decision to visit. Nearly all visitors stop by the KPNHA bookstore and view the exhibits during their visit.

> *I absolutely love the Kīlauea Point National Wildlife Refuge. We go there every time we go to Kauaʻi (3 times to date). The views and the birds and whale-watching are spectacular in any kind of weather…I want to thank the volunteers and the U.S. Fish and Wildlife [Service] and National Wildlife Refuge System for making this all possible. Places like Kīlauea Point Refuge are our nation's treasures and it is so critical we nurture and honor them.*
>
> -Survey comment from visitor to Kīlauea Point NWR

Visitors' overall satisfaction with the services, facilities, and recreational opportunities provided at Kīlauea Point NWR are high, with 86 percent satisfied with the recreational activities and opportunities; 92 percent satisfied with the information and education about the Refuge and its resources; 95 percent satisfied with the services provided by employees or volunteers, and 93 percent satisfied with the Refuge's job of conserving fish, wildlife, and their habitats. When asked about specific Refuge attributes, visitors reported the following regarding the importance of and their

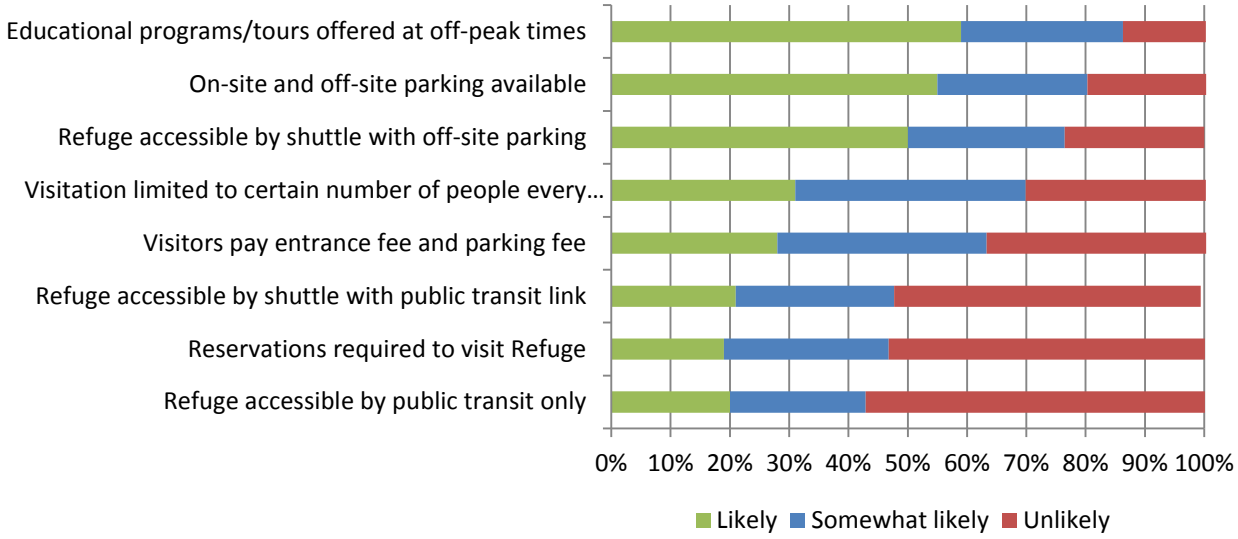
satisfaction with these attributes. All services and facilities provided at Kīlauea Point NWR received high importance and satisfaction ratings, including available, knowledgeable, and courteous employees and volunteers; convenient hours and days of operation; and information kiosks/displays and exhibits about the Refuge. Recreation opportunities provided on the Refuge also received high marks, in particular opportunities for photography and bird and other wildlife viewing. High importance and satisfaction ratings indicates "keep up the good work" regarding management. Of the 79 percent of visitors who indicated that they paid a fee to enter the Refuge in 2010–2011, three-quarters agreed that the opportunities and services were at least equal to the fee they paid and nearly all felt the fee was about right, whereas 19 percent felt that the fee was too high (8 percent) or too low (11 percent).

Three-quarters or more of visitors indicated they would spend more time on the Refuge and the surrounding area if the following were offered: a self-guided hike through restored native forest for a scenic view of the lighthouse, Kīlauea Town, ocean, and surrounding mountains (at no cost); an introduction to the Refuge by Refuge staff or volunteers (at no cost). About half of visitors indicated they would spend more time for a guided hike to the summit of an extinct volcano crater to view native seabirds, other wildlife, and World War II bunkers (for a fee); and a guided history tour of Kīlauea Town (for a fee).

As part of the 2006 ATS study and the supporting 2003–2004 survey, visitors to Kīlauea Point NWR were asked about their perceptions of crowding and their preferences for access and transportation options (including a shuttle specifically). These questions were asked in an effort to address methods for improving access and transportation needs in light of identified traffic congestion and parking problems occurring in Kīlauea Town and on the Refuge. In context, visitors to Kīlauea Point NWR were familiar with using a shuttle or bus at another park, forest, or other public facility, though most indicated they did not use alternative transportation in their daily lives.

Interestingly, the majority of visitors did not perceive crowding to be a problem on the Refuge and there seemed to be no association between parking capacity and visitor perceptions of crowding (though winter visitors did perceive some crowding in parking areas when parking capacity was exceeded and overflow parking occurred). When asked about specific transportation-related aspects at Kīlauea Point NWR, all attributes received high marks, including safety of driving conditions, directional signs on highways, safety of Refuge entrance, directional signs on Refuge, and condition of trails/boardwalks. Visitors were asked about options for managing visitation, ranging from a reservation system and fees to off-peak hour offerings to encourage different visitation patterns. Over half of visitors indicated they were likely to visit if educational programs or guided tours were offered at off-peak times. They were also supportive of a choice of on- and offsite parking where offsite parking with a shuttle to the Refuge would cost less than parking onsite. Lastly, they were likely to visit if the Refuge were accessible only by shuttle from offsite parking. Most visitors were *not* likely to visit if the Refuge were only accessible by public transportation, if reservations were required to visit the Refuge, or if the Refuge were only accessible by a shuttle that had a public transit link to other visitor attractions on Kaua‘i (Figure 5-3).

Figure 5-3. Likelihood of visiting Kīlauea Point NWR versus management options (Parsons Brinckerhoff 2006).



Regarding a shuttle specifically, visitors indicated they would be willing to wait about 20 minutes to enter the Refuge by shuttle. Key factors that would affect visitors' decision to visit the Refuge by shuttle were reliable and on-time service, the cost of the shuttle fare, and offsite parking that is easy to find and near the Refuge. Visitors were willing to pay higher amounts for a Refuge entrance fee that included a shuttle and guide.

Though alternative transportation was explored more generically in the 2010–2011 survey, only a small percentage of 2010–2011 visitors felt alternative transportation at Kīlauea Point NWR would enhance their experience. However, over half of these visitors indicated that on national wildlife refuges in general, they might be likely to use several alternative transportation options, including offsite parking with trail access, a boat that goes to different points on Refuge waterways, a bus or shuttle that provides a guided tour of the Refuge, or a bus or shuttle that takes passengers to different points on the Refuge.

Bicycle and pedestrian access along the east shore of Kaua'i between Līhu'e and Kīlauea Point NWR is mostly limited to shared-use roadway along Highway 56 and through Kīlauea Town. There are also several local residents who access the Crater Hill area on foot or bicycle via a gated community located up Kīlauea Road, about one mile from the Overlook. There are plans for a separate bicycle and pedestrian path to go from Nāwiliwilli to Anahola along the east shore. Portions of this path, known as the Ke Ala Hele Makalae trail, are built, but even when complete, a visitor on bicycle or foot would still be over 10 miles from Kīlauea Point NWR.

5.3.4 Visitor Services Management Challenges

High visitation to the Refuge poses several transportation, signage, and access-related challenges for staff. Visitors to the Refuge arrive using State Highway 56 (Kūhiō Highway), turning onto Kolo County Road and then onto the 2-mile Kīlauea County Road which passes through the heart of Kīlauea Town and leads to the Refuge. Residences, as well as commercial sites, line the sides of the road on this first half-mile stretch. After passing through the center of Kīlauea, the remaining 1.5

miles of Kīlauea Road contains a few residences and open space, and then terminates at the Refuge Overlook. Hawai‘i Department of Transportation traffic counts conducted in 2009 on Kīlauea Road found a two-way average daily traffic load of 4,600 cars in the first half-mile and 1,300 cars in the remaining area between downtown Kīlauea and the Kīlauea Point NWR Overlook. From these counts it is estimated that 25 percent of all traffic on Kīlauea Road is headed to the Refuge, either the Point or the Overlook.

There is little to no signage properly directing traffic from the main highway down the County roads to the Refuge. There is also no intelligent transportation system (ITS) that conveys real-time information about parking availability at the Refuge (a comment was made on this issue on one of the visitor surveys). At this time the Refuge is being considered to take part in a Service ITS demonstration project. This demonstration would most likely involve the use of vehicle detection counts at the Refuge to relay parking availability and operation status of the Refuge to visitors out on Kūhiō/State Route 56 Highway via electronic messages. Some further planning, design, public involvement, and compliance would still need to occur before this technology could be tested.

The entrance road from the Overlook to the parking area has a number of issues. At the Overlook, pedestrians do not have a designated path by which to navigate from where they parked to the actual Overlook. They sometimes must weave between cars entering and exiting the Refuge. Although signs indicate that pedestrian use of the access road beyond the entrance gate is not allowed, a number of individuals disregard or do not see the signage and walk down the access road. Traffic congestion also occurs at the Overlook due to its cul-de-sac configuration when there is a queue to enter the Refuge or people are waiting for parking spots at the Overlook.

There is limited advance directional or orientation/information signs to help visitors understand how to access the Point and see the Lighthouse, or what their options are. Visitors who arrive by car typically park to see the view at the overlook but are confused about whether or not they are supposed to drive or walk past the gate down into the Refuge. There are signs however they are not readily noticed by the visitor. It is also unclear to bicyclists whether or not they are allowed to ride their bicycles past the entrance gate. Residents expressed concern about the impact of tourists on transportation infrastructure and they did not want to see overbuilding of the Refuge’s circle infrastructure to accommodate more visitors (Parsons Brinckerhoff 2006).

The winding, narrow, steep road leading into the Refuge makes for dangerous conditions. Larger vehicles, such as tour buses, have no access because of the road conditions and limited parking facilities. School groups that use school buses are accommodated outside of the hours for the general public. However, the groups often leave after the Refuge has opened, which requires a minimum of two staff to stop traffic to allow the bus to use the access road, as well as a staff member to work in the entrance booth. Bicycle use of the access road is also an issue for many of the same reasons cited for pedestrians.

Parking is often insufficient at the Refuge, especially during peak visitation periods (comments were made on this issue in the visitor surveys). At such times, Service staff must be stationed to direct traffic and promote safety when the parking lot is congested. When visitation exceeds parking capacity, including reasonable overflow limits, Service staff place a sign at the entrance gate to indicate that public entry into the Refuge is temporarily closed. During these times, a staff member is stationed at the entrance gate to facilitate a one-car-in, one-car-out operation. Such overflow conditions not only prevent Refuge staff from conducting other key duties such as providing talks

and interpretive opportunities, but also degrade the quality of wildlife habitat, negatively impact the visitor experience, and undermine the Service's ability to fulfill its goals for wildlife-dependent uses.

Traffic flow through the existing parking lot is also an issue as shown by visitor survey comments about the steep climb from the lot to the booth, limited parking, and the tightness of the parking area. There are two paved parking areas, the upper and lower lots, which include 32 designated stalls, oriented at 90 degrees to the parking access lanes. The upper lot has one designated ADA- accessible parking stall and access aisle located near the existing fee booth and Point Area Pedestrian Pathway entrance. The two lots are connected on the north side by a paved asphalt pedestrian access ramp which has steep slopes of up to 18 percent. Bollards block vehicular access to this ramp at the north end of each lot. The current parking lot traffic flow in these lots is U-shaped; vehicles must pull-in and pull-out the same direction they came from (no through traffic). Drivers are unable to determine the availability of parking until after entering each respective lot. If parking is unavailable, drivers must back up out of the parking lot in order to turn around and look for parking in other locations.

Vehicles must also avoid pedestrians walking to the entrance fee booth. Grass areas are used for parking during overflow conditions. However, wet grass or slippery conditions can be hazardous and have resulted in accidents. They are also endangered nēnē foraging, roosting, and brood-rearing areas. Traffic cones are used to direct traffic when possible. However, the effort involved for Refuge staff to install and move cones creates additional staffing issues. Through the use of Public Lands Highway Discretionary program funds, the Refuge is planning to undertake minor construction to improve the traffic flow situation in these lots. Included in this work would be improvements and stabilization to the administrative and graveled parking areas and stabilization of the retaining wall below the pedestrian walkway.

After the visitors exit their parked vehicles, there is a lack of information and signage to let them know where they can and cannot go, leading to confusion. There are several buildings adjacent to the parking areas; however, the Lighthouse, restrooms, and VC are not visible from the parking lot. Therefore, visitors are often confused about how to get to these facilities, as well as the existing buildings and where they should go. In the visitor surveys conducted, several comments about needing better signage were recorded.

The transportation, signage, and access issues also pose a danger to native wildlife. There is threatened ʻaʻo or ʻuaʻu kani habitat on the side of the narrow, curving road leading into the Refuge, which makes regrading or expanding this road problematic. Nēnē also nest and rear young along this road and have been killed or injured, despite the wildlife and slow down signs posted and speed bumps.

As a result of these issues and staff desire to provide quality visitor services experiences (versus increasing visitation numbers), several studies were conducted to provide solutions. Alternative transportation systems (ATS) were evaluated, including a traffic, visitor, and parking study; visitor and community survey; and Refuge visitor projection report. The 2006 ATS study provided five alternatives for consideration to deal with current transportation issues and anticipated rise in island visitor numbers:

- No improvements, which would keep current status;
- Minor improvements, transportation system management, and transportation demand management. These would include physical or operational changes to increase effective capacity through improved management of parking resources, or they would redistribute

demand to less busy times;
- Moderate improvements to increase capacity, which would include physical improvements such as additional parking and/or widening roads;
- Voluntary shuttle service with private vehicle access, which would institute a shuttle system from a new offsite hub facility while continuing to allow private vehicles onto the Refuge; and
- Mandatory shuttle service, which would prohibit public parking beyond the entry gate at Kīlauea Point NWR and require all visitors to use a shuttle system from an offsite hub facility.

It should be noted that in the Kīlauea Town Plan planning process, the shuttle bus for visitors was heavily discussed in the public workshop discussions (County of Kaua‘i 2006). The Kīlauea community's interest was to manage visitor demand at Kīlauea Point NWR by using entry fees and other measures and to make only modest changes to parking and transportation rather than take steps that may promote increased visitation to the Refuge.

The report also looked at cost feasibility as well as modeled several different case scenarios related to visitor numbers and anticipated use. Several of the recommendations and analyses were integrated into the proposed actions in Chapter 2, as well as the effects analysis in Chapter 6. This study can be found at http://www.cflhd.gov/lrtp/documents/projects/KPNWR_ATS_FINAL.pdf.

In addition to the 2006 ATS report, a Transportation Assistance Group (TAG) was convened in 2009 to assist the Service in further refining data and recommendations to pursue regarding transportation, especially as it relates to the CCP. In addition to the problems already identified, additional issues identified by TAG included:

- Transit viability concerns due to visitation patterns;
- Fee collection location creates circulation problems, does not capture visitors at the Overlook, and the flat rate does not encourage the use of alternative transportation;
- Constrained footprint in which to expand or support transportation infrastructure; and
- Visitation is expected to grow and to remain diverse.

The TAG group provided a series of recommendations for the Refuge to consider. Most focused on incorporating transportation goals and planning into the CCP process. The recommendations were:

- Revisit previous approach of pursuing NEPA analysis funds for 2006 ATS Study; integrate transportation planning with CCP and town planning;
- Consider proposals for additional funding from other sources;
- Develop transportation goals and objectives, and an assessment of needs;
- Continue productive stakeholder partnerships; play a leadership role;
- Adopt an incremental approach; move away from planning and toward implementation; experiment with operational changes, such as:
    - Change operating hours–e.g., closing once per week, opening 1 hour later or earlier on particular days–to attempt to address anticipated traffic/parking problems, and/or to offer new services (such as sunrise hikes) that might smooth out demand over the course of the day, reducing the need to increase parking capacity;

  - Charge differential fees (subject to the Refuge's fee authority), depending on the level of crowding by time of day;
  - Work with cruise operators to coordinate transit from cruise ships docking at Kaua'i;
  - Install temporary traffic humps in town to determine how effective they could be at slowing traffic;
  - Test a parking reservation system to enable advance planning for managing visitor traffic and parking;
  - Test variations on the one-on, one-off protocol for managing visitor car access;
  - Require staff to park offsite, providing transit or carpooling, in order to free up additional parking spaces for Refuge visitors;
  - Arrange a transit demonstration service;
- Pursue small-scale infrastructure improvements;
- Identify data needs and collect data to fill gaps; and
- Scope other planning efforts.

In March 2011, another workshop, the CCP Visitor Services and Alternative Transportation Workshop, was conducted to assist in incorporating TAG and other transportation-related study recommendations into the CCP. Refuge and Service regional staff, along with technical advisors from Federal Highway Administration-Central Federal Lands Division, U.S. Department Of Transportation, Volpe Center, U.S. Geological Survey, Hawai'i Department of Transportation, Kaua'i Bus, and Kaua'i County participated in this workshop. The group examined CCP goals and identified how transportation related to achieving these goals. These transportation objectives and goals were broadly folded into the alternatives discussed in Chapter 2 (e.g., adopting an incremental approach at first to include demonstration projects and small, incremental changes for infrastructure and operations).

More specific transportation planning and implementation will take place via SDMPs that take their direction from the final CCP. The Refuge has received funding from the Federal Transit Administration's Paul S. Sarbanes Transit in Parks Program to assist in planning for the implementation of the transportation components that emerge from the CCP. The study will provide recommendations on how to implement components, such as data collection, coordination with other entities, and additional planning required to implement elements.

5.4 Wildlife-Dependent Public Uses

The Improvement Act identified hunting, fishing, wildlife observation and photography, and environmental education and interpretation as wildlife-dependent, priority public uses for the Refuge System.

5.4.1 Hunting

The Refuge is not open for hunting. However, there are other lands (e.g., state forest reserves) on the island where public hunting is offered.

5.4.2 Fishing

The Refuge is open for recreational fishing. From 2010 to 2013, the number of participants per year ranged from 18 to 104 (USFWS 2014). Fishing occurs at Kāhili Quarry (sea) and the Kīlauea River

(estuary). In addition, cultural Native Hawaiian fishing access is granted to the East Cove of Kīlauea Point. Participants must sign a waiver as well as receive an orientation on sensitive areas. For additional information please refer to Appendix B and the CD for fishing.

5.4.3 Wildlife Observation and Photography

Most of the wildlife viewing and photography occurs on the Point or at the Overlook. The Refuge offers exceptional opportunities for wildlife observation and photography and is one of the best accessible locations in the main Hawaiian Islands for viewing wildlife as it has a high diversity of breeding birds at one location. Six to eight species of seabirds, as well as Hawai‘i’s State bird, the endangered nēnē, can readily be seen by the majority of visitors. The sheer number of birds, as well as their proximity, makes for an extremely high-quality viewing and photography experience.

The National Oceanic Atmospheric Administration (NOAA) also administers the Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS) in the waters surrounding the Refuge, and endangered koholā (humpback whales) are readily seen offshore and photographed from December to April. Groups of nai‘a (spinner dolphins), ‘īlio-holo-i-ka-uaua (Hawaiian monk seal), and honu (green sea turtle) can also be seen from the Point. In addition, due to climate change and associated sea level rise, protected areas like the Refuge will become increasingly important for the persistence of seabird populations in the main Hawaiian Islands.

General information about the wildlife is provided on the Refuge’s website; however, it does not include information such as current highlights, sightings, or wildlife counts. A wildlife checklist is offered onsite, but is directed at avid wildlife watchers. Viewing scopes are set up in multiple locations around the Point and binoculars are provided for loan in order to enhance wildlife viewing. Volunteers help visitors use the scopes and binoculars, identify species, point out and provide information about wildlife behavior, and provide interpretation about the Refuge and its resources. In the past, the Refuge utilized a remote camera focused on a nesting mōlī or ‘ā (red-footed booby), which then sent a live video feed to the visitor Contact Station. Staff and volunteers regularly receive requests to re-institute these cameras. Currently, wildlife observation and photography programs, workshops, and activities are not provided on a consistent basis and could be expanded or enhanced.

While the best viewing opportunities are on the Kīlauea Point Peninsula, additional opportunities are provided at the overlook at the entrance to the Refuge, as well as on Crater Hill (offered in the past but discontinued in 2003). They also provide a different perspective than is provided from the peninsula.

Between 2010 and 2013, total wildlife observation visits annually ranged from 366,890 to 376,937 and photography ranged from 290,000 to 300,100 (USFWS 2014). Many of the 2010–2011 visitor survey comments reflected visitor enjoyment of seeing the wildlife and habitats and identified these resources as making the Refuge unique.

5.4.4 Environmental Education

Environmental education occurs mostly on the Point. School groups participating in EE programs generally arrive at the Refuge at around 8:30 a.m., before the Refuge opens. This way, school buses can easily maneuver the roadway and have adequate room to park without the complication of regular visitor traffic. The children also have the Point to themselves and are not distracted by the

large number of visitors. Although most school groups try to leave before 10:00 a.m., they often leave after the Refuge has opened, which then requires a minimum of two staff to assist in safely getting the children through the busy parking lot to their bus, as well as to stop traffic to allow the bus to exit the Refuge. By departing at 10:00 a.m., this leaves only one hour for the EE program given loading, unloading, restroom breaks, etc., which does not lend itself to a high-quality EE program. Also, given the small time window during which EE is offered (8:30 to 10:00 a.m.) many schools on the west, south and even east side of the island are unable to make it to the Refuge during this timeframe given the time it takes to travel to the Refuge. Only seven percent of Kaua‘i’s public and charter school students (K–12) are within a 20-minute drive of the Refuge. For 68 percent of the students, it is at least a 40-minute drive to get to the Refuge and for nearly 30 percent it takes more than an hour.

In 1987, Congressional funding provided for the design and construction of an EE Center. Today, the main floor of this facility serves as the VC and houses the bookstore operated by KPNHA (the bookstore was originally located in the Contact Station adjacent to the Lighthouse). The bottom floor of the VC has a multi-purpose room. The size of the multi-purpose room is often insufficient for EE programs. As such, the Contact Station adjacent to the Lighthouse is frequently used for EE, but staff often find they are racing to pack up their EE supplies and reorganize the room as visitors begin arriving at the Refuge. From 1997 to 2007, a portion of the bottom floor also provided office space for the Refuge’s EE Specialist. It currently provides office space for three KPNHA staff members, and storage for KPNHA supplies and merchandise.

Beginning in 1985, when the Refuge was established, a dedicated cadre of volunteers and KPNHA developed EE materials. During the summers of 1986 and 1987, an intern developed additional EE materials for teachers, and a teacher’s manual was later completed as part of an intern-led effort. In 1988, over 3,000 students participated in EE programs at the Refuge. In 1997, the Refuge hired a full-time EE Specialist and more materials such as field trip leader packets and a traveling trunk about Refuge seabirds were created. In 1999, through a partnership with a university, a website was established to allow classes to follow the flights of foraging mōlī. In 2001, the Jason Project brought the Refuge’s wildlife to schoolchildren via satellite. From 2000 to 2001 the EE Specialist position was vacant and the position was later replaced with a Volunteer/EE Coordinator position of which 40 percent of the position’s time was devoted to EE. In 2004, the additional responsibilities of overseeing the daily operations of the Refuge’s VS program and the fee program, as well as supervising the Refuge ranger staff, were added to the position, leaving even less time for management of the EE program. In 2009, a junior ranger program was instituted.

During the summer months, the Refuge can receive over 100 visitors under the age of 16 per day. Due to Lighthouse restoration during the 2010–2011 school year, the Refuge was only able to accommodate a limited number of school visits onsite. In turn, staff developed a program whereby 12 North Shore 2nd grade classes followed the life history of the mōlī throughout the school year. The program included five visits by a Refuge AmeriCorps member or ranger to each class, along with a culminating field trip to the Refuge.

Since budget sequestration in 2013 and the resulting loss of staff, with the exception of the Albatross Life Cycle program managed by one volunteer, the Refuge has not been able to conduct onsite EE programs. Instead, the EE program has been adapted to allow (elementary) classes access to the Refuge via a “short” bus (which carries 25 passengers—and is paid for by KPNHA) during public hours. They are offered a program that they can lead, or they can choose to utilize onsite interpretive

signs. A ranger-led program is no longer available, as was traditionally done. Although offered in the past, the Refuge does not currently conduct teacher trainings.

The Refuge conducts EE programs throughout the year with the greatest number of students visiting from January through May.

Between 2010 and 2013, education participants involved in on- and offsite EE programs ranged from 7,200 to 12,032 per year (USFWS 2014). In 1988, 3,000 students participated in EE (USFWS 1989). KPNHA provides funding for bus transportation for schools that visit the Refuge, which is a significant contribution to the EE program.

5.4.5 Interpretation/Outreach

Interpretation and outreach occur mostly at the Point and Overlook. Visitors are first welcomed to the Refuge at the fee collection booth. The staff on duty assists in orienting visitors, answering their questions, informing them about wildlife activity that day and advising them of Refuge services offered at the VC and Contact Station (Radio Beacon Building), such as free binoculars for loan and docent interpretive services. Volunteers help visitors use the viewing scopes and binoculars, identify species, point out and provide information about wildlife behavior, and provide interpretation about the Lighthouse, the Refuge, and its resources. Volunteers are the primary means of personal interpretation on the Refuge. The majority of volunteer hours were dedicated to the VS program.

Under optimum conditions, there are at least two volunteers on duty, with one volunteer operating an on-call golf cart to help visitors who may need assistance getting from the parking lot to the VC or Lighthouse. The Contact Station, as well as the area surrounding the Lighthouse, is almost entirely staffed by volunteers. The Refuge is extremely fortunate to have volunteers to provide this person-to-person service as opposed to resorting to self-guided interpretation.

The Refuge has a number of interpretive panels around the Point highlighting native and nonnative plants and wildlife. Some of the panels were done at different times, using different styles, approaches, and materials. These panels are appealing, of a good size, and are well-placed to be visible but not obtrusive. The most recent panels were completed in 1999. The panels are permanent and are in place year-round. Wildlife at the Refuge is seasonal. For example, whales and albatross are found in the winter months. Thus, this can cause some confusion for the visitor.

When entering the VC, people are often expecting to see exhibits relating to the Kīlauea Point Light Station or the wildlife at the Refuge. However, some of the exhibits are only tangentially related or fully irrelevant to the site. This may prove disorienting to the visitor who may have expectations of finding information regarding the Refuge. In addition, due to the 1.5 million plus visitors who have passed through the VC since it reopened after Hurricane ‘Iniki in 1994, as well as the open air conditions of the building, the exhibits are badly worn. They are out of date and interpretive messaging for children is lacking (some comments from the 2010–2011 visitor surveys indicated the desire for more updated displays). In the past, visitors viewed a video presentation based on refuges in their home state. However, due to maintenance issues having to do with electronics in the salty, open-air environment they were removed.

In 1989, the Contact Station was remodeled and new interpretive displays were added. The building contains an interpretive display on the history of Kīlauea Lighthouse, a desk staffed by volunteer docents, binoculars for loan, as well as an area to sit and watch a video about the Refuge.

One of the most popular and notable features of the Refuge is the historic Kīlauea Lighthouse. Since restoration, visits into the Lighthouse are only possible on a guided tour. Since Lighthouse Day (the first Saturday in May) in 2014, the Refuge started offering guided tours weekly, dependent upon staff and volunteers availability. Guided tours require temporary modifications of the interior and an intensive staff and volunteer effort. Free tour tickets are issued 60 minutes prior to the start of the tour and each tour can accommodate 15 people, every hour on the half hour beginning at 10:30 a.m. with the last tour at 2:30 p.m. (except on Lighthouse Day, when the Lighthouse is open until 7 p.m.). The tours take 30 minutes given the time it takes to get everyone up the narrow staircase to the top of the Lighthouse, provide opportunities for visitors to look around and take photographs in the small area, and then make their way back down. Both the community and visitors regularly express a strong desire to have greater access to the interior of the Lighthouse and to see it lit. Overall, the frequency of opportunities for the public to experience the interior of the Lighthouse on guided tours is variable; tours may in the future occur more or less frequently than once per week depending upon the availability of staff and volunteers.

Most of the Refuge's current outreach efforts have been conducted on an ad hoc basis to meet the needs of an individual event or program. While this has resulted in favorable results in some individual instances, its overall effect has been a scattershot approach to communications. Existing resources dedicated to outreach are limited. Refuge staff often note that the public confuses the Service with State wildlife agencies and the National Park Service. Anecdotal evidence suggests that most are not aware of who the Service is, while an even greater number are not aware of what the Service does or why it does this work. Messages describing how the Service is different from other government agencies, how national wildlife refuges are different from other public lands, and why the Service's work is important to people are currently absent.

Between 2010 and 2013, participants engaged in on an offsite talks and programs ranged from 160,600 to 210,528 per year (USFWS 2014).

5.4.6 Cultural Resources Interpretation

Interpretation of historic structures such as the lighthouse occurs daily. Additional cultural resources interpretation is available during National Wildlife Refuge Week with a special tour highlighting the Native Hawaiian and plantation cultural resources on the Refuge.

5.5 Other Refuge Uses

Other recreational uses of the Refuge include horseback riding along an approved easement.

Between 2010 and 2013, participants in other recreational activities ranged from 21,840–22,000 per year (USFWS 2014). The majority includes secondary public uses involving access through the Refuge at Kāhili Quarry or near the mouth of Kīlauea River (aka Kāhili Stream) for boating, including launching and loading of canoes, kayaks, paddle boards, and surfboards; and for stream, beach, and ocean uses (such as snorkeling, sun bathing, surfing, swimming, and walking).

5.6 Illegal Uses

According to the annual law enforcement NWRS reports between 2008 and 2010, illegal uses included trespass, violation of liquor laws, drug possession, illegal hunting, off-roading, vandalism, drunkenness, theft, weapons possession, disorderly conduct, and presence of suspicious persons. Incidences reported ranged from 19–29 per year. Most illegal uses occur during evening hours at the overlook (e.g., late night drinking) or unintentional trespass by fishermen along the Refuge's coastline or at Kāhili (or Rock Quarry) Beach.

The Service law enforcement issues on lands and waters of the Refuge are under the jurisdiction of the Service Zone Officer based in Honolulu and the KNWRC law enforcement officer on Kaua‘i. The role of both is to enforce laws and document law enforcement incidents. They also coordinate and meet with Refuge staff and law enforcement partners. Primary laws and regulations enforced include the:

- Administration Act;
- Lacey Act;
- ARPA;
- ESA;
- MBTA;
- Marine Mammal Protection Act; and
- Code of Federal Regulations.

Zone and Refuge officers are also empowered to enforce all criminal laws. Activities could include issuing traffic citations and warrants for arrest as they relate to drugs, trespass, hunting, fishing, and the taking of wildlife on Federal lands and, in some instances, boating safety related to refuges. The KNWRC officer will also be responsible for enforcing SUPs. Service officers often partner with other law enforcement agencies, such as the Division of Conservation and Resources Enforcement-DLNR and other Federal law enforcement agencies.

5.7 Area Outdoor Recreational Opportunities and Trends

This section provides an overview of outdoor recreational opportunities and trends on Kaua‘i.

5.7.1 Nearby Recreational Opportunities

The island of Kaua‘i provides myriad recreation opportunities on a variety of public and private lands and waters. Kaua‘i is home to 3 national wildlife refuges (including Kīlauea Point NWR); 23 State parks and boating facilities; 68 County parks; and 13 private parks, camps and gardens (Hawai‘i DLNR 2009). The Hawai‘i State Parks Survey (OmniTrak Group Inc. 2007) conducted in 2003 and 2007 found that millions of people visit State parks annually. Four of the top ten most visited State parks are on Kaua‘i: Wailua River State Park, Hā‘ena State Park, Waimea Canyon State Park, and Nā Pali Coast State Wilderness Park.

Preliminary results from the 2011 Kaua‘i Parks and Recreation Master Plan Public Input Survey indicate that Kaua‘i residents visiting County parks most commonly engaged in walking/ jogging/running, swimming/surfing/paddling, and picnicking (County of Kaua‘i 2013). Hunting is

not allowed in County parks, but more than a third of the residents surveyed indicated they had fished in county parks (Miller pers. comm 2011)

Table 5-1 provides an overview of recreation activities and the number of areas providing these activities on Kaua‘i. Though not listed, wildlife viewing is a component of many of the activities and also is an activity in its own right. Kaua‘i is home to many indigenous, migratory, and introduced bird species, including a number of endangered or threatened species. Additionally, the island provides opportunities to see marine life such as whales, dolphins, sea turtles, and saltwater fish through activities such as boat tours, swimming, snorkeling, SCUBA diving, and scenic lookouts.

Table 5-1. Number of areas providing specific recreation activities on Kaua‘i[1].

Recreation Activity	Number of Areas Providing Activity
Fishing (shore or boat)	39
Picnicking	23
Beach activities (including snorkeling, SCUBA diving, swimming, and surfing)	22
Boating (motorized, sailing, kayaking, and canoeing)	19
Camping (established sites and wilderness)	18
Education/interpretative display[2]	13
Hiking[2]	10
Scenic lookouts[2]	7
Historic/cultural sites[2]	7
Botanic gardens/nature parks	6
Hunting	3
Bicycling	1

[1]Data from Hawai‘i Department of Land and Natural Resources, 2009.
[2]Activities which Kīlauea Point NWR offers.

Near the Refuge is Kāhili Beach where surfing, fishing, picnicking, diving, camping, and other recreation occurs; about 10–200 persons use the area daily (USFWS 1989). Access to Kīlauea Falls is no longer available and access to Slippery Slide has been closed for at least a decade. Both are at the upper (mauka) part of the Kīlauea River.

5.7.2 Outdoor Recreation Rates and Trends

Wildlife-Related Recreation Rates and Trends

According to the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (USFWS and U.S. Census Bureau 1993, 1998, 2003, 2008), thousands of people participate in wildlife-related recreation each year in Hawai‘i (Table 5-2). A large decline in numbers for away-from-home wildlife watching and fishing occurred from 1996 to 2001 and was driven primarily by declines in the numbers of nonresidents participating in these activities. These declines mirror the drop in overall visitation to Hawai‘i in 2001 as a result of the events of September 11, 2001 (HDBEDT 2001). For

example, in 1996, 130,000 anglers were nonresidents; in 2001, that number had dropped to 41,000. In contrast, the number of Hawai‘i residents participating in wildlife watching actually increased from 1996 to 2001. Numbers increased from 2001 to 2006 for all types of wildlife-related recreation overall, though not all groups increased. For instance, the number of nonresident anglers increased to 65,000 from 41,000 while the number of resident anglers decreased to 92,000 from 109,000.

Table 5-2. Number of people participating in wildlife-related recreation in Hawai‘i over time.[1]

Activity	1991	1996	2001	2006
Wildlife watching	N/A	325,000	220,000	262,000
Away-from-home	321,000	255,000	141,000	154,000
Around-the-home	217,000	111,000	120,000	145,000
Fishing	202,000	260,000	150,000	157,000
Hunting	18,000	23,000	17,000	18,000

[1]Data from USFWS and U.S. Census Bureau, 1991, 1996, 2001, and 2006.

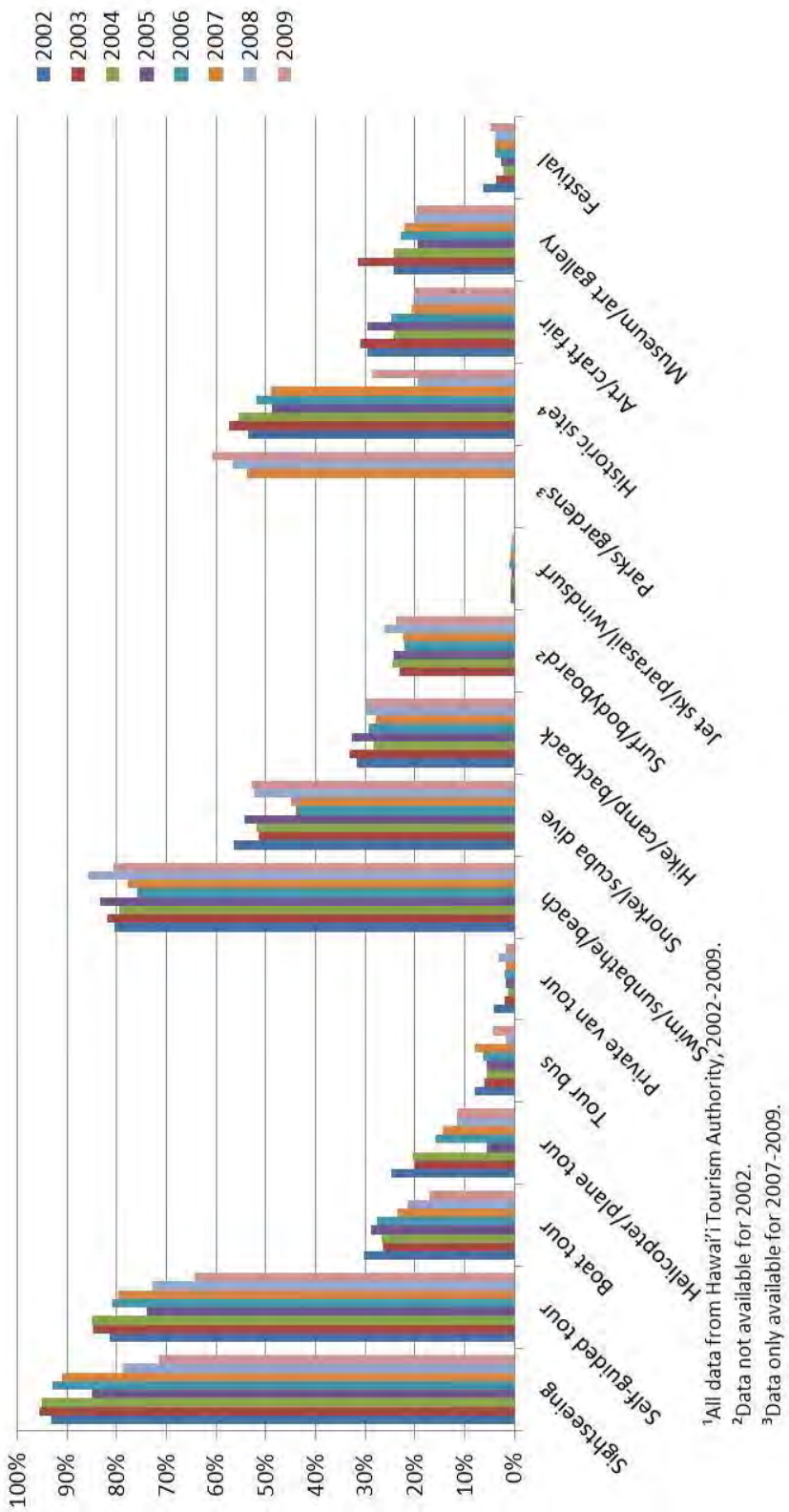
Non-Wildlife-Related Recreation Rates and Trends

Visitors to Kaua‘i tend to participate in the same recreation activities consistently over time, according to the Visitor Satisfaction and Activity Report produced by the Hawai‘i Tourism Authority (2002–2009). Figures 5-4 through 5-6 show the activities over time of visitors from the western U.S., eastern U.S., and Japan. The majority of visitors from the U.S participated in self-guided sightseeing and beach activities such as swimming and sunbathing. Among U.S. visitors, there appears to be a decreasing trend in participation in sightseeing in general including sightseeing by self-guided tour, boat, aircraft, and tour bus over this time period. Participation in activities such as swimming, snorkeling, hiking, surfing, and jet skiing remained relatively constant. Cultural activities such as visiting historic sites, arts and crafts fairs, and museums and art galleries also seemed to be declining, while visiting parks and gardens was increasing.

The majority of visitors from Japan participated in sightseeing via tour bus and they were less likely to participate in outdoor recreation and cultural activities than U.S. visitors. Participation in most activities seems to have remained constant among Japanese visitors over this time period. It does appear that tour bus sightseeing decreased in 2008 and 2009 while self-guided sightseeing increased.

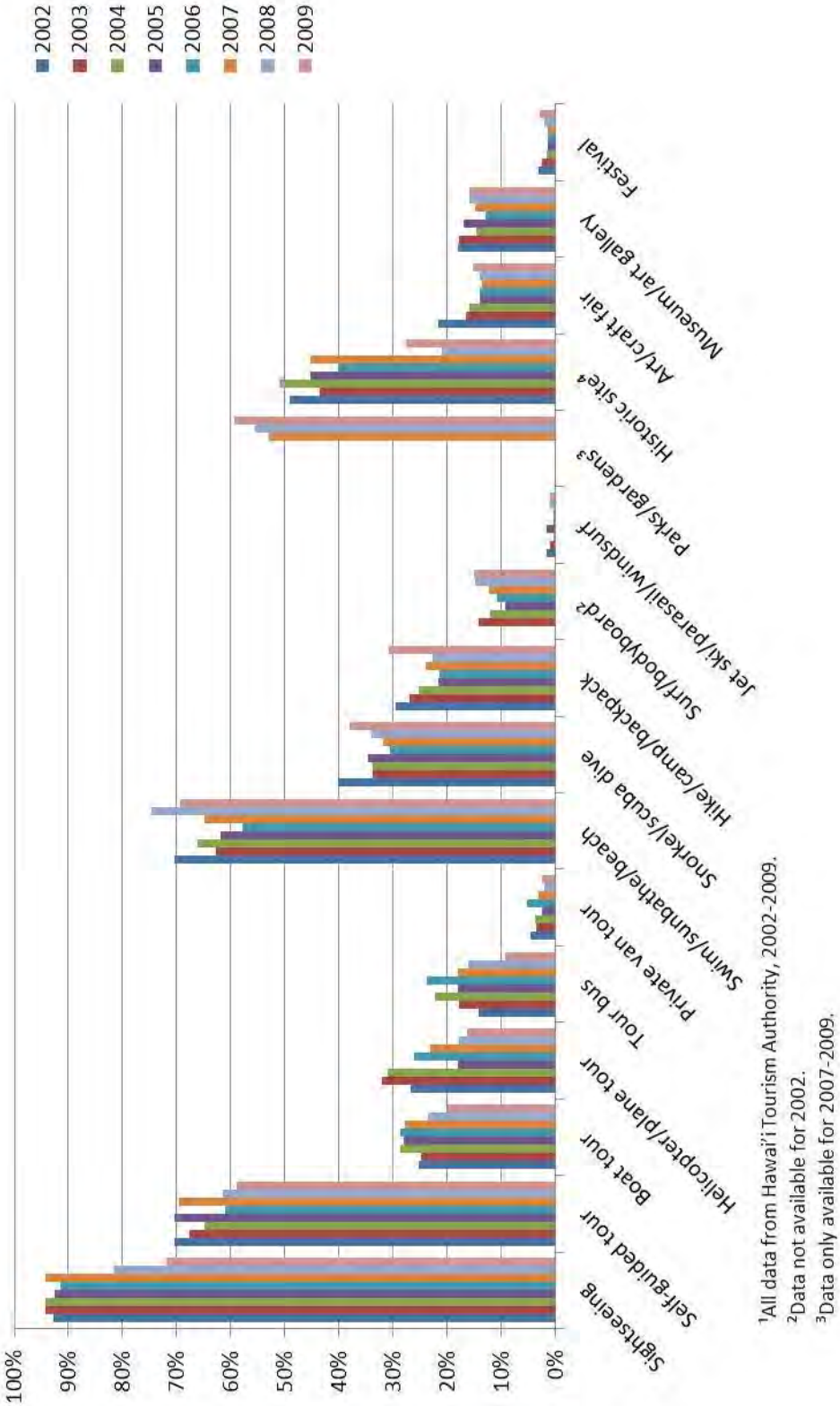
The Hawai‘i State Parks Survey (OmniTrak Group Inc. 2007) found that most of the visitors to State parks on Kaua‘i in 2007 were nonresidents (86 percent), which was not the case on Maui (69 percent), Hawai‘i Island (57 percent), and O‘ahu (53 percent). The most common activities participated in while visiting the parks on Kaua‘i in 2007 were observing scenic views or taking photographs (83 percent), hiking or walking (35 percent), recreating in the ocean or other water bodies (29 percent), seeing park flora and/or fauna (28 percent), picnicking or having an outing (23 percent), and visiting historical or cultural sites (16 percent). Nonresidents were more likely to observe scenic views or take photographs, hike or walk, and see park flora and fauna than nonresidents, while residents were more likely to fish or hunt and camp than non-residents.

Figure 5-4. Percentage of visitors from the western U.S. participating in certain recreation activities on Kaua'i over time.[1]



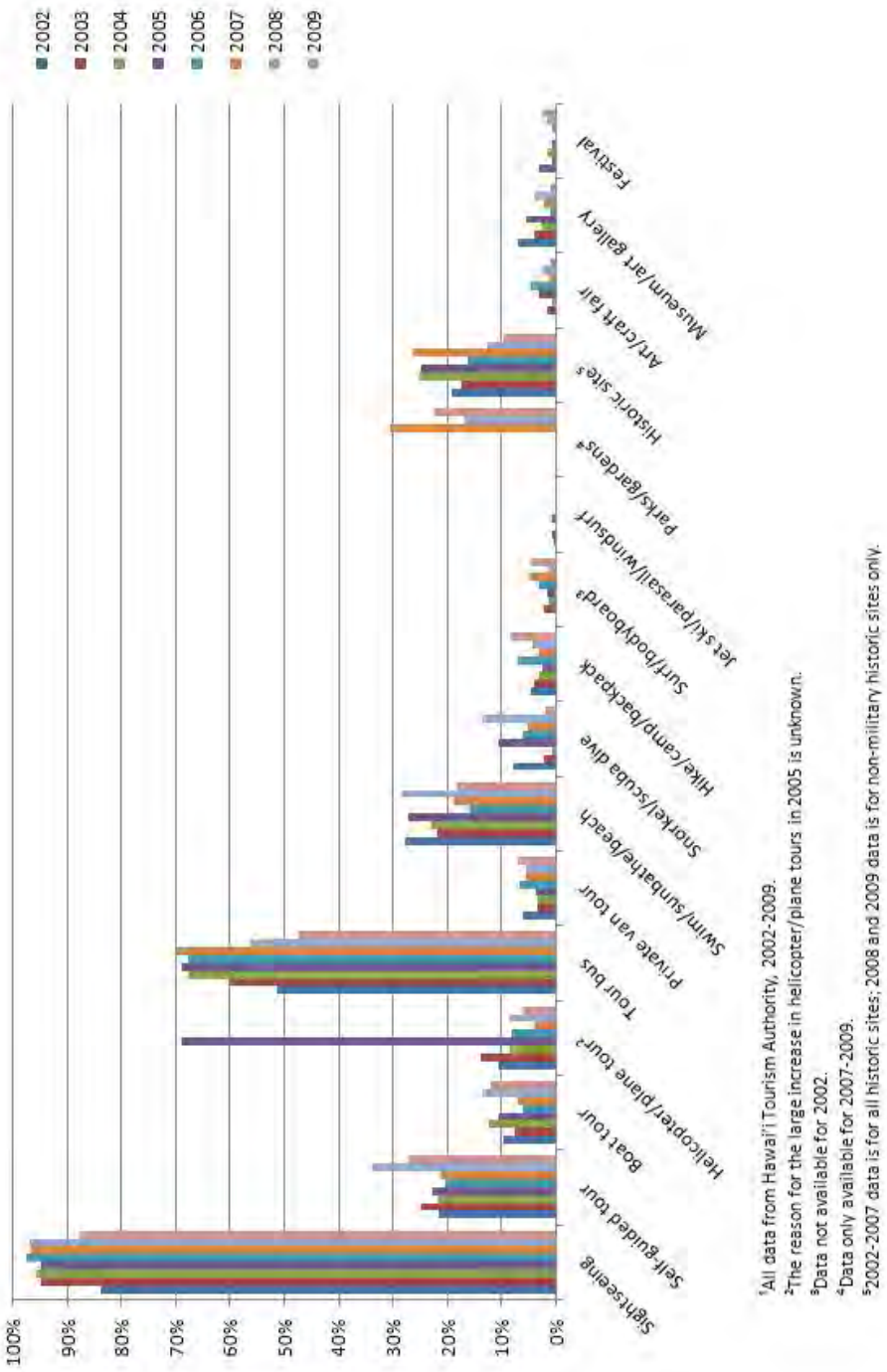
[1]All data from Hawai'i Tourism Authority, 2002-2009.
[2]Data not available for 2002.
[3]Data only available for 2007-2009.

Figure 5-5. Percentage of visitors from the eastern United States participating in certain recreation activities on Kaua‘i over time.[1]



[1]All data from Hawai‘i Tourism Authority, 2002-2009.
[2]Data not available for 2002.
[3]Data only available for 2007-2009.

Figure 5-6. Percentage of visitors from Japan participating in certain recreation activities on Kaua‘i over time.[1]



[1]All data from Hawai‘i Tourism Authority, 2002-2009.
[2]The reason for the large increase in helicopter/plane tours in 2005 is unknown.
[3]Data not available for 2002.
[4]Data only available for 2007-2009.
[5]2002-2007 data is for all historic sites; 2008 and 2009 data is for non-military historic sites only.

5.8 Social/Economic Environment

A regional economic analysis provides a means of estimating how current management and proposed management activities affect the local economy. This type of analysis provides two critical pieces of information: it illustrates the Refuge's contribution to the local community and it can help determine whether economic effects are a real concern in choosing among management alternatives.

In order to assess the economic contributions and impacts to the local economy of visitation and management at Kīlauea Point NWR, an appropriate local region must be defined. For the purposes of an economic impact analysis, a region (and its economy) is typically defined as all counties within a 30–60 mile radius of the impact area. Only spending that takes place within this regional area is included as stimulating changes in economic activity. The size of the region influences both the amount of spending captured in the local region and the economic multiplier effects that capture the circulation of money within the local economy. Kīlauea Point NWR is located in the County of Kaua‘i. As an island economy, most of the economic activity related to the Refuge occurs within the island. Therefore, the economic impact region for the Refuge is defined as the County of Kaua‘i.

The management activities of economic concern for this analysis are:

- Refuge purchases of goods and services within the local community;
- Refuge personnel salary spending;
- Revenues generated from Refuge Revenue Sharing; and
- Spending in the local community by Refuge visitors.

The next sections describe the socioeconomic characteristics and trends in Kaua‘i, and highlight key Refuge activities that affect the local economy.

Communities near Kīlauea Point National Wildlife Refuge

Kīlauea Town is the gateway to Kīlauea Point NWR. The town covers about 1.5 square miles, and has a population of 3,072 residents in 2010 (U.S. Census Bureau 2011b). As a former sugar plantation town, Kīlauea has a rural quality and residents feel a strong connection to the agricultural heritage of the area (County of Kaua‘i 2006). Visitors travel to Kīlauea mainly to visit the Refuge; however, some also enjoy hiking in the area (Go Hawai‘i 2011). The town offers several restaurants, specialty gift stores, and one of only two gas stations on Kaua‘i's North Shore. In 2005, 13.7 percent of visitors surveyed at Kīlauea Point NWR reported Kīlauea as the primary town in which their local purchases were made (Sexton et al. 2005).

In addition to the visitor survey conducted in 2003–2004, a survey of residents of Kīlauea Town was also conducted (Sexton et al. 2005) in support of the Alternative Transportation Study conducted for the Refuge (Parsons Brinckerhoff 2006). The objectives of this resident survey were to better understand residents' use and experience of the Refuge, community/Refuge relations, community quality of life, and community preferences for alternative transportation options as they might affect Kīlauea Town and its residents.

The survey found that community visitation to the Refuge is somewhat limited. Most had been five or fewer times in the past 5 years. About one-third had attended special events held at the Refuge. Overall, residents who visit the Refuge participate in activities similarly to other visitors (though they tended to rank viewing native wildlife and being in a natural area higher than visitors) and are

satisfied with activities and services provided by the Refuge. Residents are supportive of increased environmental education, guided hikes, and increased access (though in the 2003–2004 survey they did not want the Refuge to become too crowded and another "all-American amusement park").

In terms of quality of life, residents of Kīlauea Town were satisfied with community living and felt things were going well for them at the time of the survey. They felt community issues most needing to be addressed were slowing growth and development and improving local land use planning. Community attributes that residents felt needed concentrated efforts (they were rated as high importance and low satisfaction) included parks and open space, walkways/bike paths, number of stores and shops, affordable housing, and reliable and convenient public transit. These findings also reflect what is in the Kīlauea Town Plan.

Having the Refuge nearby is important to residents (now and for future generations), even though many do not regularly spend time there. The biggest benefits to being a neighbor of the Refuge are preservation of the land and available access to the area. The majority of residents indicated they trust and have confidence in Kīlauea Point NWR staff and decisions made by the Service.

Regarding transit options in the community, residents cited reliable public transit, walkways, and bike paths as important features when selecting a community in which to live. Residents indicated there were some impacts to the community from visitors to the Refuge. Traffic congestion in town, traffic safety, and traffic noise were perceived as at least a small problem (especially if visitor numbers increased). However, residents generally did not feel their personal privacy or disruption of daily activities were a problem.

Most residents considered pedestrian and/or bike access to the Refuge and the completion of the Kīlauea Road walking path to be desirable Refuge access/transportation options. Residents were more evenly split in the desirability of a North Shore shuttle that would link to Kīlauea and the Refuge as a Refuge transit option. When asked what factors may be important in encouraging residents to support a shuttle system, community respondents ranked the reduction of traffic congestion on Kīlauea Road, the preservation of homeowner privacy, offsite parking for shuttle near the highway, and a shuttle system that benefits the local economy as the top factors. Community members were less willing to pay a Refuge fee that included a shuttle and guide compared to just an entrance fee (as opposed to visitors). Related to access and program offerings once on the Refuge, residents indicated a desire for self-guided hikes to scenic views, guided hikes to Crater Hill, and environmental programs for school and community groups.

Other issues tied into the Kīlauea community are recent discussions about development of a supermarket and other stores where the Post Office is located. This has prompted renewed interest by the Kīlauea Town residents about a bypass road (identified in the Kīlauea Town plan) that would link Kūhiō Highway to this development area, thereby directing traffic from the highway away from the main part of town. Given that an estimated 25 percent of the traffic on Kīlauea Road is attributable to visitors to the Refuge (Parsons Brinckerhoff 2006), the Refuge is engaged with the Kīlauea Neighborhood Association and other groups in these discussions and how it may impact Refuge visitation and community concerns about traffic.

In 1992, prior to Hurricane Iniki, there was less local traffic and more visitor traffic through Kīlauea than in 1998. Although current visitor traffic on Kīlauea Road is lower than in 1992, local traffic has increased due to land use changes, such as the construction of a new subdivision in Kīlauea and the

relocation of the Post Office (Parsons Brinckerhoff 2006). The Kīlauea Town Plan also calls for looking at transit centers (either on Kūhiō highway or Kīlauea Town) to also manage traffic.

Other communities near the Refuge include Princeville, Kapaʻa, and Līhuʻe. Princeville is located on the North Shore of Kauaʻi in proximity to Kīlauea Point NWR and Hanalei NWR. A scenic overlook that provides visitors with views of the Hanalei Valley is located just past the Princeville turnoff on Kūhiō Highway. The overlook provides panoramic views of the loʻi kalo on Hanalei NWR and the Waiʻoli Huiʻia Mountains. Princeville was home to 2,066 residents in 2010 (U.S. Census Bureau 2011b). Visitors are drawn to Princeville by its remarkable resort features, with golf courses overlooking the Pacific Ocean, as well as outdoor recreation opportunities on public lands and waters (Princeville at Hanalei 2011).

Kapaʻa is one of the larger towns on the island of Kauaʻi with 10,060 residents in 2010, or 16 percent of the island's population (U.S. Census Bureau 2011b). Covering almost ten square miles, Kapaʻa has a local population density of 971 persons per square mile. The town is located about 17 miles southeast of Kīlauea Point NWR. Kapaʻa's economy is centered around tourism and features a large number of hotels, shopping centers, gift shops, and restaurants. In 2005, 20.8 percent of visitors surveyed at Kīlauea Point NWR reported that Kapaʻa was the primary town in which their local purchases were made (Sexton et al. 2005).

Līhuʻe is also one of the larger towns on Kauaʻi with 7,387 residents in 2010, or 10 percent of the island's population (U.S. Census Bureau 2011b). The town is home to Kauaʻi County's government and is the commercial center of the island. Līhuʻe houses the island's main airport and serves as its major shipping center and cruise ship port (Go Hawaiʻi 2011). Located about 25 miles south of Kīlauea Point NWR, 19.5 percent of visitors surveyed at Kīlauea Point NWR in 2005 reported that Līhuʻe was the primary town in which their local purchases were made (Sexton et al. 2005).

5.8.1 Population, Housing, and Income

Table 5-3 summarizes the population characteristics of Hawaiʻi and the County of Kauaʻi. As of 2010, the total population of Kauaʻi was 67,091 residents, or 5 percent of Hawaiʻi's total population. Kaua'i's population grew by 14.8 percent from 2000 to 2010, outpacing the 12.3 percent growth rate for the state as a whole. Over the same period, the island's population density increased from 104 persons per square mile to 119 persons per square mile; meanwhile, Hawaiʻi's population density increased from 189 to 212 persons per square mile (U.S. Census Bureau 2000, U.S. Census Bureau, 2010). The Hawaiʻi Department of Business, Economic Development, and Tourism predicts that the population of Kaua'i will continue to grow at annual rate close to 1 percent through 2040, resulting in an estimated 2040 population of 93,000 (DBEDT 2012). Kauaʻi is proud of its rural feel, and residents of the island value its lush vegetation, agricultural lands with wide open vistas, and communities where people know each other (County of Kauaʻi 1999).

Table 5-3. County and state population estimates.

	Population in 2010		Percent Population Change
	Residents	Persons per Square Mile	2000-2010
Hawai‘i	1,360,301	212	12.3%
Kaua‘i	67,091	119	14.8%

Sources: U.S. Census Bureau 2000, U.S. Census Bureau 2010

As of 2011, white persons (33.5 percent) and persons of Asian descent (31.8 percent) together comprised nearly two-thirds of the population of Kaua’i. Persons of Hispanic or Latino origin represented the next largest group (9.7 percent), followed by native Hawaiians and other Pacific Islander persons (9.2 percent) (U.S. Census Bureau 2011a). In Kaua‘i County, approximately 28 percent of residents age 25 or older have earned a bachelor’s degree or higher, compared with 29.1 percent for the state of Hawai‘i (U.S. Census Bureau 2011b). Kīlauea Town consists of 21.3 percent Asians, 54.9 percent Caucasians, 4.9 percent Native Hawaiian or other Pacific Islander, 1.5 percent persons of some other race, 0.3 percent American Indian or Alaska Natives, and 0.5 percent Black or African Americans (U.S. Census Bureau 2011b).

At the beginning of the 2010–2011 school year, there were 1,610 elementary-aged students enrolled in kindergarten through 5th grade in the region (Hawai‘i Department of Education 2011). For Kīlauea Town, 578 students were enrolled from kindergarten through high school (U.S. Census Bureau 2011b).

Table 5-4 summarizes median household income, unemployment, and percentage of persons below the poverty level. As of 2011, median household income for Kaua’i County was higher than that for Hawai‘i ($67,116 compared to $64,422) (U.S. Census Bureau 2011c). In 2011, the percent of the Kaua’i County population living below the poverty line was on par with the state average and below the national average (10.0 percent compared to 10.2 percent and 15.9 percent). Similarly, the unemployment rate for residents aged 16 and older for Kaua’i was slightly below that of Hawai‘i and well below the national average (7.2 percent compared to 7.7 percent and 10.3 percent) (U.S. Census Bureau 2011c). Kīlauea Town’s median household income is $69,688, with unemployment at 5.1 percent (or 123 individuals), with only 7.1 percent of individuals below the poverty line (U.S. Census Bureau 2011b).

Although the median income in Kaua‘i is above the national median, the cost of living on the island is very high. As of the year 2011, Kaua’i’s median gross rent (MGR) recorded was much higher than the national average ($1,335 compared to $871). Median gross rent as a percentage of household income, however, was lower than both the Hawaiian and national averages (31.2 percent compared to 34.4 percent and 31.9 percent) (U.S. Census Bureau 2011c). Food prices also tend to be higher than prices on the mainland. The transportation cost of food to Hawaiian residents is 66 percent higher than that for residents of the mainland (Alternative Hawai‘i 2007). With the influx of warehouse clubs like Sam’s Club and Costco, food prices are beginning to fall in line with those of the mainland (Alternative Hawai‘i 2007).

Table 5-1. State and county income, unemployment, and poverty statistics, 2011.

	Median Household Income (2011)	Percentage of Individuals below Poverty (2011)	Percentage Unemployed (2011)
Hawaii	$64,422	10.2	7.7
Kaua'i	$67,116	10.0	7.2

Source: U.S. Census Bureau 2011c

5.8.2 Employment and Business

Kaua‘i’s modern economy was founded on its agricultural industry, which produced crops such as sugarcane and wetland kalo. Although agriculture is still an important industry on the island, tourism has far surpassed agriculture as the County’s leading industry. The tourism industry in Kaua‘i has grown tremendously over the past 50 years and has become a key foundation of the island’s economy (Go Hawai‘i 2011, HDBEDT- Research and Economic Analysis Division 2009).

Kaua‘i’s economy is sensitive to visitor arrivals. In 2010, there were 963,520 visitor arrivals on Kaua‘i Island. Since 2000, visitor arrivals have closely followed world events such as the 2001 terrorist attacks, as well as the recent recession. Kaua‘i was hit particularly hard by the 2008 recession as tourism and recreation are an integral piece of its economy. In 2007, Kaua‘i saw almost 1.3 million visitors arrive, followed by a 20.6 percent reduction the following year (UHERO- Kaua‘i Interactive Database 2011). As tourism declined from 2007 to 2008, unemployment for the State rose from 2.7 percent to 4 percent (U.S. Department of Labor, Bureau of Labor Statistics 2011). Tourism continued to decline by almost 10 percent from 2008 to 2009, while unemployment rose from 4 percent to 6.8 percent (U.S. Department of Labor, Bureau of Labor Statistics 2011, UHERO- Kaua‘i Interactive Database 2011). From 2009 to 2010, visitor arrivals increased by 3.8 percent and unemployment fell from 6.8 percent to 6.6 percent (U.S. Department of Labor, Bureau of Statistics 2011, UHERO- Kaua‘i Interactive Database 2011). Visitor spending in Kaua‘i has followed the same trend. From 2007 to 2008, visitor spending fell by 13.3 percent, and fell another 12.6 percent from 2008 to 2009 before growing by 12.4 percent from 2009 to 2010 (UHERO- Kaua‘i Interactive Database 2011).

Table 5-5 summarizes full-time employment by industry for Kaua’i County in 2011. The travel and tourism sector is particularly important to the Kaua’i economy, with 23.1 percent of the County’s jobs in arts, entertainment, recreation, accommodation, and food, compared to 16.1 percent for Hawai‘i and 9.0 percent nationally (U.S. Census Bureau 2012). Employment in all travel and tourism sectors–including retail trade, passenger transportation, arts, entertainment and recreation, and accommodation and food–constitutes 40.3 percent of total private employment in Kaua’i County, compared to 27.8 percent statewide and 15.2 percent nationally. Average annual wages among Kaua’i residents employed in the travel and tourism industry are higher than Hawai‘i and U.S. averages ($33,676 compared to $28,372 and $21,495) ($2012) (Bureau of Economic Analysis 2012). Other industries that employ a large percentage of Kaua’i residents include education, health care, and social assistance (16.1 percent), and retail trade (12.6 percent) (U.S. Census Bureau 2012). Government jobs at the federal, state, and local levels comprise 12.4 percent of all County part-time and full-time employment (Bureau of Economic Analysis 2012).

Table 5-5. Full-time employment by sector, 2011, Kaua‘i County.

Industry	Number	Percent of Total
Total civilian employed population > 16 years	32,372	
Agriculture, forestry, fishing & hunting, mining	995	3.1%
Construction	2,976	9.2%
Manufacturing	681	2.1%
Wholesale trade	558	1.7%
Retail trade	4,074	12.6%
Transportation, warehousing, and utilities	1,679	5.2%
Information	574	1.8%
Finance and insurance, and real estate	1,777	5.5%
Prof., scientific, mgmt., admin., & waste mgmt.	3,048	9.4%
Education, health care, & social assistance	5,215	16.1%
Arts, entertain., rec., accommodation, & food	7,490	23.1%
Other services, except public administration	1,311	4.0%
Public administration	1,994	6.2%

Source: U.S. Census Bureau 2012

For Kīlauea Town, about 71.6 percent of the town’s population is in the labor force. The bulk of this workforce is involved in arts, entertainment, and recreation, accommodation, and food services (23.6 percent); retail trade (13.1 percent); construction (11.9 percent); and professional, scientific, management, administrative, and waste management services (11.7 percent) (U.S. Census Bureau 2011b).

5.8.3 Refuge Impact on Local Economies

Recreational spending near national wildlife refuges generates economic activity for local economies. These expenditures can include food, lodging, transportation, and other purchases from local businesses while engaging in refuge uses. More than 34.8 million visits were made to national wildlife refuges nationwide in fiscal year 2006, with visitor expenditures equating to an estimated $1.7 billion ($2006) in sales in regional economies. Accounting for both the direct and secondary effects, spending by national wildlife refuge visitors generated nearly 27 thousand jobs, and over $542.8 million ($2006) in employment income (Carver and Caudill 2007).

Refuges also contribute money to the local economy through the Refuge Revenue Sharing Act of 1978 (16 U.S.C. 715s). Under this act, the Service makes payments to counties where refuge lands are located. Payments are in lieu of taxes and the revenue is used by the counties for any government purpose. In 2012, $11,490 for Kīlauea Point NWR, $9,691 for Hanalei NWR, and $2,343 for Hulēʻia NWR was paid to Kaua‘i County through Refuge Revenue Sharing.

Tourism and Recreation

Visitors travel from all over the world to see Hawai‘i. With opportunities from relaxing beach getaways to hiking mountains and surfing the waves, there is no shortage of activities to stimulate the economy. From 2003 to 2010, the average annual expenditure by visitors arriving by air totaled over $11.1 billion, or 18.5 percent of the State’s gross domestic product (U.S. Department of Commerce, Bureau of Economic Analysis 2011). In 2007, Kaua‘i accounted for 9.8 percent of Statewide visitor expenditures and is projected to maintain that ratio through 2035 (HDBEDT 2009).

Wildlife Viewing

Wildlife viewing opportunities are abundant throughout the State of Hawai‘i. Wildlife viewing can include the activities of observing, identifying, or photographing wildlife. In 2011, the number of people that reported participating in wildlife viewing as a primary form of recreation totaled 358,000 in Hawai‘i. Spending associated with wildlife viewing in Hawai‘i totaled $669 million, of which 94 percent ($628 million) was trip-related expenditures and $41 million was spent on other expenses such as equipment (USFWS 2012).

5.8.4 Additional Economic Contributions

It is important to note that the economic value of the Refuge encompasses more than just the impacts on the regional economy. The Refuge also provides substantial nonmarket values (values for items not exchanged in established markets) such as maintaining endangered species, preserving wetlands, educating future generations, and adding stability to the ecosystem (Carver and Caudill 2007). According to a recent report, the total value of ecosystem services provided by natural habitats in the Refuge System in the contiguous states totaled $32.3 billion/year, or $2,900 thousand/acre/year (Southwick Associates 2011). Wetlands were found to provide the most services at $27.5 billion/year, or $10,600/acre/year. If these figures had been extrapolated to include Alaska and Hawai‘i NWRs, the total amount would exceed $2 trillion per year (likely more since the study only looked at terrestrial systems). The same report also identified that the loss of 9.9 million acres of wetlands in the U.S. over the last 50 years has resulted in more than $81 billion of economic loss linked to the ecosystems services wetlands provide.

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Chapter 6
Environmental Consequences

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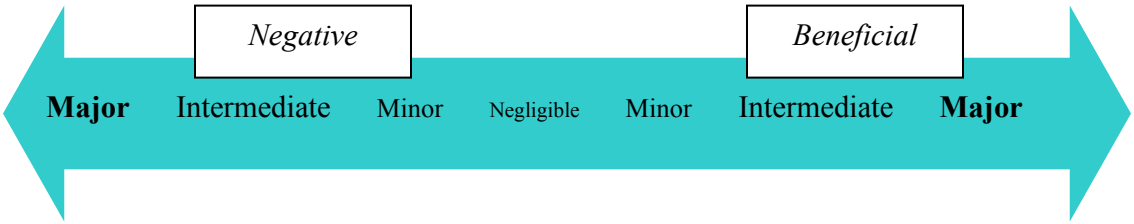
Chapter 6. Environmental Consequences

6.1 Introduction

This chapter provides analyses of the environmental consequences of implementing the alternatives described in Chapter 2. As appropriate, the potential effects of implementing the strategies described under each alternative were assessed for the main environmental resources described in Chapters 3–5, including physical, biological, cultural, and socioeconomic elements. The alternatives are compared side by side under each topic, and both the adverse and beneficial effects of implementing each alternative are described. The overall cumulative effect on the environment from implementing the various alternatives is summarized in Section 6.6.2. More detailed assessments of the Refuge's cumulative effects for relevant impact topics are presented section by section. The information used in this analysis was obtained from relevant scientific literature, existing databases and inventories, consultations with other professionals, and professional knowledge of resources based on field visits and experience.

Although the analysis shows that none of the alternatives would be expected to result in significant (major) effects, some positive (beneficial) or negative effects are expected. The qualitative terms moderate (intermediate), minor, and negligible are used to describe the magnitude of the effect. To interpret these terms, intermediate is a higher magnitude than minor, which is of a higher magnitude than negligible. The word negligible is used to describe an effect that, when compared with the current situation or the current situation forecast 15 years into the future, would not be measurable or would be difficult to measure.



The terms below were used to describe the scope, scale, and intensity of effects on natural, cultural, social (including recreational), and economic resources.

- **Neutral or Negligible.** Resources would not be affected (neutral effect), or the effects would be at or near the lowest level of detection (negligible effect). Resource conditions would not change or would be so slight there would not be any measurable or perceptible consequence to a population, wildlife or plant community, recreation opportunity, visitor experience, or cultural resource. If a resource is not discussed, impacts to that resource are assumed to be neutral.

- **Minor.** Effects would be detectable within the Refuge, but localized, small, and of little consequence to a population, wildlife or plant community, other natural resources; social and economic values, including recreational opportunity and visitor experience; or cultural resources. Mitigation, if needed to offset adverse effects, would be easily implemented and successful based on knowledge and experience.

- **Intermediate or Moderate.** Effects would be readily detectable and localized with measurable consequences to a population, wildlife or plant community, or other natural resources; social and economic values, including recreational opportunity and visitor experience; or cultural resources within the Refuge but not readily detectable or measurable beyond the Refuge. Mitigation measures would likely be needed to offset adverse effects, and could be extensive, moderately complicated to implement, and probably successful based on knowledge and experience.

- **Significant or Major.** Region-wide effects would be obvious and would result in substantial consequences to a population, wildlife or plant community, or other natural resources; social and economic values, including recreational opportunity and visitor experience; or cultural resources. Extensive mitigating measures may be needed to offset adverse effects and would be large-scale in nature, possibly complicated to implement, and may not have a high probability for success. In some instances, major effects would include the irretrievable loss of the resource.

As appropriate, effects are identified as short-term or long-term, local or widespread, and, where data and analyses were available, effects are quantified.

Time and duration of effects have been defined as follows:

- **Short-term or Temporary.** An effect that generally would last less than a year or season.
- **Long-term.** A change in a resource or its condition that would last longer than a year or season.

6.1.1 Summary of Effects

Table 6-1 provides an overview of the effects under each alternative by indicator. The effects related to implementing each alternative are described in terms of the change from current conditions (i.e., the environmental baseline). Alternative A, the “no action” alternative, would continue present management actions. However, the consequences of implementing Alternative A may have beneficial, neutral, or negative effects. For example, the continued use of IPM techniques under Alternative A to control invasive species would have a minor positive impact on native habitats and species.

Table 6-1. Summary of Effects under CCP Alternatives.

	Alternative A (Current Management)	Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point)	Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill)	Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby)
EFFECTS UPON THE PHYSICAL ENVIRONMENT				
Topography, Geology, and Soils	Short- and long-term, minor, negative	Short-term, minor to intermediate, negative Long-term, minor to intermediate, positive	Short-term, minor to intermediate, negative Long-term, minor to intermediate, negative	Short-term, minor to intermediate, negative Long-term, minor, negative to minor, positive
Minerals and Energy Resources, and Resource Consumption/ Recycling	Short- and long-term, minor, negative	Same as A	Short-term, minor to intermediate, negative Long-term, minor, positive	Same as C
Hydrology and Water Quality	Short- and long-term, negligible to minor, negative	Short-term, minor to intermediate, negative Long-term, minor, positive	Short-term, minor to intermediate, negative Long-term, minor, negative to minor, positive	Short-term, minor to intermediate, negative Long-term, minor, positive
Air Quality	Short- and long-term, negligible	Short- and long-term, neutral or negligible	Short-term, minor, negative Long-term, neutral or negligible	Same as C
Climate	Short- and long-term, negligible	Same as B	Short-term, negligible to minor, negative Long-term, negligible to minor, positive	Same as C
EFFECTS UPON WILDLIFE AND HABITAT				
Common to All Habitats	Long-term, minor, positive from public use and outreach programs; negligible to minor, positive from inventory, monitoring, and research	Long-term, minor, positive from public use and outreach programs; minor to intermediate, positive from increased inventory, monitoring, and research	Same as B	Same as B
Coastal Mixed Woodland-	Short- and long-term,	Short- and long-term, minor to	Short- and long-term, intermediate,	Similar to B

	Alternative A (Current Management)	**Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point)**	**Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill)**	**Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby)**
Grassland	minor, positive	intermediate, positive	negative	
Sea Cliff	Short- and long-term, minor to intermediate, negative	Short- and long-term, minor to intermediate, positive	Same as B	Same as B
Beach Strand	Short- and long-term, minor to intermediate, negative	Short- and long-term, minor, positive	Same as B	Same as B
Common to All Wildlife	Long-term, minor, positive from public use and outreach programs; negligible to minor, positive from inventory, monitoring, and research	Long-term, minor, positive from public use and outreach programs; minor to intermediate, positive from increased inventory, monitoring, and research	Same as B	Same as B
Seabirds	Short- and long-term intermediate, positive	Same as A, except slightly more positive primarily due to increased management, enhancement, and restoration of coastal mixed woodland-grassland habitat	Short- and long-term, minor to intermediate, negative	Similar to B, except slightly more negative primarily due to allowing of guided interpretive hikes at Crater Hill
Threatened and Endangered Wildlife	Short- and long-term, minor to intermediate, positive	Short- and long-term, intermediate, positive	Short- and long-term, intermediate, negative	Similar to B
Threatened and Endangered Plants	Short- and long-term, minor, positive	Same as A, except slightly more positive primarily due to increased pest plant removal,	Similar to B, except for negligible to minor, negative effect from construction & operation of new	Same as C, except effects from construction and operation of new off-Refuge facilities are less certain

	Alternative A (Current Management)	Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point)	Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill)	Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby)
		outplanting efforts, and interplanting within the 10–30 acre native plant restoration area	facilities at Crater Hill and reinstatement of guided interpretive hikes at Crater Hill	
Nonnative, especially Invasive Species	Short- and long-term, minor to intermediate, positive	Similar to A	Similar to A	Similar to A
EFFECTS UPON THE SOCIAL AND ECONOMIC ENVIRONMENT				
Volunteers and Partnerships	Short- and long-term, minor, positive	Short- and long-term, intermediate, positive	Same as B	Same as B
Environmental Justice	Negligible	Short- and long-term, negligible to minor, negative	Same as B, except minor, positive effects from Crater Hill hikes	Same as C
Aesthetics, including Visual Quality/Views, Noise, and Odor	Neutral effects on views or odors; short- and long-term, minor, negative effects from traffic-related noise	Short-term, minor, negative Long-term, minor to intermediate, negative	Short-term, minor, negative Long-term, minor to intermediate, negative	Short-term, minor, negative Long-term, minor to intermediate, negative depending upon siting of new offsite facilities
Visitation and General Visitor Orientation and Experience	Long-term, minor increase in total visitation due to broader Kaua‘i visitation trends. Neutral or negligible effects to general visitor orientation and experience	Visitation same as A. Minor, positive effects to general visitor experience	Negligible to minor decrease in visitation to Point due to mandatory shuttle. Long-term, negligible to minor increase in total visitation, including at new welcome and orientation center at Crater Hill. Minor to intermediate, positive effects to general visitor orientation and experience	Similar to C

	Alternative A (Current Management)	**Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point)**	**Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill)**	**Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby)**
Wildlife Observation, Photography, and Interpretation	Negligible to minor, positive	Minor to intermediate, positive	Same as B, except slightly greater positive effects from additional guided interpretive hikes at Crater Hill and creation of a living history site at Quarters #1	Same as C
Environmental Education (EE)	Negligible to minor, negative	Minor, positive	Same as B, except slightly greater positive effects from better access and logistics for school groups	Same as C
Other Uses	Negligible	Minor, positive	Same as B	Same as B
Employment and Income	Direct & secondary economic effects of Refuge program to Kaua‘i County = 88 jobs, $3.2M in income, & $5.6M in added economic value	Direct & secondary economic effects of Refuge program to Kaua‘i County = 94 jobs, $3.5M in income, & $5.9M in added economic value	Direct & secondary economic effects of Refuge program to Kaua‘i County = 79 jobs, $2.9M in income, & $5.1M in added economic value	Same as C
Property Values	Effects, if any, unclear	Same as A	Same as A, except potential minor, negative effects on 2 neighbors from construction & operation of welcome and orientation complex	Same as A
Government Revenues	Neutral	Same as A	Same as A	Same as A
Non-Market Values	Negligible	Minor, positive	Negligible to minor, positive	Same as C

	Alternative A (Current Management)	Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point)	Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill)	Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby)
Cultural, including Historic Resources, Values, and Uses	Negligible to minor, positive	Same as A	Same as A	Same as A
Transportation including Traffic	Minor, negative	Minor, positive	Intermediate, positive	Minor to intermediate, positive
OTHER EFFECTS				
Irreversible and Irretrievable Commitments of Resources	Overall minor, negative effects	Same as A	Minor to intermediate, negative effects due to the construction and operation of a welcome and orientation center and facilities complex at Crater Hill	Similar to C, except effects due to the offsite welcome and orientation center and maintenance facilities are less certain

6.1.2 Future Evaluations of Effects

This draft CCP/EA provides descriptions of the affected environments and resources; guidance in the form of goals, objectives, and strategies for several Refuge program areas; and potential environmental consequences of certain types of activities. However, since this draft CCP/EA is programmatic in many issue areas, it may not contain the necessary detail on every future action outlined to adequately present and evaluate all physical, biological, and socioeconomic impacts. Consequently, regardless of the alternative selected as the final management plan for the Refuge, additional evaluations and documentation to comply with legal and policy requirements, including NEPA, will be conducted as appropriate.

Crater Hill Welcome and Orientation Center and Maintenance Facilities. Under Alternative C, the construction of a new visitor welcome and orientation center and maintenance facilities would be associated with several actions that may need to occur prior to or in conjunction with the actual construction potentially including, but not limited to, the following: (1) completion of a transportation implementation study; (2) expansion of the Refuge boundary to include Kīlauea Road; (3) acquiring land and easements; (4) redesigning Kīlauea Road for safe ingress–egress of pedestrians, cars, trucks, shuttle, and heavy equipment; (5) complete design of the new building and associated infrastructure; and (6) complete development of an associated transportation system. Within this draft CCP/EA, these actions are addressed at a conceptual level. Thus, more detailed planning, facility and transit design, and appropriate evaluation would be undertaken, including

additional effects assessment in compliance with NEPA, evaluation and consultation under Section 7 of ESA, and surveys and consultation under Section 106 of NHPA.

Off-Refuge Welcome and Orientation Center and Maintenance Facilities. Under the Preferred Alternative D, the construction of a new visitor welcome and orientation center and maintenance facilities would be associated with several actions that may need to occur prior to or in conjunction with the actual construction potentially including, but not limited to, the following: (1) completion of a transportation implementation study; (2) expansion of the Refuge boundary to encompass the new site; (3) land acquisition, easement, or interim leasehold; (4) complete design of the new building and associated infrastructure; and (5) complete development of an associated transportation system.

However, an alternative to off-Refuge land acquisition and construction of a new building would be to modify an existing facility or co-locate the Refuge welcome and orientation center with a partnering conservation organization located within 1 mile of the current Refuge boundary (e.g., in Kīlauea Town, near the proposed Kīlauea Town Bypass), as described in the site selection criteria below, which would preclude several actions listed above. Within this draft CCP/EA, all of these actions are addressed at a conceptual level. Thus, more detailed land acquisition planning, facility and transit design, and appropriate evaluation would be undertaken, including additional effects assessment in compliance with NEPA, evaluation and consultation under Section 7 of ESA, and surveys and consultation under Section 106 of NHPA.

The location of the new visitor welcome and orientation center, as well as other facilities to support Refuge management (see Objectives 4.1 and 6.1), would likely be guided by a number of site selection criteria which may include, but would not be limited to, the following:

- Reasonable cost.
- Availability at the time when the Refuge had adequate funds to move forward on such a large project.
- Within 1 mile of the existing established Refuge boundary.
- Consistency with local land use plans.
- Sufficient in size (e.g., at least 3 to 4 acres) to accommodate all needed facilities, including parking, shuttle access, and possible maintenance building/yard.
- Existing facilities that could be modified to satisfy needs or a readily developable site.
- Good access to existing or planned roads (e.g., Kīlauea Road, Kūhiō Highway, or Kīlauea Town Bypass).
- Accessible by bus, bicycle, and walking.
- Existing parking area (including one that could accommodate a shuttle bus[es]) that could be shared with others or a site where such parking could be readily developed.
- Existing utilities (e.g., electricity, potable water, high-speed internet, and sewer).
- A relatively level site that would require minimal recontouring to accommodate the proposed facilities.
- A site that was or could readily be made secure.
- Building site would be located in an already developed or disturbed area.
- Colocation with another conservation organization (e.g., the U.S. National Oceanic and Atmospheric Administration's marine sanctuary discovery center on Kaua'i [NOAA 2011]) or another Federal, Hawai'i, or local public agency.
- Views of the Kīlauea Point Lighthouse, ocean, or mountains.

- Construction and management would have negligible negative effects on trust resources (e.g., federally listed species, migratory birds)
- Construction and management would not be anticipated to reduce the quality or quantity or fragment habitat for trust resources.

Refuge Expansion and Land Acquisition. The assessment of effects in this chapter does not address potential effects associated with acquisition of additional lands within the approved Refuge boundary. This boundary was officially expanded in 2007 and the effects of that expansion were addressed in the Service's Land Conservation Plan and Environmental Assessment (USFWS 2007).

As discussed above, the potential effects of land acquisition and associated development of a potential new welcome and orientation center and maintenance facilities sited outside the current approved Refuge boundary (Alternative D) are addressed herein at a conceptual level.

Alternative Transportation Systems. Alternative B proposes an optional shuttle into the Point from the scenic Overlook at the current Refuge entrance. The shuttle would be mandatory when parking at the Point is at capacity. Alternatives C and D propose a mandatory, dedicated transit shuttle system to transport visitors from a new welcome and orientation center either at the southwestern corner of Crater Hill (Alternative C) or at a site outside of current Refuge lands (Alternative D). Public parking at the Point would be prohibited. These alternative transportation systems would be further analyzed in conjunction with other proposals (e.g., new visitor welcome and orientation center) via SDMPs and/or other planning. Evaluations could include, but would not be limited to, examining various operational issues (e.g., parking and management policies), conducting a traffic study, and assessing transit vehicle types and attributes (e.g., unit cost, capacity and size, reliability, aesthetics, visitor experience, legality, and applicability for the location and climate). The Refuge has received funding from the Federal Transit Administration's Paul S. Sarbanes Transit in Parks Program to assist in planning for the implementation of the transportation components that emerge from the CCP.

Public Uses. Potential physical, biological, and socioeconomic effects of a broad range of public uses on the Refuge are briefly discussed in this chapter and described in more detail in appendices A and B. These appendices include appropriateness findings and compatibility determinations associated with continuation of existing recreational, commercial, and other public uses, and potentially allowing expanded or new public uses. Conditions (stipulations) associated with these uses that would avoid or minimize potential adverse effects, thereby allowing these uses to occur in a compatible manner, are also described. The effects of existing or potential public uses found not appropriate or determined not compatible—and therefore not to be allowed—are also addressed in appendices A and B.

6.2 Effects Common to All Alternatives

Integrated Pest Management. Potential effects to the biological and physical environment associated with the proposed site-, time-, and target-specific use of pesticides (Pesticide Use Proposals [PUPs]) on Refuge lands would be evaluated using scientific information and analyses documented in "Chemical Profiles" (see Appendix G). These profiles provide quantitative assessment/screening tools and threshold values to evaluate potential effects to species groups (birds, mammals, and fish) and environmental quality (water, soil, and air). Any pesticide use must be approved through a PUP. PUPs (including appropriate BMPs) would be approved when the Chemical Profiles provide scientific evidence that potential impacts to Refuge biological resources

and physical environment are likely to be only minor, temporary, or localized in nature. Along with the selective use of pesticides, PUPs would also describe other appropriate IPM strategies (biological, physical, mechanical, and cultural methods) to eradicate, control, or contain pest species in order to achieve resource management objectives.

Based on scientific information and analyses documented in "Chemical Profiles", most pesticides allowed for use on Refuge lands and waters would be of relatively low risk to nontarget organisms as a result of low toxicity or short-term persistence in the environment. Thus, potential impacts to Refuge resources and neighboring natural resources from pesticide applications would be expected to be minor, temporary, or localized in nature.

The effects of nonpesticide IPM strategies (e.g., mowing, weeding, brush-cutting, trapping, and shooting) to address pest species on Refuge lands and waters would be similar to those effects described elsewhere within this chapter, where they are discussed specifically as habitat or wildlife management techniques to achieve resource management objectives on the Refuge.

Prescribed Fire. Although prescribed fire is listed as one of the available IPM strategies, it is unlikely to be utilized on the Refuge in the near term in part due to the lack of trained personnel, proximity to residences, persistent tradewinds, and presence of threatened or endangered species. However, if utilized, a primary objective of prescribed fire would be to reduce nonnative grass aboveground biomass to reduce fire risk and control invasive species. There would be no expectation to replace the nonnative grasslands with more desirable species solely through the use of prescribed burning. Native species respond too slowly to fire to compete with nonnative pyrophytic grasses, or lack fire adaptations entirely. Woody species would encroach on grassland systems whenever fire is absent for more than several years. Nonnative grasses (e.g., California grass, Guinea grass) would quickly regenerate and return the system to its pre-fire state in a short period of time.

Because the growing season in Hawai‘i is essentially year round, the return to pre-burn conditions may occur in a relatively short period of time; left unmanaged, dry grasslands could reach pre-burn conditions in less than 5 years. Repeated burns would not be used as a tool to encourage native revegetation, although an individual burn may be useful to clear an area targeted for revegetation. Without aggressive post-fire management, recovery of native vegetation would likely be overwhelmed by rapid growth of nonnative species. Therefore, revegetation strategies would need to include a series of post-fire herbicide treatments timed to coincide with new growth combined with mechanical removal.

Grassland and edge species, such as the pueo, may be attracted to recently burned areas for foraging because reduced vegetation would expose prey and perhaps increase foraging efficiency. Foraging opportunities for herbivores (e.g., nēnē) and insectivores (e.g., kōlea) would be reduced immediately following a fire. Direct effects of fire on grassland birds are expected to be minimal in terms of injury or direct mortality. If the fire occurs during nesting season, then mortality of eggs and nestlings would be expected during fires. The ‘ōpe‘ape‘a occasionally forage over water but primarily use the edges of grasslands or grassland/forest interface while hunting for insects. They would be expected to avoid active burns. The fire would remove the prey base upon which the bat forages, resulting in a shift in foraging patterns for some individuals.

All other terrestrial small mammals in this ecosystem are introduced rodent species. These species would be somewhat vulnerable to direct injury and mortality from prescribed fire depending on their

denning characteristics. Fire would remove their habitat and expose them to higher rates of predation. Small mammalian predators in this community include pigs, dogs, cats, and rats. All of these species would likely escape any fire and may benefit from an increase in scavenging opportunities (e.g., carcasses, exposed prey). The cover on which predators rely to conceal their approach would also be reduced, but not significantly.

Overall, the immediate effect of prescribed fire on predators is mixed. They would benefit from increased scavenging opportunities but may be impacted by reduced cover and possibly reduced volumes of prey. Hawai‘i has no native species of terrestrial reptiles or amphibians. The introduced reptiles and amphibians have limited mobility and may suffer injury and mortality from fire in grasslands in areas with continuous fuel and high fuel loads.

Grasslands would be expected to rapidly regenerate following the burn; depending on the species, regeneration could begin within days. This would provide forage for species that graze on the vegetation (e.g., nēnē). Nesting habitat would be reduced in quality for species that require dense cover to protect their nests from predators. However, species using more open areas would find increased habitat availability. Nēnē typically require some form of shrub cover under which to hide their nests; thus, the frequency of suitable nesting sites would likely be reduced following a fire. ‘Ōpe‘ape‘a foraging would gradually improve as invertebrates recolonize the grasslands. The rate of this change is difficult to predict and would depend on the rate of invertebrate population growth.

As the grasslands mature and densities approach pre-burn conditions, forage for herbivorous birds would gradually increase. However, at some point, use would likely decrease when forage density and height begin to limit how palatable and accessible the grasses are. Forage for insectivores would increase gradually as insects recolonize burned areas. The ‘ōpe‘ape‘a would continue to find suitable foraging areas over the grassland. As invertebrate species increase in abundance, this foraging area would likely increase. Nonnative small mammals and feral cats could gradually find more suitable denning habitat as vegetation density increases.

Recolonization of the burned area by introduced reptiles and amphibians would be expected to occur as their prey items increased during the next growing cycle. It would also depend on development of adequate cover for those species that require it. Recolonization of more intensively burned areas may be slow depending on adjacent source populations and initial mortality. Population recovery in areas where burns were patchier would be expected to be quicker.

The following measures could reduce the effects of prescribed fire on wildlife and encourage faster recovery. These measures are conceptual and some could conflict. Measures that are applicable to a specific fire plan would need to be adjusted to the local conditions. Ground-nesting birds (e.g., nēnē) are especially vulnerable to prescribed fire. Measures to minimize harm to these species include the following:

1. To minimize direct mortality, conduct prescribed fire outside of the nesting period for birds.
2. Conduct surveys for priority resources of concern to document locations and areas of use, allowing for more accurate fire planning and thereby minimizing adverse effects.
3. Burn in small units to create mosaics of grasslands that would retain functionality for wildlife, thereby minimizing long-distance or large-scale displacement.
4. In areas where sensitive invertebrate species may occur, conduct burns during the underground or aquatic or adult life-stages to minimize direct mortality.

5. Focus burn programs on the removal of habitat for invasive animal species to create conditions that are detrimental or less favorable to these species.

Most Hawaiian soils are relatively erodible, and some care is necessary to ensure that prescribed fires do not burn steep slopes or ash soils. Soil heating is not a major concern in most fires in dry grasslands as the residence time of grass fires is usually insufficient to heat the soil to more than a depth of 1 to 2 inches (Beavers, pers. obs.). Woody overstory species can provide sufficient larger diameter fuels to produce localized detrimental impacts such as nutrient volatilization and soil sterilization. Very little published information addresses the effects of fires on soils in Hawai‘i. Removal of larger woody material may be prescribed through cut-and-pile treatments. Piles can generate substantial heat and combust soil organic matter, alter soil structure, and increase the hydrophobic nature of underlying mineral soil (DeBano et al. 1998). Pile burning can also lead to subsequent nonnative species invasion in areas of localized soil disturbances. In even heavily encroached grasslands, piles typically cause only minor, patchy effects (piles typically cover less than 5 percent of the burned landscape).

Because of the limited residence time in most grassland fires, soil heating is generally not an issue. If pile burning is required, it should be conducted over wet soils in small piles. Pile burn locations may require focused follow-up to minimize the invasion by nonnative plant species.

Impacts to air quality would occur from the actual burning activities and also from emissions associated with equipment used to facilitate and manage the prescribed burn for fire control purposes. Emissions associated with equipment for prescribed burning are assumed to be minimal in comparison with the emissions associated with the actual prescribed burn. Through effective planning and methods by which prescribed burns are controlled, emissions associated with prescribed burns can be limited to such a degree that ambient air quality standards are not exceeded, and impacts would be adverse but not significant. Additionally, properly planned and executed prescribed fire can reduce the frequency and intensity of wildfire thereby reducing the massive effects wildfire can have on air quality.

There are several methods by which emissions associated with prescribed burning can be limited so as not to exceed ambient air quality standards. The majority of such measures involve limiting the level of fuel to be consumed. Measures that can be implemented include, but are not limited to, the following: (1) removal of fuel within the prescribed burn area, (2) limiting the size of the prescribed burn area, (3) seasonal timing of prescribed burn, (4) meteorologically driven timing of prescribed burn, (5) increased frequency of burning, (6) condensed burning areas, and (7) active monitoring. Additionally, public service announcements would inform the local populations of potential air emissions associated with prescribed burning and allow people to make accommodations to limit potential secondary health effects (e.g., use of personal humidifiers, staying indoors, personal respiratory aids, and reduced activity).

As referenced in Chapter 2, Section 2.3.1, a step-down Wildland Fire Management Plan would be developed to provide guidelines for appropriate wildland fire suppression, hazard fuel reduction, prescribed burning, and pile burning programs at the Refuge. Articulation of wildland fire management goals and objectives would be integrated with management goals and objectives from the CCP and other sources, as appropriate.

Transportation Assistance Group Recommendations. Under all alternatives, several mostly operational transportation improvements recommended in 2009 by the TAG would be evaluated. The recommended changes include improving off-Refuge signage directing visitors to the Refuge; implementing transportation system management, transportation demand management, and intelligent transportation system strategies to encourage visitation at nonpeak dates and times; establishing a reservation system; installing onsite parking meters or a pay station; increasing or charging differential fees; changing operating hours; keeping better data on the onsite parking situation related to visitation levels; making changes to the parking areas, and internal vehicle and pedestrian circulation system on the Point to improve flow and efficiency; moving the fee booth further out on the Point; correcting a serious erosion problem beneath the paved pedestrian pathway to the Lighthouse; and acquiring property adjacent to Kīlauea Road at the Overlook.

It is expected that, following preliminary evaluation, the full implementation of a suite of these actions would reduce confusion and frustration associated with visitors locating the Refuge; balance the flow of visitation daily, weekly, and possibly seasonally; relieve traffic congestion and associated frustration and safety issues at the Overlook, along the entrance road, and in the area of the parking lots on the Point; reduce the frequency that visitors would need to wait in line prior to entering the Refuge; help address onsite traffic circulation and parking problems, and help visitors quickly and safely find an onsite parking space; reduce some Refuge-associated traffic concerns through Kīlauea Town; and enhance the quality of the visitor experience. These improvements could also result in long-term increases in Refuge visitation (minor effect) and in the quality of the visitor experience (intermediate effect).

Fishing. Under all alternatives, fishing would continue as at present. This would include fishing by the general public in the ocean at Kāhili Quarry and in the estuary of Kīlauea River. Additionally, a small number of permits would be issued to allow individuals with traditional family ties to the land to fish, as a traditional Hawaiian cultural practice, at Kīlauea (East) Cove. These uses, their effects, and conditions associated with these uses are addressed in greater detail in compatibility determinations included in Appendix B. Overall, under all alternatives, there would be a negligible effect on the quality of or opportunities for fishing and negligible to minor negative effects on populations of fish or shellfish due to State of Hawai‘i regulations consistent with sustained yield population management principles. Under the action alternatives, there would be new stipulations regarding temporary shelters, portable camp stoves or barbeques, and dogs. These effects are described in detail in the following sections.

Fence Maintenance or Replacement (including at the Base of Mōkōlea Point). Under all alternatives, the Service would maintain or replace 2.7 miles of existing hogwire fencing. Included within this amount is the replacement of an existing fence located at the base of Mōkōlea Point (i.e., bordering the Kāhili Quarry public use area) with predator-resistant fencing. This fence would be in a modified alignment for approximately 600 feet, following the base of vegetation growing down the cliffs defining Mōkōlea Point. The current fence is weathered and degraded, its alignment is much higher up slope than necessary, and seabirds using habitat below the fence are readily disturbed by Refuge visitors and exposed to predation by dogs.

The installation and maintenance of the fence would disturb the soil and could result in some wind- and/or water-related soil erosion. However, the terrain below the new fence line is relatively flat, so erosion would be limited. Additionally, the effects on soils of this project could be reduced if on-the-ground work was scheduled outside of the storm season (when rain and wind are the greatest), and

straw bales, compost socks, or similar methods were employed along the fence line to catch/divert eroded soils. Relocating and rebuilding the fence closer to the lower edge of the vegetation line and the Quarry flats would expand the area of coastal mixed woodland/sea cliff habitat available for relatively safe use by breeding seabirds and endangered nēnē and reduce trespass by dogs, pigs, and other nonnative predators. Overall, reestablishment and maintenance of the boundary fence would reduce predation risk and assist in curbing trespassing and erosion from illegal trails, leading to minor to intermediate positive effects to soils, hydrology, water quality, wildlife, and habitats. Fence maintenance or replacement across the Refuge would have similarly beneficial long-term effects.

Other Common Effects. None of the alternatives, including continuation of current operation of the Refuge, would be expected to have major effects on the following: geology, geologic hazards or risks (e.g., flooding, earthquakes, or volcanic eruptions), critical habitat for threatened or endangered species, the size of the human populations and their social characteristics in Kīlauea Town, other communities along the North Shore, or elsewhere on Kaua‘i, public health, use of the Point as the focal area for the vast majority of Refuge public uses, the Kīlauea Point Lighthouse, Refuge Revenue Sharing payments to the County, and floodplains.

Initial visitor access to the Refuge would be altered under alternatives B, C, and D. Additionally, the specific conditions under which existing public uses would continue to be allowed on the Refuge could be altered somewhat from how they have been managed in the past. However, the types of public uses currently allowed and prohibited on the Refuge would remain unchanged and would be the same under all four alternatives. More specific information regarding these public uses and associated conditions (stipulations) can be found in appendices A and B.

Additionally, under all alternatives, the Service would continue to support implementation of the Kaua‘i Energy Sustainability Plan (SENTECH Hawai‘i 2010) and would integrate sustainability considerations into the maintenance and repair of existing and the construction of new Refuge structures, and consideration of future transportation options. Such considerations could include reuse of materials, conservation of energy and use of renewable energy technology, and use of alternative transportation. Such sustainable technologies often result in a reduction in contributions to climate change.

Under all alternatives, the Refuge would contribute to the recovery of threatened and endangered species. A list of recovery plans reviewed for this CCP is available in Chapter 1, Section 1.7. There could be socioeconomic side effects of successful growth of nēnē and ‘a‘o populations on the Refuge. Since a small Refuge is unable to meet all life history requirements of a wide ranging species such as nēnē, and birds define their habitats as that which meets their requirements, not by property boundaries, birds would continue to use both the Refuge and nearby off-Refuge lands to forage, roost, breed, or engage in other life history activities. Public or private properties the birds use would be subject to ESA regulations regarding listed species (50 C.F.R. 17). Potentially, this could constrain some uses of these properties; however, there are tools for private landowners (e.g., Safe Harbor Agreements, Habitat Conservation Plans).

While some property owners might not appreciate having nēnē grazing and leaving droppings on their property, others view having a few members of a very rare, native species on their property as special and take this into consideration when purchasing property adjoining a Refuge. In addition, land values and marketability of private property adjoining protected areas and greenbelts are

typically higher than those that are not. These effects would be expected to be minor, and would continue until the populations had successfully recovered and were delisted.

6.3 Effects to the Physical Environment

Under all alternatives, inventory and monitoring of, and research and scientific assessments regarding Refuge natural and cultural resources, public uses, and interactions among these elements would be expected to have negligible effects on the physical environment. Compatibility determinations included in Appendix B address the effects of and conditions associated with these uses in greater detail.

6.3.1 Effects to Topography, Geology, and Soils

Effects of Alternative A (Current Management): Mowing of grasslands could cause soil compaction associated with the use of heavy machinery. Repeated mowing over an extended period of time regularly compacts soils, reduces natural soil porosity, and leads to less percolation and more runoff. However, negative impacts to the soils and geology of the area are anticipated to be localized and minor. Best management practices (e.g., not mowing over wet soils) would be followed to minimize impacts.

Large colonies of breeding seabirds can alter the soils of an area. These birds feed on marine organisms and, through direct feeding or regurgitation, serve their land-based chicks the same prey. Both adults and young deposit excrement in nesting areas. Over time, this can generate large deposits of guano. This changes the composition and chemistry of surface soils, and the ability of these soils to support vegetation. Some species also remove or otherwise disturb vegetation in preparation for breeding. This increases the exposure of soil to erosive forces. It takes a substantial amount of time and large numbers of birds to markedly change soils in breeding seabird colonies. Over time, these effects would help restore local soils to a more natural state, yet be negligible.

The effects of the Nihoku Ecosystem Restoration Project, which involves the construction of an approximately 2,400 foot long predator-proof fence around 7 acres of the Refuge slightly east of Crater Hill, were analyzed within a separate EA and determined to be, in the short term, minor to intermediate and negative while in the long term, minor and positive to soils (Anden Consulting 2014.

Under this alternative, existing roads and trails on the Refuge would be maintained as at present. Most of these roads and trails are unimproved and travel by vehicles, pedestrians, dogs, and potentially pigs removes vegetation or reduces the potential for its (re)establishment, increases the potential for soil erosion by wind and rain, and increases the potential for sedimentation of downslope water bodies. Areas where this is a concern or a potential concern include the paved trail to the Lighthouse, the lower end of the Kāhili Quarry Road, the road along the crater rim, informal trails up the south side of Mōkōlea Point from the Kāhili Quarry area (illegal trails into a closed area), and the Crater Hill trail(s). Where the surface has been hardened, water runoff and velocity is increased, which facilitates more rapid soil erosion in adjacent areas (e.g., eroded soils adjacent to the paved trail leading from the parking lot to the lighthouse on the Point). Existing problems are localized and usually vegetation (often nonnative) quickly takes root in disturbed areas. Parking of private vehicles in the grassy overflow area on the Point also creates problems. Especially during the rainy season, car and truck tires create ruts and can expose soils to erosion by rain and wind.

If pigs became established on the Refuge, their sharp hooves easily dig into surface soils and could exacerbate soil erosion on frequently used trails. In wet areas, they can create wallows and compact soils. They also use their sharp tusks to uproot vegetation which can further contribute to soil erosion.

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): Effects of mowing, breeding seabirds, and those associated with Refuge trails and roads within or affecting sea cliff habitat would be similar to those described for Alternative A, with the following exceptions.

Under this alternative, the Service would work with partners to explore expansion of or separate additions to the Nihoku predator-proof fence area. This fence would be a separate project from the replacement of 2.7 miles of existing hogwire fence common to all alternatives. Preparation for fence construction would require the use of heavy equipment and hand tools to clear and flatten the fence corridor, which would necessitate some movement of soils to create a level construction surface. The installation and maintenance of the new fence would disturb the soil and could result in some localized wind- or water-related soil erosion. However, BMPs would be incorporated to minimize the potential for erosion and would include, for example, avoiding the use of heavy equipment in steeper and more erosion-prone portion areas, phasing construction to reduce exposed ground areas, minimizing the length and steepness of disturbed areas, avoiding earthwork in inclement weather, using vegetative buffers for erosion control and soil stabilization, incorporating culverts to allow water to easily pass through during heavy rain events, and revegetating of bare areas with native coastal plants. It is anticipated that adverse effects to soils would be minor to intermediate, because BMPs would be incorporated. Effects would be short-term.

The removal of nonnative vegetation and restoration of native vegetation under this alternative may also have effects to soil through changes in vegetation cover type. Temporary disturbance of the soil would occur when nonnative plants are removed using mechanical methods. However, to minimize soil disturbance and the potential for erosion, manual cutting would likely be combined with application of herbicide, and the root system would be left in place to maintain soil stability and control erosion while the plant dies. Mechanical methods may be used where the risk of erosion is minor or to reduce the density of nonnative plants prior to manual cutting or application of herbicide. Minor soil disturbance may occur when other nonnative plants are removed and native plants reintroduced through activities such as uprooting and planting.

In particularly sensitive areas, specific erosion control techniques, such as staking down fence cloths or utilizing vegetative buffers (e.g., coconut coir or straw bales) would be used for soil stabilization after removal of invasive plants. Given that nonnative vegetation was not part of the original habitat, removal could be beneficial for soils in returning soil chemistry to a previous state. Moreover, if the restored native coastal habitat encourages more breeding seabirds, this would increase the amount of guano input into soils. It is anticipated that this would be a beneficial effect that could assist in restoring nutrient cycles and other ecosystem processes. Overall, effects on soils from habitat restoration are anticipated to be in the short term, minor to intermediate, and negative, and in the long term, minor, and positive.

The Service would conduct a road and trail assessment to identify problem areas (e.g., accelerated erosion, compaction) within or affecting sea cliff and other habitats. BMPs (e.g., water bars, erosion matting, revegetation, realignment, and closure) would then be identified, as appropriate. Implementation of these efforts under Alternative B would reduce erosion and compaction of sea

cliff habitat and the potential that it could develop again in the future, increase the potential for natural revegetation, enhance soil structure for burrowing seabirds, and reduce filling of burrows with eroded soils. The effects are anticipated to be long-term, minor to intermediate, and positive.

Under this alternative, the vehicle parking capacity at the Overlook would be increased, and a public/tour bus stop, bike parking, and a drop-off and pick-up stop for an optional shuttle bus would be established at the Overlook. Increasing parking at the Overlook could involve construction on the west and/or east sides of Kīlauea Road. On the west side, increased parking would involve hardening and striping the existing gravel area to provide up to a total of 15–20 parking stalls. This would permanently cover less than one-half acre of the underlying soils; however, the soils in this area have already degraded by the existing gravel surface and compacted by many years of automobiles parking there. On the east side, the hillside slopes down to meet the road margin.

Options for this area include do nothing, construct a handful of parallel parking spaces, or clear vegetation (a mix of nonnative and native species) and cut away the hillside to create angled parking spaces. If the last option was pursued, then less than one-half acre (to accommodate 10–15 parking stalls) of topography, geology, and soils would be affected (minor negative effect). The Refuge would investigate the use of pavers or some other permeable surfacing (instead of blacktop) and employ BMPs for erosion control during and after construction to reduce negative effects on soils and drainage. Establishing a public/tour bus stop, bike parking, and a drop-off and pick-up stop would be expected to have few if any effects on soils. Overall, these actions would have minor adverse effects.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): Effects on topography, geology, and soils under this alternative would be the same as those described for Alternative B, except as described below.

Construction of a new welcome and orientation center and maintenance facilities on the southwestern corner of Crater Hill on Kīlauea Road under this alternative would involve clearing approximately 4 acres of coastal mixed woodland-grassland habitat (a mix of native and nonnative species) currently used by endangered nēnē and ʻuaʻu kani, cutting and filling to create stepped, flat surfaces for building foundations, and additional contouring to create smooth drives and parking areas with relatively gradual slopes and proper drainage. Benching the structures into the hillside and mounding berms to reduce their visual presence would require even more cutting and filling. A trail would be built from the new complex to the Overlook which would require clearing an additional 0.5–1.0 acre of coastal mixed woodland-grassland habitat and cutting away (benching into) the hillside to create adequate room for a comfortably wide, flat trail with stable slopes on the east side. These actions should not affect geology or geological hazards (including landslides, earthquakes, and volcanic eruptions), but would alter the local topography and mix surface soils in an approximately 3–4 acre area of Crater Hill. Additionally, this area of the Refuge contains highly erodible soils that could be vulnerable to wind and water erosion.

Equipment and material staging areas would be identified to minimize soil disturbance and compaction onsite. Erosion control measures would be incorporated into site development plans to reduce or eliminate loss of site soils during construction. Under this alternative, public parking would not be allowed on the Point (mandatory shuttle service). Therefore, the grasslands habitat currently serving as a parking overflow area would not be subjected to continuous soil compaction and erosion. Overall, the effects on topography, geology, and soils are anticipated to be long-term, minor

to intermediate in scale, and negative. Although the site is proposed, the design and construction are conceptual, Thus, a more detailed planning, facility and transit design, and appropriate evaluation would be undertaken, including additional effects assessment in compliance with NEPA, evaluation and consultation under Section 7 of ESA, and surveys and consultation under Section 106 of NHPA.

Guided interpretive hikes up Crater Hill would occur under this alternative. The hikes would involve small groups of visitors and local residents, traveling on designated routes, and with trained guides through areas containing highly erodible soils. Repeated trampling by many shoes/boots along the same trails would increase the potential for wind- and water-related soil erosion (minor negative effect). The compatibility determination addressing wildlife observation, photography, and interpretation included in Appendix B addresses the effects of and conditions associated with this use in greater detail.

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): Effects on topography, geology, and soils under this alternative would be the same as those described for Alternative B, except as follows. The effects of not allowing public parking at the Point would be the same as those described for Alternative C. The effects of reinstating hikes up Crater Hill under this alternative would be the same as described for Alternative C.

Under Alternative D, the Refuge would construct a new welcome and orientation center and maintenance facilities offsite within 1 mile of the Refuge boundary. During the construction, soils would be disturbed to form graded surfaces and adequate foundations for the proposed buildings and paved areas. Due to the collective footprint required for these facilities, the overall anticipated adverse impacts to soils would be minor to intermediate. However, if the Refuge modifies an existing facility or co-locates with a conservation organization, the adverse impacts are expected to be reduced. Since the siting and construction of these facilities are conceptual and not site-specific, implementation would require more detailed planning, design, and compliance, including site-specific effects analysis. Erosion control and other avoidance or minimization measures would be identified during detailed site planning.

Comparison of overall effects across alternatives to topography, geology, and soils: Overall, Alternative A would continue existing Refuge management and maintenance practices and continue vehicle and pedestrian use of roads and trails, leading to adverse but localized effects. When evaluated across the Refuge, the effects are expected to be minor, negative in the short and long term. Alternative B would involve fence expansion or building, removal of nonnative vegetation, and restoration of native vegetation. These actions would lead to minor to intermediate, negative, short-term impacts but in the long term, would result in minor, positive impacts to soils. A negligible effect is expected from the increase in parking capacity at the Overlook on the west side. If parking is added on the east side, a minor negative effect would occur. However, taken together with the implementation of efforts to stabilize sea cliff areas of accelerated erosion, as identified in a road and trail assessment, Alternative B would result in an overall long-term, minor to intermediate, positive effects.

Alternatives C and D are similar to Alternative B in terms of impacts from wildlife and habitat management. However, these alternatives propose the construction of new facilities and reintroduce hikes to Crater Hill. Under Alternative C, the proposed new facilities would impact Crater Hill and would likely result in intermediate negative impacts. Thus, overall, the effects to soils under Alternative C would be minor to intermediate negative. Under Alternative D, impacts would be

minor to intermediate for new construction or reduced if an existing facility is developed at a site yet to be determined. However, since site selection criteria include a relatively level grade, impacts to soils could likely be less detrimental than in Alternative C. Overall, the implementation of Alternative D would result in minor negative to minor positive effects.

6.3.2 Effects to Minerals and Energy Resources, and Resource Consumption/Recycling

Effects of Alternative A (Current Management): Due to the heavy rains, high winds, and corrosive effects of sea salt, the high costs of maintaining and repairing the Refuge's facilities on the Point would continue under this alternative. In addition, continued storage of Refuge vehicles and equipment in inadequately protected facilities on the Point, as at present, increases the number of repairs required and reduces their life expectancy. This costly situation would continue and result in an unnecessary consumption of metals, glass, hydrocarbons, and other nonrenewable resources.

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): Under this alternative, efforts would be undertaken to improve or rebuild maintenance facilities within the existing footprint on the Point. Although this would likely improve the situation for Refuge vehicles and equipment, the continued proximity to the corrosive influence of the near-ocean environment would continue to increase the number of repairs required and reduce their life expectancy, when compared with storage further inland. This situation could somewhat reduce costs, but would continue to result in an unnecessary consumption of metals, glass, hydrocarbons, and other nonrenewable resources.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): Construction, operation, and maintenance of a new welcome and orientation center and maintenance facilities on Crater Hill would approximately double the human footprint on the Refuge and consume a substantial volume of renewable and non-renewable resources, including metals, minerals, glass, hydrocarbons, energy, wood, and water. It's clear that construction of such a complex would consume more materials than continuing to operate the existing facilities on the Point. However, through use of modern design and construction concepts, it is possible that operation and maintenance of the new complex could consume fewer materials and energy (or at least fewer materials and energy per square foot) than are used to operate the existing facilities on the Point. The actual quantity of materials and energy consumed would need to be determined through more detailed planning and design.

Under this alternative, a new maintenance baseyard would be constructed on Crater Hill as part of the welcome and orientation center complex. This would be expected to greatly improve the situation for Refuge vehicles and equipment regarding their proximity to the corrosive influence of the near-ocean environment. The number of repairs required would be reduced and their life expectancy would be increased. This would result in reduced consumption of metals, glass, hydrocarbons, and other non-renewable resources compared with the current situation.

If the native plant nursery also moved off site, then the current nursery-associated buildings could be converted to enclosed storage areas for equipment and vehicles regularly used for maintenance and repair on the Point. This would provide additional protection for these items from the corrosive effects of the shoreline environment, resulting in similar effects regarding repair frequency, lifespan, and use of non-renewable resources.

Although the Crater Hill site is proposed, the design and construction of the welcome and orientation center and maintenance baseyard are conceptual. Thus, a more detailed planning, facility and transit design, and appropriate evaluation would be undertaken, including additional effects assessment in compliance with NEPA.

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): Construction, operation, and maintenance of a new off-Refuge welcome and orientation center and maintenance facilities would be expected to generally have similar negative effects on minerals, energy resources, and other materials as described under Alternative C for siting such a complex on Crater Hill. If an existing facility is used, the negative effects could be lower than those described for Alternative C. This alternative would also have similar positive effects regarding the need for repair and replacement of Refuge vehicles and equipment as that described for Alternative C. Once the offsite location is determined, a further effects assessment would be conducted in the future in association with more detailed planning and design, and, as appropriate, as part of a separate NEPA process and document.

Comparison of overall effects across alternatives to minerals and energy resources, and resource consumption/recycling: Overall, under Alternative A, the lack of adequately protected facilities leads to a minor negative effect on resource consumption. Inadequate vehicle and equipment storage would continue under Alternative B, leading to a similar minor negative effect. Under alternatives C and D, the construction of new facilities would likely result in a short-term, minor to intermediate negative effect due to the energy and resource consumption required, but use of an existing facility under Alternative D would reduce those effects; however, in the long term, the new vehicle and equipment storage would reduce resource consumption by reducing repair frequency, lifespan, and use of non-renewable resources.

6.3.3 Effects to Hydrology and Water Quality

Effects of Alternative A (Current Management): A recent environmental compliance audit at the Refuge found no water quality problems (USFWS 2010). Some unknown amount of sediment-laden runoff from Refuge parking lots, roads, and trails may reach underlying groundwater and/or adjacent surface waters. Potentially, this could include Kīlauea River near Kāhili Quarry, which the State of Hawai‘i has listed as an impaired waterway due to turbidity (HDOH 2012). The State has also included the near-coast marine waters off the Refuge in its listing of Kaua‘i marine waters to be evaluated, but has stated that there are not adequate data to make a determination regarding the quality of those waters (HDOH 2012).

Under this alternative, the gravel parking area on the Point would be paved and striped, which would improve parking for visitors, but potentially increase the rapidity and volume of surface runoff during storm events. Surface evaporation, uptake and evapotranspiration by surrounding vegetation, and groundwater seepage would all be expected to greatly reduce the volume of runoff and associated pollutants (such as petrochemicals and metals from vehicles) from the Refuge that reach Kīlauea River and the near-coast marine waters. This situation would be expected to continue under this alternative (negligible to minor negative effect). The effects on water quality could be reduced if porous paving or another semi-permeable, yet durable surface was used for paving the gravel parking area and/or through the design and installation of stormwater swales. This action would facilitate rainwater seeping into the ground and substantially reduce the volume and rapidity of surface runoff

from storms and reduce discharge of vehicle-related contaminants (e.g., petrochemicals and metals) from entering surface drainages and potentially the near-shore marine environment.

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): The water-quality effects for this alternative would be the same as for Alternative A, except as described below.

Under this alternative, the Service would explore expansion of or separate additions to the Nihoku predator-proof fence area. These projects would disturb the soil and could result in some sediment-laden runoff to and turbidity in Refuge and near-shore waters; however, erosion, sedimentation, and degradation of water quality in Kīlauea River and Kīlauea Bay would likely be minor. BMPs would be incorporated to minimize the potential for erosion and encourage normal runoff patterns. These include avoiding the use of heavy equipment in the steeper and more erosion-prone portion of the project area, phasing construction to reduce exposed ground areas, minimizing the length and steepness of disturbed areas, avoiding earthwork during inclement weather, utilizing vegetative buffers for erosion control, incorporating culverts to allow water to easily pass through during heavy rain events, and revegetating bare areas with native coastal plants.

The removal of nonnative vegetation may have effects to water quality through soil disturbance during restoration efforts. The objective is to replace nonnative vegetation with native vegetation to restore native coastal habitat. Temporary disturbance of the soil occurs when plants are removed or planted, providing the opportunity for changes to water runoff patterns. To minimize soil disturbance and the potential for erosion or changes to water runoff patterns, removal methods would be performed as described in Section 6.3.1. Given that nonnative vegetation was not part of the original habitat, removal of nonnative species could be beneficial to water quality over the long term as hydrologic and nutrient cycles are restored through restoration of native plant and animal communities. Overall, effects on water quality from habitat restoration are anticipated to be in the short term, minor to intermediate, and negative, and in the long term, minor, and positive.

Under this alternative, efforts to resolve erosion and water quality problems associated with Refuge trails and roads (discussed more under sea cliff habitat) would be expected to reduce silt-laden runoff to and turbidity of Kīlauea River and near-shore waters (negligible to minor positive effect).

Under this alternative, hardening (increasing the imperviousness) of the existing gravel area on the west side of Kīlauea Road to increase vehicle parking capacity at the Overlook would be expected to increase the volume and rapidity of surface runoff (especially during the rainy season) and increase the potential for vehicle-related contaminants to reach local surface waters and potentially near-shore marine waters (minor negative effect).

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): The water-quality effects for this alternative would be the same as for Alternative B, except as described below.

This alternative includes development of a new welcome and orientation center and maintenance facilities on the southwest corner of Crater Hill on Kīlauea Road. This alternative would involve clearing approximately 3–4 acres of coastal mixed woodland-grassland habitat (native and nonnative species) currently used by endangered nēnē and ʻuaʻu kani, cutting and filling to create benches for structures, parking, and a pedestrian trail to the Overlook. This site lies on the side of a hill and

immediately below it is a swale that drains to the west and through a culvert under Kīlauea Road. Paving of new roadways, trails, and parking lots associated with the new complex would be expected to increase the volume of and rapidity with which stormwater runoff reached adjacent drains and surface waters. This runoff would also carry pollutants such as sediments and vehicle-related petrochemicals and metals. However, the new complex would utilize modern design, construction, and operation standards that would strive to minimize any potential construction-related or operational effects on runoff water quantity and quality. As a result, potential negative offsite water quantity and quality effects associated with the new complex would be expected to be minor to intermediate during construction and minor during management.

The increase in vehicles and pollutants has not been estimated. However, the design and construction of the welcome and orientation center and maintenance baseyard at Crater Hill are largely conceptual. Thus, a more detailed planning, facility and transit design, and appropriate evaluation would be undertaken, including additional effects assessment in compliance with NEPA.

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): The water-quality effects for this alternative would be the same as for Alternative C, except as described below.

Under Alternative D, instead of developing a new welcome and orientation center and maintenance facilities on the southwest corner of Crater Hill, these facilities would be developed at a yet-undetermined site off-Refuge within 1 mile of the Refuge boundary. The Refuge could potentially modify an existing facility or co-locate with a conservation partner. It is not expected that construction and operation of these new off-Refuge facilities under this alternative would have any effects on hydrology. Site selection for and design, construction, and operation of the complex would be pursued in a manner that would minimize potential adverse effects on water quality. Further assessment of effects on water quality would be conducted in the future in association with more detailed planning and design, and, as appropriate, as part of a separate NEPA process and document.

Comparison of overall effects across alternatives to hydrology and water quality: Under Alternative A, the overall effect to hydrology and water quality would be negligible to minor negative. Under Alternative B, the overall effect would be short-term, minor to intermediate, and negative, and long-term, minor, positive impacts. Impacts from wildlife and habitat management actions (e.g., fence construction, removal of nonnative vegetation, native vegetation restoration) and projects to resolve erosion and water quality problems associated with Refuge trails and roads would be comparable under alternatives C and D as in B. However, under Alternative C, the development of new facilities at Crater Hill would have short-term, minor to intermediate, negative effects and long-term, minor, negative effects. Under Alternative D, it is not expected that the new off-Refuge facilities would have greater than minor negative impacts due to site selection criteria.

6.3.4 Effects to Air Quality

Effects of Alternative A (Current Management): Under this alternative, employees, volunteers, and visitors would continue to travel to, from, and around the Refuge primarily in government or private automobiles. Additionally, Refuge staff would continue to use heavy equipment, small vehicles, and motorized hand tools—powered by hydrocarbon-fueled engines—to perform maintenance, repair, and construction work onsite. Although these vehicles and tools operate with modern pollution controls, all of these activities would generate some air pollutants, primarily carbon

dioxide (CO_2), carbon monoxide (CO), nitrous oxides (NO_x), methane, particulates, and, secondarily, ozone. Additionally, dust associated with maintenance and construction activities, and travel on dirt roads, would continue to generate dust. These impacts are localized, short-term, and negligible.

The State of Hawaiʻi installed an ambient air quality monitoring station in Līhuʻe (to assess air quality effects of cruise ships visiting Nāwiliwili Bay). There are no other such stations closer to the Refuge or elsewhere on Kauaʻi (HDOH 2010). A recent environmental compliance audit at the Refuge found no air quality problems (USFWS 2010). The Service has in the past, and would continue in the future, minimized air quality effects associated with maintenance and construction activities by continuing to adhere to reasonable precautions provided in the Hawaiʻi Department of Health's administrative rules related to fugitive dust (HAR 11-60.1-33). Air quality on the Refuge is occasionally affected by volcanic smog (vog); but, because of its coastal location, the prevailing trade winds, and the relatively short amount of time that vehicles operate onsite, air quality is usually very good at the Refuge. Under this alternative, it is expected that air quality would remain very good into the future.

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): Effects upon air quality under this alternative would be the same as for Alternative A, except as described below.

Under this alternative, the Service would explore expansion of or separate additions to the Nihoku Ecosystem Restoration Project fence. Air quality would be degraded for a short period of time and in a local area during construction of these projects. Windblown dust would be generated as a result of fence line clearing and removal of invasive vegetation. Use of construction vehicles and equipment (e.g., trucks, heavy equipment, and possibly motorized hand tools such as chain saws), most of which would be powered by hydrocarbon fuels, would generate exhaust containing the various air pollutants described under Alternative A. These effects would be localized and short-term in nature, and the prevailing trade winds would quickly disperse any air pollutants (negligible to minor negative effect). As noted above, the Service would continue to minimize construction-related air quality effects by taking reasonable precautions related to fugitive dust (HAR 11-60.1-33).

An optional shuttle system into the Refuge from the scenic Overlook is proposed under this alternative. The shuttle would be mandatory when parking at the Point is at capacity. Because of the likely low amount of replacement of vehicle miles traveled (VMT) of gasoline passenger vehicles with VMT associated with the shuttle, there would be essentially no air quality benefit associated with operating the optional shuttle service.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): Effects upon air quality under this alternative would be the same as for Alternative B, except as described below.

Construction of a new welcome and orientation center and maintenance facilities on the southwestern corner of Crater Hill on Kīlauea Road would involve clearing approximately 3–4 acres of coastal mixed woodland-grassland habitat (native and nonnative species) currently used by endangered nēnē and ʻuaʻu kani, cutting and filling the slope prior to construction, and post-construction recontouring for structures, parking, and a pedestrian trail to the Overlook. These activities would all generate dust which would degrade air quality in the local area during project construction. As noted above, exhaust from use of construction vehicles and equipment would also degrade air quality. These

effects would be localized and the prevailing trade winds would quickly disperse any air pollutants (negligible to minor negative effect). As noted above, the Service would continue to minimize construction-related air quality effects by taking reasonable precautions related to fugitive dust (HAR 11-60.1-33).

This alternative also includes operation of a mandatory shuttle to convey visitors to and from the new complex to the Point (a total distance of approximately 1 mile, round trip). Analyses by Bradley & Assoc. (2007) suggest that, compared with private automobiles, this mode of transportation would not likely result in a reduction in total CO_2 emissions (a 20'–40' urban transit bus generates CO_2 per passenger mile at a rate that is intermediate between that generated by a passenger car carrying one person versus one carrying two people). CO_2 constitutes the largest component of vehicle emissions, so it is reasonable to conclude that overall emissions (and associated air pollution) as a result of the shuttle would have a negligible effect on air quality.

Additionally, there are mixed air quality benefits of operating a shuttle service because of the replacement of VMT of gasoline passenger vehicles with VMT associated with a likely diesel shuttle bus. Gasoline passenger vehicles typically have higher emissions rates of CO_2 compared to diesel-operated vehicles, including diesel buses. Diesel-operated vehicles, including diesel buses, have higher particulate matter (PM) and NO_x emissions rates compared to gasoline-operated passenger vehicles. Because of the potential emissions increase for some pollutants, the Refuge would not be able to claim an air quality benefit associated with the shuttle system.

Although shuttles would replace passenger vehicles from Crater Hill to the Point, an increase in passenger vehicles to the new welcome and orientation center on Crater Hill would be expected, based on a 10 percent increase in visitation projected for the island. The increase in vehicles and emissions has not been estimated. However, the design and construction of the welcome and orientation center and maintenance baseyard at Crater Hill are largely conceptual. Thus, a more detailed planning, facility and transit design, and appropriate evaluation would be undertaken, including additional effects assessment in compliance with NEPA.

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): Effects upon air quality under this alternative would be the same as for Alternative B, except as described below.

Depending on its location and whether it was sited on flat or sloping, or undeveloped or developed land, construction of a new (or modification of an existing facility), off-Refuge welcome and orientation center and maintenance facilities could involve clearing of vegetation, and cutting and filling prior to construction, and post-construction recontouring. These activities would all generate dust which would degrade air quality in the local area during project construction. As noted above, exhaust from use of construction vehicles and equipment would also degrade air quality. These effects would be temporary and localized and the prevailing trade winds would help disperse any air pollutants (negligible to minor negative effect). As noted above, the Service would continue to minimize construction-related air quality effects by taking reasonable precautions related to fugitive dust (HAR 11-60.1-33).

Similar to Alternative C, this alternative also includes operation of a mandatory shuttle to convey visitors to and from the new complex to the Point. At this time, other than being within 1 mile of the Refuge boundary, it is unknown where such a new complex would be located. As noted under

Alternative C, overall emissions (and associated air pollution) as a result of the shuttle would have a negligible effect on air quality.

Also noted in Alternative C, although shuttles would replace passenger vehicles from the welcome and orientation center to the Point, an increase in passenger vehicles to the new center would be expected. The increase in vehicles and emissions has not been estimated. However, once the offsite location is determined, a further effects assessment would be conducted in the future in association with more detailed planning and design, and, as appropriate, as part of a separate NEPA process and document.

Comparison of overall effects across alternatives to air quality: The overall effect of Alternative A to air quality would be localized, short-term, and negligible. Under Alternative B, the outcome of the optional shuttle would be neutral or negligible. Construction activities associated with new facilities under alternatives C and D would result in short-term, minor, negative impacts. In the long term, proposed actions under all alternatives would lead to neutral or negligible effects.

6.3.5 Effects to Climate

The Service owns and uses 5 passenger cars and trucks, some small gas-powered tools, and a handful of other motor vehicles (e.g., riding mower and heavy equipment) for purposes of Refuge operations, maintenance, repair, and construction. The public use program operates an electric cart to transport some visitors to and from the parking area. With the exception of the electric cart, the other Refuge vehicles and some power tools are powered by internal combustion engines that are fueled by hydrocarbons. Additionally, Service employees and Refuge volunteers routinely use private automobiles to travel to, from, and around the Refuge, and to travel away from the Refuge to conduct Refuge-related business. More importantly, the Refuge attracts approximately 388,000 to 500,600 visitors each year (based on figures from 2007–2013 [USFWS 2014]) who access the Refuge (including the Overlook and the Point) almost exclusively (96 percent) by private automobile (Sexton et al. 2012).

There are approximately one dozen employees on the Kaua‘i NWR Complex staff. Almost all of these individuals support all three refuges on Kaua‘i, although a disproportionate amount of their time (approximately 40–60 percent) is spent at Kīlauea Point NWR. Additionally, Refuge staff efforts are supplemented by the valuable efforts of a handful of seasonal and part-time employees and interns (e.g., AmeriCorps) and numerous volunteers. In recent years, a total of approximately 103–115 volunteers devoted approximately 6,410–8,523 hours of service annually at Kīlauea Point NWR. Most Refuge staff and the other individuals who work onsite live in the vicinity of Kīlauea Town or elsewhere along Kaua‘i’s North Shore (roundtrip commutes likely range from 3–18 miles daily). Although levels vary seasonally and by day of the week, on average, the Refuge is staffed 5 days per week, year-round (excepting Federal holidays) with a total of approximately 7–13 individuals (including employees, volunteers, and interns). One of the staff members lives onsite. The other individuals generally commute in private passenger vehicles or light trucks and by driving alone or with one passenger.

Approximately 5 percent of the Refuge’s visitors are local residents and, on average, travel an average of 14 miles to reach the Refuge (28 miles round trip). Nonlocal visitors are often visiting Hawai‘i, frequently from other U.S. states. Most (82 percent) nonlocal visitors to the Refuge lodged overnight on Kaua‘i or near Poipu, Princeville, Kapa‘a, or Līhu‘e, and traveled an estimated 15–75

miles roundtrip to visit the Refuge (Sexton 2005). For both local and nonlocal visitors, their travel to the Refuge is often part of a trip to visit other island attractions, run errands, etc. (Sexton et al. 2012).

Almost all visitors travel to the Refuge in private automobiles carrying an average of 2.9 persons per car. Therefore, transporting visitors to the Refuge (including both the Overlook and Point) currently involves approximately 133,800 (assuming 388,000 visitors/year) or 172,600 (assuming 500,600 visitors/year) automobile trips per year (Parsons Brinckerhoff 2006). Almost all of these private vehicles are powered by hydrocarbon-fueled internal combustion engines whose exhaust includes CO_2, contributing to global warming.

According to the U.S. Environmental Protection Agency (EPA) (USEPA 2011), CO_2 emissions represent 90–95 percent of the greenhouse gases generated through operation of a passenger vehicle. Among other factors, CO_2 emissions from hydrocarbon-fueled engines in vehicles and power tools are affected by the type of fuel used (e.g., gasoline vs. diesel), the carbon content of that fuel, the size (horsepower) of the engine, whether the engine is two- or four-cycle, and the fuel economy of the vehicle. USEPA calculates that the typical passenger vehicle emits an average of 8,887 grams (19.6 pounds) of CO_2 per gallon of gasoline (or 423 grams [0.93 pounds] per mile) and 10,180 grams (22.4 pounds) per gallon of diesel (USEPA 2011). The Refuge's vehicle fleet primarily includes sport utility vehicles and light trucks, which are not as fuel efficient as the typical passenger vehicle and, therefore, generate more CO_2 per gallon of gasoline or per mile of driving. CO_2 emissions from relatively small engines (e.g., those used in chainsaws, riding mowers, and small utility vehicles) vary greatly (by two orders of magnitude) and generate almost 50 grams (0.11 pounds) to over 5,000 grams (12 pounds) of CO_2 per hour. None of these values include consideration of the greenhouse gases generated through the production and distribution of fuels.

None of the Refuge buildings are heated and the onsite residence has a solar water heater. However, the Service does use electricity for lighting, computer operations, and a variety of other purposes on the Refuge. The Visitor Center uses air conditioning and there is a portable air conditioning unit elsewhere onsite (both powered by electricity). Electricity on Kaua‘i is produced primarily with hydrocarbon-fueled generators, so use of electricity onsite, including through use of the electric vehicle, indirectly results in creation of greenhouse gases. EPA (USEPA 2012) estimates that approximately 1.35–1.62 pounds of CO_2 are produced for each kilowatt of electricity generated in Hawai‘i.

The 191 acres at the Refuge, of which 97 percent are unpaved and undeveloped land supporting robust herbaceous and woody vegetation, would continue to remove CO_2 from the atmosphere for the next 15 years and would serve as a carbon sink (a process that absorbs carbon from the atmosphere) for this greenhouse gas (a.k.a., carbon sequestration). Specific studies have not been conducted at the Refuge to quantify the photosynthetic effect of the vegetation, nor the quantity of greenhouse gases generated onsite, to measure changes in the environment that are potentially attributable to climate change. Nor have any studies been conducted to determine if the photosynthetic effect of the Refuge's vegetation offsets the CO_2 production generated by operation of the Refuge. Therefore, all that can be stated at this time is that certain aspects of current Refuge operations are likely contributing to climate change and that conservation of Refuge vegetation is likely serving as a carbon sink and counteracting, to an unknown degree, the Refuge's contribution to climate change.

Converting appropriate vehicles in the Refuge's passenger vehicle fleet to hybrid or electric power would greatly improve fuel economy and result in a further reduction in greenhouse gas emissions.

These actions would be consistent with requirements of Executive Order 13514 of October 8, 2009 (Federal Leadership in Environmental, Energy, and Economic Performance), and Executive Order 13423 of January 26, 2007 (Strengthening Federal Environmental, Energy, and Transportation Management), which, among other things, address greenhouse gases generated by Federal agencies.

Effects of Alternative A (Current Management): In recent years, the average Refuge use of electricity was approximately 48,000 kilowatt hours, which converts to the indirect generation of approximately 65,000–78,000 pounds of CO_2 each year. The Refuge drives their five passenger vehicles and light trucks a total of approximately 24,000 miles/year which generates approximately 34,000 pounds of CO_2 annually. The Refuge also uses their small-engine vehicles for approximately 280 hours/year and motorized hand tools for an unknown amount of time. The hydrocarbon-powered engines in these small vehicles and power tools generate an unknown additional amount of CO_2.

Based on the staffing levels described earlier, individuals using private automobiles to commute to work at the Refuge generate approximately 6,000 to 60,000 pounds of CO_2 annually. These contributions to atmospheric CO_2 are dwarfed by the effects of Refuge visitation. It is estimated that, in 15 years, Refuge visitors would generate perhaps 0.93 to over 4.32 million pounds (at 370,000 visitors/year) or 1.38 to 6.42 million pounds (at 550,000 visitors/year) of CO_2/year through use of private automobiles to visit the Refuge.

In the absence of detailed, onsite studies, specific effects of current Refuge management on climate are unknown. It is expected that implementation of Alternative A would result in negligible changes in current conditions regarding the Refuge's contribution to climate change, and the environmental and other effects of those changes.

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): Under this alternative, an additional 47–57 acres of habitat would be managed and habitat enhancement would take place on 2–5 acres/year. Construction of fences, removal of nonnative plants, and active management of natural or semi-natural vegetation communities would require increased use of hydrocarbon-powered internal combustion engines (both wheeled and hand-held) which would generate temporarily additional exhaust containing greenhouse gases. However, the restored habitats would also continue to serve as a long-term carbon sink. The exact quantities of additional greenhouse gases produced and CO_2 absorbed are unknown, but the net effects are estimated to be relatively small and the effects on climate negligible.

Establishing a public/tour bus stop and bike parking at the Overlook would provide a means for visitors to access the Refuge other than by private vehicles. These actions could reduce generation of greenhouse gas emissions by an unknown, but likely negligible amount.

This alternative also includes operation of an optional shuttle to convey visitors to and from the Overlook to the Point. Use of the shuttle would be mandatory when the parking lots on the Point are full. Surveys in 2004 and 2010/2011 revealed that 24–43 percent of visitors might not use such a shuttle (Sexton 2005, Sexton et al. 2012). Because use of this shuttle would be optional (except when the Point's parking lots were full), those visitors who chose not to ride the shuttle could instead drive onto the Point. It is unknown how many trips the shuttle would take each day, so estimating its likely generation of greenhouse gases is speculative. Assuming that the shuttle is powered by diesel fuel, what can be stated is that diesel engines generate more CO2 per gallon, but achieve higher fuel economy, which generally offsets the higher carbon content of diesel fuel. Regardless, considering

frequent idling, starts, and stops, and traveling such a short distance (approximately one-half mile, round trip), it is likely that net greenhouse gas effects related to shuttle operation would be negligible. Therefore, CO_2 generation by visitors under this alternative would be similar to Alternative A.

Under this alternative, the Service would take a variety of actions that would increase the Refuge's understanding of and affect the Refuge's contribution to climate change. This includes participation in and contribution to climate change assessment efforts (including science-management partnerships such as the Pacific Islands Climate Change Cooperative) to address climate change and biological stressors in an integrated fashion. This would have the effect of informing others of Service management activities and decisions that could potentially have climate-related effects. Additionally, these activities would inform the Service of new climate-related data and effects of climate change, and emerging climate-related research. This would allow the Service to better assess the effects of ongoing and proposed management actions, and make appropriate course corrections to reduce potential adverse climate-related effects, consistent with adaptive management principles (minor positive effect).

This alternative would also include actions to increase the abundance and diversity of breeding seabirds on the Refuge. Providing additional attractive and safe habitat on the Refuge would help compensate (to a limited extent) for the anticipated loss of seabird breeding habitats on low-lying islands in the Pacific Ocean due to climate-change induced sea level rise. These actions and their biological effects are discussed in greater detail in Section 6.3.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): This alternative would have the same habitat management-related effects on climate, and the same effects related to participation in and contribution to climate change assessment efforts as described under Alternative B.

Construction, operation, and maintenance of a new welcome and orientation center and maintenance facilities on Crater Hill would consume a substantial volume of renewable and nonrenewable resources, including metals, minerals, glass, hydrocarbons, energy, wood, and water. Use of some of these resources would generate greenhouse gases as a result of their extraction, manufacturing, delivery, disposal, and/or combustion. It's clear that construction of such a complex would consume more materials and generate more greenhouse gases than continuing to operate the existing facilities on the Point. However, an estimate of the quantity of greenhouse gases produced would require more detailed planning and analysis.

This alternative also includes operation of a mandatory shuttle to convey visitors to and from the new complex to the Point (a total distance of approximately 1 mile round trip). Assumptions for this analysis are that the shuttle would accommodate 35–40 passengers and be powered by a diesel engine. The Refuge would operate two shuttles that, it is estimated, would on average operate at 15-minute intervals and convey 720–960 passengers per day (this would accommodate visitation on all but the busiest days). Surveys in 2004 and 2010/2011 revealed that 24–43 percent of visitors might not use such a shuttle (Sexton 2005, Sexton et al. 2012). If, when faced with a choice between not visiting the Point or riding a mandatory shuttle, this percentage of visitors actually chose not to board the shuttle, then Refuge visitation at the Point would decrease. This decrease would be offset to some degree by the projected 10 percent increase (over 15 years) in visitation to Kaua'i and increased visitation to the Refuge because of its new facilities. A reduction in visitation would result in a

concurrent reduction in vehicle miles driven by Refuge visitors and associated generation of CO_2. It's estimated that, in 15 years, Refuge visitors would generate perhaps 0.53 to over 3.29 million pounds (at 370,000 visitors/year) or 0.79 to 4.88 million pounds (at 550,000 visitors/year) of CO_2/year through use of private automobiles to visit the Refuge.

The shuttle would result in a reduction in traffic volume and congestion at the Point and Overlook, but the traffic volume and congestion may shift south on Kīlauea Road to the new welcome and orientation center at the southwest corner of Crater Hill. Based on analyses using the U.S. Environmental Protection Agency's Motor Vehicle Emission Simulator (MOVES2010b; USEPA 2012), there would be a negligible to minor decrease in the amount of CO_2 equivalent (including methane) generated from operation of the shuttle compared to letting visitors operate their private vehicles between the new complex and the Point. The tool uses assumptions based on average national characteristics for diesel transit buses and passenger vehicles.

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): This alternative would have similar habitat management-related effects on climate, and the same effects related to participation in and contribution to climate change assessment efforts as described under Alternative B.

Construction, operation, and maintenance of a new welcome and orientation center and maintenance facilities off-Refuge would consume a substantial volume of renewable and nonrenewable resources, including metals, minerals, glass, hydrocarbons, energy, wood, and water. Use of some of these resources would generate greenhouse gases as a result of their extraction, manufacturing, delivery, disposal, and/or combustion. It's clear that construction of such a complex would consume more materials and generate more greenhouse gases than continuing to operate the existing facilities on the Point. However, an estimate of the quantity of greenhouse gases produced would require more detailed planning and analysis.

This alternative also includes operation of a mandatory shuttle to convey visitors to and from the new complex to the Point. At this time, other than its general proximity to the Refuge, it is unknown where such a new complex would be located, so the round-trip travel distance of the shuttles could vary from approximately 1 mile (if it was sited adjacent to the Refuge) to perhaps 3 miles (if it was sited near Kūhiō Highway). Visitation projections, and the effects of visitation and the shuttle operation on generation of CO_2 would be similar to Alternative C.

Comparison of overall effects across alternatives to climate: Under alternatives A and B, the overall effects of Refuge management on climate would be negligible. Under alternatives C and D, the construction of new facilities would result in short-term, negligible to minor negative impacts. In the long-term, the operation of a mandatory shuttle could lead to negligible to minor positive impacts to climate due to potentially decreasing the generation of greenhouse gases.

6.4 Effects to Wildlife and Habitats

6.4.1 Effects to Habitats and Plant Communities

Common to All Habitats

Under Alternative A, wildlife-dependent and nonwildlife-dependent public uses and Refuge outreach programs would continue. These programs play a key role in fostering public understanding, appreciation, and support for the Refuge's native plants and habitats and would lead to long-term, indirect, and minor benefits to the conservation of these resources. Under Alternatives B–D, the quality and quantity of these programs would expand slightly and lead to similar benefits as in Alternative A. Disturbance impacts to specific habitat types as a result of public use programs are discussed in the following sections.

Under Alternative A, inventory and monitoring of, and research and scientific assessments regarding, Refuge natural and cultural resources, public uses, and interactions among these elements would continue as at present. Relative to wildlife habitats and plant communities, most of these activities would involve observation and measurement. Occasionally, tissues or whole specimens of native or nonnative plants would be taken, removed, transplanted, or outplanted. Additionally, some of these activities would involve implementing and assessing various habitat management techniques, at small scales. Disturbance, including trampling and potentially transporting nonnative species, would be the primary effect of the vast majority of these activities. The effects of some of these activities, such as inventories of invasive plants or evaluations of the contributions of specific habitat management practices to achievement of Refuge goals and objectives, would be primarily local.

Other activities, such as studies of the effectiveness of outplanting threatened or endangered plant species, would have broader effects. Overall, these activities would generate information which would be analyzed and interpreted to help Refuge staff assess the efficacy of management practices and facilitate appropriate course corrections as part of the adaptive management process. The effects of these activities on Refuge wildlife habitats and plant communities would be negligible to minor positive. Compatibility determinations included in Appendix B address the effects of and conditions associated with these uses in greater detail.

Under Alternatives B–D, inventory and monitoring of, and research and scientific assessments regarding, Refuge natural and cultural resources, public uses, and interactions among these elements would increase compared to those occurring at present. In addition to generating the same types of effects described for Alternative A, it would be expected that this would result in an increase in information about Refuge wildlife habitats and plant communities. This would reduce uncertainty associated with wildlife and plant responses to Refuge habitat management, promote achievement of management goals and objectives, and facilitate adaptive management. For example, this would include better information about population changes in plant species of special concern; the efficacy of pest management programs; the effects of visitor use on wildlife habitats and plant communities; and changes in plant phenology, potentially as a result of climate change.

Through application of adaptive management principles, enhanced knowledge would slowly lead to improved management, and an increase in the health, productivity, and value of the Refuge's wildlife habitats and plant communities to native vegetation and wildlife. The effects of these activities on Refuge wildlife habitats and plant communities would have beneficial minor to intermediate effects.

Compatibility determinations included in Appendix B address the effects of and conditions associated with these uses in greater detail.

Coastal Mixed Woodland-Grassland

Effects of Alternative A (Current Management): Under Alternative A, the existing mix and acreage of wildlife habitats and plant communities on the Refuge, including coastal mixed woodland-grassland, would continue to be managed and enhanced as at present. This habitat type contains both native and nonnative species. The grasslands are dominated by nonnative Kikuyu grass (beneficial to endangered nēnē); native naupaka and ʻakoko and nonnative ironwood, Christmasberry, and haole koa are common among the shrubs and trees.

Under this alternative, coastal mixed woodland-grassland and grassland areas would not be managed principally to restore the mix of native species that likely occurred in the past, but instead, the structure of these areas would be managed to benefit breeding seabirds and special status species such as nēnē. Approximately 40–50 acres of coastal mixed woodland-grassland habitats (of the 97 acres of this habitat that currently occur) on the Refuge would continue to be managed and enhanced for seabird breeding and roosting. Approximately 27 acres of grasslands (within 32–34 acres of this habitat) would continue to be managed primarily for nēnē foraging, breeding, and roosting. Mowing within these areas would be performed to stimulate a vigorous growth of grasses, maintained at <4–6 inches tall. Additionally, Mōlī Hill would be mowed occasionally to ensure that vegetation remained low and the grasslands were not overrun by shrubs or trees. Consistent with IPM principles (see Appendix G), additional pest control methods (e.g., brush-cutting, excavation, and prescribed fire) would be employed to control Christmasberry, lantana, ironwood, and other pest/undesirable plants. These vegetation management practices would be scheduled to avoid or minimize disturbance to breeding seabirds and nēnē.

Although not including the full potential acreage of these habitats on the Refuge and containing expanding populations of nonnative plant and pest species, the managed areas would nonetheless provide valuable and relatively safe habitats for native wildlife species, including breeding seabirds and special status species. Pest plant species would continue to degrade native habitats. Dogs, cats, rats, mice, and pigs would continue to occasionally circumvent the fencing, traps, and other control measures, and destroy bird eggs, and kill young and sometimes adult birds.

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): Implementation of this alternative would result in an increase in the total acreage of managed and enhanced coastal mixed woodland-grassland habitat for the benefit of seabirds from 40–50 acres to 97 acres. Removal of pest plants would occur on 2–5 acres/year (within the 97-acre area), enhancing 30–75 acres of this habitat type (over 15 years) compared to Alternative A. The areal extent of grassland habitat would increase to approximately 32–34 acres (compared with 27 acres under Alternative A), through enhancement of 5–7 acres of degraded grasslands, primarily to support nēnē foraging, breeding, and roosting. Additionally, the Service would work with partners to restore and/or enhance 10–30 acres (within the 97-acre area) of native coastal plant communities on Crater Hill and Mōkōlea Point (compared with 3–5 acres under Alternative A) (minor to intermediate beneficial effect).

As at present, these habitats would not be managed to restore the mix of native species that likely occurred in the past. Instead, the structure of these habitats would be managed to benefit breeding

seabirds such as mōlī and special status species such as nēnē. Mowing of 2–3 acres/year would continue to be used to create open patches (>3 acres in size) of short (<6" tall) grass. Within the 5–7-acre enhancement area, pest plants such as Christmasberry, lantana, and other aggressive weeds would be removed to expose historic Kikuyu grasslands. Dispersed islands of native shrubs (e.g., naupaka) would be planted to provide additional food, cover, and breeding habitat. Both of these sets of actions would benefit nēnē foraging, breeding, and roosting, and possibly entice more use by seabirds such as albatrosses and shearwaters (minor positive effect).

Additional efforts would focus on benefitting mōlī populations on Mōlī Hill on Kīlauea Point and Mōlī Flat on Mōkōlea Point. Two to 5 acres/year of mixed coastal woodland-grassland would be enhanced through removal of pest plants such as ironwood, haole koa, other trees, tall shrubs (e.g., oleander), and signs. This would occur through use of IPM techniques (see Appendix G), such as tree and brush cutting, excavation, and prescribed fire. Likely this would be conducted selectively and some of the larger ironwoods would be left standing (these trees appear to have allelopathic properties, i.e., they biochemically suppress undergrowth). These actions would help clear obstacles to flight, and maintain open-understory woodlands adjacent to flight corridors for cover and breeding habitat. Ironwood-dominated woodlands with very little understory are already heavily used by mōlī on the Refuge. It's expected that these efforts would increase the areal extent and attractiveness of these habitats for mōlī and, over time, support slow growth in their onsite population. Populations of nēnē and ʻuaʻu kani would likely also have a minor benefit from these habitat enhancement efforts Mōlī Hill and Mōlī Flat.

Examples of the restored/enhanced native plant communities include naupaka coastal dry shrubland with pohuehue, and ʻilima coastal dry mixed shrub and grassland with ʻāheahea and pōpolo. These communities would be interplanted with appropriate threatened and endangered plants such as dwarf naupaka, ʻohai, and ʻawiwi. This effort would involve volunteers, native plant organizations, and other partners, and include plant propagation, site preparation and maintenance (including appropriate IPM strategies to remove and control pest plants and insects), monitoring and evaluation, and adaptive management. As occurs at present, these habitat management practices would be conducted in a manner and at times to minimize disturbance of and other effects on breeding seabirds. Management of these native plant communities would support the Refuge's long-term plant restoration strategy and, although not the primary purpose, they could provide habitat structure or function for breeding seabirds (Bruegmann and Castillo 1999).

Areas conducive to burrowing by seabirds, such as ʻuaʻu kani, koaʻe ula, and ʻaʻo, would be identified and maintained. These include areas with rock and root crevices, good soil/root structure, or sub-canopy layer (e.g., hala/naupaka woodlands with an open understory or dense subcanopy layer of hala leaf litter). Other habitat patches that are important for breeding seabirds would also be identified and maintained. These include rocky ledges and steep cliff crevices used by koaʻe kea, and large patches of woodlands >3' tall and the availability of small woody debris used by ʻā. Small scale outplantings of āheahea, hala, and select other species would provide structure and function for seabirds, create patches of native plants within the larger habitat, and also support implementation of the Refuge's long-term plant restoration strategy (Bruegmann and Castillo 1999).

Approximately 2.7 miles of hogwire fence would continue to be maintained in an effort to protect this habitat and its native wildlife from nonnative mammalian predators. Additionally, the Service would explore expansion of or separate additions to the Nihoku Ecosystem Restoration Project area. Construction of the fencing; removal of the nonnatives; and planting, irrigating (as necessary), and

otherwise restoring the native habitat would all take time. However, in the absence of invasive plants and animals, it would be expected that the restored habitat within the fenced area would, in the long term, thrive (minor to intermediate beneficial effect).

All of these efforts would help create and maintain coastal mixed woodland-grassland habitat whose succession was set back, that was healthy, and that had the key features to make it attractive for breeding and brood-rearing by nēnē, mōlī, and other seabirds, and other native species (e.g., wintering migratory waterfowl such as cackling geese and shorebirds such as kōlea and kioea). When combined with the enhanced predator-control actions addressed in Section 6.4.2, it would be expected that seabird breeding attempts and breeding success would increase, eventually leading to new species colonizations and growing populations of these birds on the Refuge (intermediate beneficial effect).

This alternative would include an expansion in roadside parking at the Overlook. Assuming the same footprint as the existing gravel area on the west side of the road, there is adequate room to create several angled parking spaces without the need to clear any vegetation. On the east side, however, the hillside slopes down to meet the road margin. Options for this area include do nothing, construct a handful of parallel parking spaces, or clear vegetation (a mix of nonnative and native species) and cut away the hillside to create angled parking spaces. If the last option was pursued, then less than one-half acre (to accommodate 10–15 parking stalls) of coastal mixed woodland-grassland habitat with breeding seabirds (e.g., ‘ua‘ u kani, ‘ā [red-footed booby]) and endangered nēnē would be removed, and roadway vehicle and associated human disturbance would penetrate deeper into Crater Hill (minor to intermediate negative effect).

Under this alternative, approximately 4 acres of coastal mixed woodland-grassland habitat on the southwest corner of Crater Hill would remain available for additional restoration and management of a semi-native vegetation community. In addition, this area would not experience the disturbance and fragmentation effects associated with construction and operation of a new welcome and orientation center and maintenance facilities. Nēnē currently use this area for breeding and a‘o flight calls have been recorded on the west slope of Crater Hill. Therefore, restored habitats would be expected to allow endangered nēnē to further expand their foraging, roosting, and breeding activities and likely continue to expand their population on the Refuge. Additionally, this area could host increased numbers of breeding shearwaters, including threatened ‘a‘o.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): Under this alternative, construction of a new welcome and orientation center and maintenance facilities would displace approximately 4 acres of coastal mixed woodland-grassland habitat on the southwestern corner of Crater Hill on Kīlauea Road. Along with a new pedestrian trail (described below), this would double the human footprint on the Refuge. In the 1980s, the area was restored to a native plant community. This habitat is currently dominated, from lack of maintenance, by nonnative invasive plants, including Christmasberry and Guinea grass in the lower area, and Kikuyu grass in the upper area with remnants of native species such as hala and naupaka. The shrublands are used by seabirds (e.g., ‘ua‘u kani) for breeding, and the shrublands and grasslands are used by nēnē for foraging, roosting, and breeding.

These wildlife values would be eliminated and the potential to re-restore this area to a native or semi-native vegetation community would be lost along with clearing, construction, and building use. Additionally, pest species typically associated with people (e.g., ant colonies, rodents, cats), trash,

and debris would potentially increase and negatively affect native plants and wildlife. The disturbance and fragmentation effects of this new complex would penetrate deeper into the Crater Hill area and compromise the plant and wildlife values of existing and potentially restored habitats outside the 4-acre site (intermediate negative effect).

This alternative also includes the development of a pedestrian trail from the new complex to the Overlook. To avoid potential safety hazards associated with pedestrians crossing Kīlauea Road, this trail would likely be constructed on the east side of the road. In this area, the steep hillside slopes down to meet the road margin. This hillside was enhanced with native plants in the 1980s (e.g., naupaka, hala). If a trail was built here, it would require clearing of vegetation (a mix of nonnative and native species) and cutting away (benching into) the hillside to create adequate room for a comfortably wide, flat trail with stable slopes on the east side. This would require the removal of 0.5–1 acre of coastal mixed woodland-grassland habitat that is used by seabirds (e.g., ‘ua‘u kani) and nēnē. Human disturbance associated with trail use would penetrate deeper into Crater Hill (intermediate negative effect).

Although the Crater Hill site is proposed, the design and construction are conceptual. Thus, a more detailed planning, facility and transit design, and appropriate evaluation would be undertaken, including additional effects assessment in compliance with NEPA, evaluation and consultation under Section 7 of ESA, and surveys and consultation under Section 106 of NHPA

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): Other than its general proximity to the Refuge, within 1 mile of the Refuge boundary, it is unknown where a new off-Refuge welcome and orientation center and maintenance facilities would be located. Its offsite location would result in no effects upon coastal mixed woodland-grassland or any other habitats on the Refuge.

If located in a developed area or existing facility, given the site selection criteria for an already developed or disturbed area, it is unlikely the site would have much, if any, native vegetation, and therefore it is unlikely there would be any effects on coastal mixed woodland-grassland habitat. Because of the surrounding terrain, if the new complex was located in an undeveloped area, it is likely the site would have historically supported coastal mixed woodland-grassland habitat. However few, if any, such sites exist within 1 mile of the Refuge boundary that are not currently dominated by nonnative, including invasive plant, species, and are of high restoration value. Therefore, effects on coastal mixed woodland-grassland habitat would be minimal, if any. Further assessment of effects on habitats would be conducted in the future in association with more detailed planning and design, and, as appropriate, as part of a separate NEPA process and document.

Under this alternative, approximately 4 acres of coastal mixed woodland-grassland habitat on the southwest corner of Crater Hill would remain available for potential restoration and management of a semi-native vegetation community. In addition, unless the complex was located immediately adjacent to the Refuge’s southern boundary (e.g., in the vicinity of Seacliff Plantation), this area would not experience the wildlife and habitat disturbance effects associated with construction and operation of a new welcome and orientation center and maintenance facilities. Therefore, restored habitats would be expected to allow nēnē to further expand their foraging, roosting, and breeding activities and likely expand their population on the Refuge. Additionally, this area could host increased numbers of breeding seabirds, potentially including mōlī and ‘a‘o.

If the new complex were constructed closer to Kīlauea Town and farther from the Refuge, then the maintenance portion of the new complex might have to be sited closer to the Refuge. This portion of the complex would require approximately 1.5 acres of land and would reduce the acreage required for the remainder of the complex. As noted above, further effects assessment would be conducted in the future.

Otherwise, effects of implementing Alternative D on coastal mixed woodland-grassland habitats would be the same as those described for Alternative B (minor to intermediate positive).

Comparison of overall effects across alternatives to coastal mixed woodland-grassland: A minor positive effect would occur for coastal mixed woodland-grassland and associated species under Alternative A because various management practices would propagate desired plant species composition and keep vegetation at desired height. Under Alternative B, the acreage of coastal mixed woodland-grassland habitat managed and enhanced for breeding seabirds would approximately double while the areal extent of grassland habitat enhanced for the benefit of nēnē would increase by 5–7 acres. Additional strategies include restoring and/or enhancing 10–30 acres of native coastal plant communities, fencing construction, and increased parking at the Overlook. Considering all actions, the overall effect of Alternative B is minor to intermediate positive. Alternative C would be similar to Alternative B with one notable difference: the construction of new facilities at the southwestern corner of Crater Hill and a trail from the new facilities to the Overlook would displace over 4 acres of coastal mixed woodland-grassland habitat. Thus, the net result of implementing Alternative C would be an intermediate negative impact. In Alternative D, the effects would likely be similar to Alternative B since the new facilities would be located outside of the current Refuge boundary.

Sea Cliff

Effects of Alternative A (Current Management): Because of its steep slope, high erosion potential, and high value for breeding and roosting seabirds, protection, rather than active manipulation, is the management focus for this habitat type. Sea cliff habitat supports active and relatively safe breeding by ʻā, koaʻe kea, koaʻe ʻula, ʻuaʻu kani, and roosting by ʻā (brown and red-footed boobies),ʻ iwa, and nēnē. Due to the steep slope, this habitat type is less accessible than the coastal mixed woodland-grassland habitat to dogs and pigs, but small mammals (e.g., cats and rats) and barn owls are still able to prey upon adult seabirds and their offspring. This habitat type contains a mix of native and nonnative plants, including haha, naupaka, ʻakoko, ʻilima, pōhinahina, ironwood, Christmasberry, and lantana.

People (including anglers, hikers, swimmers, and surfers) circumvent fences, ignore regulatory signs, and, along with their unleashed dogs, are known to scale the Refuge's steep sea cliffs (which are officially closed to general public use). These activities occur up to six times per month and most frequently around Mōkōlea Point with access from the Kāhili Quarry area or near Makapili Rock. Trespassers build fires and often leave trash behind them, and they compromise the physical integrity and wildlife values of this habitat type by generating erosion, crushing nesting burrows (sometimes destroying eggs or killing young or adult birds), preying on birds and eggs (dogs), and causing general disturbance. In addition, human access to these areas is a public safety concern.

This habitat also suffers from erosion associated with formal and informal trails and roads on the Refuge. To date, the Refuge has addressed this problem by diverting runoff and hardening affected

sites (e.g., with asphalt or shotcrete on the Point or with concrete bars on the unimproved road between Crater Hill and Mōkōlea Point). The fence replacement at the base of Mōkōlea Point (common to all alternatives) and associated signage would reduce trespass to sea cliff habitat.

Under Alternative A, the approximately 55 acres of sea cliff habitat would continue to be managed and exhibit the habitat values as at present and would have minor–intermediate negative, long-term effects.

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): The Service would monitor the health and wildlife use of sea cliff habitat to determine what natural events or human activities were affecting this habitat type and the wildlife species it does or could support. Appropriate management actions (e.g., enhanced public education and outreach, signage, law enforcement, and fencing) would be taken to address trespass and other problems, and reduce adverse effects. Additional stipulations on public uses occurring in Kāhili Quarry area would be implemented. As a result of these additional actions, it is expected that illegal activities and disturbance by Refuge visitors and unleashed dogs would be reduced. This would enhance the quality of the sea cliff habitat and potentially increase the quantity and/or diversity of wildlife use in this area.

The Service would evaluate erosion, compaction, and other problems associated with Refuge trails and roads within or affecting sea cliff habitat. Solutions (e.g., water bars, erosion matting, revegetation, realignment, and closure) would be identified and implemented, as appropriate. These efforts would reduce erosion and compaction of sea cliff habitat and the potential that it could develop again in the future, increase the potential for natural revegetation, enhance soil structure for burrowing seabirds, and reduce filling of burrows with eroded soils.

Implementation of this alternative would enhance and protect sea cliff habitat on the Refuge. Taken together, all of these actions would have minor to intermediate positive, long-term effects.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): Implementation of this alternative would be expected to have the same effects as described for Alternative B. The primary difference in Alternative C, construction and operation of a new welcome and orientation center and maintenance facilities on Crater Hill, would not be expected to affect sea cliff habitat and associated wildlife values on the Refuge.

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): Implementation of this alternative would be expected to have the same effects as described for Alternative B. The main distinction in Alternative D, construction and operation of a new, off-Refuge welcome and orientation center and maintenance facilities, would not be expected to affect sea cliff habitat on or off the Refuge.

Comparison of overall effects across alternatives to sea cliff: Primarily as a result of human trespass and disturbance, implementation of Alternative A would lead to minor to intermediate negative effects. Alternative B includes actions that would reduce the potential for habitat degradation from public use and a strategy to reduce erosion and compaction. Thus, the overall effect would be minor to intermediate positive. Alternatives C and D would be the same as Alternative B.

Beach Strand

Effects of Alternative A (Current Management): The Refuge includes relatively small areas (totaling 8 acres) of beach strand. Most of these areas provide foraging habitat for migratory shorebirds (e.g., ulili, ʻakekeke, and kōlea). The more secluded of these habitats (e.g., at Kīlauea [East] Cove) also provide relatively protected basking areas for ʻīlio-holo-i-kauaua and potentially honu. Traditional native Hawaiian fishing at Kīlauea [East] Cove would remain open; however stipulations articulated in the Compatibility Determination (Appendix B), including limits on group size, would minimize adverse effects. The Kāhili Quarry area also contains beach strand, but sometimes experiences relatively high levels of visitor use (e.g., for fishing) and some illegal uses (e.g., camping, trespassing, firewood cutting, and dumping of trash). These uses and associated disturbance, including by unleashed dogs, compromise the habitat and associated wildlife values of this area. Occasionally, people (e.g., anglers and surfers) are known to circumvent fences, ignore regulatory signs, and round Mōkōlea Point or scale the Refuge's steep sea cliffs (which are officially closed to general public use) and access the small, secluded beaches on the northwest shore. Because these habitat patches are so small, disturbance by just one person or one dog can drive off or exclude all wildlife using these beaches. Human access to these areas is also a public safety problem.

Under Alternative A, the status and wildlife values of this habitat type on the Refuge would continue as at present and would have minor to intermediate negative effects.

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): Under this alternative, the Service would monitor health and wildlife use of beach strand habitat to determine what natural events or human activities were affecting this habitat type and the wildlife species it does or could support. Appropriate management actions (e.g., enhanced public education and outreach, signage, law enforcement, and fencing) would be taken to reduce adverse effects. Additional stipulations on public uses occurring in Kāhili Quarry area would be implemented. As a result of these additional actions, it is expected that illegal activities and disturbance by Refuge visitors and unleashed dogs would be reduced in the Kāhili Quarry area. This would enhance the quality of the beach strand habitat and potentially increase the quantity and/or diversity of wildlife use in this area. Implementation of this alternative would also reduce human and canine disturbance of other, more secluded beaches on the Refuge, and thereby increase the duration and frequency of wildlife uses of these areas. Taken together, all of these actions would have minor beneficial effects.

Implementation of this alternative would have no effect on the acreage of beach strand habitat on the Refuge.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): Implementation of this alternative would be expected to have the same effects as described for Alternative B. Construction and operation of a new welcome and orientation center and maintenance facilities on Crater Hill would not be expected to affect beach strand habitat and associated wildlife values on the Refuge.

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): Implementation of this alternative would be expected to have the same effects as described for Alternative B. Construction and operation of a new off-Refuge welcome and orientation center and maintenance facilities would not be expected to affect beach strand habitat and associated wildlife values on or off the Refuge.

Comparison of overall effects across alternatives to beach strand: Primarily due to human trespass and disturbance, Alternative A would lead to minor to intermediate negative effects. Alternative B includes actions that would reduce the potential for habitat degradation from public use. Thus, the overall effect would be minor positive. Alternatives C and D would be the same as Alternative B.

6.4.2. Effects to Wildlife

Common to All Wildlife

In the 1980s, the Service used sound recordings and decoys to attract prospecting mōlī to the Refuge in the interest of establishing a colony. Since 1988, mōlī have been relocated from the U.S. Navy's Pacific Missile Range Facility (PMRF) to the Refuge as part of the Service's participation in the Bird-Aircraft Strike Hazard (BASH) program. In recent years, 300–500 birds have been released at the base of Mōlī Hill annually as part of this program. The birds are captured at PMRF, banded, held in crates, and driven about 60 miles to the Refuge. The process can take 3–4 hours for an individual bird. Birds arrive at the Refuge disoriented and stressed and usually fly off within 5 minutes of release.

Releases occur December through May, when endangered nēnē are breeding (intermediate negative effect), which often triggers territorial aggression from and creates disturbance to nēnē, whose numbers, along with mōlī, are increasing. Banding and recapture data from 2006–2008 suggest mōlī translocations are far less successful for adults, than subadults. Although 73 percent of subadult birds are captured and translocated just one time, approximately 76 percent of the adult birds are recaptured back at the PMRF, some up to 18 times (Anders et al. 2009).

From 2005–2012, 4–21 viable PMRF eggs were exchanged for nonviable Refuge eggs annually, as part of the PMRF-BASH mōlī egg-swap program, resulting in approximately 3 additional fledglings per year. The candling and swapping of albatross eggs occurs in December when endangered nēnē pairs are undergoing all breeding stages (defending breeding territories, laying, incubating, hatching, and rearing young), adding another form of disturbance to nēnē in a closed area (minor negative effect). The egg-swap program's purpose was to save some unwanted PMRF eggs from destruction by giving them to foster parents who "failed" or laid unviable eggs, and increase the reproductive success rates of Refuge birds (Zaun 2009). However, more recent information suggests that adult annual survival is higher for birds who fail to breed or skip breeding (e.g., breed every other year), than those who breed in successive years because of apparent costs to reproduction. Furthermore, mate retention and selection in recently established colonies is less stable than previously thought and appears to be influenced by reproductive success (Young and VanderWerf 2013). These more recent analyses indicate complex trade-offs between adult survival and reproduction in recently established colonies. Thus, giving eggs to "failed" breeders could be interfering with these evolutionary processes (negligible to minor negative effects).

Through the CCP planning process, the Refuge is re-evaluating all programs and priorities to be consistent with the Improvement Act and BIDEH Policy, which require refuges to manage for ecosystem-level biological integrity which includes restoring populations but also restoring or preserving natural biological processes and functions that shape genomes, organisms, and communities. PMRF has also funded a study to evaluate the efficacy of the egg-swap program. From 1988 to 2013, the number of mōlī breeding pairs on-Refuge has increased four-fold (32 in 1988, 125

in 2013), suggesting the PMRF-BASH programs have assisted with mōlī establishment, although the true mechanisms are unknown. Likewise, PMRF's mōlī population has continued grow at similar rates. In the same period, the nēnē population on-Refuge has gone from 0 to 134 breeding pairs, and site visitation has almost doubled from 284,000 to 500,000 people annually, resulting in a rise in people–wildlife interactions and bird distribution shifts toward remote areas like Mōlī Hill. The egg-swap program appears to benefit mōlī in the short-term by producing more chicks. However, with the long-term effects of population manipulation on adult survival and fitness of this long-lived seabird less clear and potentially negative, the Refuge has discontinued its role as a receiving site in the PMRF-BASH program.

The Service would continue to work with the partners to re-evaluate program efficacy and seek long-term conservation solutions. For example, PMRF could contribute funds for fence installation/ maintenance to protect albatross colonies. PMRF could continue working with the Service and DLNR to identify alternate receiving sites that have control of introduced predators and long-term protection, and are potentially closer to PMRF to reduce bird-holding times. It is anticipated that the Service switching from a receiving site to an advisory role would provide overall minor to intermediate beneficial effects to native wildlife.

Under Alternative A, wildlife-dependent and nonwildlife-dependent public uses and Refuge outreach programs would continue. These programs play a key role in fostering public understanding, appreciation, and support for the Refuge's native fish and wildlife and would lead to long-term, indirect, and minor benefits to the conservation of these resources. Under Alternatives B–D, the quality and quantity of these programs would expand slightly and lead to similar benefits as in Alternative A. Disturbance impacts to specific wildlife species as a result of public use programs are discussed in the following sections.

Under Alternative A, inventory and monitoring, research, and scientific assessments regarding Refuge natural and cultural resources, public uses, and interactions among these elements would continue as at present. Relative to wildlife, most of these activities would involve observation and measurement; however, in rare situations tissues or whole specimens of native or nonnative animals would be purposefully or accidentally taken. Otherwise, disturbance and an increased potential to transport nonnative species would be the primary effects of the vast majority of these activities. Data collection, analyses, and interpretation would help Refuge staff assess the efficacy of management practices in achievement of goals and objectives, and facilitate appropriate course corrections as part of the adaptive management process (negligible to minor positive effect). Compatibility determinations included in Appendix B address the effects and conditions associated with these uses in greater detail.

Under Alternatives B–D, inventory and monitoring, research, and scientific assessments regarding Refuge natural and cultural resources, public uses, and interactions among these elements would increase compared to those occurring at present. In addition to generating the same types of effects described for Alternative A, it would be expected that this would result in a minor increase in information about Refuge wildlife, including wildlife responses to Refuge management programs, and achievement of management goals and objectives. For example, this would include better information about population changes in wildlife species of special concern, the efficacy of pest management programs, the effects of visitor use on wildlife, and changes in animal phenology, potentially as a result of climate change.

Through application of adaptive management principles, enhanced knowledge would slowly lead to improved management and an increase in the abundance and diversity, potentially including genetic diversity, of native wildlife on the Refuge. The effects of some of these activities, such as inventories of invasive plants or evaluations of the contributions of specific habitat management practices to achievement of Refuge objectives, would be primarily local. Other activities, such as studies of the effectiveness of attracting or translocating wildlife species of special management concern, would have broader effects (minor to intermediate positive effect).

Compatibility determinations included in Appendix B address, in greater detail, the effects and conditions associated with all public uses on the Refuge, including inventory and monitoring, and research and scientific assessments.

Seabirds

Effects of these alternatives on ʻaʻo are primarily described in Section 6.4.3.

Effects of Alternative A (Current Management): Implementation of this alternative would continue current management of breeding seabirds on the Refuge. This would include the habitat management efforts evaluated above (see Section 6.4.1) and control of nonnative species (through maintenance of the 2.7-mile hogwire fence, trapping, shooting, and toxicants) to reduce predation by introduced dogs, cats, rats, mice, barn owls, and pigs. The techniques employed (e.g., limiting the frequency of visits to seabird breeding colonies, approaching animals indirectly and limiting physical contact, moving slowly through colonies, and keeping speech and other noise to a minimum) and scheduling of these efforts (to coincide with non-breeding periods, where possible) would be designed to minimize effects on breeding seabirds and other wildlife. Although these efforts would create some disturbance, the net effects (maintaining or enhancing habitat and reducing predation) would far outweigh any short-term and localized disturbance impacts.

The hogwire boundary fence is fairly effective in keeping larger mammalian predators (e.g., dogs and pigs) off the Refuge, but it does not preclude access by cats, rats, mice, or barn owls. For example, in 2010 at the Refuge, more than 75 adult ʻuaʻu kani were found preyed upon by owls (compared with about 5 in 2009), and carcass recoveries subsided after removal of 4 introduced barn owls (USFWS unpubl.). Under this alternative, predation would still extract its lethal toll at approximately the same rate or at a slightly lower rate as at present.

Consistent with IPM principles (see Appendix G), control actions would continue to be taken and predation, parasitism, and disease-related threats to breeding seabirds posed by ants, mosquitoes, scale insects, and other similar pests would be reduced. These actions would continue to be effective when applied; however, the inaccessibility of many seabird breeding sites and the lack of regular monitoring due to the small size of the staff would limit the effectiveness of these actions on breeding seabirds across the Refuge.

Efforts would also continue to reduce seabird flight hazards posed by trees and shrubs and to reduce encroachment/displacement of seabird breeding sites by nonnative plants. Actions employed would include weeding, cutting of shrubs and trees, mowing, and spraying of herbicides. These techniques would continue to be carefully undertaken to avoid work within colonies while seabirds were breeding and to avoid creating soil erosion above, in, or near colonies. This has proven to be especially challenging on Mōlī Hill because together, the key species that use this area (i.e., nēnē,

mōlī, and ʻuaʻu kani) engage in breeding activity year round. Therefore, this management activity results in some minor disturbance to individual birds or perhaps an entire colony for short periods of time, but is essential to maintenance of habitat quality and the long-term health of the breeding populations.

The small but well-established breeding colony on the Refuge now includes over 100 pairs. The population trend on the Refuge is stable and slowly increasing. Mōlī now also breed elsewhere on Kauaʻi (primarily on the North Shore) outside of the Refuge. Under this alternative, the Refuge population would be expected to continue to slowly increase.

Ongoing work with Kīlauea Town and the Hawaiʻi Department of Land and Natural Resources to reduce disorientation caused by light hazards and injury caused by other obstacles for seabirds that forage all day at sea and return to land at night would continue under this alternative. This would include closing of the Refuge at 4:00 pm to reduce the effects of automobile headlights and lighting in public use facilities. On average, four ʻuaʻu kani annually die on the Point or end of Kīlauea Road from headlight blinding and head-on collision. Continuation of efforts to reduce lighting hazards would be expected to continue to limit the number of seabirds that were disoriented by lighting or collided with other obstacles (minor positive effect).

Excepting the occasional vehicle collision (primarily with nēnē), crushed seabird or seabird burrow (possibly including birds or eggs), or seabird collision with structures, current visitor use programs on the Refuge affect seabirds primarily through disturbance (periodic in most areas, chronic along parking lots, roads, and lighthouse trail), attraction of commensal and trash-associated pests (e.g., ants, rats, cats), and potential introduction of new invasive species. Almost all visitor use would continue to take place on the Point. In this area, visitors are provided outstanding and up-close opportunities to view and photograph seabirds, while simultaneously confining almost all of the effects of their uses to a relatively small portion of the Refuge. Most of the remainder of the Refuge would remain closed under normal conditions, which would continue to enhance the probability of successful seabird breeding in those areas. The area of the Point that is being colonized by breeding ʻaʻo, a threatened species, would remain closed to public use, which would greatly increase the likelihood that the colonization effort would be successful.

The Kāhili Quarry area sometimes experiences relatively high levels of visitor use and some illegal uses. Occasionally, people are known to circumvent fences, ignore regulatory signs, and round Mōkōlea Point or scale the Refuge's steep sea cliffs. Seabirds nest in the vegetation at the base of the cliffs at Kāhili Quarry. Walking through the Quarry area and along the ocean-side trail at the east base of Mōkōlea Point would be expected to cause some wildlife disturbance. Efforts would continue to be made to minimize seabird disturbance associated with wildlife observation and photography, environmental interpretation and education, fishing, special events, and hikes. Effects and conditions associated with public uses of the Refuge, including monitoring and adaptive management, are described in greater detail in the compatibility determinations included in Appendix B.

The approximately 7-acre Nihoku Ecosystem Restoration Project, located north (makai) of the crater rim road, south of Makapili Rock, and approximately halfway between the upper Overlook and Mōkōlea Point, includes construction and maintenance of a 6.5-foot-tall, marine-grade stainless steel fence with outwardly rolled hood, small mesh size, and a buried skirt extending approximately 1 foot out from the fence. This type of fencing has been constructed and studied extensively in New Zealand. It was also installed at the Kaʻena Point Natural Area Reserve on Oʻahu in 2011.

Experience to date reveals that, when carefully constructed and maintained, this type of fencing would fully exclude access by introduced mammalian predators, including dogs, cats, mongooses, pigs, rats, and even 2-day-old mice. Positive responses by native plants and breeding seabirds within these fenced enclosures have occurred more quickly than anticipated (Anden Consulting 2014, Burgett et al. 2007, Young et al. 2012). In a recent article, Young et al. (2013) stated that, at Kaʻena Point, "Record numbers of Laysan albatross and Wedge-tailed shearwater chicks fledged from the reserve after predators were eradicated…[and that they]…anticipate regeneration of native plants and invertebrates, and recolonization by other seabirds…."

Social attraction techniques would be used to encourage prospecting seabirds to explore the area's breeding potential. Seabirds that currently overfly the project area or nest nearby (e.g., ʻā [red-footed booby], ʻiwa, koaʻe kea, koaʻe ula, and ʻuaʻu kani) would likely be the first to attempt breeding within the enclosure (Anden Consulting 2014). Over time, this project would be expected to support successful breeding by ʻaʻo and eventually, perhaps other seabirds such as ʻā (brown booby), ʻakeʻake, Christmas shearwater, ʻewaʻewa, kaʻupu, noio, noio kōhā, ʻou, pākalakala, and ʻuaʻu. As a result of protection from mammalian predators, breeding success, including survival of mōlī and nēnē eggs, chicks, and adults (currently nesting within the area), would be expected to markedly improve (intermediate positive effect).

During the CCP's 15-year planning horizon, it is expected that this project would also result in the seabirds listed above, and perhaps other seabirds, establishing small breeding populations within the enclosure (intermediate positive effect). Those populations would be expected to continue to slowly grow as the habitat and invasive species were appropriately managed, and the fencing was properly maintained, repaired, and/or replaced in the future. It is anticipated that the response by breeding seabirds to the Nihoku Project would be lower (slower) than that experienced at Kaʻena Point because, unlike the situation at the Nihoku Project site, Kaʻena Point already had, "…one of the largest seabird colonies in the main Hawaiian Islands…" (Young et al. 2013). Actual wildlife response would be measured by comparing pre-project wildlife surveys with post-construction surveys. More detailed information is available in the environmental assessment for this project (Anden Consulting 2014).

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): Under this alternative, the many ongoing actions (Alternative A) to manage breeding seabirds would be continued and additional efforts would be undertaken to enhance diversity and abundance of breeding seabirds on the Refuge. Chief among this latter group would be exploring an expansion or separate additions to the Nihoku Ecosystem Restoration Project area and increased enhancements of coastal mixed woodland-grassland habitats (as described in Section 6.4.1). Generally, a predator-resistant fence on Mōkōlea Point would be expected to have similar minor to intermediate positive effects on seabirds as described for the current Nihoku project.

Predation by nonnative mammals (e.g., dogs, cats, rats, mongooses, mice, and pigs) can severely damage populations of native species, especially those indigenous to islands, including seabirds, particularly for seabirds that nest on the ground or in burrows. Control, including elimination of nonnative mammalian predators from an island or protected area, can cause suppressed populations of breeding seabirds and other wildlife species to rebound. Under this alternative, continued predator control (including trapping, shooting, and toxicants), and especially the construction and maintenance of predator-proof or predator-resistant fencing, would be expected to result in a rebound of populations of seabirds breeding at the Refuge (intermediate positive effect). Species whose

nesting and brood-rearing habits make them particularly vulnerable to mammalian predation, would be expected to have the greatest response, including seabirds such as mōlī, ʻuaʻu kani, and ʻaʻo, and the nēnē (Caut et al. 2008, Hughes et al. 2008, Mitchell et al. 2004, Nogales et al. 2004, Rauzon 1985, Reaser et al. 2007, Seto and Conant 1996, Thibault 1995, USFWS 2005, Whitworth et al. 2005). Refuge efforts to control nonnative predators are consistent with recommendations of the Regional Seabird Conservation Plan for the Pacific Region (USFWS 2005).

Efforts on Mōlī Hill and Mōlī Flat to enhance mixed coastal woodland-grassland habitat through removal of flight obstacles and enhance the quality of breeding habitat (see description in Section 6.4.1) would increase the areal extent and attractiveness of these habitats for koaʻe ula, mōlī, and ʻuaʻu kani and continue the slow growth in their onsite populations (minor positive effect).

Special inventory and monitoring actions would be undertaken in association with this project. Prior to construction, comprehensive vegetation and wildlife baseline surveys would be conducted. Following construction, additional surveys would be periodically conducted to determine the efficacy of this project, including the effects on breeding seabirds and native plants. This is all in addition to the regular predator monitoring noted earlier.

Enhanced habitat management efforts under this alternative (evaluated in Section 6.4.1) would increase the areal extent of Refuge habitats that were attractive to breeding seabirds. This would include the small-scale outplantings of native plants, some of which are known to provide structure and function for breeding seabirds (e.g., ʻā use āheahea for nesting and for lining their nests). When combined with the enhanced predator-control efforts, these habitat management practices would be expected to increase seabird breeding attempts and breeding success, eventually leading to growing populations of these birds on the Refuge.

This alternative would include an expansion in roadside parking at the Overlook and an optional shuttle from the Overlook onto the Point. Assuming the same footprint as the existing gravel area on the west side of the road, there's adequate room to create several angled parking spaces without the need to clear any vegetation. On the east side however, the hillside slopes down to meet the road margin. Options for this area include do nothing (only create parking along the west side), construct a handful of parallel parking spaces, or clear vegetation (a mix of nonnative and native species) and cut away the hillside to create angled parking spaces. If the last option were pursued, then habitat currently in use by seabirds (e.g., boobies, tropicbirds, and ʻuaʻu kani) for roosting and/or breeding would be removed and roadway vehicle disturbance would penetrate deeper into Crater Hill (negligible to minor negative effect).

Operation of the optional shuttle would result in a reduction of unknown magnitude in the number of vehicles traveling the Refuge entrance road (from the Overlook onto the Point) and parking in the parking lots. This reduction in disturbance could increase seabird use of the shrubbery and grasslands nearer the parking areas on the Point. Because it is unknown how many people would use the optional shuttle and the amount of disturbance cars would continue to create, it is unknown what effects, if any, this action would have on seabird use (negligible to minor effect).

Under this alternative, there would be no major changes to public uses allowed or open and closed areas on the Refuge. Additional stipulations on public uses occurring in Kāhili Quarry area would be implemented. As a result of these additional actions, it is expected that illegal activities and wildlife disturbance by Refuge visitors and unleashed dogs would be reduced. This would potentially

increase the seabird use in adjacent areas. Effects and conditions associated with Refuge public uses are addressed in greater detail in compatibility determinations in Appendix B.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): The effects of implementing this alternative on the Refuge's breeding seabirds would be the same as described for Alternative B, except as they relate to construction and operation of a new welcome and orientation center and maintenance facilities and trail on the southwestern corner of Crater Hill on Kīlauea Road. Under this alternative, construction of the new complex would displace approximately 4 acres of coastal mixed woodland-grassland habitat on Crater Hill and would generate disturbance and fragmentation effects deeper into the Crater Hill area nearly doubling the size of the human footprint and thereby compromising the wildlife values of existing and potentially restored habitats.

In the 1980s, the area was restored to a native plant community. The lower, shrubland habitat is currently dominated, from lack of maintenance, by nonnative invasive plants, including Christmasberry and Guinea grass; the upper slopes are predominantly Kikuyu grass, with remnants of native species such as hala and naupaka. The shrublands are used by seabirds (e.g., ʻuaʻu kani) for breeding, and the shrublands and grasslands are used by nēnē for foraging, roosting, and breeding. These wildlife values would be eliminated and the potential to re-restore this area to a native or semi-native vegetation community would be lost along with clearing, construction, and building use. Additionally, commensal pest species typically associated with people (e.g., ant colonies, rodents, cats), trash, and debris would increase and negatively affect native plants and wildlife. The disturbance and fragmentation effects of this new complex would penetrate deeper into the Crater Hill area and compromise the plant and wildlife values of existing and potentially restored habitats outside the four-acre site (intermediate negative effect).

Human disturbance has differential effects on wildlife and is dependent upon, among other variables, the species involved and its age; the time of year; the breeding cycle stage (if applicable); the surrounding environment; whether the activity involves vehicles; the intensity, speed, noise, nature, and frequency of the disturbing activity; and the directness of approach to an animal (Blanc et al. 2006, Hammitt and Cole 1998, Holmes et al. 2005, Knight and Cole 1995a, Knight and Cole 1995b). Disturbance can cause abandonment of nests and young; allow predators access to nests/young, reduce parental attention to young, and otherwise impact survival of individual birds, eggs, nestlings, or broods; and cause animals stress and to alter their normal behavior (Haysmith and Hunt 1995). The effects of disturbance on individual animals are likely additive.

Breeding seabirds are often sensitive to disturbance, so, in addition to directly reducing the quantity and quality of habitat and their current potential use of the 4-acre site, disturbance related to construction and operation of the proposed complex would be expected to cause them to nest farther north, in shrublands along the western and northern flanks of Crater Hill (habitats currently used by boobies, tropicbirds, and ʻuaʻu kani). If they were unable to find suitable habitat that was free of disturbance in these areas, then implementation of this alternative could result in a reduction in numbers of breeding seabirds, breeding success, and survival of young (intermediate negative effect) (Beale and Monaghan 2004, Hammitt and Cole 1998, Kitaysky et al. 2003, Trulio 2005).

Under this alternative, the northernmost, approximately one-fifth of a mile of Kīlauea Road would be gated and closed daily. Daytime traffic by cars to the Overlook would be prohibited. Overlook access would be via pedestrian trail from the new welcome and orientation center or bicycle. This trail

would likely be constructed on the east side of the road and would require removal of 0.5–1 acre of coastal mixed woodland-grassland habitat that is used by seabirds (e.g., ʻuaʻu kani) and nēnē. Visitors would be transported from the welcome and orientation center to the Point on a mandatory shuttle. During closed hours, visitors would be able to drive their cars to the Overlook when the Point was closed and the gate was opened.

Reducing traffic volumes through this area when Kīlauea Road is closed would be expected to reduce vehicle disturbance, but human disturbance associated with trail use would increase. One set of effects would increase breeding success of these birds, and the other set of effects would degrade the value of this habitat for these and other breeding seabirds. These disturbance effects could cancel each other, resulting in a neutral net effect; however, habitat and existing and potential breeding and foraging sites would still have been removed (minor negative effect).

There would also be a major reduction in the number of vehicles traveling the Refuge entrance road (from the Overlook onto the Point) and parking in the parking lots. This reduction in disturbance could allow seabirds to initiate roosting and breeding in the shrubbery and grasslands nearer the entry road and parking areas. Because some degree of disturbance would continue (by the shuttle and, after hours, at the Overlook), it is speculative to estimate the actual amount of such increases in use/success (minor negative effect).

Alone, the actions of reducing the magnitude of disturbance in already disturbed areas (the Point and Overlook) would provide net benefits to seabirds. However, under Alternative C, these beneficial effects would be nullified by the greater disturbance generated from construction of a welcome and orientation and maintenance center into previously undisturbed habitat (Crater Hill) (intermediate negative effect). The species and individuals that currently breed on the Point are believed to be habituated or have adaptations that help them survive in human-disturbed environments. Consequently, these species represent a subset of the suite of seabirds that could potentially breed and roost on the Refuge.

Several of the species that breed and roost predominantly on Crater Hill and Mōkōlea Point (rarely at the Point) are believed to be less tolerant of human disturbance (e.g., ʻā [red-footed booby], ʻiwa [frigatebirds]). Collectively, with other activities on Crater Hill (e.g., school groups, SeaCliff Plantation residents, volunteers, Crater Hill hikes), the construction of a welcome and orientation center and associated activities at Crater Hill could be potentially limiting for expanding distributions (e.g., ʻā) or new colonizations (e.g., kaʻupu [black-footed albatross]) of less tolerant species, compromising the resource goal of providing a high-island refugium for seabirds whose low-lying islands are vanishing due to climate change.

In addition, guided interpretive hikes up Crater Hill would be reinstated under this alternative. The hikes would involve small groups of visitors and local residents, traveling on designated routes, and with trained guides. The hikes would provide participants with special opportunities to view and photograph boobies, mōlī , tropicbirds, ʻuaʻu kani, and possibly other seabirds. Special conditions would be imposed on these hikes to ensure that they would not significantly adversely affect native wildlife or their habitats (minor negative effect). Hikes would be suspended during the endangered nēnē breeding season, approximately September–April, with exceptions for National Wildlife Refuge Week. The compatibility determination addressing wildlife observation, photography, and interpretation included in Appendix B addresses the effects of and conditions associated with this use in greater detail.

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): The effects of implementing this alternative on the Refuge's breeding seabirds would be the same as described for Alternative B, except as they relate to construction and operation of a new off-Refuge welcome and orientation center and maintenance facilities located within 1 mile of the Refuge boundary. If the new complex were constructed adjacent to the Refuge's southern boundary (e.g., in the vicinity of Seacliff Plantation) and Kīlauea Road, then the northernmost, approximately one-fifth of a mile of Kīlauea Road would be gated and closed daily, as proposed under Alternative C. Under this alternative option, breeding seabirds would experience the same effects associated with the road closure as described under Alternative C.

Seabirds are not known to breed in the lowlands near Kīlauea Town; therefore, if this new complex were constructed farther from the Refuge boundary (e.g., in Kīlauea Town, near the proposed Kīlauea Town Bypass), the likelihood is low that it would create any effects on breeding seabirds. Nonetheless, prior to construction, surveys would be conducted to determine whether breeding seabirds use the potential site. If they were found, appropriate actions would be taken to avoid, reduce, or mitigate any possible effects.

Comparison of overall effects across alternatives to seabirds: Under Alternative A, the overall effect on seabirds is intermediate and positive. Under Alternative B, ongoing actions would be continued and additional efforts such as fence construction and increased management, enhancement, and restoration of coastal mixed shrubland-grassland habitat, including removal of flight obstacles, would lead to an overall effect similar to A but slightly more positive. Implementation of Alternative C would involve the construction and operation of new facilities and guided interpretive hikes at Crater Hill. Primarily due to the loss and disturbance of approximately 4 acres of seabird habitat, the overall effect of Alternative C would be minor to intermediate negative. The effects of Alternative D would be similar to Alternative B, except as they related to the construction and operation of the new facilities that would be located outside of the current Refuge boundary and the reinstatement of guided interpretive hikes at Crater Hill.

6.4.3 Effects upon Threatened and Endangered Species, other Species of Special Concern, and Critical Habitat

The Refuge does not include any officially designated critical habitat for threatened or endangered species. Therefore, none of the alternatives would affect critical habitat. The effects of the alternatives on undesignated habitat supporting threatened species, endangered species, or species of special concern are addressed under each of the habitat types (in Section 6.4.1) and under the particular species or species group of interest (in this section).

Threatened and Endangered Wildlife

Effects of Alternative A (Current Management): Under this alternative, the areas surrounding the Refuge entrance road, parking lots (including the grassland overflow lot), lighthouse, and grass-topped leach field on the Point would continue to be heavily used by nēnē for foraging, nesting, and brood rearing. These birds would continue to be attracted by the short lush grass, adjacent shrub and tree cover, and the fresh water associated with irrigation practices, and regular washing of walks and porches. As described in Section 6.4.1, the Kikuyu grassland on Crater Hill would continue to be mowed once every 3–4 weeks at a 2–4" height, thereby providing additional nēnē habitat. Because of their habituation to Refuge facilities, humans, and vehicle (including automobiles and buses), and

despite the 15 mph speed limit on Kīlauea Road just south of the Refuge and the 10 mph speed limit on the Refuge entrance road, a number of these birds (on average, 4 per year) would continue to be injured or killed as a result of collisions with vehicles on and near the Refuge. Regardless, under this alternative, the Refuge's nēnē population would be expected to continue to experience moderate growth and continue to expand their population off the Refuge (minor positive effect).

Efforts to entice ʻaʻo to the Refuge, and support their breeding success and chick survival would continue under this alternative. In 2012, there were at least 11 breeding or prospecting pairs of ʻaʻo on the Refuge (USFWS 2012). Some, or perhaps most, of these birds are descendants of a small population initially established in 1978–1980 through an egg translocation and cross fostering (with ʻuaʻu kani) program (Byrd et al. 1984, USFWS 2012).

Under this alternative, the Service would continue work with the Kauaʻi Endangered Seabird Recovery Project and other partners to employ social attraction techniques (e.g., recorded calls broadcast through speakers that were initiated in 2007) in an attempt to entice more ʻaʻo to breed on the Refuge (USFWS 2012). Additionally, the area of the Point that is being colonized by breeding ʻaʻo would continue to be closed to public use.

Work with Kīlauea Town and the Hawaiʻi Department of Land and Natural Resources to reduce light hazards and other obstacles (e.g., power lines and towers) for ʻaʻo would continue under this alternative. From 1978 to 2002, thousands of ʻaʻo (especially fledglings in October and November) have fallen to the ground on Kauaʻi after being disoriented by lights, including lighted towers and automobiles (Berger 1972, NESH Working Group 2005). The collisions killed some birds. Others landed on the ground, but some of these birds were unable to take off again due to injury, poor conditions for take-off, or predation by introduced mammalian predators.

Continuation of efforts to reduce lighting hazards would be expected to continue to reduce (by an unknown amount) the number of seabirds that were disoriented by lighting or collided with other obstacles. These ongoing efforts would be expected to increase the likelihood that ʻaʻo would be attracted to and successfully breed on the Refuge, and that ʻaʻo injuries and deaths related to light hazards would be reduced. However, because of the ʻaʻo's low fecundity rate, the result of these actions would be a slow increase in the Refuge's ʻaʻo population (minor effect) (NESH Working Group 2005).

As documented in an environmental assessment (Anden Consulting 2014), the approximately 7-acre Nihoku Ecosystem Restoration Project includes predator-proof fencing complemented by an intensive management and maintenance program that aims to fully exclude access by introduced mammalian predators (including dogs, cats, mongooses, pigs, rats, and mice) and immediately remove any that found their way inside. As a result of protection from mammalian predators, breeding success, including survival of nēnē eggs, goslings, and adults, would be expected to markedly improve (minor to intermediate effect).

Artificial nesting burrows (for ʻaʻo) and social attraction techniques would be used to encourage prospecting seabirds to explore the area's breeding potential. As with cross-fostering chicks, it is expected that, during the CCP's 15-year planning horizon, this project would result in ʻaʻo and eventually the other seabirds mentioned above establishing small breeding populations within the enclosure (intermediate effect). These populations would be expected to continue to grow as long as

the habitat and invasive species were appropriately managed and the fencing was properly maintained, repaired, and/or replaced in the future.

‘Ilio-holo-i-ka-uaua and honu may be seen in waters adjacent to the Refuge and may haul out on the Refuge shoreline. Stipulations on public uses are intended to minimize disturbance impacts, leading to negligible effects (see also Appendix B). For example, when viewing or photographing ‘īlio-holo-i-ka-uaua or honu, whether these animals were in the water or on shore, visitors would be requested to maintain a distance of at least 50 yards and limit their viewing/photographing time to 30 minutes (NOAA undated). If ‘īlio-holo-i-ka-uaua or honu display signs of being disturbed, then that 50 yards would be expanded and/or viewing would be minimized or shut down to stop the disturbance and avoid potential “take” under the ESA and MMPA.

Continuation of current management would not be expected to have measurable effects on populations of ‘ōpe‘ape‘a or pueo.

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): As briefly described in Section 6.4.2, the several actions taken under this alternative would increase the abundance and quality of wildlife habitats across the Refuge, thereby expanding the size of the high-island refugium that the Refuge provides for seabirds, shorebirds, and other species of native wildlife that will be displaced from low-island habitats elsewhere in the Pacific due to sea-level rise (intermediate positive effect).

As described in Section 6.4.1, under this alternative, the acreage of managed and enhanced coastal mixed woodland-grassland habitat on the Refuge would approximately double (to 97 acres) and the areal extent of grassland habitat would increase from 27 acres to approximately 32–34 acres. The additional 5–7 acres would result from enhancement of degraded grasslands. Pest plants, such as Christmasberry, lantana, and other aggressive weeds, would be removed to expose historic Kikuyu grasslands. Two to three acres of grasslands per year would be mowed to create open patches (>3 acres in size) of short (<6” tall) grass. Native shrubs (e.g., naupaka) would be planted to provide additional food, cover, and breeding habitat. These actions would benefit nēnē foraging, breeding, and roosting. Additionally, the efforts on Mōlī Hill and Mōlī Flat to enhance mixed coastal woodland-grassland habitat through removal of flight obstacles and enhance the quality of breeding habitat (see description in Section 6.4.1) would increase the areal extent and attractiveness of these habitats for nēnē and would further support the slow growth in their onsite populations (overall minor effect).

The areas surrounding the Refuge entrance road and parking lots (including the grassland overflow lot) on the Point are heavily used by nēnē for foraging, nesting, and brood rearing. Birds at the Point are habituated to humans and collisions with vehicles on and near the Refuge are common (on average, 4/year on the Point). This alternative would include an expansion in roadside parking at the Overlook and an optional shuttle bus from the Overlook to the Point. As described in Section 6.4.2, expanding parking in this area (especially on the east side) could require clearing nonnative and native vegetation, some of which is currently used by nēnē for foraging and/or nesting. Additionally, disturbance associated with an increase in the numbers and proximity of vehicles and people in this area would penetrate deeper into Crater Hill (minor negative effect).

Operation of the optional shuttle would result in a reduction of unknown magnitude in the number of vehicles traveling the Refuge entrance road and parking on the Point. Effective use of the shuttle

would be limited by the total number of parking spaces provided at the Overlook. This set of actions would be expected to reduce, by an unknown amount, nēnē collisions and disturbance along the entrance road and in the parking areas (negligible to minor effect).

Under this alternative, additional efforts would be undertaken to increase breeding by ʻaʻo and other seabirds of special concern within the Nihoku Ecosystem Restoration Project predator-proof fence. Re-colonization rates may be improved with social attraction techniques (Gummer 2003). These techniques would also be considered for use with other species that do not breed on the Refuge, but do on Kaʻula Rock (southwest of Kauaʻi) or have been extirpated on Kauaʻi, but breed nearby (e.g., on Lehua Islet, which lies west of Kauaʻi near Niʻihau). Examples of such species include ʻā (brown booby), ʻakeʻake, Christmas shearwater, ʻewaʻewa, kaʻupu, noio, noio kōhā, ʻou, pākalakala, and ʻuaʻu.

The Refuge would also explore the feasibility of the Refuge as a potential ʻaʻo chick translocation site. When the chicks are of an appropriate age, translocation of seabirds has proven to be an effective technique to establish new and rebuild former seabird colonies (Gummer 2003). However, there is empirical and theoretical evidence that colony establishment can occur faster at a considerably cheaper rate using fencing and social attraction versus fencing and chick translocations, and that chick translocations may be required at some locations but not others (Courtot et al. 2014, Sawyer and Fogle 2010, Sawyer 2014). Nonetheless, it is expected that appropriately applied techniques would, over time, result in small populations of these seabirds identifying the Refuge as their natal home and, once they matured, returning there to breed (intermediate positive effect).

Second, the ʻaʻo social attraction program would be expanded to areas east of Crater Hill (i.e., expansion of the Nihoku Ecosystem Restoration Project area) and Mōkōlea Point that are proposed sites for development of predator-proof or predator-resistant enclosures in partnership with groups such as the American Bird Conservancy and Kauaʻi Endangered Seabird Recovery Project.

Together, these additional measures would likely increase the abundance and potentially the genetic diversity of ʻaʻo and nēnē on the Refuge, and could entice ʻā (brown booby), ʻakeʻake, Christmas shearwater, ʻewaʻewa, kaʻupu, noio, noio kōhā, ʻou, pākalakala, and ʻuaʻu to breed onsite (intermediate effect). These efforts take on added importance in light of (1) the potential loss of low-island breeding sites for these birds elsewhere in the Pacific Ocean caused by sea-level rise and (2) the apparent introduction of mongooses on Kauaʻi that could exacerbate the effects of nonnative predators on critical ʻaʻo breeding colonies in the mountains.

This alternative would not be expected to have measurable effects on honu, ʻīlio-holo-i-ka-uaua, ʻōpeʻapeʻa, or pueo.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): Implementation of this alternative would have the same effects on threatened and endangered species of wildlife and other wildlife species of special concern as described for Alternative B, except as noted below.

Under this alternative, construction of a new welcome and orientation center and maintenance facilities and pedestrian trail would displace approximately 4 acres of coastal mixed woodland-grassland habitat on the southwestern corner of Crater Hill on Kīlauea Road. It would generate disturbance and fragmentation effects deeper into the Crater Hill area, and thereby compromise the

wildlife values of existing and potentially restored habitats, like those described above. The shrubland-grassland habitat proposed for clearing and construction is used by the endangered nēnē for transiting from the private lands on Kīlauea Road's west side to Crater Hill and back, as well as foraging, roosting, and breeding. The upper Kikuyu-dominated grasslands and shrublands in this area are used by nēnē for foraging, roosting, and nesting.

Nēnē breeding pairs have site fidelity (return to the same site to breed) and would probably continue to attempt to breed and forage in the same locations, despite the new facility and associated activities, and walk goslings to upper Crater Hill or retreat to private lands at SeaCliff Plantation or across Kīlauea Road; this exposes the birds to additional threats of vehicular mortality. A similar scenario currently occurs at the Point where nēnē nest near the lighthouse and walk newly hatched broods at least 1,500 feet to private property to rear their young. This is in part due to limited brood-rearing habitat, but also due to high visitation at the Point, which often unintentionally excludes broods from limited suitable grasslands during hours of operation and creates conflicts for nēnē and private landowners, and probably negatively affects nēnē survival. The peak in nēnē young broods (December–February) overlaps with peak season for visitation (January–March). Thus, expansion of the human footprint into nēnē "safe" breeding habitats, via a new center on Crater Hill, is expected to worsen habitat conditions.

The species is often perceived as more tolerant of humans than some other native wildlife species. However, breeding nēnē on Crater Hill-Mōkōlea Point exhibit "wild" (un-habituated) behavioral traits not observed in nēnē at the Point who are habituated to vehicles and visitors. Operating such a complex in proximity to an area used by nēnē could also increase their habituation to humans. This could adversely affect nēnē recovery, especially off Refuge, by increasing their collisions with vehicles, by increasing their consumption of unhealthy human food, decreasing their fear response to introduced mammalian predators, and by increasing their use of human habitats that contained other hazards (e.g., predators, disease, or contaminants). Including grasslands as part of the new complex's landscaping could prove attractive to nēnē and further exacerbate these effects. In total, these actions would generate intermediate negative effects.

The northernmost, approximately one-fifth of a mile of Kīlauea Road would be gated and closed daily under this alternative. Daytime traffic by cars though this area would be prohibited, and visitors would instead be transported from the welcome and orientation center to the Point on the mandatory shuttle. Overlook access would either be via pedestrian trail from the new welcome and orientation center or bicycle. During closed hours, visitors would be able to drive their cars to the Overlook when the Point was closed and the gate was opened. Nēnē forage and nest in shrub and grassland habitat along the roadside and it is not uncommon to see nēnē in or adjacent to the road in this area and along the Refuge entrance road to the Point. Compared to private automobiles, fewer shuttle vehicles would be required to transport the same number of visitors to the Point. Shuttle drivers would be aware of the potential for encountering nēnē along the road from the welcome and orientation center to the Point, and it would be expected that their collision rate would be much lower than for visitors driving their cars. Therefore, greatly reducing private automobile traffic would be expected to reduce nēnē-vehicle collisions in these areas (known collisions in 2011 and 2012 along 0.4 miles of pavement totaled approximately 4/year [USFWS unpublished data]).

The pedestrian trail from the new complex to the Overlook would be constructed along the east side of Kīlauea Road and require removal of approximately 0.5–1 acre of coastal mixed woodland-grassland habitat used by nēnē and seabirds. It is unclear how nēnē would interact with the trail; they

may occasionally use it for transiting. Nonetheless, the habitat and existing and potential breeding and foraging sites would still have been removed and human disturbance may force birds to move up slope of the trail higher on Crater Hill (minor negative effect).

As with seabirds, reducing traffic volumes through this area when the Kīlauea Road is closed would be expected to reduce vehicle disturbance, but human disturbance associated with trail use along the east side of Kīlauea Road would increase. Effects would both increase survival of nēnē and degrade the habitat value for nēnē. These disturbance effects could cancel each other, resulting in a neutral net effect. There would also be a major reduction in the number of vehicles traveling the Refuge entrance road (from the Overlook onto the Point) and parking in the parking lots. This reduction in disturbance could allow nēnē to initiate roosting and breeding in the shrubbery and grasslands nearer the entry road and parking areas. Because some degree of disturbance would continue (by the shuttle and, after hours, at the Overlook), it is speculative to estimate the actual amount of such increases in use/success (minor negative effect).

Limited guided interpretive hikes up Crater Hill would be reinstated under this alternative. Stipulations would be required for these hikes to ensure that they would not adversely affect threatened or endangered wildlife or their habitat. The hikes would involve small groups of visitors and local residents, traveling on designated routes, and with trained guides. The hikes would provide participants with special opportunities to view and photograph nēnē and other species of native wildlife. Special conditions would be imposed on these hikes to ensure that they would not adversely affect native wildlife or their habitat (minor negative effect). Hikes would be suspended during the endangered nēnē breeding season, approximately September–April, with exceptions for National Wildlife Refuge Week. The compatibility determination addressing wildlife observation, photography, and interpretation included in Appendix B addresses the effects and conditions associated with this use in greater detail.

Lastly, the endangered ‘ōpe‘ape‘a, threatened ‘a‘o, and native pueo have been recorded flying over or adjacent to the proposed site of the new center and trail. Prior to construction, surveys would be conducted to determine whether such wildlife species use the site. If they were found, actions would be taken to avoid, reduce, or mitigate any possible effects, consistent with consultation under the ESA, as appropriate.

This alternative would not be expected to have measurable effects on honu or ‘īlio-holo-i-ka-uaua.

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): Implementation of this alternative would have the same effects on threatened and endangered species of wildlife, and other wildlife species of special concern, as described for Alternative B, except as noted below.

If the new off-Refuge welcome and orientation center and maintenance facilities complex were constructed adjacent to the Refuge’s southern boundary (e.g., in the vicinity of Seacliff Plantation) and Kīlauea Road, then the northernmost, approximately one-fifth of a mile of Kīlauea Road would be gated and closed daily, as proposed under Alternative C. Under this alternative option, nēnē would experience the same effects associated with the road closure as described under Alternative C.

If instead, the new off-Refuge complex was constructed (or existing facility modified) farther from the Refuge but within 1 mile of the Refuge boundary (e.g., in Kīlauea Town, near the proposed

Kīlauea Town Bypass), then, in the absence of more detailed information, it would be speculative to project specific effects of its construction, operation, and maintenance on nēnē or other wildlife species that are threatened, endangered, or species of special concern. Siting a new complex of this nature would require more detailed planning and design, and site-selection criteria would include a variety of relevant factors, likely including its potential effects on such species. Prior to construction, surveys would be conducted to determine whether such wildlife species use the site. If they were found, actions would be taken to avoid, reduce, or mitigate any possible effects, consistent with consultation under the ESA, as appropriate.

Comparison of overall effects across alternatives to threatened and endangered wildlife, other species of special concern, and critical habitat: The overall effect of Alternative A to threatened and endangered species would be minor to intermediate and positive. Due primarily to increased management of habitat and introduced predators, potential chick translocation, and expanded social attraction, the overall effect of Alternative B would be intermediate and positive. Alternative C involves the construction and operation of new facilities and guided interpretive hikes at Crater Hill. Primarily due to the loss and disturbance of approximately 4 acres of habitat, the overall effect of Alternative C would be intermediate and negative. The effects of Alternative D would be similar to Alternative B, except as they related to the construction and operation of the new facilities that would be located outside of the current Refuge boundary and the reinstatement of guided interpretive hikes at Crater Hill.

Threatened and Endangered Plants

Effects of Alternative A (Current Management): Under this alternative, the Service would continue to use the small, onsite nursery to propagate native plants, including those that are endangered, threatened, and other species of special concern. Small-scale, demonstration outplantings would continue to be made and maintained on the Point (primarily for interpretive purposes), with somewhat larger scale outplantings on Crater Hill (minor positive effect).

The Nihoku Project area is largely covered by exotic vegetation and pre-project surveys have revealed the presence of 5 percent cover of native plants and no endangered plants. The predator-proof fence excludes pigs, rats, and other invasive mammals that can uproot and prey upon native plants. During the CCP's 15-year planning horizon, it is expected that the project would result in the establishment and/or enlargement of small but growing populations of threatened, endangered, and other plant species of special concern. It is expected that the response by these plant species at the Nihoku Project would be lower (slower) than that experienced at Ka‘ena Point Natural Area Reserve because, unlike the situation at the Nihoku Project site, Ka‘ena Point already had, "…three species of endangered plants…" (Young et al. 2013). Actual plant response would be measured by comparing data generated by pre-project plant surveys with post-construction survey data. Nonnative mammals would be eradicated within the enclosure using the same IPM techniques used elsewhere on the Refuge (see Appendix G). More detailed information is available in the environmental assessment for this project (Anden Consulting 2014).

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): Under this alternative, the irrigation system on Crater Hill would be rehabilitated to allow for small-scale outplantings of āheahea, lo'ulu, and select other species. Such outplantings would also occur along the crater rim, near the upper crater overlook, and as part of the Nihoku Ecosystem Restoration Project. These outplantings would create patches of native plants within the larger habitat and

thereby initiate implementation of the Refuge's long-term plant restoration strategy (Bruegmann and Castillo 1999). These outplantings would also provide structure and function for seabirds and nēnē.

As described in Section 6.4.2, under this alternative, the Service would also work with partners to restore/enhance 10–30 acres of native plant communities on Crater Hill and Mōkōlea Point. This would include naupaka coastal dry shrubland, and 'ilima coastal dry mixed shrub and grassland which would be interplanted with a variety of indigenous, endemic, federally listed plants. These would include 'āheahea, 'awiwi, dwarf naupaka, 'ohai, pohuehue, and pōpolo. These outplantings would help (re)establish populations of threatened, endangered, and other plant species of special concern within native plant communities in relatively secure sites on the Refuge. Long-term maintenance of these communities would support recovery efforts for Hawai'i's native flora, including those species listed as threatened or endangered (minor positive effect).

Some species of breeding seabirds remove or otherwise disturb vegetation in association with nesting. This would be expected to also occur in areas on the Refuge where native plant communities were (re)established and interplanted with threatened, endangered, and other plant species of special concern. This would damage and possibly even kill individual plants, but, because these plant and animal species coevolved, it would be expected to have negligible effects on native plant communities and Refuge populations of these species.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): Under this alternative, there would be no opportunity to restore communities of native plants including threatened, endangered, or other plant species of special concern to portions of the 4-acre area of Crater Hill off Kīlauea Road proposed for a new welcome and orientation center and maintenance facilities. Additionally, ground disturbance, fragmentation, and new pathways for invasive species (e.g., vehicles, visitors) could potentially lead to an increase in nonnative plants. Following construction, the complex could be landscaped to include native plants. Although these plantings would not be functional plant communities, they could augment the complex's interpretive program (negligible to minor negative long-term effect). The remaining area on Crater Hill, Mōkōlea Point, and other sites on the Refuge would still be available for native plant restoration.

The guided interpretive hikes at Crater Hill have the potential to cause trampling of native plants, erosion, and introduction or spread of exotic species, including invertebrates, plants, and other organisms. However, participants would be required to follow established trails and brush sediment and seeds off boots into trash receptacles prior to commencing a hike, and any areas with listed plant species would be avoided or viewed from a distance to preclude accidental trampling (negligible effect).

Otherwise, the effects of this alternative on threatened and endangered species of plants, and other plant species of special concern would be the same as described for Alternative B.

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): It would be speculative to project the effects of construction, operation, and maintenance of a new off-Refuge welcome and orientation center and maintenance facilities on plants that are threatened, endangered, or species of special concern because it us unknown where the new facilities would be sited. Siting a new complex of this nature would require more detailed planning and design, and site-selection criteria would include a variety of relevant factors, including

potential effects on such plant species. Siting this complex in a more-developed location or modifying an existing facility would likely have low potential to adversely affect such plant species.

Additionally, there are very few, if any, areas within 1 mile of the Refuge that retain substantial acreage of healthy native habitats and would likely fit the siting criteria. Therefore, the likelihood of finding plant species that are threatened, endangered, or species of special concern would be expected to be low. Nonetheless, surveys would be conducted prior to construction and any such plant species found would be avoided or possibly relocated, or other actions would be taken following consultation under the ESA, as appropriate. Post-construction landscaping around such a complex would provide the opportunity to plant, propagate, showcase, and interpret such plant species.

The guided interpretive hikes at Crater Hill have the potential to cause trampling of native plants, erosion, and introduction or spread of exotic species, including invertebrates, plants, and other organisms. However, participants would be required to follow established trails and brush sediment and seeds off boots into trash receptacles prior to commencing a hike, and any areas with listed plant species would be avoided or viewed from a distance to preclude accidental trampling (negligible effect).

Otherwise, the effects of this alternative on threatened and endangered species of plants, and other plant species of special concern would be the same as described for Alternative B.

Comparison of overall effects across alternatives to threatened and endangered plants, other species of special concern, and critical habitat: Under Alternative A, overall effects to threatened and endangered plants would be expected to be minor and positive. Increased pest plant removal, outplanting efforts, and interplanting threatened and endangered species within the 10–30 acre native plant restoration area under Alternative B would lead to a slightly more positive effect than in Alternative A. Overall, the effects of Alternative C would be similar to Alternative B except for the potential loss of opportunity to restore native plants, including threatened and endangered plants, at the 4-acre area of Crater Hill proposed for new facilities, and the potential for negligible to minor negative effects from the limited guided interpretive hikes at Crater Hill. The overall effects of Alternative D would be similar to Alternative C, except that effects related to the siting of the new off-Refuge facilities would be less certain.

6.4.4 Effects upon Nonnative, especially Invasive, Species

Effects of Alternative A (Current Management): Under this alternative, the Refuge would continue, year-round, to use a range of methods to control nonnative plants and animals, especially those that are invasive and mammalian predators. These efforts would be consistent with integrated pest management principles (see Appendix G) and would include maintenance of 2.7 miles of hogwire fencing, live and snap traps, bait boxes, hazing, shooting, biocontrol, herbicides, prescribed fire, hand-pulling, cutting with clippers, handsaws, chainsaws, and mowers, and excavation and other mechanical control by heavy equipment.

The Service would continue to use tamper-proof stations to hold poison bait for rodent control, and plant and animal pest control actions would be scheduled to reduce conflicts with seabird breeding. A multi-species control strategy would continue to be pursued. Such multi-species efforts are often more cost effective (Griffiths 2011). If efforts solely targeted large predators, populations of rodents

and other prey species could increase rapidly (Young et al. 2013). If efforts primarily targeted small mammals, rats and mice would became scarcer and larger predators could switch their prey focus to birds and other native species (Murphy and Bradfield 1992). If efforts targeted only rats or only mice, then competition for food shared between these species would be reduced and populations of the non-targeted species could increase rapidly (Witmer et al. 2007).

Due to staffing limitations, the Service's pest animal control activities do not occur year round and effort (measured by trap nights) varies greatly, in part because the same person would likely also be responsible for controlling pests on other refuges in the Kaua'i NWR Complex. Nonetheless, under this alternative, these efforts would result in a number of animal pests being taken on the Refuge. Although records are not complete, available data suggest that, in recent years, pest control efforts at the Refuge have taken 1 dog, 3 to 12 (average 5) cats per year, 1 rabbit, 3 barn owls, and 1 to 49 (average 11) chickens per year. In addition, an unknown number of rats and mice have been killed through use of bait boxes (the rodents eat the poisoned bait and then die in their burrows). Ant control efforts to benefit 'a'o and other seabird breeding sites would continue to result in numerous ants being killed annually. To date, no mongooses have been taken on the Refuge. Pigs occasionally breach the perimeter fence and are shot or captured and shot on-Refuge, approximately 1 pig every 5 years.

Pest control at the Refuge has also resulted in the take of some nontarget animals. For example, in recent years, 1 to 13 (average 2) mynahs, 1 to 4 (average 1) northern cardinals, 1 red-crested cardinal, 1 spotted dove, and 1 toad were inadvertently taken by the pest control program. Some of these animals were euthanized and others were released unharmed. Approximately this same minor level of take of target and nontarget animals would continue under this alternative.

Dogs, cats, and rabbits that were caught in live traps, but had collars, domesticated behavior, a healthy appearance, and/or appeared potentially adoptable, would continue to be transferred to the Kaua'i Humane Society for potential adoption by others. Feral cats and dogs, chickens, and other nonnative invasive animals caught in live traps would be humanely euthanized.

The perimeter fence is susceptible to the corrosive effects of the Refuge's near-ocean environment. Metal fencing and posts rust and wooden posts rot remarkably quickly, sometimes leaving the fence porous. Therefore, despite these control efforts, and extra education and law enforcement efforts, occasionally a dog or pig would bypass the fence system near Kāhili Beach or elsewhere on the Refuge's perimeter, and kill or injure native birds and other species. The Refuge's perimeter fence does not keep out rats, mice, or cats, and use of bait boxes for rodents and traps for cats is only partly successful. Therefore, these pests would continue to kill or injure native birds, plants, and other species (intermediate negative effect to native species).

Nonnative mammals would be eradicated within the predator-proof enclosure on Crater Hill (the Nihoku Ecosystem Restoration Project) using the same IPM techniques used elsewhere on the Refuge (see Appendix G). The area would be regularly surveyed to ensure that nonnative species, especially mammalian predators, did not reenter the fenced area. Pre-project surveys reveal that the project area also contains nonnative invertebrates, such as ants. Control of these animals would also be undertaken if post-project monitoring revealed they were posing threats to breeding seabirds. Then native plant communities would be restored (coastal mixed woodland-grassland, including hala, ilima, and naupaka kahakai), and plant species that were threatened, endangered, and/or species or special concern (such as lo'ulu) may be interplanted. This project is expected to increase the areal

extent of healthy native plant communities on the Refuge, and greatly increase the likelihood that nonnative predators, such as dogs, cats, rats, pigs, potentially mongooses, and even 2-day-old mice were kept out of these areas of the Refuge (intermediate positive effect to native species).

The Service's current, year-round efforts to control nonnative, especially invasive, plants would also continue under this alternative. Species of special management concern include California grass, Christmasberry, haole koa, ironwood, Kikuyu grass, lantana, and Pluchea. For a variety of reasons (e.g., they do not pose significant threats to achievement of Refuge purposes, they grow closely intertwined with native plants, they are located in inaccessible areas, or they grow and readily spread onto the Refuge from sites outside the boundary), it is not cost effective and may not even be possible to attempt complete eradication of some nonnative plants from the Refuge.

Whenever possible, pest plant control efforts would continue to be scheduled to avoid or reduce conflicts with seabird breeding or other important life history activities by native wildlife. Efforts would continue to be focused on control of invasive plants where they interfered with achievement of Refuge purposes. For example, ironwood trees would be cut where they interfered with flight corridors used by mōlī and other seabirds. Although nonnative and invasive, some species, when carefully managed, can provide habitat value to native wildlife (e.g., when mowed, Kikuyu grasslands provide valuable grazing habitat for nēnē). Effects of invasive plant species control are also addressed in Section 6.4.1.

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): Under this alternative, Service efforts to control nonnative mammalian predators, other nonnative animals, insect pests, and invasive plants would continue and have similar effects as described under Alternative A, except as described below.

The potential exists for nonnative plants and animals to be brought into and/or their range extended within the Refuge in association with the heavy equipment, vehicles, tools, and supplies utilized for projects such as predator-proof fence expansion at Nihoku or predator-resistant fence construction at Mōkōlea Point. To minimize the likelihood of this occurring, no soils, rock, or other materials would be imported to the Refuge. In addition, equipment used on these projects would be thoroughly cleaned and inspected for invasive species prior to being brought onsite.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): The effects of this Alternative on nonnative, including invasive, species would be that same as described for Alternative B, except as described below.

The potential exists that nonnative plants and animals could be brought into and/or their range extended within the Refuge in association with the heavy equipment, vehicles, tools, and supplies utilized for the construction of new facilities. BMPs would be employed to minimize this risk. Additionally, the reinstatement of hiking at Crater Hill opens up the possibility for spread of invasive species. Overall, the impacts would be minor and negative.

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): The effects of this alternative on nonnative, including invasive, species would be similar as described for Alternative B. Effects of Crater Hill hiking would be similar to Alternative C.

Comparison of overall effects across alternatives to nonnative, especially invasive, species: The overall effect of Alternative A would be minor to intermediate and positive, based on the current efforts to control nonnative predators and invasive plants. Alternative B would have similar overall effects to Alternative A. Alternatives C and D would involve the construction of new facilities at Crater Hill (Alternative C) or off-Refuge (Alternative D) and reinstatement of hikes at Crater Hill. Construction projects would need to follow BMPs and hiking at Crater Hill would need to follow stipulations to minimize the risk of invasive species spread. Overall, impacts from both alternatives C and D would be overall, minor and positive primarily due to control efforts.

6.5 Effects to the Social and Economic Environment

6.5.1 Social Effects

Volunteers and Partnerships

Effects of Alternative A (Current Management): Under this alternative, the current volunteer and partnership programs would continue as at present (including outreach, orientation, and training). This includes a close working relationship with Kīlauea Point Natural History Association (KPNHA) for a valuable and very broad range of projects and services (especially visitor services support and fundraising for special projects) on the Refuge. In addition, the Service would maintain cooperative relationships with the National Oceanic and Atmospheric Administration (that administers the Hawaiian Islands Humpback Whale National Marine Sanctuary just offshore of the Refuge); Kaua‘i Endangered Seabird Recovery Project (that is assisting with ‘a‘o recovery and leading the Nihoku Ecosystem Restoration Project on the Refuge); Save Our Shearwaters Program, Kaua‘i Humane Society, Hawai‘i Wildlife Center, and Pegasus Animal Clinic (that provide technical assistance, wildlife rehabilitation services, and short- and long-term veterinary and other animal care), and local communities and civic groups. Cultivating and maintaining volunteers and partnerships is essential to leveraging the Refuge’s budget and the staff’s capability to continue accomplishing current natural and cultural resources, and public use programs and building those programs into the future (overall minor positive effect).

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): The effects of this alternative on volunteers and partnerships would be the same as for Alternative A, except as follows.

Under this alternative, the Service would undertake efforts to raise volunteer and intern numbers to approximately 200, and increase participation by these individuals in Refuge natural resource programs (including pest management and native plant restoration). Additional efforts would be made to partner with Native Hawaiian organizations and local historical institutions to enhance protection and management of the Kīlauea Point Light Station, and cultural resources and uses of importance to Native Hawaiians. Efforts would also be made to partner with local community volunteer groups to assist with native plant restoration on the Refuge. Increased volunteer support and increased partnerships would enhance the Service’s capability to implement more strategies and achieve more objectives across a broad range of natural and cultural resource and public use programs (overall intermediate positive effects).

Effects of Alternatives C (Restore Native Ecosystems; Build Visitor Center on Crater Hill) and D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): The effects of these alternatives on volunteers and partnerships would be the same as for Alternative B.

Environmental Justice

Effects of Alternative A (Current Management): This alternative would continue to allow a small number of individuals to engage in traditional cultural practices on the Refuge. These include fishing with hook and line, and throw net at Kīlauea (East) Cove, and collection of plant materials, feathers, and possibly other natural resources from areas of the Refuge. These resources are used for subsistence, ceremonial, decorative, and perhaps medicinal or other similar personal, family, or community purposes. Participation in these traditional cultural practices would occur under a special use permit and be limited to those individuals of native Hawaiian heritage who had genealogical ties to the local community, that is, the Kīlauea and Kāhili Ahupuaʻa or surrounding ahupuaʻa, including Namahana, Kalihiwai, Kalihikai, Waiakalua, and Pīlaʻa (Wilson and Jay 2010). Collection for commercial purposes would not be allowed. Compatibility determinations included in Appendix B address the effects and conditions associated with this use in greater detail.

Under this alternative, Crater Hill would remain closed to general public use. This would apply to all visitors, but would have special (minor, negative) effects upon Native Hawaiians and others who traditionally used this high area on the northernmost point of Kauaʻi to spot fish in association with ocean fishing. In modern times, electronic fish finders and other technology are available to partially offset this effect

The Service works with volunteers to provide an electric golf cart to ensure almost all of the attractions on the Point are accessible to those visitors with mobility limitations. Assistance can be made available to help visitors with limited English language skills or with vision impairments learn about and enjoy the Refuge. At present, other than the traditional cultural uses described above, there are no other management programs or uses on the Refuge that disproportionately affect visitors, including members of the local community, based on their race, color, or national origin.

The Refuge entrance fee is $5, which could potentially be viewed as a burden for low-income persons. However, visitors can use the National Parks and Federal Recreational Lands Pass (annual or lifetime) to enter for no additional cost, a kamaʻaina pass is available for $20 that allows entry for the holder and up to three guests for an entire year, and the Refuge offers fee-free entry four times per year. Survey results reveal that 95 percent of Refuge visitors do not live in the local area (almost all are visitors to Hawaiʻi) and the median household income of these nonlocal visitors is relatively high ($100,000–149,000 per year) (Sexton et al. 2012). Therefore, any financial impacts of an entrance fee would affect only a very small number of potential visitors (negligible to minor negative effect).

Many and varied opportunities were provided for all citizens to make suggestions, voice concerns, express their opinions, and otherwise participate in development of this CCP and environmental assessment (EA). The process was open to anyone and special efforts were made to involve members of the local community, including through special listening (talk story) sessions (see Appendix I). These outreach and public involvement efforts will continue with formal public review of the draft CCP/EA.

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): This alternative includes an optional shuttle from the Overlook to the parking lots on the Point. The total entrance fee would include the cost to ride the shuttle and would possibly be increased to cover the cost of shuttle operation. Although this would likely be a small fee increase, the overall fee would be very low compared with the cost of other attractions in Hawai‘i, and special passes are available to reduce costs for repeat visits (National Parks and Federal Recreational Lands Pass and kama‘aina pass). This increased fee still might discourage some low-income people from visiting the Refuge. A 2004 survey revealed that, when compared with nonlocal visitors, Refuge visitors from the local area were less willing to pay a pay a higher Refuge entrance fee that included a shuttle and guide (Sexton et al. 2005). Local residents account for only 5 percent of Refuge visitors; however, these survey results suggest that the increased entrance fee could have a disproportionate effect on low-income visitors from the local area (negligible to minor negative effect).

Under this alternative, the environmental justice effects associated with accessibility, allowing the continuation of traditional cultural practices, maintaining the closure of Crater Hill to general public use, and opportunities for the public to be involved in the CCP process would be the same as described for Alternative A.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): Under this alternative, the environmental justice effects associated with accessibility, allowing the continuation of traditional cultural practices and opportunities for the public to be involved in the CCP process would be the same as described for Alternative A. The effects associated with the likely transit-related Refuge entrance fee increase would be similar to that described for Alternative B.

Guided interpretive hikes up Crater Hill would be reinstated under this alternative. These hikes would involve small groups of visitors and local residents traveling on designated routes and with trained guides. The hikes would provide participants with special opportunities to view, photograph, and learn more about cultural resources, values, and uses. These hikes could have special value for Native Hawaiians and others who traditionally used this high area on the northernmost point of Kaua‘i to spot fish in association with ocean fishing. Special conditions would be imposed on these hikes to ensure that they would not adversely affect these resources and values.

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): Under this alternative, the environmental justice effects associated with accessibility, allowing the continuation of traditional cultural practices, and opportunities for the public to be involved in the CCP process would be the same as described for Alternative A. The effects associated with the transit-related Refuge entrance fee increase and the Crater Hill hikes would be the same as described for Alternative C.

Comparison of overall effects across alternatives to environmental justice: The overall impact of Alternative A on environmental justice would be negligible. Due primarily to the likely transit-related increase in entrance fees, the overall impact of alternatives B–D would be negligible to minor negative.

<u>Aesthetics, including Visual Quality/Views, Noise, and Odor</u>

Effects of Alternative A (Current Management): Under this alternative, natural sounds associated with wind, waves crashing on the shore, and the raucous calls of seabirds would continue. Wind- and

wave-generated sounds vary greatly and are affected by the season, among other factors. On the Point, where almost all visitors enjoy the Refuge, the wind and waves can be weak and quiet or strong and loud. Because visitors standing on the Point are perhaps 100 feet above the surf, wave-generated sounds are greatly diminished. The seabirds can be heard almost year round, yet they are one of the key sights that visitors flock to observe.

The noise generated by Refuge visitors driving their private automobiles along Kīlauea Road to and from the Overlook and Point would also continue under this alternative. Refuge visitors account for approximately 25 percent of all traffic on the road between Kūhiō Highway and the Point. This road (Kīlauea Road) is bordered by a mix of rural, residential, and light commercial uses. The northern (makai) half of this road (between Kīlauea Town and the Refuge) lies in a relatively quiet, pastoral setting. Even when traveling the speed limit of 15–25 mph, motor vehicles, including Refuge visitors' vehicles, likely generate most of the noise along this stretch of the road. At a distance of 8 feet (very close), a typical passenger car generates approximately 70 dBA (A-weighted decibels) of noise at 30 mph (a bit faster than actual speed limits) (de Roo et al. 2011). Acoustic modeling for this alternative reveals that current traffic-related noise levels in Kīlauea Town and at the Kaua'i Christian Academy vary from approximately 10–29 dBA, and on the Point they are approximately 25 dBA. Traffic-related noise levels are the loudest at the Overlook (approximately 41 dBA for all vehicles combined) (USDOT Volpe Center 2013).

Prevailing trade winds from the northeast strongly influence smells on the Refuge which are overwhelmingly those of the ocean and seacoast. Such fresh and clean odors would remain the same under this alternative.

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): Under this alternative, natural sounds, visitor traffic-related noise, and clean coastal smells would continue, as described for Alternative A.

Under Alternative B, the Service would engage in some modest construction, including adding parking spaces, a tour bus stop, bike parking, and a drop-off and pick-up stop for an optional shuttle at the Overlook; installing water bars or erosion matting on or possibly realigning short sections of Refuge roads and trails, as needed; and clearing the fence line, building the predator-resistant fence, and removing nonnative vegetation. All of these activities would involve use of heavy equipment, motorized power tools, and/or electric power tools supported by a motorized electric generator.

Following are example noise levels generated by the types of tools and equipment that would potentially be used in these projects; all measurements are from a distance of 50 feet: backhoe, 80 dBA; bulldozer, 85 dBA; chainsaw, 85 dBA; dump truck, 84 dBA; front end loader, 80 dBA; generator, 82 dBA; and pickup truck, 55 dBA (Knauer and Pedersen 2006). For comparison, the sound level of normal human speech is 45–65 dBA; a vacuum cleaner creates 55–65 dBA; a dishwasher generates 60–70 dBA; a main road, highway, and busy city traffic create 70–85 dBA; a jet taking off generates 100 dBA; and a rock concert creates approximately 100–120 dBA of noise (Knauer and Pedersen 2006). Noise levels are recorded on a logarithmic scale and the human ear perceives a 10 dBA increase in noise as a doubling of its loudness.

Extended exposure to loud noise (e.g., >85 dBA) can cause hearing impairment and eventually permanent damage to one's hearing. Long-term exposure to high noise levels (70–85 dBA) can also result in other health problems and affect quality of life (Passchier-Vermeer and Passchier 2000).

Loud noise can also disturb wildlife and affect their behavior, including communication, and predator detection and avoidance. Pursuant to the Occupational Safety and Health Act of 1970, the National Institute for Occupational Safety and Health (NIOSH; within the Centers for Disease Control and Prevention, CDC) has recommended occupational safety and health standards to prevent human hearing loss from exposure to noise (CDC-NIOSH 1998). The NIOSH's recommended exposure limit is 85 dBA for 8 hours. That exposure time period is cut in half for every 3 dBA greater than 85.

Sound travels through the air in waves. Topography, vegetation, atmospheric conditions, and many other factors affect noise transmission. In general, noise levels attenuate approximately 6 dBA each time distance from a point source doubles. Because construction-related noise generated under this alternative would generally be of short duration, would be mostly localized and at a distance from residences, and would be scheduled for daylight hours (not to affect nighttime sleep), it is expected that effects would be minor.

Operation of the optional shuttle would also increase noise in the area of the Overlook, along the Refuge entrance road, and in the area of the parking lots on the Point. Although this vehicle would likely be powered by a modern diesel engine, it nonetheless would generate more noise than the typical passenger car used to access the Refuge. The increased noise generated by the shuttle bus would be offset somewhat by the reduction in total number of vehicles and the reduced frequency of travel of vehicles (shuttle runs) compared with the exclusive use of numerous cars at present. Acoustic modeling for this alternative suggests that, for all vehicles combined, traffic-related noise levels at the Overlook would increase to approximately 50 dBA and noise levels on the Point would increase to approximately 34 dBA (USDOT Volpe Center 2013). Each of these increases is almost 10 dBA greater than at present, which represents a doubling in perceived noise. No changes would be expected in traffic-related noise from Kūhiō Highway to the Overlook. Using an electric-, natural gas-, or propane-powered shuttle bus would reduce vehicle noise levels.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): Under this alternative, natural sounds and clean coastal smells would continue, as described for Alternative A.

Construction of a new welcome and orientation center and maintenance facilities on the southwestern corner of Crater Hill under this alternative would affect the views to the north and northwest from two existing homes in Seacliff Plantation, but not their view of the Pacific Ocean. These two homes sit above and behind, approximately 200 feet and 400 feet from (to the south and southeast of) the proposed complex site. Benching the structures into the hillside, and post-construction grading and landscaping, would minimize these visual effects, but residents and visitors to these homes would still see some structures and a number of automobiles and Refuge visitors at the new complex. These views compare with their current views of vegetation on the Refuge (in the foreground), Kīlauea Road and associated traffic at an intermediate distance, and some farmland and associated homes and outbuildings further away. The new complex would not be expected to interfere with any views these homes may have of the Pacific Ocean to the west. Noise generated by vehicles (including heavy equipment associated with maintenance facilities) and visitors at the new complex would be greater than current levels of noise generated by traffic on Kīlauea Road (minor negative effect). These visual and noise effects would be very localized.

Construction of this new complex would also generate a substantial amount of noise, potentially for several months. As described for Alternative B, the types of tools and equipment that would

potentially be used in this project (and the associated noise they generate, measured at a distance of 50 feet) include backhoe, 80 dBA; bulldozer, 85 dBA; chainsaw, 85 dBA; dump truck, 84 dBA; front end loader, 80 dBA; generator, 82 dBA; and pickup truck, 55 dBA (Knauer and Pedersen 2006). As noted above, the closest residences to this site are approximately 200 and 400 feet away. Noise attenuates approximately 6 dBA for each doubling of the distance from the noise source, so the sounds at the closest residence would be approximately 12 dBA quieter (approximately one-half as loud). They would be even quieter at the second-closest residence. Work on this project would be scheduled for daylight hours (not to affect nighttime sleep), and noise generated would vary in intensity, but it would likely continue for several months. Although possibly affecting the two closest neighbors, construction-related noise from this project and trail construction from the new complex to the Overlook would not likely affect other residents, so effects would be minor.

Operation of the shuttle would also increase noise along a short stretch of Kīlauea Road, in the area of the Overlook, along the Refuge entrance road, and in the area of the parking lots on the Point. Although this vehicle would likely be powered by a modern diesel engine, it nonetheless would generate more noise than the typical passenger car used to access the Refuge. The increased noise generated by the shuttle would be offset somewhat by the reduction in total number of vehicles and the reduced frequency of travel of vehicles to the Overlook and Point (shuttle runs) compared with the exclusive use of numerous private automobiles at present.

Acoustic modeling for this alternative suggests that, for all vehicles combined, traffic-related noise levels at the Overlook would increase to approximately 54 dBA and noise levels on the Point would increase to approximately 39 dBA (USDOT Volpe Center 2013). Each of these increases is more than 10 dBA greater than levels at present (10 dBA represents a doubling in perceived noise). Using an electric-, natural gas-, or propane-powered shuttle bus would reduce vehicle noise levels. Noise impacts at new complex would be increased over current levels. No changes would be expected in traffic-related noise from Kūhiō Highway to Crater Hill (negligible effect).

Guided interpretive hikes up Crater Hill would be reinstated under this alternative. The hikes would provide participants with special opportunities to view and photograph nēnē, ʻā (red-footed booby), mōlī, possibly other seabirds, and other species of native wildlife. In addition, hikers would have up-close views of seabird nesting burrows, and have views of the mountains, Kīlauea Town, ocean, adjacent private lands, Lighthouse, and Point from different perspectives than those normally enjoyed by Refuge visitors (minor positive effect).

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): Under this alternative, natural sounds, and clean coastal smells would continue, as described for Alternative A. The effects on views associated with the Crater Hill hikes would be the same under this alternative as those described for Alternative C.

Construction of a new off-Refuge welcome and orientation center and maintenance facilities under this alternative could generate noise in a manner similar to that described for Alternative C. However, other than its general proximity to the Refuge, it is unknown where such a new complex would be located; consequently, its impact on views are unknown. Further effects assessment would be conducted in the future in association with more detailed planning and design, and, as appropriate, as part of a separate NEPA process and document.

Operation of the mandatory shuttle bus would also increase noise levels in the area of its operation, including to some degree along Kīlauea Road, at the Overlook, along the Refuge entrance road, and in the area of the parking lots on the Point. Although this vehicle would likely be powered by a modern diesel engine, it nonetheless would generate more noise than the typical passenger car used to access the Refuge. The increased noise generated by the shuttle bus would be offset somewhat by the reduction in total number of vehicles and the reduced frequency of travel of vehicles (shuttle bus runs) compared with the exclusive use of numerous private automobiles at present.

Acoustic modeling for this alternative suggests that, for all vehicles combined, traffic-related noise levels at the Overlook would increase to approximately 52 dBA and noise levels on the Point would increase to approximately 37 dBA (USDOT Volpe Center 2013). Each of these increases is more than 10 dBA greater than levels at present (10 dBA represents a doubling in perceived noise). Using an electric-, natural gas-, or propane-powered shuttle bus would reduce vehicle noise levels. Because the location of the new complex is unknown, it is unknown what changes in traffic-related noise could be expected in Kīlauea Town or elsewhere along Kīlauea Road.

Comparison of overall effects across alternatives to aesthetics, including visual quality/views, noise, and odor: The overall impact of Alternative A on views or odors would be neutral; there would be minor negative effects from traffic-related noise. Implementation of Alternative B would involve short-term, minor, negative effects from noise due to construction activities and in the long term, minor to intermediate, negative effects from noise due to the operation of the optional shuttle. Under Alternative C, there would be short-term, minor, negative visual and noise impacts from the construction and operation of new facilities at Crater Hill. Additionally, noise impacts due to transit would shift from the current situation: noise from private automobiles would concentrate at the new Crater Hill complex and noise from the shuttle would increase overall noise levels between the complex to the Overlook and Point along the northern end of Kīlauea Road. In the long term, there would be a minor benefit to views by reinstating the Crater Hill hikes. Overall effects from Alternative D would include short-term, minor, negative effects from noise due to construction activities and in the long term, minor to intermediate, negative effects from noise due to the mandatory shuttle. Noise impacts from private automobiles would concentrate at the new offsite facilities. Noise from the shuttle would increase overall noise levels between the new facilities and the Overlook and Point along an unknown stretch of Kīlauea Road.

6.5.2 Effects upon Public Use

Visitation and General Visitor Orientation and Experience

Effects of Alternative A (Current Management): Under this alternative, the Refuge would remain a popular visitor destination for residents and visitors on Kaua‘i. Between 2007 and 2013, the Refuge visitation ranged from 388,000–500,600, approximately one-half of whom venture from the Overlook onto the Point, with a peak in 2010 (USFWS 2014). Visitation on the Point varies from 200 to almost 1,000 visitors per day, based on the day of the week and season of the year. Under this alternative, visitation levels at the Refuge as a whole would be expected to grow, in step with growth of visitation to Kaua‘i, by approximately 10 percent over the next 15 years. Therefore, a total of approximately 418,000–551,200 people per year would visit the Refuge, approximately one-half of whom venture from the Overlook onto the Point. Daily visitation would continue to vary based on the day of the week and season of the year. Parking constraints and perhaps open hours would continue to limit visitation. The Point would remain closed to all public access and use, including

public meetings, after 4:00 pm. The majority of visitors would continue to view parking constraints as a problem, but not believe the Refuge was overcrowded (Sexton et al. 2005).

Under this alternative, the Service would continue to work with local governments to provide a bus stop closer to the Refuge and create a multi-use trail connecting the Refuge with Kīlauea Town. If successful, these actions would increase the access options available to visitors to the Overlook (negligible to minor positive effect). Access into the Point would not be affected by the potential bus stop or multi-use trail.

Efforts would also be made under this alternative to move offsite some functions that do not need to be located on the Point (e.g., some maintenance and administrative storage and facilities). Potentially this could enhance the scenic and historic appeal of the Point and improve the quality of the visitor experience (negligible to minor positive effect).

Under this alternative, inventory and monitoring, and research and scientific assessments regarding Refuge natural and cultural resources, public uses, and interactions among these elements would continue as at present. Relative to public use, these activities would involve observation, measurement, and occasionally surveys. The latter activity would disturb some Refuge visitors, but the effects would be negligible because participation would be voluntary. Information generated by such studies and surveys would be used to enhance the quality of Refuge public use programs.

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): In Alternative B, public use and access would focus on reconfiguring the use of existing buildings and improving traffic flow patterns. Strategies to improve traffic flow would include increasing public parking at the Overlook and the existing parking area on the Point, providing a bus stop for tour buses and Kaua‘i Bus, offering bike parking at the Overlook, and offering an optional shuttle.

Based on the 2004 survey results, visitors do not perceive crowding to be a problem at the Refuge (Sexton et al. 2005). In both winter and summer, there were no significant associations between parking capacity and visitor perceptions of irritants related to crowding (such as noise, difficulty parking, and litter). The association between parking capacity and crowding appears to be more significant in the winter season due to the Point reaching parking capacity or exceeding it. Overall, visitors do not perceive crowding to be a problem, but when parking capacity is exceeded and overflow parking occurs in the winter, visitors do perceive some crowding in the parking areas.

More than 65 percent of winter respondents considered the parking lot to be “somewhat” to “very crowded,” and more than 52 percent had “somewhat” to “a lot of” difficulty parking. These reactions may now be part of the summer Refuge experience as well. It is possible that parking is acting as a limiting factor for visitation, because Refuge visitors are turned away when the parking areas are full. Increasing parking capacity at the Overlook could result in increased Refuge visitation (minor effect). Although current visitor perception of crowding is low, reduced crowding and increased ease of access would likely have a minor positive effect on visitor satisfaction and public safety.

Establishing a public/tour bus stop, bike parking, and a drop-off and pick-up stop for an optional shuttle at the Overlook would provide visitors with convenient options to access the Point other than by private vehicle. Ninety-seven percent of visitors used private vehicles during their visit, and two percent utilized commercial tour buses (Sexton et al. 2012). Only 1 percent of visitors utilized public transportation while on the island (Sexton et al. 2005). Kaua‘i residents would be more likely to

utilize a public bus stop than visitors, and the addition of a bus stop could add value for residents. Kaua‘i residents currently account for only 5 percent of total visitation to the Point (Sexton et al. 2012), so the addition of a bus stop would likely have a minor effect.

Only 2 percent of visitors used bicycles during their trip to Kaua‘i (Sexton et al. 2012). However, 41 percent of respondents indicated that they would be likely to use a bike share program if it were offered on the Refuge. This suggests that visitors could be interested in biking to the Refuge if a safe route and access to a bicycle were available. Kīlauea Town residents expressed a desire to be able to walk to the Refuge on foot rather than drive. Bike parking at the Overlook could help accommodate town residents' request to access the Refuge without needing to drive. The Refuge is a regular destination for many Kīlauea Town residents, with about 36 percent of residents visiting the Refuge at least once per year (Sexton et al. 2005). Increased foot or bicycle accesses could result in increased visitation and enjoyment by local community members. Overall, the addition of bicycle parking would likely have a minor effect on total visitation.

The optional shuttle would provide visitors at the Overlook with an alternative to driving their private vehicles onto the Point. Its use would be mandatory when the parking lots on the Point were full. A 2004 survey revealed that approximately three-quarters of respondents were somewhat likely, likely, or very likely to visit the Point if it was accessible by a shuttle with offsite parking. However, this also means that almost a quarter (24 percent) of visitors would be unlikely to access the Point by this means. Reliability, timeliness, cost, and location of offsite parking (e.g., easy to find, near Refuge or visitor center, or near highway) were key factors that respondents stated would influence their shuttle-use decisions. A more recent survey (2010/2011) found that 50–60 percent of visitors were somewhat likely or very likely and 33–43 percent were somewhat unlikely or very unlikely to use such a shuttle (Sexton 2005, Sexton et al. 2012). Taken together, these data from the 2004 and 2010/2011 surveys suggest that 24–43 percent of visitors might not use the shuttle from the Overlook onto the Point.

Regarding a potential increase in entrance fees to cover the operational costs of the shuttle, results of the 2004 survey found that nonlocal visitors (who comprise approximately 95 percent of all Refuge visitors) were willing to pay a higher Refuge entrance fee that included a shuttle and guide; however, visitors from the local area were less willing to pay such a higher fee. Lindberg's (2001) review of multiple studies of the effects upon visitation of visitor fee increases at protected areas around the world revealed that visitation to such areas is generally price inelastic. That is, the percentage decrease in visitation associated with a fee increase is less than the percentage increase in the fee. This increased fee could discourage a modest number (perhaps 0–10 percent) of potential visitors from riding the optional shuttle the short distance onto the Point (Parsons Brinckerhoff 2006, Sexton et al. 2005).

Because use of this shuttle would be optional (except when the Point's parking lots were full), those visitors who choose not to ride the shuttle could instead drive onto the Point. On balance, considering all the changes proposed under this alternative, it is not likely that net visitation to the Refuge as a whole would change much, if at all, from that described for Alternative A.

It is estimated that operation of the optional Overlook-Point shuttle would reduce by over 5,600 the number of motor vehicles per year traveling the narrow and winding Refuge entrance road and parking on the Point. Additionally, this program would reduce traffic congestion and public safety

hazards, allow additional vehicles to park on the Point, and reduce associated frustration for visitors (overall minor effects). See Section 6.5.5 for additional discussion.

This alternative would have the same effects as described under Alternative A associated with moving some maintenance and administrative storage and facilities off the Point.

Under this alternative, inventory and monitoring, and research and scientific assessments regarding Refuge natural and cultural resources, public uses, and interactions among these elements would increase compared to those occurring at present. It would be expected that this would result in a minor increase in the same types of effects described for Alternative A. Compatibility determinations included in Appendix B address the effects and conditions associated with these uses in greater detail.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): This alternative includes construction of a new welcome and orientation center and maintenance facilities on the southwestern corner of Crater Hill, gating of a portion of Kīlauea Road near the Refuge, and prohibiting the majority of private motor vehicles from accessing the Point. The new visitor and administrative complex would contain a variety of public use features and functions, many of which are currently located on the Point. These include visitor contact and orientation, fee collection, interpretive exhibits, a bookstore, multi-purpose room, parking areas for private vehicles and tour buses, public bus stop, pick-up and drop-off area for the shuttle, and restrooms.

During open hours, a mandatory shuttle would transport visitors from the welcome and orientation center to the parking lots on the Point. The Overlook would be accessible via pedestrian trail or bicycle from the welcome and orientation center. When the Point is closed, the Kīlauea Road gate would be opened and visitors could drive as far as the Overlook. Visitors could expect that these actions would greatly reduce the number of motor vehicles traveling the narrow and winding road leading to the Point; would reduce traffic congestion, and transportation- and traffic-related public safety hazards at the Overlook, along the Refuge entrance road, and in the area surrounding the parking lots on the Point; would eliminate waits at the Overlook to enter the Refuge entrance; and reduce frustration associated with all of these situations. Providing local shuttle service from the on-Refuge welcome and orientation center to the Point would support the park-and-ride philosophy of the transportation element of the Kaua‘i Energy Sustainability Plan (SENTECH Hawai‘i 2010).

A new on-Refuge welcome and orientation center would likely have a substantial effect on the way visitors experience the Refuge. Almost all Refuge visitors would park at the new Crater Hill complex, wait for the next shuttle, and ride it a short distance to the Point. While waiting for the shuttle, visitors could receive an orientation to the Refuge, enjoy interpretive exhibits, browse the bookstore, and secure brochures and other information. Refuge staff or volunteer interpreters would also board the shuttle and use the ride to orient visitors, and introduce them to the Refuge, its natural and cultural resources, and public use opportunities and associated regulations. As a result, it is expected that Refuge visitors would be better informed about what to expect onsite, be better educated about native wildlife and vegetation, and potentially overall enjoy a richer visitor experience.

The 2004 survey provides some insight into visitors’ possible reactions to a mandatory shuttle and their desire for additional management features on the Refuge. Visitors were asked about the factors that would affect their decision to visit the Point if it were accessible by shuttle only. The most often

cited factor was reliable, on-time service by the shuttle, followed by the cost of shuttle fare. These are also the factors most often cited as first and second in importance, respectively, in visitors' decisions to visit the Refuge. The factor that had the third highest ranking was the location of the offsite parking relative to the Refuge. This suggests that visitors would likely respond more favorably to an onsite shuttle as compared to an offsite shuttle.

Visitors surveyed are willing to wait for a shuttle from 10 to 20 minutes, and expressed interest in educational programs as an incentive for visiting the Refuge at nonpeak hours; however, this willingness did not translate into willingness to wait longer for a shuttle. It is likely that some interpretation at the visitor services complex would be welcome. In general, results showed that visitors expect more from a shuttle ride than the utilitarian function of a mass transportation system.

The effect on total Refuge visitation of a new onsite welcome and orientation center and mandatory shuttle are difficult to predict. Surveys in 2004 and 2010/2011 revealed that between 24–43 percent of visitors might not use such a shuttle and approximately 50 percent of visitors believed that alternative transportation would not enhance their experience at the Refuge (Sexton 2005, Sexton et al. 2012).

These results can be explained in part by the nature of trip planning. Since visitors would be prohibited from driving their private automobiles onto the Point, riding the shuttle would be the only means to access the Point during open hours. Visitors would have to either plan ahead and/or adjust their travel schedules in order to accommodate the potential wait time for a shuttle. This means spontaneous travel behavior would be restricted. Based on the 2004 visitor and community survey, a majority (55 percent) of survey respondents indicated that visiting the Refuge was one of many equally important reasons for visiting Kaua'i, 44 percent indicated visiting the Refuge was just an incidental or spur of the moment stop on a trip taken for other purposes, and 1% indicated that visiting the Refuge was the primary purpose of their visit to Kaua'i.

When faced with a choice between not visiting the Point or riding a mandatory shuttle, if this percentage of visitors actually chose not to board the shuttle, then visitation to this area would decrease. This decrease would be offset to some degree by the projected 10 percent increase (over 15 years) in visitation to Kaua'i and associated visitation to the Refuge. Additionally, survey results suggest that visitors would be most likely to visit the Point if the mandatory shuttle was reliable, low cost, and had short wait times. A shuttle system that meets these criteria would be likely to have negligible effect on visitation to this area.

If the shuttle ride were guided by an on-board interpreter, this would appeal to and attract more potential visitors (survey results reveal that visitors from outside the local area [95 percent of all Refuge visitors] were willing to pay an increased fee that included entrance and a guided shuttle ride to the Refuge [Sexton et al. 2005]). Total Refuge visitation, which would include the Point, Overlook, and new Crater Hill welcome and orientation center, could then follow the trend described under alternatives A and B or slightly increase if the welcome and orientation center and shuttle services enhanced visitor experience through increased interpretative and environmental education opportunities. The new complex and shuttle system would also theoretically be able to accommodate a higher level of visitation because the new complex would very likely have greater parking capacity than the Point. Capacity of the shuttle system and onsite compatibility could then become future constraints on visitation.

A higher entrance fee could be implemented to partially offset the cost of the shuttle. This increased fee could discourage some people from visiting the Point (survey results reveal that local residents were less willing than visitors from outside the area to pay a special fee for the shuttle that increased entrance costs to visit the Refuge [Sexton et al. 2005]). Lindberg's (2001) review of multiple studies of the effects upon visitation of visitor fee increases at protected areas around the world revealed that visitation to such areas is generally price inelastic. That is, the percentage decrease in visitation associated with a fee increase is less than the percentage increase in the fee. This increased fee could discourage a modest number (perhaps 0–10 percent) of potential visitors from riding the optional shuttle the short distance into the Point (Parsons Brinckerhoff 2006, Sexton et al. 2005). However, the fee increase would be small; the overall fee would be very low compared with the cost of other attractions in Hawai'i, and the fee increase would represent an almost unmeasurably small percentage of travel costs for nonlocal visitors to Hawai'i. All things considered, the modest entrance fee increase, by itself, would likely have only a minimal, if any, effect upon visitation to the Point. It is possible that visitation by low-income residents in the local area could drop somewhat (see Section 6.5.1). See Section 6.5.5 for additional transportation-related discussion.

It's estimated that operation of the mandatory shuttle bus would reduce by almost 47,000 the number of motor vehicles per year traveling between the new complex and the parking lots on the Point. Additionally, this program would reduce traffic congestion and public safety hazards, and reduce associated frustration for visitors between the Crater Hill complex, Overlook, and Point. See Section 6.5.5 for additional discussion.

Under this alternative, the effects of inventory and monitoring, and research and scientific assessments on Refuge public use would be the same as described for Alternative B.

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): Under this alternative, a new off-Refuge welcome and orientation center and maintenance facilities complex would be constructed and operated within one mile of the approved Refuge boundary. A mandatory shuttle would transport visitors from the welcome and orientation center to the Overlook and Point. This new complex would contain the same public use features and functions described for Alternative C.

If this complex was sited adjacent to the Refuge's southern boundary (e.g., in the vicinity of Seacliff Plantation) and Kīlauea Road, then the northernmost, approximately one-fifth of a mile of Kīlauea Road would be gated and closed daily, as proposed under Alternative C. Under this scenario, effects on public use would be the similar to Alternative C.

If instead, the new off-Refuge complex was constructed further from the Refuge (e.g., in Kīlauea Town, along Kūhiō Highway, or near the proposed Kīlauea Town Bypass), then it likely would be easier for Refuge visitors to find the new complex than the current Refuge entrance gate. As with Alternative C, Refuge visitors would drive, ride a bus, bike, or walk to the complex, then park and wait for the next shuttle, and ride it a short distance onto the Point. While waiting for the shuttle, visitors could receive an orientation to the Refuge, enjoy interpretive exhibits, browse the bookstore, and secure brochures and other information. Refuge staff or volunteer interpreters would also board the shuttle and use the ride to orient visitors, and introduce them to the Refuge, its natural and cultural resources, and public use opportunities and associated regulations. Visitors would pay an increased entrance fee to ride the shuttle and enter the Refuge.

It is expected that the effects upon visitors and visitation levels of the new complex and shuttle ride (including the modestly increased entrance fee) under this alternative would be similar to Alternative C. The effects of operating the shuttle bus would reduce traffic congestion, parking issues, public safety hazards, and frustration for visitors at the Point. Additionally, providing local shuttle service to the Point would support the park-and-ride philosophy of the transportation element of the Kaua‘i Energy Sustainability Plan (SENTECH Hawai‘i 2010). Similar to Alternative C, in spite of the potential for a decrease in visitation to the Point due to the mandatory shuttle, there could be an overall negligible or slight increase in the total number of Refuge visitors, which would include visitation at the new welcome and orientation center. At this time, other than its general proximity to the Refuge, it is unknown where such a new complex would be located. Further effects assessment would be conducted in the future in association with more detailed planning and design, and, as appropriate, as part of a separate NEPA process and document.

Under this alternative, the effects of inventory and monitoring, and research and scientific assessments on Refuge public use would be the same as described for Alternative B.

Comparison of overall effects across alternatives to visitation and general visitor orientation and experience: Under Alternative A, total Refuge visitation and public use would increase; however, parking limitations and traffic congestion at the Point and Overlook would persist. Efforts to improve access, enhance the scenic and historic appeal of the Point, and improve the quality of the visitor experience would be ongoing. Overall, these actions would lead to neutral or negligible effects.

Under Alternative B, total Refuge visitation and public use would be similar to Alternative A. Strategies to improve traffic flow and public safety and reduce parking congestion, including an optional shuttle from the Overlook to the Point, would lead to an overall minor positive effect to the general visitor experience.

The effects of both alternatives C and D on total Refuge visitation are uncertain; however, a negligible to minor decrease in visitation to the Point is possible due to the mandatory shuttle. Under Alternative C, since the Overlook is only accessible by foot or bicycle during open hours, visitation there could also experience a negligible to minor decrease. Under Alternative D, the Overlook would be accessible by private vehicle at all hours if the new offsite visitor welcome and orientation center is sited farther away from the Refuge’s southern boundary and not adjacent to Kīlauea Road. Under this scenario, visitation to the Overlook would be similar to Alternative A or B. Otherwise, visitation to the Overlook would be similar to Alternative C.

Depending upon factors related to the implementation of the shuttle system, there could be a negligible or slight increase in total Refuge visitation, which would include visitors to the Point, Overlook, and new welcome and orientation center at Crater Hill (Alternative C) or off-Refuge (Alternative D). Under both Alternative C and D, the general visitor experience would receive overall minor to intermediate positive impacts, primarily due to the reduction of traffic congestion and public safety hazards and more opportunities for orientation and environmental interpretation associated with the shuttle.

Wildlife Observation, Photography, and Interpretation

Effects of Alternative A (Current Management): For many people, having an opportunity for an up-close view of Kīlauea Point Lighthouse is a major reason for their visit to the Refuge (Sexton et al. 2012). Recent completion of the restoration of this structure enhances the quality of their visit. Efforts would be made to expand opportunities for public access to the Lighthouse and to light the Lighthouse more frequently. This would help address the strong demand by the visiting public to access the Lighthouse.

While onsite, many of these same people observe, photograph, learn more about, and enjoy the associated historic buildings, the surrounding ocean and crater walls, the diverse assemblage of native wildlife, especially the ever-present seabirds, and national wildlife refuges. Photography, bird watching, wildlife observation, and, to a lesser extent, interpretation are the most popular visitor activities at the Refuge (Sexton et al. 2012). Visitor support for use of the Refuge and enjoyment of its many attractions is provided by Refuge personnel and numerous volunteers and partners. Guided interpretive hikes would be offered at least once per day, depending on staff availability.

The Service would also redesign and improve the displays and information at the Overlook. This would reduce confusion regarding how to access the Point, and enhance visitor orientation, Refuge interpretation, and the quality of the visitor experience, leading to a negligible to minor positive effect.

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): Effects of this alternative on wildlife observation, photography, and interpretation would be the same as described for Alternative A, except as described below.

This alternative would expand observation and photography program offerings to include workshops and other efforts to teach and enhance viewing skills and ethics, provision of remote wildlife cameras, observation/photography blinds, citizen science opportunities, and staff participation in local conferences, meetings, and other events. These efforts would increase the percentage of Refuge visitors who were able to effectively use binoculars, viewing scopes, and cameras to get up-close views of wildlife. This would enhance their enjoyment and likely increase their appreciation for the seabirds, marine mammals, and other native species seen from the Point. Participation in more offsite activities would increase knowledge about the Refuge, including its natural and cultural resources, recreational and volunteer opportunities, and management programs and challenges among locals and visitors. It would also help associate a human face with the Federal agency managing the Refuge, increase dialogue between staff and local citizens, and enhance staff understanding of citizens' concerns regarding the Refuge.

Under this alternative, the contact station (radio beacon building) would be remodeled to provide expanded interpretation and the visitor center would be remodeled for environmental education purposes or for interpretation. The bookstore would remain on the Point, but be moved to quarters #1. The reconfiguration of uses of existing buildings would provide an opportunity to update and add to the exhibits, greatly expand the area available for interpretive exhibits and displays, and expand the capacity for visitors to enjoy and learn from them. Visitors would still be able to readily access the bookstore and its wares. These changes would enhance the quality of the visitor's experience on the Refuge (minor to intermediate positive effect).

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): Effects of this alternative on wildlife observation, photography, and interpretation would be the same as described for Alternative B, except as described below.

Guided interpretive hikes up Crater Hill would be reinstated under this alternative. There would be special amenity (user) fees for visitors to participate in these hikes. Similar fees could be imposed for special tours of the Lighthouse. Because the demand for these hikes and tours is high (especially by local residents), it is unlikely that such fees would dissuade visitors from participating (this is also supported by survey results) (Sexton et al. 2005).

The hikes would provide participants with special opportunities to view and photograph nēnē, ʻā (red-footed booby), mōlī, possibly other seabirds, and other species of native wildlife. In addition, visitors would have up-close views of seabird nesting burrows; learn more about Refuge wildlife and habitat management practices; learn more about cultural resources and values (including uses of Crater Hill, Mōkōlea Point, and the surrounding areas by native Hawaiians, for agriculture and related shipping, and during World War II); and have views of the mountains, Kīlauea Town, ocean, Lighthouse, and Point from different perspectives than those normally enjoyed by Refuge visitors. Special conditions would be imposed on these hikes to ensure that they would not adversely affect native wildlife or their habitat. The compatibility determination addressing wildlife observation, photography, and interpretation included in Appendix B addresses the effects and conditions associated with this use in greater detail.

Under this alternative, Quarters #1 would be converted to a living history site, and the visitor center would be remodeled for environmental education purposes or for interpretation. If the visitor center was used for interpretation, this would provide additional capacity to supplement whatever interpretive exhibits and displays were provided at the new Crater Hill complex. Housing a living history facility in a historic structure on the Point would provide an opportunity to more fully showcase the Kīlauea Light Station (minor positive effect).

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): Effects of this alternative on wildlife observation, photography, and interpretation would be the same as described for Alternative C.

Comparison of overall effects across alternatives to wildlife observation, photography, and interpretation: Overall effects of Alternative A would be negligible to minor positive, primarily due to increased access to the Lighthouse and improved interpretive displays and information. Under Alternative B, expanded wildlife observation and photography options, as well as expanded facilities for interpretation, would lead to an overall minor to intermediate positive impact. The effects of Alternatives C and D would be similar to Alternative B but of slightly higher magnitude (minor to intermediate positive), primarily due to the addition of guided interpretive hikes at Crater Hill and the creation of a living history site.

Environmental Education

Effects of Alternative A (Current Management): Under this alternative, the Service's current Refuge-associated environmental education (EE) program would continue. As described in Chapter 2, this includes both onsite and offsite efforts. These activities rely heavily on the efforts of volunteers and provide some level of environmental education.

Because of the travel times required and the short amount of time available for onsite EE programs, continuation of current efforts would mean that only students from Kaua‘i schools on the North Shore would be likely to enjoy an onsite visit to the Refuge. Because of the narrow, steep, and winding entrance road and limited turnaround area in the parking lots, access by school buses would remain challenging. This is especially true if school groups remained onsite after the Refuge officially opened for the day (10:00 a.m.) and children needed to maneuver around cars in the parking areas to find and reboard the buses. Then incoming traffic would need to be temporarily halted at the Overlook in order to provide room for the school buses to negotiate their departure. This situation would continue under this alternative (negligible to minor negative effect).

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): Effects of this alternative on EE would be the same as described for Alternative A, except as described below.

Additional efforts would be undertaken to review and update EE curricula and materials, regularly train all persons (including staff, volunteers, teachers, and other educators) involved in delivering the EE program, provide teacher training, and develop a multifaceted Junior Ranger program. Together, these efforts would enhance the quality of EE provided by the Service. This would result in students having an increased understanding of and appreciation for native wildlife, plants, and their habitats, Refuge management programs, and potentially more environmentally appropriate on- and off-Refuge behavior (minor positive effect).

Under this alternative, the visitor center and/or Quarters #2 would be remodeled for EE purposes. This would greatly expand the capacity for EE in a sheltered area, improve the acoustics for teaching and discussion, and overall enhance the quality and diversity of programs that could be offered (minor positive effect).

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): Effects of this alternative on EE would be the same as described for Alternative B, except as described below.

The new welcome and orientation center at the southwestern corner of Crater Hill would improve access and logistics for school groups visiting the Refuge either by removing private automobiles at the Point, thereby facilitating easier entry, parking, and exit by school buses or, if the shuttle system is used, relocating bus parking and turnaround to the new facilities.

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): Effects of this alternative on EE would be the same as described for Alternative C, except as described below.

Quarters #2 would not be remodeled and converted to EE purposes but would remain as a staff residence. EE would benefit from having an enlarged and improved facility onsite at the visitor center. The new off-Refuge welcome and orientation center would improve access and logistics for school groups visiting the Refuge either by removing private automobiles at the Point, thereby facilitating entry, parking, and exit by school buses or, if the shuttle system is used, relocating bus parking and turnaround to the new facilities.

Comparison of overall effects across alternatives to environmental education: Overall, Alternative A would have negligible to minor negative effects on environmental education, primarily due to the issues related to school bus access and parking. Alternatives B–D would lead to minor positive effects due to additional efforts to enhance the quality of the program, including converting an existing structure to a designated facility/facilities for EE. Alternatives C and D would have slightly greater effects than Alternative B due to the better access and logistics for school groups accessing the Point via bus or shuttle.

Other Uses

Effects of Alternative A (Current Management): Although the focus is clearly upon wildlife-dependent recreational and educational uses, the Service does provide visitors with some opportunities to enjoy other, non–wildlife-dependent uses on the Refuge. These include research, surveys, and scientific collecting; access through Kāhili Quarry to access Kāhili Beach, Kīlauea Bay, and Kīlauea River for various recreational uses; dog walking at Kāhili Quarry; traditional cultural gathering; commercially guided tours; and commercial wildlife and landscape filming and photography. These additional uses have the potential to generate adverse effects on the Refuge's natural and cultural resources, and on visitors enjoying wildlife-dependent uses. Therefore, conditions are imposed to ensure that the uses occur in a compatible manner.

Appropriateness findings included in Appendix A include brief evaluations of several non–wildlife-dependent uses, including those determined to be not appropriate, and therefore, not allowed on the Refuge. Compatibility determinations included in Appendix B provide more detailed assessments of the effects of these uses and the conditions (stipulations) associated with their authorizations. Local residents and nonlocal visitors have many opportunities to participate in numerous non–wildlife-dependent recreational uses on the North Shore and elsewhere across Kaua‘i. Non–wildlife-dependent uses that are currently authorized on the Refuge would continue under this alternative (negligible effects).

Effects of Alternatives B–D: Non–wildlife-dependent uses that are currently authorized on the Refuge would continue under the action alternatives. Extra education and law enforcement efforts would continue to address trespass, overnight camping, unleashed dogs, pet abandonment, vehicle damage to the earth, abandoning vehicles and dumping of trash, and other illegal activities, especially in the Kāhili Quarry area. Improved signage, additional outreach (e.g., through local meetings, with brochures, and through the internet), and special training of staff and volunteers would supplement education and law enforcement efforts to address illegal activities. New stipulations would be implemented for public uses occurring at Kāhili Quarry.

As a result, violations of special use permit conditions, and illegal activities in the Kāhili Quarry area and elsewhere across the Refuge would be expected to diminish. Additionally, abandoned vehicles and other trash, illegal campsites, and illegal fire rings would be removed from Kāhili Quarry, creating a safer and more inviting area for a variety of legal public uses and for native wildlife (minor positive effect).

Comparison of overall effects across alternatives to other uses: Overall, Alternative A would lead to a negligible effect on non–wildlife-dependent, existing, legal public uses. Under the action alternatives B–D, these uses would still be allowed; however, illegal uses would be reduced and

additional stipulations would reduce threats to natural resources and potential for user conflicts, and improve visitor safety, leading to minor positive effects.

6.5.3 Economic Effects

Many of the effects presented in this section were generated through use of the economic input-output computer model IMPLAN (Impact Analysis for Planning). IMPLAN draws data from the Bureau of Economic Analysis, Bureau of Labor Statistics, and U.S. Census Bureau, among other sources. For purposes of analyses, the County of Kaua‘i was identified as the economic impact region, spending by nonlocal visitors only was included in the analyses, and only those visitors who actually ventured out onto the Point were counted as visitors (analyses did not include visitors to the Overlook). Visitor expenditures included in the analyses appropriately accounted for the fact that, for some visitors, the Refuge visit was the primary purpose for their trip; for others it was one of many equally important reasons for their trip; and for still others, it was an incidental or spur of the moment stop.

As described in Section 6.5.2, each alternative could lead to a range of possible effects on visitation. The effects of alternatives C and D, in particular, are difficult to predict. Based on surveys conducted in 2004 and 2010/2011, between 24–43 percent of visitors would not visit the Point if a mandatory shuttle was implemented (Sexton 2005, Sexton et al. 2012). If, when faced with a choice between not visiting the Point or riding a mandatory shuttle, this percentage of visitors actually chose not to use the shuttle, then visitation to these areas would decrease. The economic analysis that follows assumed that visitation to the Point would not change over the next 15 years under alternatives A or B, but instituting a mandatory shuttle would reduce visitation by 24 percent. However, it is worth noting that other factors such as reliability, low cost, short wait times, and additional value (e.g., guided interpretation) would affect that decision and consequently, overall Refuge visitation numbers.

As visitor expenditures work their way through the economy, they generate direct and secondary (indirect) jobs, associated labor income, and add value to the economy. Economic effects were also calculated for salary spending by Refuge employees, and the Service’s purchases of goods and services for the Refuge. Because solid estimates were not available, expenditures for operation and maintenance of the welcome and orientation center and maintenance facilities and the shuttles were not included in these analyses. Values presented were in 2012 U.S. dollars (see Thomas and Koontz 2014).

<u>Employment and Income</u>

Effects of Alternative A (Current Management): Under this alternative, it is estimated that direct and secondary economic effects of expenditures by Refuge visitors generate approximately 80 full- and part-time jobs, approximately $2.9 million in labor income, and approximately $5.1 million in value added to Kaua‘i’s economy. Direct and secondary economic effects of salary spending by Refuge employees generate approximately 2 jobs, approximately $77,000 in labor income, and approximately $151,000 in value added to Kaua‘i’s economy. Direct and secondary economic effects of spending for Refuge annual operations and maintenance needs, and annualized one-time expenditures, generate approximately 5 jobs, approximately $226,000 in labor income, and approximately $315,000 in value added to Kaua‘i’s economy. Direct and secondary economic effects of Kīlauea Point NWR’s Refuge Revenue Sharing payments to the County (approximately

$12,000/year) generate less than 1 job, approximately $3,200 in labor income, and approximately $4,900 in value added to Kaua‘i’s economy (Thomas and Koontz 2014).

In aggregate, the direct and secondary economic effects to the County of the Refuge’s operations total approximately 88 full- and part-time jobs, approximately $3.2 million in labor income, and approximately $5.6 million in value added to Kaua‘i’s economy (Thomas and Koontz 2014). County-wide, these economic effects represent approximately 0.2 percent of total income and approximately 0.2 percent of total employment. These economic effects would be expected to continue at these levels for the next 15 years.

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): Under this alternative, it is estimated that direct and secondary economic effects of expenditures by Refuge visitors would generate approximately 80 full- and part-time jobs, approximately $2.9 million in labor income, and approximately $5.1 million in value added to Kaua‘i’s economy. Direct and secondary economic effects of salary spending by Refuge employees would generate approximately 3 jobs, approximately $121,000 in labor income, and approximately $239,000 in value added to Kaua‘i’s economy. Direct and secondary economic effects of spending for Refuge annual operations and maintenance needs, and annualized one-time expenditures, would generate approximately 11 jobs, approximately $469,000 in labor income, and approximately $649,000 in value added to Kaua‘i’s economy. Direct and secondary economic effects of Kīlauea Point NWR’s Refuge Revenue Sharing payments to the County (approximately $12,000/year) would continue to generate less than 1 job, approximately $3,200 in labor income, and approximately $4,900 in value added to Kaua‘i’s economy (Thomas and Koontz 2014).

In aggregate, the direct and secondary economic effects to the County of the Refuge’s operations would total approximately 94 full- and part-time jobs, approximately $3.5 million in labor income, and approximately $5.9 million in value added to Kaua‘i’s economy (Thomas and Koontz 2014). County-wide, these economic effects would represent approximately the same percentage of total income and total employment as described for Alternative A.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): Under this alternative, it is estimated that direct and secondary economic effects of expenditures by Refuge visitors would generate approximately 64 full- and part-time jobs, approximately $2.3 million in labor income, and approximately $4.1 million in value added to Kaua‘i’s economy. Direct and secondary economic effects of salary spending by Refuge employees would generate approximately 5 jobs, approximately $174,000 in labor income, and approximately $342,000 in value added to Kaua‘i’s economy. Direct and secondary economic effects of spending for Refuge annual operations and maintenance needs, and annualized one-time expenditures, would generate approximately 10 jobs, approximately $439,000 in labor income, and approximately $607,000 in value added to Kaua‘i’s economy. Direct and secondary economic effects of Kīlauea Point NWR’s Refuge Revenue Sharing payments to the County (approximately $12,000/year) would continue to generate less than 1 job, approximately $3,200 in labor income, and approximately $4,900 in value added to Kaua‘i’s economy (Thomas and Koontz 2014).

In aggregate, the direct and secondary economic effects to the County of the Refuge’s operations would total approximately 79 full- and part-time jobs, approximately $2.9 million in labor income, and approximately $5.1 million in value added to Kaua‘i’s economy (Thomas and Koontz 2014).

County-wide, these economic effects would represent approximately the same percentage of total income and total employment as described for Alternative A.

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): The direct and secondary economic effects of implementing this alternative would be the same as described for Alternative C.

Property Values

Effects of Alternative A (Current Management): Studies reveal that the values of residential properties in the vicinity of natural areas, including national wildlife refuges, can be higher than similar properties located elsewhere. This valuation effect is believed to be associated with the protection from future development that a refuge provides for green areas, a refuge's scenic views, and other open space amenities. This effect applies to houses in urban areas or in the urban fringe that are located within one-half mile of a refuge and within 8 miles of an urban center. Increased property values also result in increased property tax revenues for local governments (Taylor et al. 2012).

Kīlauea Point NWR lies in what might best be characterized as a semi-rural area or, because of its proximity to Kīlauea Town and considering the surrounding housing developments, perhaps a suburban area. In addition, the properties in the area near the Refuge are already very highly priced, and off-Refuge open space and scenic views are readily available in the immediate area. Therefore, it is unclear exactly what effect, if any, proximity to this Refuge has on property values in the area.

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): Effects on the values of properties in the vicinity of the Refuge under this alternative would be the same as described for Alternative A.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): Effects on the values of properties in the vicinity of the Refuge under this alternative would be the same as described for Alternative A, except as follows. Values of the two Seacliff Plantation properties adjacent to the southwest corner of Crater Hill where the new welcome and orientation center and maintenance facilities would be constructed and operated could be affected by this alternative. Noise, dust, and traffic congestion associated with construction could diminish values somewhat if the owners attempted to sell during that time period. Views to the north and northwest from two existing homes in Seacliff Plantation could be affected; however, their view of the Pacific Ocean would not be affected. This might affect property values.

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): Effects on the values of properties in the vicinity of the Refuge under this alternative would be the same as described for Alternative A.

Government Revenues.

The Service provides Kaua'i County with annual payments pursuant to the Refuge Revenue Sharing Act of 1935, as amended (16 U.S.C. 715s). This Federal statute requires that the Service pay to local governments a portion of any revenues generated on refuge lands (e.g., for special privileges, leases, or sales of products of the soil), a percentage of the assessed value of refuge lands, or an amount

determined by the acreage of the refuge. The actual amount of these payments depends on appropriations from the U.S. Congress.

Local governments also receive revenues indirectly as a result of sales and income taxes associated with economic activity related to the Refuge. This includes sales taxes paid by visitors who purchase items at the Refuge bookstore, and by individuals who purchase food, lodging, fuel, or other items associated with their visit to the Refuge. Additional government revenue is generated by income taxes paid by Refuge employees, contractors working for the Refuge, and those whose businesses directly or indirectly benefit from the existence of the Refuge and its visitors. The State of Hawai‘i's sales tax is currently 4 percent. Kaua‘i County assesses real property taxes, but neither Kīlauea Town nor the County collects a sales tax. The State's marginal income tax ranges from 1.4 to 11 percent. An estimate of the sales, property, and income tax revenues related to the operation of the Refuge is not available.

Effects of Alternatives A–D: In recent years, Refuge Revenue Payments to the County for Kīlauea Point NWR have totaled approximately $12,000 annually (Thomas and Koontz 2014). Under all alternatives, Refuge Revenue Sharing payments to the County would remain as they are at present. It is expected that other government revenues (e.g., sales, property, and income taxes) related to the operation of the Refuge would also remain as they are.

Non-Market Values

The Earth's natural environment provides a range of benefits (ecosystem goods and services) to human society. These include clean air; protection from the sun's ultraviolet radiation; fresh water; warmth, light, and fuel; fertile soils; nutritious, culturally valuable, and scientifically interesting wild plants, fish, and wildlife; natural medicines; genetic diversity; pollination and pest management; the ability to cycle water and nutrients, convert organic wastes into nutrients, filter polluted water, reduce flooding and storm damage, and sequester carbon; calming open space and beautiful scenery; outdoor recreation; native wildlife to view and photograph; and inspirational storms, sunrises, and sunsets (Carver and Caudill 2007, Daily 1997, Daily et al. 1997). Daily defines ecosystems services as, "…the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life." Because many of these benefits are not traded in the market place, they are referred to as nonmarket values. Analyses have been conducted in an attempt to estimate economic values for ecosystem goods and services. Calculations suggest that, at a global scale, these goods and services are worth at least tens of trillions of dollars per year. On average, this is more than the annual global gross national product (Costanza et al. 1997).

A recent report noted that, "All Americans—including those who have never set foot on a national wildlife refuge and may not even know that refuges exist—benefit from their protection" (CARE 2013). Through conservation of a healthy and diverse assemblage of native fish, wildlife, plants, and their habitats, the Service supports a continuation of ecosystem goods and services and associated nonmarket values across the National Wildlife Refuge System, on this Refuge, and elsewhere that migratory birds and other wildlife hosted by the Refuge travel.

Effects of Alternative A (Current Management): The ecosystem goods and services generated by current Refuge management have not been itemized. However, it is expected that implementation of Alternative A would result in the Refuge continuing to provide approximately the same levels of these nonmarket values over the next 15 years as it does at present. These services and values would

continue to be freely available to all who visit the Refuge, live adjacent to or view the Refuge from outside its boundary, or interact with migratory wildlife that spend part of their lives on the Refuge.

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): Expansion and enhancement of healthy wildlife habitat under this alternative would be expected to result in a minor increase in the ecosystem goods and services and associated nonmarket values provided by the Refuge.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): Similar to Alternative B, this alternative would also include expansion and enhancement of healthy wildlife habitats and an associated minor increase in the ecosystem goods and services and associated nonmarket values provided by the Refuge. However, these increases would be partially offset by the loss of 4 acres of habitat due to construction of the welcome and orientation center and maintenance facilities on the southwestern corner of Crater Hill and the resulting degradation of habitat values in the Crater Hill vicinity as a result. Landscaping the new complex with native plants and potentially attracting some native wildlife to the complex would be a worthwhile venture for other reasons. But, due to its small size and fragmentary nature, this landscaping would not offset the losses to ecosystem goods and services associated with the complex's displacement and disturbances losses. Additionally, some people might find that this complex reduced the scenic values of Crater Hill.

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): The ecosystem goods and services and associated nonmarket values provided by the Refuge under this alternative would be the same as provided by Alternative B, except as described below.

There are very few, if any, areas within 1 mile of the Refuge that would meet the likely siting criteria for a potential Refuge welcome and orientation center (such as proximity to a well-traveled road and good access to utilities), and also retain substantial acreage of healthy native habitats. Siting such a complex off the Refuge would likely affect a 4-acre area with degraded native wildlife and plant values or an already developed area (with few, if any, native wildlife and plant values). The loss of ecosystem goods and services from (further) development of such sites would be minor. Landscaping the new complex with native plants and potentially attracting some native wildlife to the complex would be a worthwhile venture for other reasons. But, due to its small size, fragmentary nature, and distance from other healthy and functioning native or semi-native habitats, the new complex would provide negligible ecosystem goods and services.

6.5.4 Effects upon Cultural, including Historic Resources, Values, and Uses

Effects of Alternative A (Current Management): The Refuge includes a number of cultural sites, values, and uses, including those of importance to Native Hawaiians (e.g., for fishing, and bird and egg collecting), the Kāhili Quarry and sugar plantation-related shipping sites in the Quarry area and on Mōkōlea Point, the Lighthouse and related structures on the Point, and the World War II radar and radio station-related structures on Crater Hill (Fredericksen and Fredericksen 1989). An automated beacon was erected to replace Kīlauea Point Lighthouse in 1976 and, in 1979, the Lighthouse and associated buildings were listed on the National Register of Historic Places (Kīlauea Point Light Station is an historic district) (Aikin 1988, Boynton 2004). A few decades ago, decontamination efforts removed mercury from the Lighthouse. More recently, with funding assistance from KPNHA, the Lighthouse has undergone extensive, careful, and historically appropriate restoration. Some of the

other cultural sites listed above have been determined eligible, but are as yet not listed on the National Register of Historic Places (Fredericksen and Fredericksen 1989). No archaeological (precontact) sites have been located on the Refuge.

Some of the historic sites, including the Lighthouse and the several related structures on the Point, have been stabilized or restored, and are being reused. This is consistent with direction in the NHPA. Under this alternative, stabilization, restoration, and reuse of these historic structures would continue.

Additionally, prior to undertaking any ground-disturbing or other activities that could affect the Refuge's cultural resources, the Service would continue to undertake appropriate surveys and engage in consultations as required by the NHPA. Where practicable, cultural sites would be avoided. Mitigation of effects (e.g., through excavation and recording of data) and minimization of effects would be secondary choices. In the event that human bones, burial remains, or other archaeological or historic resources were inadvertently disturbed in the course of conducting Refuge management, maintenance, repair, construction, or other activities, the disturbing activity would be immediately discontinued and the relevant State, Federal, and/or Native Hawaiian authorities would be notified. Refuge activities in the affected area would not be resumed until appropriate clearance had been obtained.

Under this alternative, Crater Hill would remain closed to general public use. This would apply to all visitors, but would have special effects upon Native Hawaiians and others who traditionally used this high area on the northernmost point of Kaua'i to spot fish in association with ocean fishing. In modern times, electronic fish finders and other technology are available to partially offset this effect.

Inventory and monitoring, and research and scientific assessments regarding Refuge natural and cultural resources, public uses, and interactions among these elements would continue as at present. Relative to archaeological and historic resources, most of these activities would involve observation, measurement, and recording. Occasionally, under special permit, artifacts would be collected for study and display and/or because they would otherwise be disturbed or destroyed in association with a development or activity for which an avoidance alternative was not practicable. Protective constraints associated with these activities would help ensure that effects were negligible. Compatibility determinations included in Appendix B address the effects of and conditions associated with these uses in greater detail.

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): Effects upon cultural resources, values, and uses under this alternative would be the same as for Alternative A, except as described below.

This alternative would also include efforts to restore coastal mixed woodland-grassland habitat, remove nonnative plants, and clear flight obstacles on Mōlī Hill on the Point, on Crater Hill, and on Mōkōlea Point. These efforts could involve ground disturbance; prior to proceeding, the Service would undertake appropriate surveys and engage in consultations as required by the NHPA to avoid, mitigate, and/or minimize potential effects on cultural resources, values, and uses.

Remodeling and reuse of historic residences on the Refuge for environmental interpretation, education, or bookstore purposes would be explored with this alternative. Because of the historic nature of these buildings, remodeling would be carefully undertaken to avoid damaging historic features and potentially could restore features that may have previously been lost or degraded.

Maintaining and/or restoring the integrity of historic structures on the Refuge is in keeping with their status as part of the historic district. Reuse of historic buildings is consistent with direction of the NHPA.

This alternative would also involve exploring the potential to designate the Refuge or a portion of the Refuge as a traditional cultural property in the National Register of Historic Places. A traditional cultural property is defined as a place (a property) that has significance for a living community's historically rooted traditions, beliefs, customs, social institutions, lifeways, arts, crafts, and/or practices. Designation of the Refuge or a portion of the Refuge would contribute to further protecting and preserving traditional cultural and religious sites that have continuing relevance to the Native Hawaiian people.

Under this alternative, inventory and monitoring, and research and scientific assessments regarding Refuge natural and cultural resources, public uses, and interactions among these elements would increase compared to those presently occurring. It would be expected that this would result in a minor increase in the same types of effects described for Alternative A. Compatibility determinations included in Appendix B address the effects of and conditions associated with these uses in greater detail.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): The effects of this alternative upon archaeological and historic resources, values, and uses would be the same as those described for implementing Alternative B, except as described below.

Under this alternative, a new welcome and orientation center and maintenance facilities would be constructed on the southwestern corner of Crater Hill. This would likely involve cutting and filling to create stepped, flat surfaces for building foundations, and additional contouring to create smooth drives and parking areas with relatively gradual slopes and proper drainage. Benching the structures into the hillside and mounding berms to reduce their visual and possibly acoustic presence would require even more cutting and filling. Prior to undertaking any such earth-moving or similar activities that could affect the Refuge's cultural resources, the Service would undertake appropriate surveys and engage in consultations as required by the NHPA. Where practicable, cultural sites would be avoided. Mitigation of effects (e.g., through excavation and recording of data) and minimization of effects would be secondary choices. These steps would help ensure that this project would result in negligible effects on cultural resources.

Guided interpretive hikes up Crater Hill would be reinstated under this alternative. These hikes would occur twice per week and involve small groups of visitors and local residents, traveling on designated routes, and with trained guides. The hikes would provide participants with special opportunities to view, photograph, and learn more about cultural resources, values, and uses. These hikes could have special value for Native Hawaiians and others who traditionally used this high area on the northernmost point of Kaua'i to spot fish in association with ocean fishing. Special conditions would be imposed on these hikes to ensure that they would not adversely affect these resources and values. The compatibility determination addressing wildlife observation, photography, and interpretation included in Appendix B addresses the effects of and conditions associated with this use in greater detail.

Under this alternative, the effects of inventory and monitoring, and research and scientific assessments on Refuge archaeological and historic resources would be the same as described for Alternative B.

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): The effects of this alternative upon archaeological and historic resources, values, and uses would be the same as those described for implementing Alternative C, except as described below.

Under this alternative, a new welcome and orientation center and maintenance facilities would be constructed off the Refuge. Other than its general proximity to the Refuge, it is unknown where the new complex would be located. If it were possible to remodel and occupy an existing set of buildings, then it is likely that there would be negligible effects on cultural resources. This is, unless the existing structures were historic, in which case consultations and other actions would be taken to ensure that the remodeling and reuse was conducted appropriately. If the complex was instead constructed on an undeveloped site and cutting, filling, drilling, benching, contouring, or other similar ground-disturbing actions were contemplated, then the same sorts of surveys, consultations, avoidance, mitigation, and/or minimization would occur as described for Alternative C. These steps would help ensure that this project would result in negligible effects on cultural resources.

Comparison of overall effects across alternatives to cultural resources: Any activity identified in the alternatives being considered, including construction, remodeling, or restoration of facilities; habitat management; or changes in public uses could have a potential impact to cultural resources. Compliance with cultural resource investigation protocol prior to conducting ground-disturbing actions, and subsequent compliance with procedures if cultural resources are found, would ensure that negative impacts to cultural resources from implementation of any of the alternatives are negligible. Additionally, the stabilization, restoration, and reuse of these historic structures under all alternatives and the potential designation of the Refuge or a portion thereof as a traditional cultural property within the action alternatives would result in minor positive effects.

6.5.5 Effects upon Transportation, including Traffic

Effects of Alternative A (Current Management): Under this alternative, Refuge visitors would continue to comprise approximately 20–25 percent of the traffic volume on Kīlauea Road through Kīlauea Town (Parsons Brinckerhoff 2006). Kīlauea Road is mostly straight, two-laned, and narrow, and houses and driveways front directly on the road. Traffic associated with Refuge visitors would continue to contribute to noise, air pollution, public safety concerns, and occasional traffic congestion in Kīlauea Town and through rural lands to the north (makai). This would include occasionally requiring local residents whose houses fronted the road to have to wait longer for traffic to clear prior to backing out from their driveways onto the road (minor negative effect).

On-Refuge parking would continue to be limited and include existing and newly paved parking areas and an overflow grassy area (regularly used by nēnē). Efforts would be made to pursue use of offsite parking for some staff and volunteers. This would free up additional parking spaces on the Point which could then accommodate more visitors' vehicles.

Because of the narrow and winding entrance road and limited turnaround area in the parking lots, access by school buses would remain challenging. This is especially true if school groups remained

onsite after the Refuge officially opened for the day (10:00 a.m.) and children needed to maneuver around private automobiles in the parking areas to find and reboard the buses. Then incoming traffic would need to be temporarily halted in order to provide room for the school buses to depart. This situation would continue under this alternative (minor negative effect).

The Service would continue to work with local governments to provide a bus stop closer to the Refuge and create a multi-use trail connecting the Refuge with Kīlauea Town (construction of pedestrian and bicycle paths is important to local residents [Sexton et al. 2005]) . Although use of private automobiles would continue to be the primary means to travel to the Refuge, if these actions were successful, then visitors would have additional transportation options available to access the Refuge (minor positive effect).

The Service would also redesign and improve the displays and information at the Overlook under this alternative. Importantly, this would reduce confusion regarding how to access the Point (minor positive effect).

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): If visitation remained at approximately the same level as at present, it could be expected that this alternative would result in a slight reduction in traffic congestion at the Refuge entrance (e.g., through the use of an optional shuttle, providing bicycle parking at the Overlook, creating an area for public/tour bus drop-off). However, if visitation levels increased substantially, these actions could result in somewhat more congestion and additional public safety hazards, especially during prime visitation hours, as even more motor vehicles, bikes, and people carried by buses collected at the Overlook and Refuge entrance. The bike, bus, and shuttle elements of these activities would be consistent with Bike Plan Hawai‘i 2003 (HDOT 2003) and transportation elements of the Kaua‘i Energy Sustainability Plan (SENTECH Hawai‘i 2010). See 6.5.2 for additional discussion.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): The required use of a mandatory shuttle during open hours between the new visitor welcome and orientation center at Crater Hill and the Point along with limiting vehicular traffic on Kīlauea Road beyond the new visitor center would be expected to greatly reduce traffic congestion from the Refuge entrance onto the Point and surrounding the parking lots on the Point, and, during open hours, at the Overlook (intermediate positive effect). This assumes no major increases in visitation to the Refuge and a well-designed entryway to the new complex at the southwest corner of Crater Hill on Kīlauea Road . See 6.5.2 for additional discussion.

The gate could be a minor inconvenience for the residents and guests of two private parcels adjacent to the Refuge whose driveways open onto Kīlauea Road behind where the gate would be constructed. Appropriate arrangements would be made with these property owners to provide them and their guests with reasonable access (minor negative effect).

When the Refuge was closed, the Kīlauea Road gate would be opened and visitors could drive as far as the Overlook. During closed hours, the potential for traffic congestion would continue at the Overlook. However, traffic volumes are generally less at that time of day, the increased parking capacity at this location would accommodate more private vehicles (including automobiles and bicycles), and the potential for public/tour buses to service this location at these times would reduce the number of vehicles required to transport visitors (negligible to minor positive effect). Providing local shuttle service from the on-Refuge Transportation Hub to the Point would support the park-and-

ride philosophy of the transportation element of the Kaua‘i Energy Sustainability Plan (SENTECH Hawai‘i 2010).

As in Alternative B, this alternative would include bike parking at the Overlook. This might encourage some visitors who might otherwise travel in private motor vehicles to instead bicycle to the Refuge. This would reduce traffic congestion at the Overlook and Refuge entrance, might attract even more visitors to the Refuge than at present, and would be consistent with Bike Plan Hawai‘i 2003 (HDOT 2003) (minor positive effect).

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): If the new visitor welcome and orientation center and maintenance facilities complex was located along Kīlauea Road immediately adjacent to the Refuge boundary, then Kīlauea Road would be gated and the gate would be operated (opened and closed daily) as in Alternative C. This set of actions would be expected to greatly reduce traffic congestion from the Refuge entrance onto the Point and surrounding the parking lots on the Point, and, during open hours, at the Overlook. The gate-related effects noted for Alternative C would then occur under this alternative.

On the other hand, if the new complex was located elsewhere, Kīlauea Road would not be gated and visitors would have a mandatory shuttle ride of unknown length from the off-Refuge welcome and orientation center to the existing parking lots on the Point. If roadway signage and other Kaua‘i visitor information about accessing the Refuge were adequate, potentially a high percentage of visitors' private automobiles that would otherwise drive through Kīlauea Town enroute to the Refuge would instead be diverted to the new complex and visitors would ride the shuttle to and from the Refuge. This would greatly reduce Refuge-related traffic and associated congestion, safety concerns, noise, and air pollution between the new complex and the Refuge. This set of actions would also be expected to greatly reduce traffic congestion from the Refuge entrance onto the Point and in the area surrounding the parking lots on the Point.

Depending on its actual location, the new off-Refuge complex could create new or exacerbate existing traffic problems (e.g., congestion, safety concerns, noise, and air pollution). Properly designed and constructed directional signage, traffic signs and/or signals, and ingress and egress points would reduce such potential effects. Because the actual location, site design, and other features of and associated with the new complex are unknown, it is speculative to further assess other transportation, including traffic, effects. Such an effects assessment would be conducted in the future in association with more detailed planning and design, and, as appropriate, as part of a separate NEPA process and document.

As in Alternative B, this alternative would include bike parking at the Overlook. This might encourage some visitors who might otherwise travel in private motor vehicles to instead bicycle to the Refuge. This would reduce traffic congestion at the Overlook and Refuge entrance, might attract even more visitors to the Refuge than at present, and would be consistent with Bike Plan Hawai‘i 2003 (HDOT 2003) (minor effect).

Although visitors would be able to drive, bike, or walk to the Overlook, they could not enter the Point without boarding the shuttle. Although a potentially high percentage of Refuge visitors would be diverted directly to the new complex, the potential for daytime traffic congestion at the Overlook would continue. The increased parking capacity at this location would accommodate more private vehicles (including cars and bicycles) and public/tour buses (negligible to minor positive effect).

Providing shuttle service from the off-Refuge transportation hub to the Point would be consistent with the park-and-ride philosophy of the transportation element of the Kaua‘i Energy Sustainability Plan (SENTECH Hawai‘i 2010).

Construction and farming equipment (used for facility construction, maintenance, and repair, and habitat management) would travel on public roads between this new complex and the Refuge. If the new complex was constructed closer to Kīlauea Town or Kūhiō Highway and farther from the Refuge, then the maintenance portion of the new complex could be sited closer to the Refuge. Large and heavy vehicles move slowly and would hinder movement of passenger vehicles while en route. Travel by these large vehicles would be expected to be occasional, and only for short distances (less than 1 mile) and short time periods, so effects would be localized and minor.

Comparison of overall effects across alternatives to transportation: Overall, implementation of Alternative A would result in minor negative impacts to transportation, primarily due to traffic-related effects (e.g., congestion, noise, public safety, and pollution) from visitation. Alternative B would alleviate some parking limitations at the Overlook and traffic congestion at the Point (due to the optional shuttle) and would provide more transportation options (bicycle, pedestrian, and bus access), leading to minor positive effects. Alternative C would have positive impacts by reducing traffic congestion at the Overlook and Point from the use of a mandatory shuttle and from facilitating bicycle and pedestrian access, leading to an overall intermediate positive effect. Alternative D would result in a reduction of traffic-related effects at the Point from visitation. However, depending upon where the offsite complex was sited, there could be negligible to minor positive effects on traffic congestion at the Overlook and negligible to minor negative impacts on traffic congestion from construction and farming equipment on Kīlauea Road. Overall, Alternative D would result in minor to intermediate positive effects.

6.6 Other Effects

6.6.1 Irreversible and Irretrievable Commitments of Resources

Effects of Alternative A (Current Management): Under this alternative, irreversible and irretrievable commitments of resources would continue as at present and result in minor adverse effects. This includes such things as use of fossil fuels to power vehicles and motorized equipment (see Section 6.3.5), and use of metals, glass, hydrocarbons, and other nonrenewable resources for vehicle and facility maintenance and repair.

Effects of Alternative B (Restore Native Ecosystems; Maintain Visitor Center on Point): The irreversible and irretrievable commitments of resources under this alternative would be generally the same as those described for implementing Alternative A.

Effects of Alternative C (Restore Native Ecosystems; Build Visitor Center on Crater Hill): The irreversible and irretrievable commitments of resources under this alternative would be generally the same as those described for implementing Alternative B, except as described below.

Creation of the new welcome and orientation center and maintenance facilities on Crater Hill would involve an irretrievable commitment of the metals, aggregate, glass, hydrocarbons, and other nonrenewable resources used in its construction. Production from the soils underlying these facilities, including roads, and parking and storage areas, would also be irretrievably committed. Fossil fuels

used to power vehicles and motorized equipment, and indirectly to supply electricity (see Section 6.3.5), and use of metals, aggregate, glass, hydrocarbons, and other nonrenewable resources for vehicle and facility maintenance and repair would be irreversibly and irretrievably committed as part of the operation of the new complex. Taken together, these commitments would represent a minor to intermediate adverse effect.

Effects of Alternative D (Preferred – Restore Native Ecosystems; Move Visitor Center Off-Refuge Nearby): Unless the new complex was able to remodel and occupy an existing set of buildings, the irreversible and irretrievable commitments of resources under this alternative would be generally the same as those described for implementing Alternative C (minor to intermediate negative effect).

6.6.2 Cumulative Effects

Cumulative effects can result from the incremental effects of a project when added to other past, present, and reasonably foreseeable future projects in the area. Cumulative impacts can result from individually minor but cumulatively significant actions over a period of time. This analysis is intended to consider the interaction of activities at the Refuge with other actions occurring over a larger spatial and temporal frame of reference.

The Council on Environmental Quality (CEQ) regulations for implementing the provisions of NEPA define several different types of effects that should be evaluated in an EA, including direct, indirect, and cumulative. Direct and indirect effects are addressed in the resource-specific sections of this draft CCP/EA. This section addresses cumulative effects.

The CEQ (40 CFR § 1508.7) (CEQ 1997) provides the following definition of cumulative effects:

> "The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions."

It should be noted that the cumulative effects analysis has essentially been completed by virtue of the comprehensive nature in which direct and indirect effects associated with implementing the various alternatives was presented. The analysis in this section primarily focuses on effects associated with reasonably foreseeable future events and/or actions regardless of what entity undertakes that action.

<u>Effects from Reasonably Foreseeable Future Refuge Activities</u>

As described in Chapters 3–5, cumulatively, there has been a substantial modification to native habitats surrounding the Refuge over time. Many of these modifications have resulted in the loss or degradation of important habitats, including coastal mixed woodland-grassland, sea cliff, and beach strand. The losses of these habitats and introduction of nonnative species have altered ecosystem processes. A variety of government and nongovernment agencies, including the U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, State of Hawai‘i, Kaua‘i County, and private landowners have worked to protect, enhance, and restore some of these habitats.

However, alterations and loss of native habitats continue at a landscape scale as challenges such as human development and climate change pose complex and persistent threats. Within this context, region-wide biological integrity may be at risk. Over time, the Refuge, although relatively small, may

become increasingly valuable for the persistence of native wildlife. Active improvement of Refuge habitats would increase or maintain the value of Refuge lands and waters for a wide variety of native fish and wildlife, and biological diversity. All of the alternatives would protect and maintain Refuge habitats valuable to wildlife. Additionally, the Service would improve the availability and quality of wildlife-dependent recreation, contributing to increased regional recreational opportunities.

Compared to Alternative A, the action alternatives present the potential for increased benefit to conservation of native species and to recreational users, because under these alternatives the Service would actively enhance larger blocks of wildlife habitat, enrich public use programs, and address access and safety issues related to transportation. Also, the action alternatives emphasize additional wildlife and habitat monitoring (e.g., population of focal species), which would enrich the ability of the Service to evaluate the consequences of management actions and perform adaptive management. Cumulative effects of the action alternatives would result in the conservation and slow restoration of a healthy and increasingly diverse native biological community (vegetation and wildlife) across the Refuge (see Section 6.4), and the continuation of a vibrant and highly valued public use program that provides visitors with a rare opportunity to observe a natural seabird colony and its residents at close range (see Section 6.5.2). The management program also preserves historic properties and cultural values and uses (see Section 6.5.4) (overall minor to intermediate positive effect).

Implementing the CCP would have overall beneficial effects to habitats, species, and the American public. In the context of all of the factors (both natural and human-caused) that negatively affect habitats and species (e.g., food availability, human disturbance, and contaminants) the positive contributions associated with CCP implementation do not represent a major (significant) effect.

Other Reasonably Foreseeable Events and Activities

Island-wide and regional conservation: Populations of nēnē, mōlī, ʻaʻo, and possibly other native species; and native plants, including some that are endangered, threatened, or are species of special concern, would be expected to increase elsewhere on Kauaʻi and within the main Hawaiian Islands due to additional conservation efforts such as those of the Kauaʻi Endangered Seabird Recovery Project, Pacific Rim Conservation, and PMRF-BASH.

Regional development and transportation infrastructure: Kīlauea Town has pursued a slow growth development strategy, which is reflected in both the Kīlauea Town Plan and the Kauaʻi County General Plan. Nevertheless, some development concepts have advanced in recent years including, but not limited to, the following:

- Kaua'i County recently entered into an agreement with a private nonprofit enterprise to create an agriculture park on 70-acre parcel on the east side of Kīlauea Road near its intersection with Kāhili Quarry Road. The proposed agricultural park would be used as an educational community facility to encourage local farming. A farmers' market may also be located onsite and parking facilities for visitors are currently planned. Work on this development would start no earlier than 2015.
- The Hunt Development Group has submitted plans to Kaua'i County for a shopping center at the intersection of a new town entrance from Kuhio Highway west of Kolo Road to the Post Office road in the center of Kīlauea Town. Work on this development would start no earlier than 2015.
- The Anaina Hou Community Park is a new, multi-use attraction located across Kuhio Highway from the town just west of the intersection with Kolo Road. The attraction consists

of a playground, skatepark, walking trail, miniature golf course, Kaua‘i Bus Park and Ride facility, bike rental, weekly farmers’ market, and café. Anaina Hou plans to add a conference facility, theater, outdoor pavilion, and commercial kitchen to its facilities. Additionally, the Pu`ukumu School may be relocated to Anaina Hou. Work on these projects would start no earlier than 2015.

In addition to new commercial and community facilities, residential growth is likely. The Kīlauea Town Plan indicates an area north and west of the center of Kīlauea Town, sometimes referred to as the Plateau, as an area capable of absorbing medium- to high-density residential development.

As a result of proposed developments, the traffic profile for Kīlauea Town would likely be altered as the roadway network would have to accommodate more local traffic. A bypass road is being considered in order to alleviate traffic through the main part of town along Kīlauea Road. Other transportation-related developments within the immediate vicinity of the Refuge include a proposed bicycle/pedestrian path system along the north shore of Kaua‘i and expanded coverage by Kaua’i Bus, the regional transit system.

Minor to intermediate cumulative impacts to transportation, traffic, visitation, visitor experience, and potentially wildlife would be expected under implementation of any of the CCP alternatives, in combination with one or more of the above-described related projects. For example, the development of the agriculture park could potentially affect the Refuge by (1) creating an attraction for wildlife, particularly the nēnē; (2) increasing traffic; (3) providing Refuge parking during nonfarmers’ market times; (4) facilitating more cooperation and collaboration with local farmers; and (6) garnering community assistance with management at Kāhili Beach. Another example of cumulative impacts would result from the bypass road. Given that 25 percent of traffic utilizing Kīlauea Road results from vehicles destined for the Refuge, potential benefits of a bypass for visitors (Refuge and non-Refuge) and local residents would be anticipated.

Under all alternatives, as referenced in Section 2.3.1, the Refuge would continue to coordinate with partners and stakeholders on regional development activities. Additionally, implementation of the transportation components of the CCP would be further analyzed through a separate and subsequent transportation implementation study, which would incorporate the cumulative effects of development projects and potential new Refuge infrastructure.

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Appendices A-J

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Appendix A. Appropriate Use Findings

A.1 Introduction

The Appropriate Refuge Uses policy (603 FW 1) outlines the process that the Service uses to determine when general public uses on refuges may be considered. Priority public uses previously defined as wildlife-dependent uses (hunting, fishing, wildlife observation and photography and environmental education and interpretation) under the National Wildlife Refuge System Improvement Act of 1997 are generally exempt from appropriate use review. Other exempt uses include those situations where the Service does not have adequate jurisdiction to control the activity and refuge management activities. In essence, the Appropriate Refuge Uses policy provides refuge managers with a consistent procedure to first screen and then document decisions concerning a nonpriority public use. When a use is determined to be appropriate, a refuge manager must then decide if the use is compatible before allowing it on a refuge. For purposes of this CCP an "appropriate use" must meet at least one of the following three conditions:

- The use is a wildlife-dependent recreational use as identified in the Refuge Improvement Act.
- The use involves the take of fish and wildlife under state regulations.
- The use has been found to be appropriate as specified in Section 1.11 of the policy and documented on FWS Form 3-2319.

During the CCP process, the refuge manager evaluated all existing and proposed Refuge uses for Kīlauea Point National Wildlife Refuge that are associated with the Preferred Alternative (Alternative D). Documentation of appropriateness findings for wildlife-dependent uses is not included in this appendix because wildlife-dependent uses are appropriate by definition. They are, however, evaluated for compatibility in Appendix B, Compatibility Determination. All other Refuge uses were evaluated using the criteria described in policy and listed on FWS Form 3-2319. The table below shows the uses evaluated and appropriateness findings made by the refuge manager. Additional documentation is included in this appendix for each use identified in the table.

Table A-1. Summary of Appropriate Use Findings

Refuge Use	Appropriate?
Camping	No
Fires	No
Dogs, Cats, and Other Pets	No
Dogs (Kāhili Quarry)	Yes
Bicycling, Horseback Riding, Motorcycling, and Off-Road Vehicle Use on Trails	No
Picnicking, Beach Sports, and Organized Social Gatherings	No
Collecting Plant Materials and Other Natural Resources	No
Commercial Wildlife and Landscape Filming and Photography	Yes
Commercially Guided Tours	Yes
General Access for Off-Refuge Stream, Beach, and Ocean Uses (Kāhili Quarry)	Yes
Research, Survey, and Scientific Collections	Yes
Traditional Cultural Practices	Yes

Finding of Appropriateness of a Refuge Use

Refuge Name: Kīlauea Point National Wildlife Refuge

Use: Camping

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		**X**
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?		**X**
(h) Will this be manageable in the future within existing resources?		**X**
(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?		**X**
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see 603 FW 1, section 1.6D. for description), compatible, wildlife-dependent recreation into the future?		**X**

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes __X__ No _____

When the refuge manager finds the use **appropriate** based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate__X__ Appropriate_____

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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Finding of Appropriateness of a Refuge Use

Supplement to FWS Form 3-2319

Further Explanation of Answers Provided for the Decision Criteria:

Project: Camping

Summary: The uses evaluated herein for appropriateness address camping on the Refuge, which may be defined to include the following: occupying a specific area, erecting a tent or other shelter, and sleeping overnight onsite, sometimes for multiple nights. Associated activities may include preparing and eating food, and other activities at or near the campsite.

For the findings listed on FWS Form 3-2319 and if deemed necessary, a justification has been provided below:

(a) Do we have jurisdiction over the use?
The area proposed for this use lies within Kīlauea Point National Wildlife Refuge (NWR or Refuge). The U.S. Fish and Wildlife Service (Service) owns and administers the Refuge and, consistent with Title 50 of the Code of Federal Regulations ("Wildlife and Fisheries"), has jurisdiction over public uses of the Refuge.

(e) Is the use consistent with goals and objectives in an approved management plan or other document?
Service policy on Appropriate Refuge Uses (603 FW 1) states, "General public uses that are not wildlife-dependent recreational uses (as defined by the Improvement Act) and do not contribute to the fulfillment of refuge purposes or goals or objectives as described in current refuge management plans are the lowest priorities for refuge managers to consider. These uses are likely to divert refuge management resources from priority general public uses or away from our responsibilities to protect and manage fish, wildlife, and plants, and their habitats. Therefore, both law and policy have a general presumption against allowing such uses within the Refuge System."

Camping commonly involves occupying a specific area, possibly erecting a tent or other shelter, preparing and eating food, enjoying other activities at or near the campsite, and sleeping overnight onsite, sometimes for multiple nights. Camping has many effects on the environment, habitat, and wildlife. These include soil compaction, reduction in the surface organic (humus) layer, and erosion; vegetation trampling, other damage, and removal and reduction in natural regeneration (Hammitt and Cole 1998). These effects vary based on the frequency of use and the durability of soils and vegetation at campsites (Cole 1995). As occurs with other visitors, the mere presence of campers in a wildlife area can cause stress and disturbance to wildlife, and can frighten birds off nests, affecting their reproductive success (Ream 1976). Camping can also alter the species composition of local plant and animal communities (favoring plants that can tolerate more abuse, and animals, often generalists, that are more tolerant of human disturbance) and a reduction in species richness (Hammitt and Cole 1998).

Camping could involve transporting, storing, preparing, and eating human food on the Refuge. This could result in an increase in litter and a buildup of food scraps, and could increase the potential for direct feeding of wildlife. These foods would likely attract undesirable pests and predators (e.g., cats

and rats) to the Refuge. The presence of food could also attract native wildlife species, reducing their fear of humans and habituating them more to people and human foods. This can result in adverse impacts for both wildlife and humans. Visitors contribute to wildlife mortality by feeding birds. For example, feeding causes endangered nēnē to beg at road-sides and parking lots and approach vehicles on highways, increasing bird vehicular injuries and deaths. Road casualties are a major cause of nēnē mortality at two Hawai‘i National Parks (55 deaths from 1989 to 1999) (USFWS 2004) and on or adjacent to Kīlauea Point NWR (20 deaths 2010 to 2014) (USFWS unpublished).

Exposing wildlife to human foods could also reduce their foraging on natural foods and cause young wildlife not to fully develop critical foraging skills, potentially decreasing their survivability in areas and at times when such foods were less or not available. Potentially, human foods could also sicken wildlife or reduce their fitness and affect growth, reproductive potential, and survivability (Heiser undated).

Any campfires or nighttime lighting (e.g. lanterns) used by campers could cause petrels returning from foraging all day at sea to become disoriented and not be able to find their burrows and young. Fledglings could similarly become disoriented in their initial flights to the sea and circle such lights until exhausted or crash into obstacles.

Because of the adverse impacts this use could cause for native habitats and wildlife, and potential for conflicts with visitors that are engaged in wildlife-dependent uses (e.g., fishing, wildlife observation and photography), it would be inconsistent with goals 1, 2, 4, and 6 in the draft CCP.

(g) Is the use manageable within available budget and staff?
(h) Will this be manageable in the future within existing resources?
Two areas of the Refuge are open to the general public. There are no camping or related facilities at either area. Almost all public use on the Refuge occurs at Kīlauea Point/Peninsula. This area is very limited in size, has no campsites, picnic tables, or fire rings, and is open during daylight hours only. Kāhili Quarry, the other Refuge area open to general public use, has no designated parking, campsites, picnic tables, fire rings, potable water, toilets, or recycling or garbage cans. This area has been heavily impacted by many years of uncontrolled vehicle use, camping, squatting, and other types of public use. Soils are compacted, the area is sparsely vegetated, and it has several fire pits, trash, and abandoned motor vehicles. Resources needed to manage an overnight camping program that adequately provides for public and employee sanitation and safety, without disturbing or harming focal wildlife species, would divert existing and future resources from accomplishing priority Refuge tasks, including serving visitors participating in priority, wildlife-dependent public uses.

(i) Does the use contribute to the public’s understanding and appreciation of the Refuge’s natural or cultural resources, or is the use beneficial to the Refuge’s natural or cultural resources?
Potentially, visitors engaged in camping could gain an enhanced understanding and appreciation for the Refuge’s natural and cultural resources. However, for the reasons discussed earlier, this use would not be beneficial to the Refuge’s natural resources and it would be expected to have no benefits for cultural resources. This use does not require the presence of wildlife. There are many other areas on Kaua‘i, including on the North Shore, where this use could occur and is allowed.

(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?

As noted above, camping commonly involves occupying a specific area, possibly erecting a tent or other shelter onsite, and potentially staying in place for multiple nights. Almost all public use on the Refuge occurs at Kīlauea Point/Peninsula. A campsite would remove the underlying area for use by other visitors who are attempting to enjoy wildlife-dependent public uses at the Kīlauea Point/Peninsula. Campers would also compete with other visitors for the limited parking spaces, toilets, and potable water available onsite. Camping-related wildlife disturbance and human food associated with camping could alter wildlife behavior or health and these effects would diminish the quality of experience for other visitors.

As noted above, Kāhili Quarry has no designated parking, campsites, picnic tables, fire rings, potable water, toilets, or recycling/garbage cans. Camping at the Quarry would cause continued degradation of the area's environmental quality. As at the Kīlauea Point/Peninsula, campers at the Quarry would occupy areas that could otherwise be used by visitors who were attempting to enjoy wildlife-dependent public uses such as wildlife observation and photography and fishing. Camping-related wildlife disturbance and human food associated with camping could alter wildlife behavior or health and these effects would diminish the quality of experience for other visitors.

For these reasons, camping would impair the Refuge's ability to provide quality, wildlife-dependent public use opportunities (including wildlife observation and photography and environmental education and interpretation), and reduce the potential to provide quality, compatible, wildlife-dependent recreation into the future.

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Finding of Appropriateness of a Refuge Use

Refuge Name: Kīlauea Point National Wildlife Refuge

Use: Fires

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		**X**
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?		**X**
(h) Will this be manageable in the future within existing resources?		**X**
(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?		**X**
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see 603 FW 1, section 1.6D. for description), compatible, wildlife-dependent recreation into the future?		**X**

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes __X__ No _____

When the refuge manager finds the use **appropriate** based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate__X__ Appropriate_____

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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02/06

Finding of Appropriateness of a Refuge Use

Supplement to FWS Form 3-2319

Further Explanation of Answers Provided for the Decision Criteria:

Project: Fires

Summary: The uses evaluated herein for appropriateness address building of fires on the Refuge, which may be defined to include the building of open fires on the ground, within fire rings, or pits, using either natural plant materials or briquettes, compressed sawdust logs, etc. The use of portable stoves or barbecues, in which burning materials are enclosed and kept off the ground, is allowed at Kāhili Quarry in association with fishing (see Fishing compatibility determination, Stipulations Necessary to Ensure Compatibility).

For the findings listed on FWS Form 3-2319 and if deemed necessary, a justification has been provided below:

(a) Do we have jurisdiction over the use?
The area proposed for this use lies within Kīlauea Point National Wildlife Refuge (NWR or Refuge). The U.S. Fish and Wildlife Service (Service) owns and administers the Refuge and, consistent with Title 50 of the Code of Federal Regulations ("Wildlife and Fisheries"), has jurisdiction over public uses of the Refuge.

(e) Is the use consistent with goals and objectives in an approved management plan or other document?
Campfires could cause ʻaʻo and ʻuaʻu kani returning from foraging all day at sea to become disoriented and not be able to find their burrows and young. Fledglings could similarly become disoriented in their initial flights to the sea and circle such lights until exhausted or crash into obstacles. Fires may also spread to vegetation, destroying habitat for ground-nesting birds. Campfires may also be used to cook food. The presence of food and food scraps could attract cats, rats, and other predators of seabirds and their eggs. Because of the adverse impacts this use could cause for native habitats and wildlife, this use is would be inconsistent with goals 1, 2, 4, and 6 in the draft CCP.

(g) Is the use manageable within available budget and staff?
(h) Will this be manageable in the future within existing resources?
Two areas of the Refuge are open to general public: Kīlauea Point/Peninsula and Kāhili Quarry on Mōkōlea Point. Fires would most often be associated with camping, picnicking, and night fishing. There are no camping or picnicking facilities at either area, and these activities would not be allowed under the CCP. Fishing, including night fishing, is allowed in accordance with State regulations at Kāhili Quarry. Kāhili Quarry has been heavily impacted by many years of uncontrolled vehicle use, camping, squatting, and other types of public use. Soils are compacted, the area is sparsely vegetated, and it has several fire pits, trash, and abandoned motor vehicles. Resources needed to manage camping and picnicking that adequately provide for public and employee sanitation and safety, without disturbing or harming focal wildlife species, would divert existing and future resources from accomplishing priority Refuge tasks, including serving visitors participating in priority, wildlife-dependent public uses.

(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?
For the reasons discussed in section (e) above, this use would not be beneficial to the Refuge's natural resources and it would be expected to have no benefits for cultural resources. This use does not require the presence of wildlife. There are many other areas on Kaua'i, including on the North Shore, where this use could occur and is allowed.

(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?
As noted above, building of fires is typically associated with camping, picnicking, and night fishing at Kāhili Quarry. The Quarry has no designated parking, campsites, picnic tables, fire rings, potable water, toilets, or recycling or garbage cans. Camping and picnicking, including fire building, at the Quarry would cause continued degradation of the area's environmental quality. In addition, campers at the Quarry would occupy areas that could otherwise be used by visitors who were attempting to enjoy wildlife-dependent public uses. Camping-related wildlife disturbance, including building fires, could alter wildlife behavior or health and these effects would diminish the quality of experience for other visitors.

For these reasons, building fires would impair the Refuge's ability to provide quality, wildlife-dependent public use opportunities (including wildlife observation and photography and environmental education and interpretation), and reduce the potential to provide quality, compatible, wildlife-dependent recreation into the future.

Finding of Appropriateness of a Refuge Use

Refuge Name: Kīlauea Point National Wildlife Refuge

Use: Dogs, cats, and other pets

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		**X**
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?	**X**	
(h) Will this be manageable in the future within existing resources?	**X**	
(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?		**X**
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see 603 FW 1, section 1.6D. for description), compatible, wildlife-dependent recreation into the future?		**X**

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ___ No__X__

When the refuge manager finds the use **appropriate** based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate__X__ Appropriate_____

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

Finding of Appropriateness of a Refuge Use

Supplement to FWS Form 3-2319

Further Explanation of Answers Provided for the Decision Criteria:

Project: Dogs, cats, and other pets

Summary: The uses evaluated herein for appropriateness address bringing pets onto the Refuge. This includes transport of pets to the Refuge, pet walking on the Refuge (whether leashed or under voice command), and allowing pets to run freely on the Refuge. Pets include dogs, cats, and other animals whether domestic, feral, wild, or hybrid, either accompanied or not accompanied by an owner. The following are exceptions to the uses evaluated herein: (1) legitimate, leashed guide animals; and (2) penned or leashed dogs at Kāhili Quarry in association with fishing or access to off-Refuge areas (Kīlauea River, Kīlauea Bay, and Kāhili Beach). See separate appropriate use finding and compatibility determination for dog walking (Kāhili Quarry).

For the findings listed on FWS Form 3-2319 and if deemed necessary, a justification has been provided below:

(a) Do we have jurisdiction over the use?
The area proposed for these uses lies within Kīlauea Point National Wildlife Refuge (NWR or Refuge). The U.S. Fish and Wildlife Service (Service) owns and administers the Refuge and, consistent with Title 50 of the Code of Federal Regulations ("Wildlife and Fisheries"), has jurisdiction over public uses of the Refuge.

(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?
Walking or otherwise having pets on refuges is not prohibited by laws and regulations. However, in the absence of specific authorization, it is a violation of regulations to introduce, liberate, or place an animal taken elsewhere, including a pet, on a refuge ("Introduction of plants and animals," 50 C.F.R. 27.52). The Code of Federal Regulations also states that no dog shall be permitted to roam at large on refuge lands (50 CFR 26.21(b)).

Allowing a nonnative species with high potential to disturb and/or kill the Refuge's native wildlife would run counter to Refuge purposes and violate requirements of the National Wildlife Refuge System Administration Act of 1966, as amended (16 U.S.C. 668dd-668ee). The Administration Act prohibits uses on a refuge that would materially interfere with or detract from refuge purposes (i.e., allowed uses must be compatible).

(c) Is the use consistent with applicable executive orders and Department and Service policies?
There are no Executive orders or Department or Service policies that prohibit pets on national wildlife refuges. In fact, Service policy on "Field Trials" (631 FW 5) provides guidance for permitting field dog trials on refuges when such trials are compatible and support hunting programs. The policy states that such trials can, "…enhance tradition and quality and reduce the incidence of downed but unretrieved game." However, the Refuge does not have a hunting program.

For the reasons discussed above, allowing these uses on the Refuge would violate Service "Compatibility" policy (603 FW 2).

(d) Is the use consistent with public safety?
Dogs have the potential to present a safety hazard to other visitors. Dogs maintain their instincts to hunt and chase, and they may attempt to chase or attack strangers if not kept under physical control. Dogs can bite humans and cats can scratch and bite humans. According to Holmquist and Elixhauser (2010), over 4 million people in the U.S. are bitten by dogs each year. These animals can also carry rabies and other diseases that are transmittable to humans. In a wildlife-rich environment, with its stimulating sights, sounds, and smells, pets may become excited and less controllable, increasing hazards to wildlife, other pets, and people. Allowing pets onto highly visited portions of the Refuge such as Kīlauea Point (Point) or the cul-de-sac (turnaround) at the end of Kīlauea Road (Overlook) would increase public safety risks.

(e) Is the use consistent with goals and objectives in an approved management plan or other document?
Dogs, cats, and potentially other pets can pose serious risks to native habitat and wildlife, especially species that nest on or in the ground, or in low vegetation, and those that evolved in the absence of terrestrial mammalian predators. Domestic dogs have retained instincts to hunt and chase (Sime 1999) and dogs can chase and kill wildlife (Knight and Cole 1995). Dogs can also disrupt roosting, foraging, and breeding activities among birds, and flush birds from nests (Thomas 2000, Sime 1999). Ground-dwelling birds appear to be most affected. The mere presence of a dog can cause stress (evidenced by an increased heart rate [Knight and Cole 1995]) or other disturbance to wildlife. When a dog accompanies a human, the dog can exacerbate the disturbance effects of the human. In a study of disturbance to birds in natural areas, Banks and Bryant (2007) found that on-leash dog walking caused significant reductions in diversity and abundance of birds, substantially more than when humans walked the same trails without dogs. This occurred even in areas where dog walking was frequent. Also, dog walkers are apparently more likely to leave designated paths, increasing the potential for wildlife disturbance.

When dogs are running free, off-leash, they cause even more wildlife disturbance than when being walked on-leash (Blanc et al. 2006). Free-roaming dogs can harass, injure, or kill wildlife. Dogs have been known to attack and bite ʻīlio-holo-i-kauaua, which can injure these critically endangered animals and potentially transmit diseases (Braun 2003, MMC et al. 2003). Dogs can also transport parasites and nonnative seeds into wildlife habitat, and transmit diseases to wildlife (e.g., distemper, parvovirus, rabies, and plague) (Sime 1999). In a wildlife-rich environment, with its stimulating sights, sounds, and smells, not all dogs are controllable with voice commands.

Like dogs, domestic and feral cats have retained their ancestral hunting behaviors and are believed to kill hundreds of millions of birds in the United States each year (Coleman et al. 1997). Ground-nesting and ground-feeding birds, and eggs, nestlings, and fledglings are most susceptible to cat predation (Rauzon 1985, ABC undated). Where cats have been released on islands, they have devastated seabird populations (Rauzon 1985, ABC undated). Free-roaming cats have killed ʻaʻo at nesting colonies on Kauaʻi (Kauaʻi Endangered Seabird Recovery Project 2014). Cats can also transmit diseases to wildlife (e.g., feline distemper, feline leukemia virus, rabies, and an immune deficiency disease) (Coleman et al. 1997) and toxoplasmosis (NOAA undated). Toxoplasmosis can be particularly harmful to pregnant women and babies and is known to have been transmitted to endangered ʻīlio-holo-i-kauaua on Kauaʻi, resulting in the death of several seals (Dawson 2010). Free-roaming cats on the Refuge would be expected to disturb and potentially kill seabirds.
See further discussion on negative impacts of dogs and cats on native wildlife in Chapter 4 of the draft CCP.

Because of the adverse impacts dogs, cats, and potentially other pets can have on native habitats and wildlife on the Refuge (especially species that nest on or in the ground, or in low vegetation, and those that evolved in the absence of terrestrial mammalian predators) these uses would not support any of the Refuge's draft goals and would be inconsistent with draft goals 1, 2, 4, and 6.

(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?

Bringing dogs or other pets onto the Refuge would not contribute to the public's understanding and appreciation of the Refuge's natural and cultural resources. For the reasons discussed earlier, these uses would not be beneficial to the Refuge's natural resources and they would be expected to have no benefits for cultural resources. This use does not require the presence of wildlife. There are many other areas on Kaua'i, including on the North Shore, where this uses could occur and is allowed.

(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?

For the reasons discussed in criterion (e) above, bringing dogs or other pets onto the Refuge would potentially impact wildlife and their habitat by disturbing or killing wildlife, transmitting diseases, and transporting parasites or nonnative seeds. As discussed in criterion (d) above, these uses can also pose safety risks to the public. Therefore, this use would be expected to impair the Refuge's existing wildlife-dependent recreational uses (including wildlife observation and photography and environmental education and interpretation), and reduce the potential to provide quality, compatible, wildlife-dependent recreation into the future.

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Finding of Appropriateness of a Refuge Use

Refuge Name: Kīlauea Point National Wildlife Refuge

Use: Dogs (Kāhili Quarry)

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		**X**
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?	**X**	
(h) Will this be manageable in the future within existing resources?	**X**	
(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?		**X**
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see 603 FW 1, section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	**X**	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ___ No__X__

When the refuge manager finds the use **appropriate** based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ Appropriate__X__

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

Finding of Appropriateness of a Refuge Use

Supplement to FWS Form 3-2319

Further Explanation of Answers Provided for the Decision Criteria:

Project: Dog Walking (Kāhili Quarry)

Summary: The use evaluated herein for appropriateness addresses leashed dogs at Kāhili Quarry in association with fishing at Kāhili Quarry, and with access to off-Refuge areas (Kīlauea River, Kīlauea Bay, and Kāhili Beach). See compatibility determinations for fishing and general access for off-Refuge stream, beach, and ocean uses.

For the findings listed on FWS Form 3-2319 and if deemed necessary, a justification has been provided below:

(d) Is the use consistent with public safety?
Dogs have the potential to present a safety hazard to other visitors. Dogs maintain their instincts to hunt and chase, and they may attempt to chase or attack strangers if not kept under physical control. According to Holmquist and Elixhauser (2010), over 4 million people in the U.S. are bitten by dogs each year. These animals can also carry rabies and other diseases that are transmittable to humans. In a wildlife-rich environment, with its stimulating sights, sounds, and smells, dogs may become excited and less controllable, increasing hazards to wildlife, other pets, and people.

Dogs would only be permitted within designated areas at Kāhili Quarry (Quarry) in association with wildlife-dependent uses (fishing, wildlife observation and photography) and access to off-Refuge areas (Kīlauea River, Kīlauea Bay, and Kāhili Beach). Dogs would be required to be on a short leash (no longer than 8 feet) at all times, or in a secure pen or crate. Feces would diminish the quality of other visitors' experiences and could potentially spread disease to wildlife. Therefore they must be removed from the Refuge and disposed of properly. The Refuge does not provide receptacles for animal waste. Restrictions on this activity would be clearly posted at the Quarry entrance and other locations and on the Refuge website.

Westgarth et al. (2010) found that negative interactions between people and dogs are reduced when dogs are leashed. By maintaining control of dogs, public safety risks would be reduced. Additionally, the number of visitors at the Quarry is limited by the rough access road and lack of drinking water, toilets, or making other improvements onsite, decreasing the likelihood that dog(s) would have a negative interaction with visitors.

(e) Is the use consistent with goals and objectives in an approved management plan or other document?
Dogs can pose serious risks to native habitat and wildlife, especially species that nest on or in the ground, or in low vegetation, and those that evolved in the absence of terrestrial mammalian predators. Domestic dogs have retained instincts to hunt and chase (Sime 1999) and dogs can chase and kill wildlife (Knight and Cole 1995). Dogs can also disrupt roosting, foraging, and breeding activities among birds, and flush birds from nests (Thomas 2000, Sime 1999). Ground-dwelling birds appear to be most affected. The mere presence of a dog can cause stress (evidenced by an increased heart rate [Knight and Cole 1995]) or other disturbance to wildlife. When a dog accompanies a

human, the dog can exacerbate the disturbance effects of the human. In a study of disturbance to birds in natural areas, Banks and Bryant (2007) found that on-leash dog walking caused significant reductions in diversity and abundance of birds, substantially more than when humans walked the same trails without dogs. This occurred even in areas where dog walking was frequent. Also, dog walkers are apparently more likely to leave designated paths, increasing the potential for wildlife disturbance. When dogs are running free, off-leash, they cause even more wildlife disturbance than when being walked on-leash (Blanc et al. 2006). Free-roaming dogs can harass, injure, or kill wildlife. Dogs have been known to attack and bite ʻīlio-holo-i-kauaua, which can injure these critically endangered animals and potentially transmit diseases (Braun 2003; MMC et al. 2003). Dogs can also transport parasites and nonnative seeds into wildlife habitat and transmit diseases to wildlife (e.g., distemper, parvovirus, rabies, and plague) (Sime 1999). In a wildlife-rich environment, with its stimulating sights, sounds, and smells, not all dogs are controllable with voice commands. See further discussion on negative impacts of dogs on native wildlife in Chapter 4 of the draft CCP.

Because of the potential for adverse impacts on native habitats and wildlife on the Refuge (especially species that nest on or in the ground, or in low vegetation, and those that evolved in the absence of terrestrial mammalian predators), the presence of dogs at Kāhili Quarry would not support any of the Refuge's draft goals. However, the potential for and severity of impacts from dogs can be reduced, mitigating the overall effect on Refuge wildlife, by ensuring that dogs are always on leash and remain within the designated public use area located within the Quarry area along the water, below the cliffs at Mōkōlea Point. The relatively low wildlife value within the designated public use area indicates that the likelihood of disturbance to wildlife from dogs on leash to be low.

The Refuge is aware that some visitors already disregard Refuge and Kauaʻi County regulations requiring dogs to be on leash and the requirement of dog owners to remove and dispose of their pets' feces from public property. Compliance with stipulations related to this use would be monitored on an on-going basis. If monitoring indicates routine noncompliance or compatibility conflicts, the Service would evaluate the need for limiting or prohibiting this use.

(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?

Dog walking of the Refuge would make no contribution to the public's understanding and appreciation of the Refuge's natural and cultural resources. However, it is expected that visitors either bring their dogs in conjunction with the wildlife-dependent uses of wildlife observation, photography, and fishing, or would enjoy some wildlife observation and photography ancillary to walking dogs. The Refuge would use this opportunity to reach out to dog owners, to educate them about how to minimize the effects of dogs on wildlife, and to encourage them to observe wildlife and to learn about the National Wildlife Refuge System.

For the reasons discussed earlier, these uses would not be beneficial to the Refuge's natural resources and they would be expected to have no benefits for cultural resources. It's important to note that these uses do not require the presence of wildlife and do not need to occur at Kīlauea Point NWR. There are many other areas on Kauaʻi, including on the North Shore, where these uses could occur and are allowed.

(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?

Since dogs would be required to be on a short leash at all times and only allowed within the designated public use area at the Quarry, this use would not be expected to impair the Refuge's existing wildlife-dependent recreational uses (including fishing) or reduce the potential to provide quality, compatible, wildlife-dependent recreation into the future.

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Finding of Appropriateness of a Refuge Use

Refuge Name: Kīlauea Point National Wildlife Refuge

Use: Bicycling, Horseback Riding, Motorcycling, and Off-Road Vehicle Use on Trails

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?		**X**
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		**X**
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?	**X**	
(h) Will this be manageable in the future within existing resources?	**X**	
(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?		**X**
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see 603 FW 1, section 1.6D. for description), compatible, wildlife-dependent recreation into the future?		**X**

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ___ No__X__

When the refuge manager finds the use **appropriate** based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate__X__ Appropriate_____

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

Finding of Appropriateness of a Refuge Use

Supplement to FWS Form 3-2319

Further Explanation of Answers Provided for the Decision Criteria:

Project: Bicycling, Horseback Riding, Motorcycling, and Off-Road Vehicle Use on Trails

Summary: The uses evaluated herein for appropriateness include the following when they would occur on a pedestrian or other Refuge trail: riding a bicycle, including use of a mountain bike; riding or using a horse, donkey, burro, llama, or other pack animal; motorcycling, including use of a dirt bike, motor scooter, or other motorized bike, whether street legal or not; and use of a 3-wheeled, 4-wheeled, tracked, or other off-road vehicle (a.k.a. off-highway vehicle and all-terrain vehicle), whether street legal or not. For ease of reference, all of these uses are referred to herein as bicycling, horseback riding, motorcycling, and use of off-road vehicles.

Excluded from this evaluation are bicycling, horseback riding, and use of street-legal motorcycles and off-road vehicles on legitimate roads and parking areas that are open to the public where there would not be safety or wildlife conflicts (e.g., the cul-de-sac at the end of Kīlauea Road). Also excluded is limited horseback riding along a designated route in the Crater Hill area by owners of homesites and lots in Seacliff Plantation. This access and use was specifically and legally reserved; however, per terms of the easement, the Service will be able to "do all things deemed necessary and appropriate… to provide for the management, operation, and maintenance of a bird and wildlife sanctuary, including, but not by way of limitation, the right to erect fences, regulate entrance, and enforce all laws rules and regulation related to the management of the Bird & Wildlife Sanctuary."

For the findings listed on FWS Form 3-2319 and if deemed necessary, a justification has been provided below:

(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)? There are no laws or regulations that specifically prohibit bicycling or horseback riding on refuges. However, Federal regulations at 50 C.F.R. 27.31 ("General provisions regarding vehicles") prohibit, "Travel in or use of any motorized or other vehicles, including those used on air, water, ice, snow…on national wildlife refuges except on designated routes of travel…." The regulation goes on to say that, "The operation of a vehicle which does not bear valid license plates and is not properly certified, registered, or inspected in accordance with applicable State laws is prohibited." For purposes of this evaluation, these provisions would apply to motorcycling and use of off-road vehicles.

(c) Is the use consistent with applicable Executive orders and Department and Service policies? There are no Executive orders or Department or Service policies that specifically prohibit bicycling and horseback riding on national wildlife refuges. However, Executive Order 11644 of Feb 8, 1972 ("Use of off-road vehicles on the public lands"), as amended by EO 11989 of May 24, 1977, states in part that in determining whether to open areas and trails to off-road vehicles, agencies should consider, "…damage to soil, watershed, vegetation… harassment of wildlife or significant disruption of wildlife habitats…[and]…conflicts between off-road vehicle use and other existing or proposed recreational uses." Additionally, when an agency determines that, "…the use of off-road vehicles will cause or is causing considerable adverse effects on the soil, vegetation, wildlife, wildlife habitat

or cultural or historic resources…," the EO requires agencies to, "…immediately close such areas or trails to the type of off-road vehicles causing such effects…."

Implementation of EO 11644 is guided by Department policy ("Use of Off-Road Vehicles," 616 DM 1) and National Wildlife Refuge System (Refuge System) policy ("Off-Road Vehicles," 8 RM 7). Refuge System policy states in part that, "All lands within the National Wildlife Refuge System are closed to off-the-road use of vehicles by the general public, unless specifically designated as open to the use of off-road vehicles." Opening off-road areas or trails to off-road vehicle use requires a study of potential effects on Refuge resources, a positive compatibility determination, and compliance with requirements of the National Environmental Policy Act.

(d) Is the use consistent with public safety?
Because of their speed of travel, the narrowness of some Refuge trails, and the number of other Refuge visitors who use these trails, allowing these uses could generate safety problems for riders and other visitors (Thurston and Reader 2001).

(e) Is the use consistent with goals and objectives in an approved management plan or other document?
Bicycles, horses, motorcycles, and off-road vehicles all provide transportation and are alternatives to cars, trucks, and similar vehicles. These alternative transport modes differ from conventional passenger cars and trucks in that they can more easily navigate rough terrain and trails. However, when traveling off pavement, gravel, or other hardened surfaces, these alternative modes of transport can have a variety of effects. These include soil compaction, reduction in the surface organic (humus) layer, and erosion; trampling and other damage to vegetation, reduction in natural regeneration, and introduction and spread of nonnative plants and plant pathogens; and wildlife disturbance, including flushing and crushing of burrows (Pickering et al. 2010, Wimpey 2010, Switalski and Jones 2010, Snetsinger and White 2009, Landsberg et al. 2001, Jordan 2000, Hammitt and Cole 1998, Vandeman 1997, Wilson and Seney 1994, Weaver and Dale 1978). Because of their speed, bicycles, horses, motorcycles, and off-road vehicles can also cover more distance in the same amount of time as a pedestrian, thereby more quickly extending the areal extent of their environmental effects.

Mountain bicyclists are known to ride off-trail and create new (informal) trails, extending the impact zone of this use (Pickering et al. 2010, Wimpey 2010).

Because of their concentration of greater weight in smaller areas (their hooves), horses and riders can cause more damage to soils and vegetation and increase the potential for erosion when compared with impacts of some other trail users, including pedestrians (Hammitt and Cole 1998, Wilson and Seney 1994). Horses can also graze trailside vegetation and alter species composition by discouraging certain species through selective grazing, and can transport nonnative seeds into wildlife habitat (Jordan 2000, Hammitt and Cole 1998).

Motorcycling and use of off-road vehicles have similar environmental effects. Their weight and the spinning of vehicle tires can readily dislodge soil and vegetation and encourage erosion (Hammitt and Cole 1998). Also, motorcyclists and off-road vehicle users often seek out steeper, unstable slopes where their activities increase the potential for erosion (Hammitt and Cole 1998). These vehicles commonly generate considerable noise. Loud noise can stress wildlife, make them irritable, alter their natural behavior, and cause them to flush (Schubert and Smith 2000, Bowles 1995). Because of

their size and speed, motorcycles and off-road vehicles can also kill wildlife directly, through collision (Switalski and Jones 2010).

Because of the adverse impacts these uses could cause for native habitats and wildlife, and conflicts with other visitors on the Refuge, they would be inconsistent with draft Refuge goals 1, 2, 4, and 6.

(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?

In 1994, the Service completed a compatibility determination for reserved access rights by owners of homesites and lots in Seacliff Plantation. These rights include limited horseback riding along a designated route in the Crater Hill area. However, the 1994 document did not address bicycling, motorcycling, and use of off-road vehicles, or other horseback riding on pedestrian or other trails on the Refuge. This is the first time these uses have been proposed and analyzed.

(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?

Because of the nature of these uses, it is unlikely or incidental that visitors engaged in bicycling, horseback riding, motorcycling, and use of off-road vehicles would gain an enhanced understanding and appreciation for the Refuge's natural and cultural resources. For the reasons discussed earlier, these uses would not be beneficial to the Refuge's natural resources and they would be expected to have no benefits for cultural resources. These uses do not require the presence of wildlife. There are many other areas on Kaua'i, including on the North Shore, where these uses could occur and are allowed.

(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?

These uses can conflict with satisfaction by others who visit a natural area to observe or photograph wildlife or enjoy nature appreciation. These other visitors usually enjoy a higher quality experience in an uncrowded and relatively quiet setting, and the noise from motorized vehicles can be disruptive. Because of their speed, bicycles, motorcycles, and off-road vehicles can also alarm other visitors when they suddenly appear on the same trail. This is a special concern with bicycles because they move so quietly yet quickly (Thurston and Reader 2001, Vandeman 1997). Due to their large size and especially on narrow trails, horses can intimidate pedestrians and few people enjoy walking on paths where horse manure is common (Landsberg et al. 2001, Hammitt and Cole 1998). Because of such conflicts among these user groups, some parks and recreation areas design, construct, and maintain separate trail systems for these uses. Bicyclists, horseback riders, motorcyclists, and off-road vehicle riders would also compete with other visitors for use of the limited parking areas and other visitor amenities onsite. Disturbance to wildlife could alter wildlife behavior or flush wildlife and these effects would diminish the quality of experience for other visitors.

For these reasons, bicycling, horseback riding, motorcycling, and use of off-road vehicles would impair the Refuge's ability to provide quality, wildlife-dependent public use opportunities (including wildlife observation and photography, and environmental education and interpretation), and reduce the potential to provide quality, compatible, wildlife-dependent recreation into the future.

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Finding of Appropriateness of a Refuge Use

Refuge Name: Kīlauea Point National Wildlife Refuge

Use: Picnicking, Beach Sports, Organized Social Gatherings

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		**X**
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?	**X**	
(h) Will this be manageable in the future within existing resources?	**X**	
(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?		**X**
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see 603 FW 1, section 1.6D. for description), compatible, wildlife-dependent recreation into the future?		**X**

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ___ No__X__

When the refuge manager finds the use **appropriate** based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate__X__ Appropriate_____

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

Finding of Appropriateness of a Refuge Use

Supplement to FWS Form 3-2319

Further Explanation of Answers Provided for the Decision Criteria:

Project: Picnicking, Beach Sports, and Organized Social Gatherings

Summary: The uses evaluated herein for appropriateness include picnicking, beach sports, and organized social gatherings on Kīlauea Point National Wildlife Refuge (NWR or Refuge). Beach sports include, but are not limited to, volleyball, Frisbee, and kite flying. Kite-related activities include kite flying, kite surfing, and kite boarding. Organized social gatherings include, but are not limited to, weddings, music concerts, and arts and crafts fairs. For the findings listed on FWS Form 3-2319 and if deemed necessary, a justification has been provided below:

(a) Do we have jurisdiction over the use?
The area proposed for these uses lies within Kīlauea Point NWR. The U.S. Fish and Wildlife Service (Service) owns and administers the Refuge and, consistent with Title 50 of the Code of Federal Regulations ("Wildlife and Fisheries"), has jurisdiction over public uses of the Refuge.

(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?
There are no laws or regulations that specifically prohibit these activities on national wildlife refuges.

(c) Is the use consistent with applicable executive orders and Department and Service policies?
There are no Executive orders or Department or Service policies that specifically prohibit picnicking, beach sports, or organized social gatherings. However, the Service policy on Appropriate Refuge Uses (603 FW 1) states, "General public uses that are not wildlife-dependent recreational uses (as defined by the Improvement Act) and do not contribute to the fulfillment of refuge purposes or goals or objectives as described in current refuge management plans are the lowest priorities for refuge managers to consider. These uses are likely to divert refuge management resources from priority general public uses or away from our responsibilities to protect and manage fish, wildlife, and plants, and their habitats. Therefore, both law and policy have a general presumption against allowing such uses within the Refuge System."

Service policy does not encourage picnicking, although it is recognized to occur incidentally to the priority public uses described in the Refuge System Improvement Act of 1997. The Refuge does not provide amenities for any large-scale or organized gatherings for this activity. Allowing this activity would enable visitors to bring a picnic meal and eat, while not participating in wildlife-dependent recreation.

(e) Is the use consistent with goals and objectives in an approved management plan or other document?
Bringing human food onto the Refuge and picnicking onsite would result in an increase in litter and a buildup of food scraps and would increase the potential for direct feeding of wildlife. These foods would likely attract undesirable pests and predators (e.g., cats and rats) to the Refuge. The presence of food could also attract native wildlife species, reducing their fear of humans and habituating them more to people and human foods. This can result in adverse impacts for both wildlife and humans. Visitors contribute to wildlife mortality by feeding birds. For example, feeding causes endangered

nēnē to beg at road-sides and parking lots and approach vehicles on highways, increasing bird vehicular injuries and deaths. Road casualties are a major cause of nēnē mortality at two Hawai‘i National Parks (55 deaths from 1989 to 1999) (USFWS 2004) and on or adjacent to Kīlauea Point NWR (20 deaths 2010 to 2014) (USFWS unpublished).

Exposing wildlife to human foods could also reduce their foraging on natural foods and cause young wildlife not to fully develop critical foraging skills, potentially decreasing their survivability in areas and at times when such foods were less or not available. Potentially, human foods could also sicken wildlife or reduce their fitness and affect growth, reproductive potential, and survivability (Heiser undated).

Beach sports would likely alter the behavior of or otherwise disturb some wildlife on the Refuge. For example, studies have revealed that kite flying can stress shorebirds and cause them to flush (USFWS 2007, Hatch 1996). Observations on the Refuge in August 2011 suggest that some wildlife species may be curious about the presence of a kite and approach it. Other individuals may view a kite as an avian predator and attempt to drive it away (USFWS 1994). If kite flying resulted in flushing birds from nests, eggs or chicks could become more vulnerable to environmental stress or actual predators.

The intent of organized social gatherings such as music concerts and craft fairs is to attract large crowds to enjoy music or purchase goods. Weddings may also involve the gathering of a large number of people and involve the use of amplified music. Studies have revealed an increase in impacts to colonial seabirds (e.g., as reflected in increased vigilance behavior and reduced nesting success) as visitor numbers increase (Holmes et al. 2007, Beale and Monaghan 2004). Loud noise also increases human disturbance of wildlife (Blanc et al. 2006, Knight and Cole 1995). Loud noise can stress wildlife, make them irritable, alter their natural behavior, and cause them to flush (Bowles 1995). Drawing large, noisy crowds to the Kīlauea Point/Peninsula should be avoided due to wildlife disturbance.

Because of the adverse impacts these uses could cause for native habitats and wildlife, and conflicts with other visitors on the Refuge, these uses would be inconsistent with draft CCP goals 1, 2, and 4.

(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?
There has not been an earlier documented analysis of these uses. This is the first time that picnicking, beach sports, and organized social activities have been evaluated.

(g) Is the use manageable within available budget and staff?
Although it would further stretch limited staff resources focused on serving visitors participating in higher-priority, wildlife-dependent public uses, the Refuge has adequate budget and staff to manage picnicking, kite flying, music concerts, craft fairs, weddings, and collecting plant materials and other natural resources on the Refuge.

(h) Will this be manageable in the future within existing resources?
Although it would further stretch limited staff resources focused on serving visitors participating in higher-priority, wildlife-dependent public uses, it is expected that the Refuge will have adequate budget and staff in the future to manage picnicking, kite flying, music concerts, craft fairs, weddings, and collecting plant materials and other natural resources on the Refuge.

(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?

Picnicking, beach sports, and organized social gatherings would make no contribution to the public's understanding and appreciation of the Refuge's natural and cultural resources. For the reasons discussed earlier, these uses would not be beneficial to the Refuge's natural resources and they would be expected to have no benefits for cultural resources. It is important to note that none of these uses requires the presence of wildlife. There are many other areas on Kaua'i, including on the North Shore, where such uses could occur and are allowed.

(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?

Picnicking commonly involves people using a picnic table or spreading a blanket on the ground to lay out and eat a meal. Food may be prepared onsite using a barbeque, portable grill, or open fire. There are no picnic tables on the Refuge and using one of the few benches onsite for a picnic would occupy these limited spaces for a substantial amount of time, potentially prohibiting visitors from resting there. If a blanket were instead spread on the ground, it would remove the underlying area for the duration of the picnic for use by other visitors who were enjoying wildlife-dependent public uses. As noted above, human food associated with a picnic could also alter wildlife behavior or health and adversely affect the visitor experience. Like picnicking, kite flying could alter the behavior of or otherwise disturb some wildlife, thereby diminishing the visitor experience.

As noted above, the intent of music concerts and craft fairs is to attract large crowds. Holding a wedding can have a similar effect. Large crowds are often noisy. Almost all visitation at the Refuge occurs on the Kīlauea Point/Peninsula. This area is relatively small and crowding is already a problem during sanctioned special Refuge events. At such times, access to the Refuge and parking of vehicles can be problematic, and visitors' experience of wildlife in a relatively wild environment is likely already compromised. Drawing large, noisy crowds to the Kīlauea Point/Peninsula even more often would only worsen this situation.

Perhaps because it is in such a beautiful location, the Refuge routinely receives requests to hold weddings onsite. In response, the Refuge has developed a wedding policy. This policy does not allow what many people would expect at a traditional wedding ceremony, but it does not outright prohibit weddings. Instead, to reduce impacts to wildlife and other visitors, the policy clarifies that Refuge staff, volunteers, and equipment are not available to assist with weddings; any weddings held onsite must occur during regular open hours; and all wedding party guests are required to pay standard entrance fees. In addition, the following are not allowed: amplified music; throwing rice, bird seed confetti, etc.; tents, floral arrangements, arbors, stages, or other fixed structures; chairs or other furniture; and food and beverages (other than bottled water).

For the several reasons discussed above, traditional wedding ceremonies and all of the other uses evaluated herein would be expected to directly or indirectly impair the Refuge's ability to provide quality wildlife-dependent public use opportunities (including wildlife observation and photography, and environmental education and interpretation), and reduce the potential to provide quality, compatible, wildlife-dependent recreation into the future.

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Finding of Appropriateness of a Refuge Use

Refuge Name: Kīlauea Point National Wildlife Refuge

Use: Collecting Plant Materials and Other Natural Resources

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?		**X**
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		**X**
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?	**X**	
(h) Will this be manageable in the future within existing resources?	**X**	
(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?		**X**
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see 603 FW 1, section 1.6D. for description), compatible, wildlife-dependent recreation into the future?		**X**

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ___ No__X__

When the refuge manager finds the use **appropriate** based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate__X__ Appropriate_____

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

Finding of Appropriateness of a Refuge Use

Supplement to FWS Form 3-2319

Further Explanation of Answers Provided for the Decision Criteria:

Project: Collecting Plant Materials and Other Natural Resources

Summary: The uses evaluated herein for appropriateness are collecting plant materials (either living or nonliving) and other natural resources (for example, shells, feathers, bone) on Kīlauea Point National Wildlife Refuge (NWR or Refuge). As used herein, natural resource collecting involves such collections by members of the general public and does not include collecting as an element of traditional cultural practices by individuals of native Hawaiian heritage who have genealogical ties to the local community, that is, the Kīlauea and Kāhili Ahupuaʻa or surrounding ahupuaʻa including Namahana, Kalihiwai, Kalihikai, Waiakalua, and Pīlaʻa (Wilson and Jay 2010). Also see the appropriate use finding and compatibility determination for "Traditional Cultural Practices."

For the findings listed on FWS Form 3-2319 and if deemed necessary, a justification has been provided below:

(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?
(c) Is the use consistent with applicable executive orders and Department and Service policies?
In the absence of specific authorization, regulations prohibit collecting plant materials and other natural resources on refuges ("Disturbing, injuring, and damaging plants and animals," 50 C.F.R. 27.51).

(e) Is the use consistent with goals and objectives in an approved management plan or other document?
The effects associated with collection of plants, feathers, and potentially other natural resources would depend on whether collections were made from live organisms, whether they were native versus exotic species, the volume of materials collected, and the areas in which and times of day and year during which the collections occurred. If collected from live organisms, the survival of those individuals could be impacted. Collecting dropped or broken off plant materials or detached bird feathers could affect forage for herbivores and detritivores, cover and nesting materials for wildlife, and eventually impact replenishment of soil nutrients. Collecting could also cause disturbance and impact wildlife foraging, roosting, loafing, or nesting.

Three species of birds, including two listed species, construct burrows or nests on or within forest/shrubland duff (decaying leaf litter and branches on the ground, including hala and naupaka). The Refuge has substantial populations of burrow-nesting seabirds, and collectors walking through nesting colonies could easily crush burrows, destroy nests and eggs, and kill young or adult seabirds. Collectors could also trample native plants, accelerate erosion, and potentially introduce or spread exotic species, including invertebrates, plants, and invasive species. These impacts could adversely affect native fish, wildlife, plants, and their habitats; and would be of special concern in Refuge areas struggling with reestablishment of native plant communities.

Because of the adverse impacts these uses could cause for native habitats and wildlife, and conflicts with other visitors on the Refuge, this use would be inconsistent with draft CCP goals 1, 2, and 4.

(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?

Potentially, visitors engaged in collecting of plant materials and other natural resources could gain an enhanced understanding and appreciation for the Refuge's natural resources. For the reasons discussed earlier, these uses would not be beneficial to the Refuge's natural resources and they would be expected to have no benefits for cultural resources. It is important to note that this use does not require the presence of wildlife or, with the exception of collecting selected natural resources, wildlands. Additionally, there many other areas on Kaua'i, including on the North Shore, where this use is allowed.

(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?

If collection of plants, feathers, and potentially other natural resources were to occur outside of the primary public use areas on the Kīlauea Point/Peninsula, it would likely have few direct impacts on wildlife-dependent public uses. However, these outside areas are typically of high habitat value and greater wildlife impacts would be expected in these areas. Additionally, if other visitors saw people outside the designated public use zones collecting plants, feathers, and potentially other natural resources, they might be inclined to also stray and imitate these activities. This would create unwanted law enforcement issues, expose visitors to potentially dangerous situations, and increase the likelihood of wildlife and habitat impacts.

Literature Cited

Wilson, J. and J. Jay. 2010. Moku & Ahupua'a of Kaua'i Island Aha Kiole Advisory Committee. Mapping by IslandBreath. http://www.islandbreath.org/2010Year/04/100415kauaimokupuni.png.

Finding of Appropriateness of a Refuge Use

Refuge Name: Kīlauea Point National Wildlife Refuge

Use: Commercial Wildlife and Landscape Filming and Photography

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	**X**	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?	**X**	
(h) Will this be manageable in the future within existing resources?	**X**	
(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	**X**	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see 603 FW 1, section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	**X**	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ___ No__X__

When the refuge manager finds the use **appropriate** based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ Appropriate__X__

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

Finding of Appropriateness of a Refuge Use

Supplement to FWS Form 3-2319

Further Explanation of Answers Provided for the Decision Criteria:

Project: Commercial Wildlife and Landscape Filming and Photography

Summary: The proposed use evaluated herein for appropriateness is more fully described and evaluated in the compatibility determination (CD) for this use and the documents referenced in that CD. This use includes still and motion pictures, photographs captured using film and digital media, and audio recordings.

For the findings listed on FWS Form 3-2319 and if deemed necessary, a justification has been provided below:

(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?
This use would comply with applicable laws and regulations, including 50 C.F.R. 29.1 (May we allow economic uses on national wildlife refuges?). Through distribution of images or other recordings of native sea- and shorebirds, threatened and endangered species of plants and animals, and the Refuge's cultural heritage, commercial photography, filming, and audio recording have the potential to share Kīlauea Point's valuable natural and cultural resources with a larger audience over a greater geographic area. This could enhance public understanding, appreciation, and support for native fish, wildlife, plants, and their habitats, conservation, Kīlauea Point NWR, and the Refuge System. Where appropriately regulated to reduce or eliminate adverse effects, this would contribute to achievement of Refuge purposes and the Refuge System mission.

Permittees would be required to secure and maintain the currency of all necessary local and State licenses, permits, and approvals.

(c) Is the use consistent with applicable Executive orders and Department and Service policies?
This use would be consistent with applicable Executive orders and Department and Service policies. If found appropriate and determined compatible, commercial photography and videography outside of open areas and times would be authorized through issuance of a special use permit and permittees would be charged an appropriate fee. Fees would be charged, if necessary, following promulgation of final regulations implementing the Commercial Filming Act of 2000 (16 U.S.C. 460l-6d).

This use is also consistent with Service policy on Audio-Visual Productions (8 RM 16). That policy states that such productions can increase public understanding of America's wildlife and of the Service's role in managing and protecting natural resources through the Refuge System.

(d) Is the use consistent with public safety?
Some areas of the Refuge outside the Kīlauea Point/Peninsula (where almost all of the public use currently occurs) contain natural safety hazards. Permittees would be required to limit their use of the Refuge to specifically designated areas and access routes. With these conditions, this use would be consistent with public safety.

(e) Is the use consistent with goals and objectives in an approved management plan or other document?
The effects of this use upon biological resources would likely be associated with disturbance (e.g., sensitive wildlife and vegetation areas) or degradation (e.g., soil compaction). Stipulations necessary to ensure compatibility would be enforced to minimize impacts. This use may be denied or would be limited in space, time, or other manners such that effects on biological resources were avoided or greatly reduced. For example, areas that are open to this use would be evaluated on an annual, seasonal, and sometimes daily basis and would be influenced by wildlife use and habitat conditions.

It is expected that commercial recordings of Refuge sights and sounds would generate products that potentially would be broadly distributed through the market. To the extent that these images and recordings enhance public understanding and appreciation for the Refuge, Refuge System, native fish, wildlife, plants, and their habitats, cultural resources, and conservation, this use would support draft Refuge goals 4 and 5. This use would not be inconsistent with any draft Refuge goals and objectives.

(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?
Business and commercial photography have previously been evaluated for compatibility and were determined compatible.

(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?
As discussed earlier, commercial photography, filming, and audio recording have the potential to share Kīlauea Point's valuable natural and cultural resources, and the conservation story with a larger audience over a greater geographic area. This could enhance public understanding and appreciation for the Refuge's natural and cultural resources. This would be beneficial to those resources if it resulted in support for conservation of the Refuge's native fish, wildlife, plants, habitats and cultural heritage.

(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?
It is expected that the number of commercial photographers and videographers would not be large and their visits to the Refuge would not be frequent. Therefore, it's not expected that this use would impair existing wildlife-dependent recreation or reduce the potential for such uses into the future.

However, this use could adversely affect quality wildlife-dependent recreational and educational experiences by other visitors in some instances. For example, such effects could occur if a production company wished to film at the Refuge and that involved a large crew, and a substantial amount of time and equipment, or commercial photographers and videographers wanted to visit during Refuge special events, or they wished to conduct their activities in areas or at times closed to public use, but in full view of other visitors. In such cases, this use may be denied or would be limited in space, time, or other manners such that effects on other Refuge visitors were avoided or greatly reduced.

Finding of Appropriateness of a Refuge Use

Refuge Name: Kīlauea Point National Wildlife Refuge

Use: Commercially Guided Tours

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	**X**	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?	**X**	
(h) Will this be manageable in the future within existing resources?	**X**	
(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	**X**	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see 603 FW 1, section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	**X**	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ___ No__X__

When the refuge manager finds the use **appropriate** based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ Appropriate__X__

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

Finding of Appropriateness of a Refuge Use

Supplement to FWS Form 3-2319

Further Explanation of Answers Provided for the Decision Criteria:

Project: Commercially guided tours

Summary: The proposed use evaluated herein for appropriateness is more fully described and evaluated in the compatibility determination (CD) for this use and the documents referenced in that CD.

For the findings listed on FWS Form 3-2319 and if deemed necessary, a justification has been provided below:

(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?
This use would comply with applicable laws and regulations, including 50 C.F.R. 29.1 (May we allow economic uses on national wildlife refuges?). The Refuge currently experiences a significant amount of public use, almost all of which occurs on the Kīlauea Point/Peninsula. Commercially guided tours provide another opportunity for members of the public to enjoy the Refuge, perhaps as part of a larger birding, nature, or cultural or historic tour program that also visited areas elsewhere on Kaua‘i. During these tours, it is expected that the public would benefit from high-quality environmental and cultural interpretation and enjoy opportunities for wildlife observation and photography. These activities would provide good field opportunities to increase public understanding and appreciation for the Refuge System, Kīlauea Point NWR, sea- and shorebirds, endangered species, cultural resources, and the value of conservation. Where appropriately regulated to reduce or eliminate adverse effects, these activities would contribute to achievement of the Refuge’s purposes and the Refuge System mission.

Permittees would be required to secure and maintain the currency of all necessary local and State licenses, permits, and approvals.

(c) Is the use consistent with applicable Executive orders and Department and Service policies?
This use would be consistent with applicable Executive orders and Department and Service policies. If found appropriate and determined compatible, commercially guided tours would be authorized through issuance of a special use permit.

(d) Is the use consistent with public safety?
Due to the narrow road leading to the Kīlauea Point/Peninsula and small parking area with limited spaces, use of full-sized buses to bring large groups of visitors to the Refuge could create traffic and safety conflicts with other Refuge visitors. Permit conditions would limit permittees to use of medium-sized vans or smaller vehicles to transport their clients to the Refuge.

Permittees would also be required to limit their use of the Refuge to specifically designated areas and access routes, and understand and review with their clients Refuge rules and regulations and any hazardous conditions. A Refuge law enforcement monitoring program would help ensure compliance with these and other permit requirements. With these conditions, this use would be consistent with public safety.

(e) Is the use consistent with goals and objectives in an approved management plan or other document?
This use would not be inconsistent with any draft Refuge goals, and could potentially support goal numbers 4, 5, and 6 that address wildlife observation and photography, and environmental and cultural interpretation.

(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?
This use (guided tours) has previously been evaluated for compatibility and was determined compatible.

(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?
As discussed earlier, commercially guided tours at the Refuge would provide the public with high-quality environmental and cultural interpretation and opportunities for wildlife observation and photography. This would contribute to the public's understanding and appreciation for the Refuge's natural and cultural resources, and provide the building blocks of support for Refuge resources and management programs.

(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?
The Kīlauea Point/Peninsula area and existing facilities (e.g., parking area, visitor center, and contact station) are relatively small for the visitation the Refuge experiences (from 2010 to 2013, the visitor center averaged about 189,963 visitors per year). The number of vehicles that can be safely accommodated on the access road and in the parking area, and the number of visitors who can enjoy a quality, wildlife-dependent educational or recreational experience onsite, are limited. As long as permit conditions limited group sizes, it would not be expected that commercially guided tours would impair existing wildlife-dependent recreation or reduce the potential for such uses into the future. If necessary, the frequency of commercial tours could also be limited in the future and such operations could be prohibited during Refuge special events. Additionally, proposed new visitor facilities could address current capacity limitations.

Finding of Appropriateness of a Refuge Use

Refuge Name: Kīlauea Point National Wildlife Refuge

Use: General Access for Off-Refuge Stream, Beach, and Ocean Uses

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	**X**	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?	**X**	
(h) Will this be manageable in the future within existing resources?	**X**	
(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?		**X**
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see 603 FW 1, section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	**X**	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ___ No__X__

When the refuge manager finds the use **appropriate** based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ Appropriate__X__

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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Finding of Appropriateness of a Refuge Use

Supplement to FWS Form 3-2319

Further Explanation of Answers Provided for the Decision Criteria:

Project: General Access for Off-Refuge Stream, Beach, and Ocean Uses (Kāhili Quarry)

Summary: The use evaluated herein for appropriateness is use of the Refuge at Kāhili Quarry/Mōkōlea Point to access opportunities for boating, fishing, surfing, swimming, snorkeling, and other beach uses at Kāhili Beach and Kīlauea River, which lie off-Refuge. This may include driving vehicles through, parking vehicles on, and launching boats from Refuge property. The use is more fully described and evaluated in the compatibility determination (CD) for this use titled "General Access for Off-Refuge Stream, Beach, and Ocean Uses" and the documents referenced in that CD.

For the findings listed on FWS Form 3-2319 and if deemed necessary, a justification has been provided below:

(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?
This is the first time that use of the Refuge to access off-Refuge lands and waters for boating and beach uses has been evaluated. Public access to the Quarry area for swimming and surfing along the east side shoreline of Mōkōlea Point has previously been evaluated for compatibility in 1994 and was determined to be compatible.

(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?
Allowing visitors to access Kīlauea River, Kīlauea Bay, and Kāhili Beach (which lie off-Refuge) through the Kāhili Quarry area on the Refuge would not directly contribute to their understanding and appreciation of the Refuge's natural and cultural resources. However, it is likely that visitors participating in boating, and stream, beach, and ocean uses would observe and enjoy wildlife ancillary to their primary recreational activities. It is not expected that these uses would be beneficial to the Refuge's natural or cultural resources.

(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?
People have used the Kāhili Quarry and Quarry Road to access Kīlauea River, Kīlauea Bay, and Kāhili Beach for many years. Some individuals park vehicles on the Refuge. Given the limited area available for parking, it is possible that this use could interfere with Refuge visitors who fish at Kāhili Quarry. It is expected that allowing continued access through the Kāhili Quarry, with stipulations to ensure compatibility, would not impair existing wildlife-dependent recreational uses or reduce the potential to provide quality, compatible, wildlife-dependent recreation into the future.

Finding of Appropriateness of a Refuge Use

Refuge Name: Kīlauea Point National Wildlife Refuge

Use: Research, Scientific Collecting, and Survey Activities

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	**X**	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?	**X**	
(h) Will this be manageable in the future within existing resources?	**X**	
(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	**X**	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see 603 FW 1, section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	**X**	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ___ No _**X**_

When the refuge manager finds the use **appropriate** based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ Appropriate__**X**___

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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02/06

Finding of Appropriateness of a Refuge Use

Supplement to FWS Form 3-2319

Further Explanation of Answers Provided for the Decision Criteria:

Project: Research, Surveys, and Scientific Collections

Summary: The Refuge receives requests to conduct scientific research on Refuge lands. Research applicants must submit a proposal that outlines: (1) objectives of the study; (2) justification for the study; (3) detailed methodology and schedule; (4) potential impacts to Refuge wildlife and/or habitat, including disturbance (short- and long-term), injury, or mortality; (5) personnel required; (6) costs to the Refuge, if any; and (7) end products expected (i.e., reports, publications). Research proposals would be reviewed by Refuge staff, the Regional Office Branch of Refuge Biology, and others as appropriate prior to the Refuge issuing a special use permit (SUP). Projects will not be open-ended, and at a minimum, will be reviewed annually. The proposed use evaluated herein for appropriateness is more fully described and evaluated in the compatibility determination (CD) for this use and the documents referenced in that CD.

For the findings listed on FWS Form 3-2319 and if deemed necessary, a justification has been provided below:

(a) Do we have jurisdiction over the use?
Some or all of the proposed activities would take place within Refuge boundaries. The Refuge has jurisdiction over those research projects that are sited within Refuge boundaries.

(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?
Any proposed research activities would comply with all applicable laws and regulations and any restrictions or qualifications that are required to comply with laws and regulations would be specified in the SUP.

(c) Is the use consistent with applicable executive orders and Department and Service policies?
Through the review of individual projects, the Refuge would ensure that they are consistent with applicable policies, especially the Research on Service Lands Policy (803 FW 1).

(d) Is the use consistent with public safety?
Through individual project review, the Refuge will ensure that each project is consistent with public safety. If necessary, stipulations to ensure public safety will be included in the project's SUP. Permittees would be required to limit their use of the Refuge to specifically designated areas and access routes, and review and understand Refuge rules and regulations, and any hazardous conditions.

(e) Is the use consistent with goals and objectives in an approved management plan or other document?
Research activities are approved in instances where they can provide meaningful data that may contribute to Refuge management and public appreciation of natural resources. Research activities would be consistent with the research priorities described in approved management plans (e.g., Goal 3 of Chapter 2, Refuge Inventory & Monitoring Initiative Plan).

(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?
A number of research projects have been approved or denied in earlier analyses.

(g) Is the use manageable within available budget and staff?
The Refuge regularly receives requests for this activity, and it is manageable with available budget and staff.

(h) Will this be manageable in the future within existing resources?
The proposed activity at current levels would be manageable in the future with the existing resources.

(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?
The proposed use is beneficial to the Refuge's natural and cultural resources because the types of research projects approved are those that have the distinct likelihood of helping achieve Refuge purposes by providing information useful for the management of trust resources and contributing to the public's understanding and appreciation of natural and cultural resources. This is beneficial because it enhances our appreciation for and often our ability to properly manage these resources. Proposed research projects that did not result in these benefits would not be a priority for the Refuge and would likely not be authorized.

(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?
The Refuge would ensure that the research activities do not impair existing or future wildlife-dependent recreational use of the Refuge during individual project review, prior to issuing the SUP for the project. With the exception of research aimed at evaluating effects of public uses on priority resources of concern (Chapter 2, Goal 3), general and project-specific stipulations and conditions of the research would not significantly impair existing public uses or reduce the potential to provide quality, compatible, wildlife-dependent recreation into the future.

Finding of Appropriateness of a Refuge Use

Refuge Name: Kīlauea Point National Wildlife Refuge

Use: Traditional Cultural Practices

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	**X**	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	**X**	
(c) Is the use consistent with applicable executive orders and Department and Service policies?	**X**	
(d) Is the use consistent with public safety?	**X**	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	**X**	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?	**X**	
(g) Is the use manageable within available budget and staff?	**X**	
(h) Will this be manageable in the future within existing resources?	**X**	
(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	**X**	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see 603 FW 1, section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	**X**	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ___ No__X__

When the refuge manager finds the use **appropriate** based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ Appropriate__X__

Refuge Manager:_____ Date:_____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:_____ Date:_____

A compatibility determination is required before the use may be allowed.

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02/06

Finding of Appropriateness of a Refuge Use

Supplement to FWS Form 3-2319

Further Explanation of Answers Provided for the Decision Criteria:

Project: Traditional Cultural Practices

Summary: The use evaluated herein for appropriateness is more fully described and evaluated in the compatibility determination (CD) for this use, titled "Traditional Cultural Practices (fishing and natural resource collection)" and the documents referenced in that CD.

For the findings listed on FWS Form 3-2319 and if deemed necessary, a justification has been provided below:

(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?
This use would comply with applicable laws and regulations. Anglers would be required to secure and have with them relevant State fishing licenses and any other permits needed to fish in the ocean from the Refuge, and to abide by Hawaiʻi Fishing Regulations. Federal regulations prohibit collecting plant materials and other natural resources on refuges in the absence of specific authorization ("Disturbing, injuring, and damaging plants and animals," 50 C.F.R. 27.51). If allowed, this use would need to be authorized through issuance of a special use permit (SUP).

(c) Is the use consistent with applicable executive orders and Department and Service policies?
This use would be consistent with applicable Executive orders and Department and Service policies, including the policy on "Administration of Specialized Uses" (5 RM 17). If found appropriate and determined compatible, traditional cultural practices would be authorized through issuance of SUPs.

(d) Is the use consistent with public safety?
Access to the Kīlauea (East) Cove for fishing requires anglers to traverse the face of the Cove's steep cliffs along a narrow trail. The Cove is a traditional native Hawaiian fishing site that has been in use for many years. Existing and proposed use of this trail is by individuals who have personal knowledge and a lengthy family history of using this traditional Hawaiian fishing site, are aware of the safety risks, and are required to sign a liability release ("Release From Injury" form). Currently, anglers pull aside a short section of safety fence to access the trail. Other Refuge visitors could see anglers crossing through the fence and attempt to do so themselves, potentially creating new safety issues.

To ensure this use remained safe into the future, access to the Cove for this traditional cultural practice would be limited to a small number of individuals who have personal or family knowledge of the access trail (i.e., individuals and families of native Hawaiian heritage who have genealogical ties to the local community, that is, the Kīlauea and Kāhili Ahupuaʻa or surrounding ahupuaʻa including Namahana, Kalihiwai, Kalihikai, Waiakalua, and Pīlaʻa [Wilson and Jay 2010]). Additionally, access through the fence would need to be better secured.

It is not expected that a limited amount of resource collection would generate any public safety issues.

(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?
Fishing at Kīlauea (East) Cove has previously been evaluated for compatibility and was determined compatible. This is the first time that resource collection has been evaluated.

(i) Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?
Allowing traditional cultural practices would contribute to the understanding and appreciation of the Refuge's natural and cultural resources by those individuals who participated. Additionally, others who indirectly benefitted from these practices would also be expected to have an enhanced understanding and appreciation for the Refuge's natural and cultural resources. Such beneficiaries could include family, friends, and other community members who got to enjoy some of the harvested fish or shellfish, or individuals who benefitted from the ceremonial, decorative, medicinal, or other purposes for which resource collections were made.

It is not expected that these uses would be beneficial to the Refuge's natural or cultural resources.

(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?
As noted above, anglers crossing through the fence to access the Cove for fishing could encourage other Refuge visitors to also cross through the fence to access the Cove trail. This could create new safety issues. If resource collecting occurred in areas readily seen by other Refuge visitors, these other visitors could easily become confused regarding what activities are and are not allowed on the Refuge, and this could increase the amount of unauthorized collections that occurred. The fence issue could be addressed by better securing the access point and the second issue could be addressed with additional visitor information, interpretation, or law enforcement, as necessary.

It is expected that participation in these uses would be limited; therefore, these issues would be expected to be minor and not impair existing wildlife-dependent recreational uses or reduce the potential to provide quality, compatible, wildlife-dependent recreation into the future.

Literature Cited
Wilson, J. and J. Jay. 2010. Moku & Ahupuaa of Kaua'i Island Aha Kiole Advisory Committee. Mapping by IslandBreath. http://www.islandbreath.org/2010Year/04/100415kauaimokupuni.png.

Appendix B. Compatibility Determinations

B.1 Introduction

The compatibility determinations (CD) we developed during the CCP planning process evaluate uses as projected to occur under Alternative D, the Preferred Alternative in the draft CCP/EA for the Kīlauea Point National Wildlife Refuge (Refuge or NWR). The evaluation of funds needed for management and implementation of each use also assumes implementation as described under Alternative D, the Preferred Alternative (also see Appendix C). Chapter 6 of the draft CCP/EA also contains analysis of the impacts of public uses to wildlife and habitats. That portion of the document is incorporated through reference into this set of CDs.

B.1.1 Uses Evaluated At This Time

The following section includes full CDs for use at Kīlauea Point NWR that are required to be evaluated. According to Service policy, CDs are to be completed for all uses proposed under a CCP that have been determined to be appropriate. Existing wildlife-dependent recreational uses must also be re-evaluated and new CDs prepared during development of a CCP. According to the Service's compatibility policy, uses other than wildlife-dependent recreational uses are not explicitly required to be re-evaluated in concert with preparation of a CCP, unless conditions of the use have changed or unless significant new information relative to the use and its effects have become available or the existing CDs are more than 10 years old. However, Service planning policy recommends preparing CDs for all individual uses, specific use programs, or groups of related uses associated with the proposed action. Accordingly, the following CDs are included in this document for public review.

Table B-1. Summary of Compatibility Determinations.

Refuge Use	Compatible?	Year Due for Re-evaluation
Commercial Wildlife and Landscape Filming and Photography	Yes	2024
Commercially Guided Tours	Yes	2024
Environmental Education	Yes	2029
Fishing and Shellfishing	Yes	2029
General Access for Off-Refuge Stream, Beach, and Ocean Uses (Kāhili Quarry)	Yes	2024
Research, Surveys, and Scientific Collections	Yes	2024
Traditional Cultural Practices (Natural Resource Collecting)	Yes	2024
Wildlife Observation and Photography, and Interpretation	Yes	2029
Dog Walking (Kāhili Quarry)	Yes	2024

B.1.2 Compatibility–Legal and Historical Context

Compatibility is a tool refuge managers use to ensure that recreational and other uses do not interfere with wildlife conservation, the primary focus of national wildlife refuges. Compatibility is not new to the Refuge System and dates back to 1918, as a concept. As policy, it has been used since 1962. The Refuge Recreation Act of 1962 directed the Secretary of the Interior to allow only those public uses of refuge lands that were "compatible with the primary purposes for which the area was established."

Legally, national wildlife refuges are closed to all public uses until officially opened through a CD. Regulations require that adequate funds be available for administration and protection of refuges before opening them to any public uses. However, wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, EE and interpretation) are to receive enhanced consideration and cannot be rejected simply for lack of funding resources unless the refuge has made a concerted effort to seek out funds from all potential partners. Once found compatible, wildlife-dependent recreational uses are deemed the priority public uses at the refuge. If a proposed use is found not compatible, the refuge manager is legally precluded from approving it. Economic uses that are conducted by or authorized by the refuge also require CDs.

Under the compatibility policy, uses are defined as recreational, economic/commercial, or management use of a refuge by the public or a non-Refuge System entity. Uses generally providing an economic return (even if conducted for the purposes of habitat management) are also subject to CDs. The Service does not prepare CDs for uses when the Service does not have jurisdiction. For example, the Service may have limited jurisdiction over refuge areas where property rights are vested by others; where legally binding agreements exist; or where there are treaty rights held by tribes. In addition, aircraft overflights, emergency actions, some activities on navigable waters, and activities by other Federal agencies on "overlay refuges" are exempt from the compatibility review process.

New compatibility regulations, required by the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act), were adopted by the Service in October 2000 (http://refuges.fws.gov/policymakers/nwrpolicies.html). The regulations require that a use must be compatible with both the mission of the Refuge System and the purpose(s) of the individual refuge. This standard helps to ensure consistency in application across the Refuge System. The Improvement Act also requires that CDs be in writing and that the public have an opportunity to comment on most use evaluations.

The Refuge System mission emphasizes that the needs of fish, wildlife, and plants must be of primary consideration. The Improvement Act defined a compatible use as one that ". . . in the sound professional judgment of the Director, will not materially interfere with or detract from the fulfillment of the mission of the System or the purposes of the Refuge." Sound professional judgment is defined under the Improvement Act as ". . . a finding, determination, or decision, that is consistent with principles of sound fish and wildlife management and administration, available science and resources . . ." Compatibility for priority wildlife-dependent uses may depend on the level or extent of a use.

Court interpretations of the compatibility standard have found that compatibility is a biological standard and cannot be used to balance or weigh economic, political, or recreational interests against the primary purpose of the refuge (Defenders of Wildlife v. Andrus [Ruby Lake Refuge]). The Service recognizes that CDs are complex. For this reason, refuge managers are required to consider "principles of sound fish and wildlife management" and "best available science" in making these determinations (House of Representatives Report 105-106). Evaluations of the existing uses on the Kīlauea Point National Wildlife Refuge are based on the professional judgment of Refuge and planning personnel including observations of Refuge uses and reviews of relevant scientific literature.

In July 2006, the Service published its Appropriate Refuge Uses policy (603 FW 1). Under this policy, most proposed uses must also undergo a review prior to compatibility. Uses excepted from the policy include priority wildlife-dependent recreational uses, and uses under reserved rights—see policy for more detail. Appropriate Refuge Uses Findings are included in Appendix A.

B.2 References

Defenders of Wildlife v. Andrus (Ruby Lake Refuge I). 11 Envtl. Rptr. Case 2098 (D.D.C. 1978), p. 873.

Compatibility Determination

Use: Commercial Wildlife and Landscape Filming and Photography (Photography, video, filming, or audio recording – commercial)

Refuge Name: Kīlauea Point National Wildlife Refuge

County and State: County of Kaua‘i, Hawai‘i

Establishing and Acquisition Authorities:

- Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1948, as amended (16 U.S.C. 667b–667d)
- Refuge Recreation Act of 1962, as amended (16 U.S.C. 460k–460k-4)
- Endangered Species Act of 1973, as amended (16 U.S.C. 1531–1544)
- Kīlauea Point National Wildlife Refuge Expansion Act of 2004 (P.L. 108-481)

Refuge Purpose(s):
The purposes for Kīlauea Point NWR have been identified in historic legal documentation establishing and adding refuge lands and are specified as follows:

> "… particular value in carrying out the national migratory bird management program …" (Transfer of Certain Real Property for Wildlife Conservation Purposes Act)
>
> "… suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors …" (Refuge Recreation Act)
>
> "… to conserve (A) fish or wildlife which are listed as endangered species or threatened species…or (B) plants…" (Endangered Species Act)
>
> "(1) the protection and recovery of endangered Hawaiian water birds and other endangered birds, including the Nene (Hawaiian goose); and (2) the conservation and management of native coastal strand, riparian, and aquatic biological diversity…" (Kīlauea Point National Wildlife Refuge Expansion Act)

National Wildlife Refuge System Mission:

> "The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966 as amended, 16 U.S.C. 668dd–668ee).

Description of Use(s):

Service policy defines commercial photography to mean, "…a visual recording (motion or still) by firms or individuals (other than news media representatives) who intend to distribute their photographic content for money or other consideration. This includes the creation of educational,

entertainment, or commercial enterprises as well as advertising audio-visuals for the purpose of paid product or services, publicity, and commercially oriented photo contests" (Wildlife Photography, 605 FW 5). The Commercial Filming Act of 2000 (16 U.S.C. 460l–6d) defines commercial filming to include specific activities, such as filming activity that consumes more than a single day, and includes a film crew and special equipment, still photography that occurs in places where members of the public are generally not allowed, and still photography that uses models or props that are not part of the site's natural or cultural resources or administrative facilities.

For purposes of this CD, commercial wildlife and landscape filming and photography includes recording sights or sounds for commercial purposes. This includes still and motion pictures, photographs captured using film and digital media, and audio recordings. The use typically involves filming scenes for a movie, television show, public education program or commercial, taking still photographs, or recording natural sounds for commercial purposes. The final creation would be produced for sale as a commercial product. This use is regulated by Refuge Manual (RM) Part 8, Chapter 16 and the Code of Federal Regulations (CFR), Title 43, Subtitle A, Section 5.1. This does not include image and audio recording of a noncommercial nature. Official authorization to access the Refuge for commercial photography and videography would occur through issuance of a special use permit (SUP).

This use would occur in areas of the Refuge specified in the SUP. The use could occur at many locations on the Refuge, including areas open to the general public and closed areas. Areas open to general public use include Kīlauea Point (Point), the cul-de-sac (turnaround) at the end of Kīlauea Road (Overlook), Kāhili Quarry area, occasionally a trail(s) on Crater Hill. Under Alternative D, the Preferred Alternative identified in the draft CCP and associated EA, a new offsite visitor center and associated facilities would be constructed and open to general public use.

Availability of Resources:

The Administration of Specialized Uses (5 RM 17) policy requires that a refuge seek to recover its costs associated with administration of such a use and/or charge a fee equal to the fair market value of the benefit received by the user. Benefits provided to the Service by a refuge use are considered in establishing appropriate fees. Direct and indirect costs to administer this use on the Refuge include the following:

- Costs associated with construction, repair, operation, and maintenance of associated facilities;
- Salaries and associated employee expenses related to evaluation of the proposed use (including appropriateness finding, compatibility determination, and compliance with applicable laws, regulations, and policies such as the National Environmental Policy Act, Endangered Species Act, and National Historic Preservation Act) and development of the SUP;
- Salaries and associated employee expenses related to monitoring of this use to ensure that permit requirements are followed and that the use remains compatible. This includes evaluation of effects of this use on the Refuge's natural and cultural resources, and compatible, especially wildlife-dependent, public use;
- Use-related supplies, equipment, and travel; and
- An applicable portion of Refuge overhead costs.

Following is an estimate of costs associated with administering this use on the Refuge.

Tasks	Estimated Costs per Year[1]
1. Permit administration and oversight by GS-13 Project Leader (approximately 20 hours/year).	$1,200
2. Permit administration and oversight by GS-12 Deputy Project Leader (approximately 20 hours/year).	$1,000
3. Permit administration and oversight by GS-9 Supervisory Park Ranger (approximately 40 hours/year).	$1,400
4. Permit administration by GS-4 Budget Clerk (approximately 20 hours/year)	$400
5. Law enforcement by GL-9 Law Enforcement Officer (approximately 40 hours/year).	$1,500
6. Permit monitoring by GS-11 Biologist (approximately 20 hours/year).	$900
7. Refuge overhead costs associated with the above-listed work.[2]	$1,300
Total Costs	$7,700

[1] Annual personnel costs = 2014 step 1 salary for appropriate GS level x 12.25% COLA x 40% for benefits.
[2] Overhead costs = salary + benefit costs x 0.22. Overhead expenses include building rent, utilities, equipment and supplies, and support personnel, and do not include salary-related benefits.

Fee revenues collected from commercial uses of this nature are not retained by the Refuge. Instead, these monies are deposited into the U.S. Treasury Department's National Wildlife Refuge Fund. Moneys from this fund are used for redistribution to refuges to help offset the costs of administering specialized uses (Expenses for Sales) and for payments in lieu of taxes to counties or other local governments under the Refuge Revenue Sharing Act.

Commercial image and audio recording has the potential to share the Refuge's valuable natural and cultural resources with a larger audience over a greater geographic area. This could enhance public understanding, appreciation, and support for native fish, wildlife, plants, and their habitats; the Refuge's cultural heritage; conservation; and the Refuge System. To the extent that this occurred, it would be a benefit to the Refuge. Permit fees could be adjusted to acknowledge such a benefit.

The Refuge currently has adequate budget and staff to support limited commercial use of this nature.

Anticipated Impacts of the Use(s):

It is expected that commercial recordings of Refuge sights and sounds would generate products that potentially would be broadly distributed through the market. To the extent that these images and recordings enhanced the public's connection with wildlife, habitats, and cultural and historic richness of the Refuge, and helped interpret the Refuge's cultural resources, this use would support draft Refuge goals 4 and 5. To the extent that these images and recordings enhanced public understanding and appreciation for conservation or the Refuge System, this use would also support the Refuge System mission.

The effects of commercial photography and videography upon wildlife would likely be associated with disturbance. Human disturbance has differential effects on wildlife and is dependent upon, among other variables, the species involved and its age; the time of year; the breeding cycle stage (if

applicable); the surrounding environment; whether the activity involves vehicles; the intensity, speed, noise, nature, and frequency of the disturbing activity; and the directness of approach to an animal (Blanc et al. 2006, Holmes et al. 2005, Hammitt and Cole 1998, Knight and Cole 1995a, Knight and Cole 1995b). Immediate responses by wildlife to recreational activity can range from behavioral changes including nest abandonment, altered nest placement, change in food habits, physiological changes such as elevated heart rates and increased energetic costs due to flight or flushing, or even death (Belanger and Bedard 1990, Knight and Cole 1995a, Knight and Swaddle 2007, Miller et al. 1998, Miller and Hobbs 2000, Morton et al. 1989, Smith-Castro and Rodewald 2010). The long-term effects are more difficult to assess but may include altered behavior, vigor, productivity, or death of individuals; altered population abundance, distribution, or demographics; and altered community species composition and interactions.

Kitaysky et al. (2003) found levels of corticosterone (a major stress hormone) in ‘ua‘u kani at the Refuge to be higher in chicks occupying burrows within 13 feet of visitor-use areas. Holmes et al. (2005) found that, even at the recommended minimum approach distance (~16 feet), a single wildlife observer in a Royal penguin (*Eudyptes schlegeli*) colony on Macquarie Island, Australia, triggered vigilance behavior and an increased heart rate in the birds. In another study, Holmes et al. (2007) found that vigilance behavior of Gentoo penguins (*Pygoscelis papua*) increased as the numbers of observers increased. Additional studies in penguin colonies revealed that a slow approach that ended with a visitor sitting quietly and closely observing a bird had little effect on the bird’s heart rate, yet a rapid approach that ended with a visitor remaining standing and closely observing a bird resulted in an elevated heart rate (Nimon et al. 1995).

A variety of factors affect flushing distances among waterbirds, including the species involved; the activity the birds are engaged in (e.g., foraging versus nesting); and the type, speed, and noise of disturbance (e.g., approaching birds by walking versus in a motorized boat) (Rodgers and Smith 1997, Rodgers 1991). Flushing of birds or even raising their alert levels (which usually occurs at a greater distance than that for flushing) creates stress and requires animals to expend energy that otherwise would be invested in essential life history activities such as foraging, mating, nesting, brood-rearing, and predator avoidance.

Breeding birds are especially sensitive to human disturbance (Trulio 2005, Hammitt and Cole 1998). A study of visitors to a colony of kittiwakes (*Rissa tridactyla*) and guillemots (*Uria aalge*) revealed that nesting success was influenced by the distance of observers from the birds (positively correlated) and the number of observers involved (negatively correlated) (Beale and Monaghan 2004).

Studies have had mixed results regarding potential habituation of birds and some other taxa to human disturbance. Wildlife are often less disturbed by routine human activities that repeatedly occur along defined routes (e.g., trails, roads, or water channels), especially frequent disturbance that does not involve direct contact or other threats, compared with those activities that occur irregularly and outside predictable paths/channels (Blanc et al. 2006, Holmes et al. 2007, Knight and Cole 1995b).

In studies of breeding yellow-eyed penguins (*Megadyptes antipodes*), a timid and secretive species, Ratz and Thompson (1999) found that the birds appeared to have habituated to the presence of guided tourists who approached the colony through trenches and closely observed or photographed birds from camouflaged blinds. Jungius and Hirsch (1979) studied seabird colonies and found that birds that were believed to have habituated to tourists and revealed no outward behavioral changes in their presence, nonetheless exhibited stress (as reflected in elevated heartbeat frequencies) when

approached by visitors. The scientists speculated that the stress could have a negative effect on breeding. Habituation to some types and levels (intensity and frequency) of human disturbance appears to vary among species, within species, between resident and migratory populations, and potentially between inexperienced and experienced breeders. This makes it difficult to forecast habituation in actual field situations.

ʻĪlio-holo-i-ka-uaua numbers are increasing in the main Hawaiian Islands, especially on and around Niʻihau and Kauaʻi (NMFS 2007, Baker and Johanos 2003). Critically endangered ʻīlio-holo-i-ka-uaua are very sensitive to human disturbance (NMFS 2007) and disturbance of female adults with pups is of special concern (Gilmartin 2003). Seals may also injure people. Seals haul out on land to rest, molt, or pup. Approaching photographers could force hauled-out seals to move back into the water and seek a new haul-out site, causing them to expend energy and increasing their exposure to predators. Repeated disturbance over time can cause seals to abandon preferred haul-out sites (Gilmartin 2003). It is generally recommended that individuals viewing or photographing seals and sea turtles maintain a distance of at least 50 yards from the animals and limit their viewing/ photographing time to no more than 30 minutes (NOAA undated, NOAA Fisheries et al. undated; "Hawaiʻi Viewing Guidelines: Overview, Marine Mammal & Sea Turtle Viewing ʻCode of Conductʼ" at http://www.nmfs.noaa.gov/pr/education/Hawaiʻi/).

Wildlife disturbance can be a special concern with wildlife observation and photography (Cline et al. 2007, DeLong 2002, Knight and Cole 1995a). Observers and photographers often want to enhance their view or photograph by encroaching closer and closer to their subject. This can cause increased stress in wildlife and eventually lead to flushing. If a bird is nesting or brood-rearing, disturbance can cause temporary or permanent nest desertion. Even if only temporary, eggs and nestlings can face survival challenges associated with temperature extremes and predation.

Commercial photography and videography could also cause trampling of native plants, erosion, and introduction or spread of exotic species, including invertebrates, plants, and invasive species. All of these impacts would adversely affect native fish, wildlife, plants, and their habitats, and would be of special concern in Refuge areas struggling with reestablishment of native plant communities. The degree of actual effects upon reproduction, survival of individuals, and diversity and abundance of native species (community health) would depend on specific circumstances. Except with special permission, commercial photographers would be required to behave like other visitors, including remaining behind the perimeter fencing on the Point, not crossing fences elsewhere on the Refuge, and otherwise abiding by closed area signage. These and other stipulations associated with this use have been designed to greatly reduce the likelihood and magnitude of potential effects by commercial photography and videography on biological resources, including roosting, foraging, and breeding birds.

The Refuge has substantial and, in some areas, dense populations of burrow-nesting seabirds. Although some burrows lie on the Point adjacent to the area heavily used by Refuge visitors, the vast majority of the burrows are elsewhere, in less disturbed areas of the Refuge, such as Crater Hill. Humans casually walking through nesting colonies could easily crush burrows, destroy nests and eggs, and kill young or adult seabirds.

Crater Hill grasslands are primarily composed of nonnative species such as Kikuyu grass (*Pennisetum clandestinum*); however, these areas provide actual and potential habitat for roosting, foraging, and breeding activities by nēnē, mōlī, and shorebirds. Additionally, major efforts have been

undertaken to reintroduce native plants to this area. Areas on the Point and the core of the Kāhili Quarry that receive almost all of the Refuge's visitation are hardened and therefore experience very few effects from public use. However, access to Crater Hill by commercial photographers would increase the potential for erosion and compaction of trails, for crushing of nesting burrows, and for disturbance to native birds using the grasslands and to outplanting of native vegetation. Access to Crater Hill for this use would be limited in frequency, guided, and appropriately scheduled to minimize adverse effects.

Public Uses

If commercial photography and videography occurred in closed areas where it was readily seen by other Refuge visitors, these other visitors could easily become confused regarding where activities are and are not allowed on the Refuge. This could increase the occurrence of unauthorized access, and impacts to native wildlife and plants. Additionally, if a production company wished to film at the Refuge and that involved a large crew, and a substantial amount of time and equipment, or commercial photographers and videographers wanted to visit during Refuge special events, these activities could adversely affect quality wildlife-dependent recreational and educational experiences by other Refuge visitors. As noted above, stipulations associated with these uses would require visitors to remain behind the perimeter fencing on the Point, and not cross fences and otherwise abide by closed area signage elsewhere on the Refuge. These use conditions would greatly reduce potential public safety concerns. Stipulations associated with commercial photography and videography would limit this use in space, time, or other manners such that effects on other Refuge visitors were avoided or greatly reduced.

Cultural Resources

The Refuge contains a number of historic and prehistoric resources, including the Kīlauea Point Light Station (the lighthouse and associated Coast Guard facilities on the Point) that was listed on the National Register of Historic Places as a historic district in 1979 (USFWS 2006). To the extent that SUPs included clear maps depicting areas permittees were authorized to access and use, and permittees were aware of prohibitions related to cultural resources, impacts to these resources would not be expected. Potentially commercial photography and videography could enhance public knowledge of and appreciation for the Refuge's cultural resources.

Public Review and Comment:

Public availability of this CD has been widely announced together with announcement of the availability of the Refuge's draft CCP. The review and comment period has also been the same as for the draft CCP.

Determination:

_____ Use is Not Compatible

____X____ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

General

1. Permission to use the Refuge for commercial image and audio recording would be officially authorized through issuance of an SUP to minimize the possibility of damage to cultural or natural resources or interference with other visitors to the area. Requests must be submitted in writing to the Refuge Manager no less than 60 days prior to the requested date(s). Each request will be reviewed on a case-by-case basis. Permits may be approved or denied based on the availability of Refuge staff and resources to administer this use. As appropriate, each permit would authorize a one-time use or repeated uses over a time period not to exceed one year. SUPs would cover use by a specified individual or organization and could not be assigned or sub-permitted to others (i.e., the permit is not transferable).

   Prior to potential permit renewal, Refuge staff would meet with permittees to share new information, discuss results of monitoring, review compliance with permit conditions, and address other issues. Other meetings would be scheduled as needed.

2. Permittees would be charged a fee equal to the fair market value of the use, an amount to cover Refuge costs associated with administration of the use, or another fee, consistent with applicable Service policy (Administration of Specialized Uses, 5 RM 17). It would benefit the Refuge if commercial image and audio recording generated and broadly distributed quality products that enhanced the public's understanding, appreciation, and support for the Refuge's native fish, wildlife, plants, and their habitats; its cultural heritage; conservation; Kīlauea Point NWR; and the Refuge System. Permit fees could be adjusted on a case-by-case basis depending on the specific details of each permit to acknowledge such a benefit. The fee must be paid before the SUP would be issued.

3. All activities must comply with 8 RM 16 and 43 CFR, Subtitle A, Section 5.1 and may require completion of a Commercial Audio-Visual Production Application and posting of a bond.

4. Prior to recording, permittees will provide the Refuge Manager with a copy of their current liability insurance policy. The Refuge must be named as an additional insured on the policy for the duration of the production.

5. Permittees must have the SUP in their possession at all times while on the Refuge. A copy of the permit must also be prominently displayed on the dash of permittees' vehicle(s) at all times while on the Refuge. The permit must be presented to Refuge officials upon request.

6. The Refuge would provide permittees with information about the Refuge; its purposes and goals, natural and cultural resources of concern, open and closed areas and times, rules and regulations, and any hazardous conditions. Permittees would be expected to review, understand, and comply with Refuge rules and safety, interpretive, regulatory, and other signage.

7. Sites for photo/video shoots will be submitted in advance and approved by the Refuge Manager. Most of Kīlauea Point NWR is closed to general public use, so SUPs would include maps clearly depicting the areas permittees would be authorized to access and use, including the Refuge entry point(s). Travel within the Refuge would be by designated road, parking lot, and/or trail.

Permission to access Refuge closed areas would be designed to minimize effects on biological and cultural resources and visitors. Permission would generally not be granted to access areas on the Point outside the public safety fence, Mōkōlea Point, Makapili Rock, or the northern shoreline. Permission to access Crater Hill would require use of a guide(s) (Refuge staff or trained volunteer) and would be scheduled to avoid impacts to seabirds and nēnē. In the absence of specific, prior written approval of the Refuge Manager (for the purpose of these stipulations, the Refuge Manager would be the Project Leader of Kaua‘i National Wildlife Refuge Complex), permittees would be prohibited from straying outside the areas depicted on the maps or accessing the Refuge at times it was closed.

8. No sound-making or lighting devices would be permitted, unless specifically authorized by the Refuge Manager.

9. Only commercial filming and photography in support of conservation, Refuge purposes, the National Wildlife Refuge System Mission, or for educational and interpretive purposes would be permitted.

10. Permittees would be required to secure and maintain the currency of all licenses, permits, and approvals required by State and local governments to engage in the commercial activities they were proposing or pursuing.

11. Permittees would be prohibited from constructing new or maintaining existing structures, or altering the landscape (e.g., by moving natural or built features or through cutting or removal of vegetation) on the Refuge without specific, prior written approval of the Refuge Manager.

12. In the absence of specific, prior written approval of the Refuge Manager, permittees would be prohibited from collecting and removing any archaeological or historic artifacts, abiotic or biological specimens or samples, or mementos from the Refuge.

13. Consistent with Service policy regarding management of nonhazardous solid waste on Refuges (Resource Conservation and Recovery Act of 1976, as amended [42 U.S.C. 6901-6992k] – Solid Waste (Nonhazardous), 561 FW 5), permittees would be prohibited from littering, dumping refuse, abandoning equipment or materials, or otherwise discarding any items on the Refuge.

14. Permittees would be required to hold the United States Government harmless from any damages or injury to the permittee or members of the general public in areas and facilities accessed via the terms of their permit.

15. In addition to the stipulations listed here, the general permit conditions and requirements, and the special permit conditions, all visitors would be required to comply with Refuge System-related and other applicable laws, regulations, and policies including “Prohibited Acts” listed in the Code of Federal Regulations (50 C.F.R. 27).

16. No changes could be made to any of these stipulations without specific, prior written approval of the Refuge Manager.

Commercial Image and Audio Recording

1. The Refuge would provide photographers and others who made audio or video recordings on the Refuge with information about its valuable biological and cultural resources, and about responsible behavior when viewing and photographing or recording these resources. This could include, for example, the "Principles of Ethical Field Practices" developed by the North American Nature Photography Association. Among others, these principles include not distressing or otherwise interfering with animal behaviors, using telephoto lenses to photograph animals, and adhering to local regulatory requirements.

2. Permittees who made audio or video recordings on the Refuge would be requested to label the location of photographs or other recordings as Kīlauea Point National Wildlife Refuge, Kauaʻi, Hawaiʻi; use Hawaiian names (perhaps in addition to English and Latin names) for native wildlife and plant species photographed or recorded; include a conservation message with photographs and recordings; and mention that there is limited general public access to the Refuge.

3. Permittees who made audio or video recordings on the Refuge would be requested to allow the Service to use selected photographs or other recordings, with attribution, for educational, interpretive, and other Refuge management purposes.

4. Permittees who made audio or video recordings on the Refuge would be requested to donate selected photographs or other recordings to the Refuge Friends group to be used, with attribution, for educational, interpretive, and potentially fund-raising purposes.

5. Permittees who made audio or video recordings on the Refuge would be prohibited from using feed or call playback recordings to attract wildlife.

6. Permittees would be prohibited from obstructing Refuge areas of value for other visitors who were participating in observation, photography, interpretation, education, or other approved uses. Permittees would also be prohibited from engaging in active business or political operations while on the Refuge, such as soliciting alms and contributions, campaigning for election to any public office, collecting private debts, soliciting and vending for commercial purposes (including, but not limited to, the vending of newspapers and other publications), displaying or distributing commercial advertising, collecting signatures on petitions, polls, or surveys (except in association with Refuge monitoring and as authorized by the Refuge Manager).

7. If, in selected cases, it was determined that commercial photography and videography could conflict with the enjoyment of quality wildlife-dependent recreational and educational experiences by other Refuge visitors, the Refuge Manager could deny permission for these commercial uses. Examples could include using the Refuge during Refuge special events and filming by a production company that involved a large crew and a substantial amount of time and equipment.

8. All commercial photography and videography activities would avoid sensitive areas prone to disturbance (e.g., sensitive vegetation areas) or degradation (e.g., soil compaction), and would be designed to minimize impacts to nesting birds or other breeding, feeding, or resting wildlife. Areas that are open to this use would be evaluated on an annual, seasonal, and sometimes daily

basis and would be influenced by beach geomorphology and wildlife use. Seasonal closures may vary year-to-year based on wildlife use and habitat conditions. Permittees would be expected to comply with closures.

9. When photographing critically endangered ʻīlio-holo-i-ka-uaua or honu, whether these animals were in the water or on shore, permittees would be required to maintain a distance of at least 50 yards and limit their viewing/photographing time to 30 minutes (NOAA undated). ʻIlio-holo-i-ka-uaua and honu areare listed under both the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA) which have mechanisms to encourage management for population growth and recovery and to prohibit any form of "take," except for limited exceptions authorized under Federal permits. Under the ESA, "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect or attempt to engage in any such conduct. Under the MMPA, "take" includes actions such as hunting, harassing, killing, capturing, injuring and disturbing a marine mammal. There are established civil and criminal penalties for, at a minimum, disturbing ʻīlio-holo-i-ka-uaua or honu by getting too close or staying too long, which alters their behavior, thus resulting in take. If ʻīlio-holo-i-ka-uaua or honu display signs of being disturbed, then that 50 yards would be expanded and/or viewing would be minimized or shut down to stop the disturbance and avoid potential take.

Cultural Resources

1. In the absence of specific, prior written approval of the Refuge Manager, permittees would be prohibited from disturbing or otherwise adversely impacting any prehistoric, historic, or other cultural resources on the Refuge. In the event such resources were inadvertently disturbed in the course of conducting otherwise permitted activities, the disturbing activity would need to be immediately discontinued and the Refuge Manager would need to be notified within 24 hours. Collecting and removing any prehistoric or historic artifacts would be prohibited.

Monitoring, Adaptive Management, and Enforcement

1. The Refuge would establish a program to monitor compliance with the stipulations enumerated herein. Violation of any of these stipulations could result in temporary or permanent withdrawal by appropriate Refuge personnel of official permission to continue this use on the Refuge. Permits could be revoked by the Refuge Manager with 30-days written notice of non-compliance with these stipulations.

2. The Refuge would monitor habitat quantity and quality, wildlife use and productivity, and other relevant endpoints, given additional staffing, to determine if these stipulations for commercial image and audio recording were resulting in expected and desirable outcomes. In consultation with permittees, the Refuge would apply adaptive management principles to modify stipulations or adjust objectives, as necessary, to achieve desirable results.

3. The Refuge would reserve the right to add to or otherwise modify the stipulations listed herein in order to ensure the continued compatibility of this use. New or modified stipulations could be instituted as a result of new information generated by ongoing or new studies; new legal, regulatory, or policy requirements; significant changes to the Refuge environment or status of native fish, wildlife, plants, or their habitats; changes to commercial image or audio recording or related practices; mutual agreement with the permittees; or for other legitimate reasons. Except in

the case of emergencies, permittees would be advised of new or significantly modified stipulations at least 90 days prior to their becoming effective.

Justification:

As discussed earlier, commercial photography, filming, and audio recording have the potential to share Kīlauea Point's valuable natural and cultural resources, and the conservation story, with a larger audience over a greater geographic area. This could enhance public understanding and appreciation for the Refuge's natural and cultural resources, and increase support for conservation of the Refuge's native fish, wildlife, plants, and their habitats, and its cultural heritage. This is consistent with Service policy on Audio-Visual Productions (8 RM 16) that states such productions can increase public understanding of America's wildlife and of the Service's role in managing and protecting natural resources through the Refuge System.

This use has the potential to generate effects on fish, wildlife, plants, and their habitats, and cultural resources. The stipulations enumerated above, including Refuge information, behavioral guidance, use of maps, specific prohibitions, and monitoring would greatly reduce or eliminate adverse effects and help enhance potential beneficial effects.

Compatibility Standard

In order to be allowed on the Refuge, commercial photography, filming, and audio recording would need to be determined compatible. By allowing these uses to occur under the stipulations described above, it is anticipated that wildlife which could be disturbed would find sufficient food resources and resting places so their abundance and use would not be measurably lessened on the Refuge. Additionally, it is anticipated that monitoring, as needed, would prevent unacceptable or irreversible impacts to fish, wildlife, plants, and their habitats; cultural resources; and public use. For the several reasons stated above and consistent with the stipulations described herein, these uses would not materially interfere with or detract from maintenance of the Refuge's biological integrity, diversity, and environmental health; fulfillment of Kīlauea Point NWR's purposes; or the Refuge System's mission.

Mandatory Re-Evaluation Date:

_____ Mandatory 15-year re-evaluation date (for wildlife-dependent public uses)

____X____ Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

____X____ Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

This compatibility determination has being developed and issued concurrent with the CCP and EA for Kīlauea Point NWR.

Compatibility Determination: Commercial Wildlife and Landscape Filming and Photography (Photography, video, filming, or audio recording – commercial)

Refuge Determination:

Prepared by:	_____ (Signature)	_____ (Date)
Approved by Project Leader, Kaua‘i National Wildlife Refuge Complex:	_____ (Signature)	_____ (Date)

Concurrence:

Refuge Supervisor, Hawaiian and Pacific Islands National Wildlife Refuge Complex:	_____ (Signature)	_____ (Date)
Regional Chief, National Wildlife Refuge System, Pacific Region:	_____ (Signature)	_____ (Date)

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Compatibility Determination

Use: Commercially Guided Tours

Refuge Name: Kīlauea Point National Wildlife Refuge

County and State: County of Kaua‘i, Hawai‘i

Establishing and Acquisition Authorities:

- Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1948, as amended (16 U.S.C. 667b–667d)
- Refuge Recreation Act of 1962, as amended (16 U.S.C. 460k–460k-4)
- Endangered Species Act of 1973, as amended (16 U.S.C. 1531–1544)
- Kīlauea Point National Wildlife Refuge Expansion Act of 2004 (P.L. 108-481)

Refuge Purpose(s):
The purposes for Kīlauea Point NWR have been identified in historic legal documentation establishing and adding refuge lands and are specified as follows:

> "… particular value in carrying out the national migratory bird management program …" (Transfer of Certain Real Property for Wildlife Conservation Purposes Act)
>
> "… suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors …" (Refuge Recreation Act)
>
> "… to conserve (A) fish or wildlife which are listed as endangered species or threatened species…or (B) plants…" (Endangered Species Act)
>
> "(1) the protection and recovery of endangered Hawaiian water birds and other endangered birds, including the Nene (Hawaiian goose); and (2) the conservation and management of native coastal strand, riparian, and aquatic biological diversity…" (Kīlauea Point National Wildlife Refuge Expansion Act)

National Wildlife Refuge System Mission:

> "The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966 as amended, 16 U.S.C. 668dd–668ee).

Description of Use(s):

This use is any fee-based service providing recreational, educational, or interpretive enjoyment of Refuge lands and waters to the visiting public such as transportation, interpretation, educational materials, and programs. The services must aim to enhance the Refuge visitor's knowledge and enjoyment of the key natural resources, including the mission of Kīlauea Point National Wildlife

Refuge (Kīlauea Point NWR; Refuge) and the U.S. Fish and Wildlife Service (Service), or other uses otherwise determined appropriate and compatible with the purposes for Refuge establishment, including guided wildlife observation or photography, natural history or cultural history tours; transport of individual or groups (most commonly by bus or van) to or from Refuge lands for wildlife observation or photography, nature study or interpretation, and other wildlife-oriented activities.

The use may be conducted by a Service conservation partner, concessionaire, or private concern, but will fall under the general heading of ecotourism. In all cases, participants pay a fee to the individual guide, business, or a nonprofit organization for the unique skills, equipment, and expertise of the leader who enhances the experience of the participating individual or party on refuge lands.

Ecotourism involves travel to natural areas to foster environmental and cultural understanding, appreciation, and conservation. These operations are often conducted on a commercial basis, often attempt to integrate the local community in their ventures, and attempt to conduct their activities in an environmentally sensitive and sustainable manner. They routinely include natural and cultural educational or interpretive components and offer wildlife observation and natural and cultural photography opportunities. In contrast with more traditional tourism, these ventures are usually much smaller in scale.

Areas open to general public use include Kīlauea Point (Point), the cul-de-sac (turnaround) at the end of Kīlauea Road (Overlook), Kāhili Quarry area, occasionally a trail(s) on Crater Hill. Under Alternative D, the Preferred Alternative identified in the draft CCP and associated EA, a new offsite visitor center and associated facilities would be constructed and open to general public use. It is possible that some guided tours could also occur at times or in areas of the Refuge that are closed. This would provide individuals and small groups with access to areas that generally are not available to the public at large. At present, at least five different companies utilize the Point for commercially guided tours; an unknown but larger number of companies visit the Overlook.

Commercial guided tours would likely take advantage of Kīlauea Point NWR's multiple opportunities for observation, photography, and interpretation. The Point, where almost all public use at the Refuge currently occurs, offers outstanding opportunities for observation and photography of a diversity of native seabirds, nēnē (Hawaiian goose, *Branta sandvicensis*), and sometimes shorebirds, whales, dolphins, seals, and sea turtles; the Kīlauea Point Light Station; and classic Hawaiian coastal scenery, including undeveloped bluffs, the remnant walls of an ancient volcano, rocky beaches, and nearshore ocean and islands.

Facilities on the Point that support observation, photography, and interpretation include the Overlook, access road, and two modest parking areas, fee station, visitor center, contact station, outdoor interpretive panels, viewing scopes, paved trails, perimeter safety fence, restrooms, and recycling and trash receptacles. The visitor center includes indoor interpretive exhibits and a bookstore. The contact station has displays, information about the Refuge and Lighthouse, and interpretive videos. At the fee station, visitor center, and contact station, visitors can secure brochures with information about the Refuge and its valuable natural and cultural resources. This area is accessed from the town of Kīlauea via Kīlauea Road. Visitors are assessed a modest fee to enter the main public use area on the Point and a moderate fee would be charged for limited Crater Hill hikes (except during National Wildlife Refuge Week).

The proposed new offsite visitor center, transportation hub, and other facilities would provide visitor contact, orientation and information, fee collection, restrooms, bookstore/retail space, and tour bus parking. Under this proposal, parking for private automobiles and tour buses on the Point would be eliminated, and visitors would access the Refuge primarily via a shuttle from Kīlauea town and/or the new visitor center. On the Point, the existing visitor center would be remodeled to provide interpretive exhibits and displays, the scenic view and interpretation at the contact station would be expanded, and one of the former lighthouse quarters would be restored and converted into a living history site. Signage at the Overlook would be enhanced to provide more information and interpretation. In addition, efforts would be made to increase opportunities for up-close wildlife observation and photography (e.g., with remote cameras and observation/photo blinds). As a result of these changes, it is expected that the number and quality of observation, photography, and interpretive opportunities would substantially increase.

Operating a commercial program on a refuge or a program that facilitates public access to a refuge in areas or at times that it is closed is a specialized use under U.S. Fish and Wildlife Service (Service) policy (Administration of Specialized Uses, 5 RM 17). To the extent that this use facilitates an approved program on a refuge, it is also an economic use under relevant Federal regulation (50 C.F.R. 29.1). Before being allowed on the Refuge, this use would first need to be found appropriate (Appropriate Refuge Uses, 603 FW 1) and then be determined compatible (Compatibility, 603 FW 2). Official authorization to access the Refuge for this use would occur through issuance of an SUP.

Availability of Resources:

The Administration of Specialized Uses (5 RM 17) policy requires that a refuge seek to recover its costs associated with administration of such a use and/or charge a fee equal to the fair market value of the benefit received by the user. Benefits provided to the Service by a refuge use are considered in establishing appropriate fees. Direct and indirect costs to administer this use on the Refuge include the following:

- Costs associated with construction, repair, operation, and maintenance of associated facilities;
- Salaries and associated employee expenses related to evaluation of the proposed use (including appropriateness finding, compatibility determination, and compliance with applicable laws, regulations, and policies such as the National Environmental Policy Act, Endangered Species Act, and National Historic Preservation Act) and development of the SUP;
- Salaries and associated employee expenses related to monitoring of this use to ensure that permit requirements are followed and that the use remains compatible. This includes evaluation of effects of this use on the Refuge’s natural and cultural resources, and compatible, especially wildlife-dependent, public use;
- Use-related supplies, equipment, and travel; and
- An applicable portion of Refuge overhead costs.

It is very early in the planning process for a potential new visitor center and transportation hub for the Refuge. In addition, these proposed facilities would serve multiple purposes (including administrative and maintenance functions in addition to visitor services), so costs would need to be appropriately allocated among various public uses. Therefore, no estimate is made here of the share of construction, operation, and maintenance costs of this set of facilities supportive of commercially guided tours.

Following is an estimate of one-time costs associated with the commercially guided tours program.

Projects	Estimated Costs[1]
1. Conversion of visitor center to provide interpretive exhibits and displays.	$200,000
2. Expansion of the scenic view and interpretation at the contact station.	$150,000
3. Restoration and conversion of former lighthouse quarters into a living history site.	$550,000
4. Orientation materials and/or trainings.	$40,000
Total Costs	$940,000

[1] Costs displayed are totals for these changes. Note that many of these changes would also benefit wildlife observation and photography, environmental interpretation and education, and other uses of the Refuge.

Following is an estimate of other costs associated with administering this use on the Refuge.

Tasks	Estimated Costs per Year[1]
1. Permit administration and oversight by GS-13 Project Leader (approximately 20 hours/year).	$1,200
2. Permit administration and oversight by GS-12 Deputy Project Leader (approximately 20 hours/year).	$1,000
3. Permit administration and oversight by GS-9 Supervisory Park Ranger (approximately 80 hours/year).	$2,800
4. Permit administration by GS-4 Budget Clerk (approximately 20 hours/year)	$400
5. Law enforcement by GL-9 Law Enforcement Officer (approximately 40 hours/year).	$1,500
6. Permit monitoring by GS-11 Biologist (approximately 20 hours/year).	$900
7. Refuge overhead costs associated with the above-listed work.[2]	$1,600
8. Facility maintenance, repair, and materials	$3,000
Total Costs	$12,400

[1] Annual personnel costs = 2014 step 1 salary for appropriate GS level x 12.25% COLA x 40% for benefits.
[2] Overhead costs = salary + benefit costs x 0.22. Overhead expenses include building rent, utilities, equipment and supplies, and support personnel, and do not include salary-related benefits.

Fee revenues collected from commercial uses of this nature are not retained by the Refuge. Instead, these monies are deposited into the U.S. Treasury Department's National Wildlife Refuge Fund. Moneys from this fund are used for redistribution to refuges to help offset the costs of administering specialized uses (Expenses for Sales) and for payments in lieu of taxes to counties or other local governments under the Refuge Revenue Sharing Act.

The Refuge currently has adequate budget and staff to support limited commercial use of this nature.

Anticipated Impacts of the Use(s):

In the long term, the proposed offsite new visitor center, transportation hub, maintenance, and other facilities would provide enhanced interpretive opportunities, and it is likely that participants in commercially guided tour operations would stop in to enjoy its many features because the shuttle for the Point would pick up and drop all off visitors there. However, in the absence of site-specific

information, attempting to assess many of the anticipated direct and indirect impacts of the construction and operation of these new facilities would be premature. Additionally, these facilities would serve multiple purposes (including administrative and maintenance functions in addition to visitor services), so effects attributable to commercially guided tours would be only a portion of the total effects. For these reasons, many of the anticipated impacts of these potential new facilities are beyond the scope of this evaluation and are not addressed herein. More detailed evaluations would need to be undertaken, including site-specific effects analysis in compliance with the National Environmental Policy Act (NEPA), National Historic Preservation Act (NHPA), and other applicable laws and policies. Readers are also referred to the EA accompanying the Refuge CCP for more information.

Commercially guided tours would directly or indirectly support draft Refuge goals 4, 5, and 6. To the extent it enhanced the public's understanding of or appreciation for the importance of conservation; it would also support the Refuge System mission.

The effects of guided tours upon wildlife would likely be associated with disturbance. Human disturbance has differential effects on wildlife and is dependent upon, among other variables, the species involved and its age; the time of year; the breeding cycle stage (if applicable); the surrounding environment; whether the activity involves vehicles; the intensity, speed, noise, nature, and frequency of the disturbing activity; and the directness of approach to an animal (Blanc et al. 2006, Holmes et al. 2005, Hammitt and Cole 1998, Knight and Cole 1995a, Knight and Cole 1995b). Immediate responses by wildlife to recreational activity can range from behavioral changes including nest abandonment, altered nest placement, change in food habits, physiological changes such as elevated heart rates and increased energetic costs due to flight or flushing, or even death (Belanger and Bedard 1990, Knight and Cole 1995a, Knight and Swaddle 2007, Miller et al. 1998, Miller and Hobbs 2000, Morton et al. 1989, Smith-Castro and Rodewald 2010). The long-term effects are more difficult to assess but may include altered behavior, vigor, productivity or death of individuals; altered population abundance, distribution, or demographics; and altered community species composition and interactions.

Kitaysky et al. (2003) found levels of corticosterone (a major stress hormone) in ʻuaʻu kani at the Refuge to be higher in chicks occupying burrows closer to (within 13 feet of) visitor-use areas. Holmes et al. (2005) found that, even at the recommended minimum approach distance (~16 feet), a single wildlife observer in a Royal penguin (*Eudyptes schlegeli*) colony on Macquarie Island, Australia, triggered vigilance behavior and an increased heart rate in the birds. In another study, Holmes et al. (2007) found that vigilance behavior of Gentoo penguins (*Pygoscelis papua*) increased as the numbers of observers increased. Additional studies in penguin colonies revealed that a slow approach that ended with a visitor sitting quietly and closely observing a bird had little effect on the bird's heart rate, yet a rapid approach that ended with a visitor remaining standing and closely observing a bird resulted in an elevated heart rate (Nimon et al. 1995).

A variety of factors affect flushing distances among waterbirds, including the species involved; the activity the birds are engaged in (e.g., foraging versus nesting); and the type, speed, and noise of disturbance (e.g., approaching birds by walking versus in a motorized boat) (Rodgers and Smith 1997, Rodgers 1991). Flushing of birds or even raising their alert levels (which usually occurs at a greater distance than that for flushing) creates stress and requires animals to expend energy that otherwise would be invested in essential life history activities such as foraging, mating, nesting, brood-rearing, and predator avoidance.

Breeding birds are especially sensitive to human disturbance (Trulio 2005, Hammitt and Cole 1998). A study of visitors to a colony of kittiwakes (*Rissa tridactyla*) and guillemots (*Uria aalge*) revealed that nesting success was influenced by the distance observers were from the birds (positively correlated) and the number of observers involved (negatively correlated) (Beale and Monaghan 2004).

Studies have had mixed results regarding potential habituation of birds and some other taxa to human disturbance. Wildlife are often less disturbed by routine human activities that repeatedly occur along defined routes (e.g., trails, roads, or water channels), especially frequent disturbance that does not involve direct contact or other threat, compared with those activities that occur irregularly and outside predictable paths/channels (Blanc et al. 2006, Holmes et al. 2007, Knight and Cole 1995b).

In studies of breeding yellow-eyed penguins (*Megadyptes antipodes*), a timid and secretive species, Ratz and Thompson (1999) found that the birds appeared to have habituated to the presence of guided tourists who approached the colony through trenches and closely observed or photographed birds from camouflaged blinds. Jungius and Hirsch (1979) studied seabird colonies and found that birds that were believed to have habituated to tourists and revealed no outward behavioral changes in their presence, nonetheless exhibited stress (as reflected in elevated heartbeat frequencies) when approached by visitors. The scientists speculated that the stress could have a negative effect on breeding. Habituation to some types and levels (intensity and frequency) of human disturbance appears to vary among species, within species, between resident and migratory populations, and potentially between inexperienced and experienced breeders. This makes it difficult to forecast habituation in actual field situations.

‘Īlio-holo-i-ka-uaua numbers are increasing in the main Hawaiian Islands, especially on and around Ni‘ihau and Kaua‘i (NMFS 2007, Baker and Johanos 2003). Critically endangered ‘īlio-holo-i-ka-uaua are very sensitive to human disturbance (NMFS 2007) and disturbance of female adults with pups is of special concern (Gilmartin 2003). Seals may also injure people. Seals haul out on land to rest, molt, or pup. Approaching photographers could force hauled-out seals to move back into the water and seek a new haul-out site causing them to expend energy and increasing their exposure to predators. Repeated disturbance over time can cause seals to abandon preferred haul-out sites (Gilmartin 2003). It’s generally recommended that individuals viewing or photographing seals and sea turtles maintain a distance of at least 50 yards from the animals and limit their viewing/photographing time to 30 minutes (NOAA undated, NOAA Fisheries et al. undated; “Hawai‘i Viewing Guidelines: Overview, Marine Mammal & Sea Turtle Viewing ‘Code of Conduct’” at http://www.nmfs.noaa.gov/pr/education/Hawai‘i/).

Wildlife disturbance can be a special concern with wildlife observation and photography (Cline et al. 2007, DeLong 2002, Knight and Cole 1995). Observers and photographers often want to enhance their view or photograph by encroaching closer and closer to their subject. This can cause increased stress in wildlife and eventually lead to flushing. If a bird is nesting or brood-rearing, disturbance can cause temporary or permanent nest desertion. Even if only temporary, eggs and nestlings can face survival challenges associated with temperature extremes and predation.

Commercially guided tours could also cause trampling of native plants, erosion, and introduction or spread of exotic species, including invertebrates, plants, and invasive species. All of these impacts would adversely affect native fish, wildlife, plants, and their habitats; and would be of special concern in Refuge areas struggling with reestablishment of native plant communities. The degree of

actual effects upon reproduction, survival of individuals, and diversity and abundance of native species (community health) would depend on specific circumstances. Except with special permission, guided tour permittees and their clients would be required to behave like other visitors, including remaining behind the perimeter fencing on the Point, not crossing fences elsewhere on the Refuge, and otherwise abiding by closed-area signage. These and other stipulations associated with this use have been designed to greatly reduce the likelihood and magnitude of potential effects by commercially guided tours on biological resources, including roosting, foraging, and breeding birds.

The Refuge has substantial and, in some areas, dense populations of burrow-nesting seabirds. Although some burrows lie on the Point adjacent to the area heavily used by Refuge visitors, the vast majority of the burrows are elsewhere, in less disturbed areas of the Refuge, such as Crater Hill. Humans casually walking through nesting colonies could easily crush burrows, destroy nests and eggs, and kill young or adult seabirds.

Crater Hill grasslands are primarily composed of nonnative species (e.g., Kikuyu grass [*Pennisetum clandestinum*]); however, these areas provide actual and potential habitat for roosting, foraging, and breeding activities by nēnē, mōlī, and shorebirds. Additionally, major efforts have been undertaken to reintroduce native plants to the area. Areas on the Point that receive almost all of the Refuge's visitation and the core of the Kāhili Quarry are hardened and therefore experience very few effects from public use. However, a substantial increase in public use of Crater Hill would increase the potential for erosion and compaction of trails, for crushing of nesting burrows, and for disturbance to native birds using the grasslands and to outplanting of native vegetation. Crater Hill hikes would be limited in frequency and number of participants, guided, and appropriately scheduled to minimize adverse effects.

Public Uses

The Point area (approximately 31 acres in size) and existing facilities (e.g., parking area, visitor center, and contact station) are relatively small for the visitation the Refuge experiences (from 2010 to 2013, the visitor center averaged about 189,963 visitors per year). The single access road is narrow and the parking area is small. There is no single-direction drive through of the parking area (vehicles must turn around to exit the Refuge). Because of all this, the number and size of vehicles that can be safely accommodated are limited.

Additionally, the number of visitors who can simultaneously enjoy a quality wildlife-dependent educational or recreational experience on site is limited. If guided tour permittees brought large buses full of clients to the Refuge, it could create traffic and safety conflicts and reduce the quality of experience for other Refuge visitors. Currently, large tour buses (25 passenger or larger) are restricted from entering the Refuge. Stipulations would limit guided tour permittees to use of medium-sized vans or smaller vehicles to transport their clients to the Refuge and could prohibit their visits during special Refuge events. Many of these concerns would be alleviated with the development of a new visitor center and associated facilities and services.

As noted above, except in with special permission, stipulations associated with this use would require visitors to remain behind the perimeter fencing on the Point, and not cross fences and otherwise abide by closed-area signage elsewhere on the Refuge. These use conditions would greatly reduce potential public safety concerns. Stipulations associated with commercial guided tours would limit this use in

space, time, or other manners such that effects on other Refuge visitors were avoided or greatly reduced.

If commercially guided tour operations were conducted in closed areas where it was readily seen by other Refuge visitors, these other visitors could easily become confused regarding where activities are and are not allowed on the Refuge. This could increase the occurrence of unauthorized access, and impacts to native wildlife and plants. Stipulations would limit this use to reduce potential effects on other Refuge visitors.

Cultural Resources

The Refuge contains a number of historic and prehistoric resources, including the Kīlauea Point Light Station (the lighthouse and associated Coast Guard facilities on the Point) that was listed on the National Register of Historic Places as an historic district in 1979 (USFWS 2006). Extensive and unregulated commercially guided tours or ecotourism have the potential to adversely affect these resources. To the extent that SUPs included clear maps depicting areas permittees were authorized to access and use, and permittees and their clients were aware of prohibitions related to cultural resources, impacts to these resources would not be expected.

Public Review and Comment:

Public availability of this CD has been widely announced together with announcement of the availability of the Refuge's draft CCP. The review and comment period has also been the same as for the draft CCP.

Determination:

_____ Use is Not Compatible

____X____ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

General

1. Permission to use the Refuge for commercially guided tours or ecotourism would be officially authorized through issuance of an SUP to minimize the possibility of damage to cultural or natural resources or interference with other visitors to the area. Each request will be reviewed on a case-by-case basis. As appropriate, each permit would authorize a one-time use or repeated uses over a time period not to exceed 1 year. SUPs would cover use by a specified individual or organization and could not be assigned or sub-permitted to others (i.e., the permit is not transferable).

   Prior to potential permit renewal, Refuge staff would meet with permittees to share new information, discuss results of monitoring, review compliance with permit conditions, and address other issues. Other meetings would be scheduled as needed.

2. A fee greater than or equal to $250 will ordinarily be charged for SUPs, but may be fully or partially waived by the Refuge Manager.

3. Most of Kīlauea Point NWR is closed to general public use, so SUPs would include maps clearly depicting the areas permittees would be authorized to access and use, including the Refuge entry point(s). Travel within the Refuge would be by designated road, parking lot, and/or trail. Permission to access Refuge closed areas would be designed to minimize safety concerns, and effects on biological and cultural resources, and other visitors. Permission would generally not be granted to access areas on the Point outside the public safety fence, Mōkōlea Point, Makapili Rock, or the northern shoreline. In the absence of specific, prior written approval of the Refuge Manager (for the purpose of these stipulations, the Refuge Manager would be the Refuge Project Leader of the Kaua‘i National Wildlife Refuge Complex), permittees and their clients would be prohibited from straying outside the areas depicted on the maps or accessing the Refuge at times it was closed.

4. Commercially guided tour participants could also access Crater Hill on the same basis as other members of the general public. These hikes would require the use of a guide(s) (Refuge staff or trained volunteer), and would be limited to individuals 9 years or older (individuals between 9 and 16 years old would require adult accompaniment). A maximum of 15 visitors per group would be allowed on limited hikes and would be routed and scheduled to avoid impacts to seabirds and nēnē. With the exception of special, free hikes during National Wildlife Refuge Week, reservations (up to four persons per reservation) would be required and permittees and their clients (adults age 16 years or older) would be charged the same fee as other member of the public to join these hikes. An injury waiver (i.e., “Release from Injury” form) would be required.

   The Service would assess erosion and compaction on trails, and wildlife effects of visitation (e.g., disturbance and crushing of burrows) on Crater Hill and elsewhere, and develop solutions to any problems. Potentially, actions could include hardening of trails, rebuilding or rerouting of trails, reducing the frequency of use of trails, rescheduling use of trails, and/or closing trails.

5. All commercially guided tours would avoid sensitive areas prone to disturbance (e.g., sensitive vegetation areas) or degradation (e.g., soil compaction), and would be designed to minimize impacts to nesting birds or other breeding, feeding, or resting wildlife. Areas that are open to this use would be evaluated on an annual, seasonal, and sometimes daily basis and would be influenced by beach geomorphology and wildlife use. Seasonal closures may vary year to year based on wildlife use and habitat conditions. Permittees would be expected to comply with closures.

6. Permittees would be required to secure and maintain the currency of all licenses, permits, and approvals required by State and local governments to engage in the commercial activities they were proposing or pursuing.

7. Permittees would be prohibited from constructing new or maintaining existing structures on the Refuge without specific, prior written approval of the Refuge Manager.

8. In the absence of specific, prior written approval of the Refuge Manager, permittees and their clients would be prohibited from collecting and removing any archaeological or historic artifacts, abiotic or biological specimens or samples, or mementos from the Refuge.

9. Consistent with Service policy regarding management of nonhazardous solid waste on Refuges (Resource Conservation and Recovery Act of 1976, as amended [42 U.S.C. 6901-6992k] – Solid

Waste (Nonhazardous), 561 FW 5), permittees and their clients would be prohibited from littering, dumping refuse, abandoning equipment or materials, or otherwise discarding any items on the Refuge. Permittees would be required to bring and use recycling and trash receptacles on tours through the Refuge.

10. Permittees would be required to hold the United States Government harmless from any damages or injury to the permittee or members of the general public in areas and facilities accessed via the terms of their permit.

11. In addition to the stipulations listed here, the general permit conditions and requirements, and the special permit conditions, all visitors would be required to comply with Refuge System-related and other applicable laws, regulations, and policies including "Prohibited Acts" listed in the Code of Federal Regulations (50 C.F.R. 27).

12. No changes could be made to any of these stipulations without specific, prior written approval of the Refuge Manager.

Commercially guided tours

1. Permittees would be required to provide all tour participants (clients) with written and/or oral information about the Refuge, its purposes and goals, natural and cultural resources of concern, areas and times open and closed to public use, rules and regulations, and any hazardous conditions. The Refuge would provide permittees with information needed to comply with these requirements, and would provide mandatory annual training on interpretation and other subjects for permittees.

2. Permittees would be expected to comply and ensure their clients complied with Refuge rules and safety, interpretive, regulatory, and other signage. Appropriate signage would be installed and maintained. Permittees would be required to advise Refuge staff within 48 hours of signs that were missing or damaged.

3. Commercially guided tours or ecotourism permittees and their clients who accessed the Point beyond the fee station would be required to pay Refuge entrance fees in the same manner as all Refuge visitors.

4. Permittees would be prohibited from obstructing Refuge areas of value for other visitors who are participating in observation, photography, interpretation, education, or other approved uses. Permittees would also be prohibited from engaging in active business or political operations while on the Refuge, such as soliciting alms and contributions, campaigning for election to any public office, collecting private debts, soliciting and vending for commercial purposes (including, but not limited to, the vending of newspapers and other publications), displaying or distributing commercial advertising, collecting signatures on petitions, polls, or surveys (except in association with Refuge monitoring and as authorized by the Refuge Manager).

5. When viewing or photographing ʻīlio-holo-i-ka-uaua or honu, whether these animals are in the water or on shore, permittees and their clients should maintain a distance of at least 50 yards and limit their viewing/photographing time to 30 minutes (NOAA undated). ʻIlio-holo-i-ka-uaua and honu are listed under both the Endangered Species Act (ESA) and the Marine Mammal

Protection Act (MMPA) which have mechanisms to encourage management for population growth and recovery and to prohibit any form of "take," except for limited exceptions authorized under Federal permits. Under the ESA, "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect or attempt to engage in any such conduct. Under the MMPA, "take" includes actions such as hunting, harassing, killing, capturing, injuring and disturbing a marine mammal. There are established civil and criminal penalties for, at a minimum, "disturbing" ʻīlio-holo-i-ka-uaua or honu by getting too close or staying too long, which alters their behavior, thus resulting in take. If ʻīlio-holo-i-ka-uaua or honu display signs of being disturbed, then that 50 yards would be expanded and/or viewing would be minimized or shut down to stop the disturbance and avoid potential take.

6. In order to ensure safety and reduce conflicts with other users, guided tour permittees would be limited to use of medium-sized or smaller vans or buses to transport their clients to the Refuge. Additionally, if determined desirable, the frequency of commercially guided tours on the Refuge could be limited and they could be prohibited from visiting during Refuge special events.

Cultural Resources

1. In the absence of specific, prior written approval of the Refuge Manager, permittees and their clients would be prohibited from disturbing or otherwise adversely impacting any prehistoric, historic, or other cultural resources on the Refuge. In the event such resources were inadvertently disturbed in the course of conducting otherwise permitted activities, the disturbing activity would need to be immediately discontinued and the Refuge Manager would need to be notified within 24 hours. Collecting and removing any prehistoric or historic artifacts would be prohibited.

Monitoring, Adaptive Management, and Enforcement

1. The Refuge would establish a program to monitor compliance with the stipulations enumerated herein. Violation of any of these stipulations could result in temporary or permanent withdrawal by appropriate Refuge personnel of official permission to continue this use on the Refuge. Permits could be revoked by the Refuge Manager with 30 days' written notice of noncompliance with these stipulations.

2. The Refuge would monitor the quality of the visitor experience provided by permittees. Service policy includes criteria to be used in evaluating the quality of wildlife-dependent public use programs (General Guidelines for Wildlife-Dependent Recreation, 605 FW 1.6).

3. The Refuge would monitor habitat quantity and quality, wildlife use and productivity, and other relevant endpoints, given additional staffing, to determine if these stipulations for commercially guided tours resulted in expected and desirable outcomes. In consultation with permittees, the Refuge would apply adaptive management principles to modify stipulations or adjust objectives, as necessary, to achieve desirable results.

4. The Refuge would reserve the right to add to or otherwise modify the stipulations listed herein in order to ensure the continued compatibility of this use. New or modified stipulations could be instituted as a result of new information generated by ongoing or new studies; new legal, regulatory, or policy requirements; significant changes to the Refuge environment or status of native fish, wildlife, plants, or their habitats; changes to commercially guided tour activities or

related practices; mutual agreement with the permittees; or for other legitimate reasons. Except in the case of emergencies, permittees would be advised of new or significantly modified stipulations at least 90 days prior to their becoming effective.

Justification:

Commercially guided tours provide another opportunity for members of the public to enjoy the Refuge, perhaps as part of a larger birding, nature, or cultural/historic tour program that also visited areas elsewhere on Kaua‘i. During these tours, it is expected that the public would benefit from high-quality environmental and cultural interpretation and enjoy opportunities for wildlife observation and photography. Consistent with relevant law and policy (16 U.S.C. 668dd–668ee; Wildlife Observation, 605 FW 4; Photography, 605 FW 5; and Interpretation, 605 FW 7), these wildlife-dependent general public uses are to be given special consideration in refuge planning and management.

This use has the potential to generate effects on fish, wildlife, plants, and their habitats, and cultural resources. The stipulations enumerated above, including Refuge information, training, use of maps, signage, specific prohibitions, and monitoring, would greatly reduce or eliminate adverse effects and help enhance potential beneficial effects.

Economic Uses

Regulations at 50 C.F.R. 29.1 require that the Service only authorize an economic use of Refuge natural resources where a determination has been made that the use contributes to the achievement of Refuge purposes or the Refuge System mission. The regulations define an economic use to include “operations that facilitate approved programs on national wildlife refuges,” so commercially guided tours qualify as an economic use subject to these regulations.

Commercially guided tour operations on the Refuge would provide good field opportunities to increase public understanding and appreciation for the Refuge System, Kīlauea Point NWR, seabirds and shorebirds, endangered species, cultural resources, and the value of conservation. Where appropriately regulated to reduce or eliminate adverse effects, these activities would contribute to achievement of the Refuge’s purposes and the Refuge System mission.

Compatibility Standard

In order to be allowed on the Refuge, commercially guided tours would need to be determined compatible. By allowing this use to occur under the stipulations described above, it is anticipated that wildlife which could be disturbed would find sufficient food resources and resting places so their abundance and use would not be measurably lessened on the Refuge. Additionally, it is anticipated that monitoring, as needed, would prevent unacceptable or irreversible impacts to fish, wildlife, plants, and their habitats; cultural resources; and other public uses. For the several reasons stated above and consistent with the stipulations described herein, this use would not materially interfere with or detract from maintenance of the Refuge’s biological integrity, diversity, and environmental health; fulfillment of Kīlauea Point NWR’s purposes; or the Refuge System’s mission.

Mandatory Re-Evaluation Date:

_____ Mandatory 15-year re-evaluation date (for wildlife-dependent public uses)

____X____ Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

____X____ Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

This compatibility determination has being developed and issued concurrent with the CCP and EA for Kīlauea Point NWR.

Compatibility Determination: Commercially Guided Tours

Refuge Determination:

Prepared by:	_____ (Signature)	_____ (Date)
Approved by Project Leader, Kaua‘i National Wildlife Refuge Complex:	_____ (Signature)	_____ (Date)

Concurrence:

Refuge Supervisor, Hawaiian and Pacific Islands National Wildlife Refuge Complex:	_____ (Signature)	_____ (Date)
Regional Chief, National Wildlife Refuge System, Pacific Region:	_____ (Signature)	_____ (Date)

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Compatibility Determination

Use: Environmental Education

Refuge Name: Kīlauea Point National Wildlife Refuge

County and State: County of Kaua‘i, Hawai‘i

Establishing and Acquisition Authorities:

- Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1948, as amended (16 U.S.C. 667b–667d)
- Refuge Recreation Act of 1962, as amended (16 U.S.C. 460k–460k-4)
- Endangered Species Act of 1973, as amended (16 U.S.C. 1531–1544)
- Kīlauea Point National Wildlife Refuge Expansion Act of 2004 (P.L. 108-481)

Refuge Purpose(s):
The purposes for Kīlauea Point NWR have been identified in historic legal documentation establishing and adding refuge lands and are specified as follows:

> "… particular value in carrying out the national migratory bird management program …" (Transfer of Certain Real Property for Wildlife Conservation Purposes Act)
>
> "… suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors …" (Refuge Recreation Act)
>
> "… to conserve (A) fish or wildlife which are listed as endangered species or threatened species…or (B) plants…" (Endangered Species Act)
>
> "(1) the protection and recovery of endangered Hawaiian water birds and other endangered birds, including the Nene (Hawaiian goose); and (2) the conservation and management of native coastal strand, riparian, and aquatic biological diversity…" (Kīlauea Point National Wildlife Refuge Expansion Act)

National Wildlife Refuge System Mission:

> "The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966 as amended, 16 U.S.C. 668dd–668ee).

Description of Use(s):

U.S. Fish and Wildlife Service (Service) policy defines EE to be, "…a process designed to teach citizens and visitors the history and importance of conservation and the biological and the scientific knowledge of our Nation's natural resources. Through this process, …[the Service]… can help develop a citizenry that has the awareness, knowledge, attitudes, skills, motivation, and commitment

to work cooperatively towards the conservation of our Nation's environmental resources. Environmental education (EE) within the Refuge System incorporates onsite, offsite, and distance learning materials, activities, programs, and products that address the audience's course of study, refuge purpose(s), physical attributes, ecosystem dynamics, conservation strategies, and the Refuge System mission" (Environmental Education, 605 FW 6).

EE is a formal, structured program that incorporates measurable learning objectives and uses audience-appropriate curricula to satisfy State or other standards. EE activities can be provided by Refuge personnel, a volunteer(s), or other Service-authorized agent(s); or through partnerships with groups that share similar goals (e.g., the Kīlauea Point Natural History Association [KPNHA] or others). For purposes of this compatibility determination (CD), EE includes education regarding natural and cultural resources and values.

At Kīlauea Point National Wildlife Refuge (NWR or Refuge), the Service currently offers an EE program with a focus on activities at Kīlauea Point (hereafter referred to as the Point), an area of approximately 31 acres in size. With the assistance of interns and volunteers, the Refuge conducts EE programs throughout the year with the greatest number of students visiting January–May. Between 2010 and 2013, education participants involved in on- and offsite EE programs ranged from 7,200 to 12,032 per year (USFWS 2014).

The Point is accessed from the town of Kīlauea via Kīlauea Road. At the end of the road, school buses travel the winding, narrow, and steep Refuge entrance road to one of the parking areas, two of which are hardened. If they park in one of the hardened parking areas, the buses must turn around after discharging their passengers because there is no drive through. The other parking areas are grassy and serve as nēnē (Hawaiian goose, *Branta sandvicensis*) habitat. These areas become soft and muddy following a heavy rain. After being discharged, students, teachers, and chaperones walk the path from the parking area to the main public use area of the Point. KPNHA funds bus transportation for EE and participants are not charged a Refuge entrance fee.

EE activities are typically scheduled from 8:30 a.m. to 10:00 a.m. This is intended to avoid conflicts with other Refuge visitors by allowing students to depart the Point and the school buses to exit along the narrow entry road prior to the Refuge opening to general public use. However, not all school groups manage to depart by 10:00 a.m. This can create traffic conflicts in the parking area and along the entrance road, create safety problems for school children, and require substantial support by Refuge staff to facilitate a safe departure. In light of the time consumed by unloading, walking, restroom breaks, and loading, approximately 1 hour remains for formal EE.

EE activities are offered in the multi-purpose room in the basement of the visitor center or in the contact station adjacent to Kīlauea Lighthouse. Both areas are also used for other purposes, and are limited in size and the number of students they can accommodate. This problem is exacerbated during inclement weather. Occasionally, EE activities are offered on Crater Hill. EE is also an element of Refuge special events and work parties.

To support and supplement the onsite EE activities, the Refuge—with the assistance of volunteers, KPNHA, and interns—has developed EE materials for teachers, including a teachers' manual, field trip leader packets, a traveling trunk, a website, and a junior ranger program. In addition, Refuge staff or interns visit some school classrooms on Kaua‘i.

Under the Preferred Alternative, the proposed offsite new visitor center, transportation hub, and other facilities would provide visitor contact, orientation and information, fee collection, restrooms, bookstore/retail space, multipurpose room, outdoor spaces, public bus stop, and shuttle pick up/drop off. Under this proposal, parking for private automobiles and tour buses on the Point would be eliminated and visitors would access the Refuge primarily via a shuttle from Kīlauea town or the new visitor center. Additional changes are proposed for the Point, including remodeling of the existing visitor center to provide EE or interpretive exhibits and displays, expanding the scenic view and interpretation at the contact station, and restoring and converting one of the former lighthouse quarters into a living history site. In addition, efforts would be made to increase opportunities for up-close wildlife observation and photography (e.g., with remote cameras and observation/photo blinds). The Refuge has also proposed resuming EE trainings for teachers and potentially offering EE activities in the Kāhili Quarry area (e.g., water quality sampling and analyses).

Students often enjoy wildlife observation and photography and environmental interpretation opportunities ancillary to their participation in formal EE activities at the Refuge. Observation, photography, and interpretation opportunities at Kīlauea Point NWR are addressed in a separate CD (CD for Wildlife Observation and Photography, and Environmental Interpretation).

EE is a wildlife-dependent general public use and is to be given special consideration in refuge planning and management. When determined compatible on a refuge-specific basis, a wildlife-dependent use becomes a priority public use for that refuge and is to be facilitated and strongly encouraged (National Wildlife Refuge System Administration Act).

Availability of Resources:

It is early in the planning process for a potential new visitor center and transportation hub for the Refuge. In addition, these proposed facilities would serve multiple purposes (including administrative and maintenance functions in addition to visitor services), so costs would need to be appropriately allocated among various public uses. Therefore, no estimate is made here of the share of construction, operation, and maintenance costs of this set of facilities supportive of EE.

Following is an estimate of one-time costs associated with the EE program.

Projects	Estimated Costs[1]
1. Conversion of visitor center to provide interpretive exhibits and displays.	$200,000
2. Expansion of the scenic view and interpretation at the contact station.	$150,000
3. Restoration and conversion of former lighthouse quarters into a living history site.	$550,000
4. Update curricula and materials as necessary.	$20,000
5. Develop a multifaceted Junior Ranger program, to reach all ages of young visitors to the Refuge.	$20,000
Total Costs	$940,000

[1] Costs displayed are totals for these changes. Note that many of these changes would also benefit wildlife observation and photography, environmental interpretation and other uses of the Refuge.

Following is an estimate of other costs associated with administering this use on the Refuge.

Tasks	Estimated Costs per Year[1]
1. Administration and oversight by GS-9 Supervisory Park Ranger, including	

Tasks	Estimated Costs per Year[1]
recruiting and training staff and volunteers (approximately 830 hours/year).	$29,800
2. Refuge overhead costs associated with the above-listed work.[2]	$6,000
3. Facility maintenance, repair, and materials	$3,000
4. Supplies (including brochures)	$3,000
Total Costs	$41,800

[1] Annual personnel costs = 2014 step 1 salary for appropriate GS level x 12.25% COLA x 40% for benefits.
[2] Overhead costs = salary + benefit costs x 0.22. Overhead expenses include building rent, utilities, equipment and supplies, and support personnel, and do not include salary-related benefits.

With the substantial support of KPNHA and volunteers, the Refuge has adequate budget and staff to support the current level of EE on the Refuge.

Anticipated Impacts of the Use(s):

In the long term, the proposed new offsite visitor center, transportation hub, maintenance, and other facilities would provide enhanced EE opportunities. However, in the absence of site-specific information, attempting to assess many of the anticipated direct and indirect impacts of the construction and operation of these new facilities would be premature. Additionally, these facilities would serve multiple purposes (including administrative and maintenance functions in addition to visitor services), so effects attributable to EE would be only a portion of the total effects. For these reasons, many of the anticipated impacts of these potential new facilities are beyond the scope of this evaluation and are not addressed herein. More detailed evaluations would need to be undertaken, including site-specific effects analysis in compliance with the National Environmental Policy Act (NEPA), National Historic Preservation Act (NHPA), and other applicable laws and policies. Readers are also referred to the EA accompanying the Refuge CCP for more information.

It is not anticipated that other offsite EE activities, such as those conducted in area schools, would have measurable impacts on the Refuge or its natural or cultural resources.

EE activities would support draft Refuge goal numbers 4, 5, and 6. It is expected that EE would enhance participants' understanding of and appreciation for the importance of conservation; therefore, this use would also support the Refuge System mission.

The vast majority of public use at the Refuge, including EE, occurs at the Point. Visitors have incredible opportunities to hear and view numerous seabirds as they soar overhead, roost or nest on adjacent cliffs and grassy knolls, and forage in the ocean. Nēnē are routinely seen close up, on the grounds. Nēnē are fairly tolerant of human disturbance, but many seabirds are wary and flush when approached too closely.

The effects of EE upon wildlife would likely be associated with disturbance. Human disturbance has differential effects on wildlife and is dependent upon, among other variables, the species involved and its age; the time of year; the breeding cycle stage (if applicable); the surrounding environment; whether the activity involves vehicles; the intensity, speed, noise, nature, and frequency of the disturbing activity; and the directness of approach to an animal (Blanc et al. 2006, Holmes et al.

2005, Hammitt and Cole 1998, Knight and Cole 1995a, Knight and Cole 1995b). Immediate responses by wildlife to recreational activity can range from behavioral changes including nest abandonment, altered nest placement, change in food habits, physiological changes such as elevated heart rates and increased energetic costs due to flight or flushing, or even death (Belanger and Bedard 1990, Knight and Cole 1995a, Knight and Swaddle 2007, Miller et al. 1998, Miller and Hobbs 2000, Morton et al. 1989, Smith-Castro and Rodewald 2010). The long-term effects are more difficult to assess but may include altered behavior, vigor, productivity or death of individuals; altered population abundance, distribution, or demographics; and altered community species composition and interactions.

Kitaysky et al. (2003) found levels of corticosterone (a major stress hormone) in ‘ua‘u kani at the Refuge to be higher in chicks occupying burrows closer to (within 13 feet of) visitor-use areas. Holmes et al. (2005) found that, even at the recommended minimum approach distance (~16 feet), a single wildlife observer in a Royal penguin (*Eudyptes schlegeli*) colony on Macquarie Island, Australia, triggered vigilance behavior and an increased heart rate in the birds. In another study, Holmes et al. (2007) found that vigilance behavior of Gentoo penguins (*Pygoscelis papua*) increased as the numbers of observers increased. Additional studies in penguin colonies revealed that a slow approach that ended with a visitor sitting quietly and closely observing a bird had little effect on the bird’s heart rate, yet a rapid approach that ended with a visitor remaining standing and closely observing a bird resulted in an elevated heart rate (Nimon et al.1995).

A variety of factors affect flushing distances among waterbirds, including the species involved; the activity the birds are engaged in (e.g., foraging versus nesting); and the type, speed, and noise of disturbance (e.g., approaching birds by walking versus in a motorized boat) (Rodgers and Smith 1997, Rodgers 1991). Flushing of birds or even raising their alert levels (which usually occurs at a greater distance than that for flushing) creates stress and requires animals to expend energy that otherwise would be invested in essential life history activities such as foraging, mating, nesting, brood-rearing, and predator avoidance.

Breeding birds are especially sensitive to human disturbance (Trulio 2005, Hammitt and Cole 1998). A study of visitors to a colony of kittiwakes (*Rissa tridactyla*) and guillemots (*Uria aalge*) revealed that nesting success was influenced by the distance observers were from the birds (positively correlated) and the number of observers involved (negatively correlated) (Beale and Monaghan 2004).

Studies have had mixed results regarding potential habituation of birds and some other taxa to human disturbance. Wildlife are often less disturbed by routine human activities that repeatedly occur along defined routes (e.g., trails, roads, or water channels), especially frequent disturbance that does not involve direct contact or other threat, compared with those activities that occur irregularly and outside predictable paths/channels (Blanc et al. 2006, Holmes et al. 2007, Knight and Cole 1995b).

In studies of breeding yellow-eyed penguins (*Megadyptes antipodes*), a timid and secretive species, Ratz and Thompson (1999) found that the birds appeared to have habituated to the presence of guided tourists who approached the colony through trenches and closely observed or photographed birds from camouflaged blinds. Jungius and Hirsch (1979) studied seabird colonies and found that birds that were believed to have habituated to tourists and revealed no outward behavioral changes in their presence, nonetheless exhibited stress (as reflected in elevated heartbeat frequencies) when approached by visitors. The scientists speculated that the stress could have a negative effect on

breeding. Habituation to some types and levels (intensity and frequency) of human disturbance appears to vary among species, within species, between resident and migratory populations, and potentially between inexperienced and experienced breeders. This makes it difficult to forecast habituation in actual field situations.

Participants in EE programs could also cause trampling of native plants, erosion, and introduction or spread of exotic species, including invertebrates, plants, and invasive species. All of these impacts would adversely affect native fish, wildlife, plants, and their habitats; and would be of special concern in Refuge areas struggling with reestablishment of native plant communities. The degree of actual effects upon reproduction, survival of individuals, and diversity and abundance of native species (community health) would depend on specific circumstances.

The Refuge has substantial and, in some areas, dense populations of burrow-nesting seabirds. Although some burrows lie on the Point adjacent to the area heavily used by Refuge visitors, the vast majority of the burrows are elsewhere, in less disturbed areas of the Refuge, such as Crater Hill. Humans casually walking through nesting colonies could easily crush burrows, destroy nests and eggs, and kill young or adult seabirds.

Crater Hill grasslands are primarily composed of nonnative species such as kikuyu grass (*Pennisetum clandestinum*); however, these areas provide actual and potential habitat for roosting, foraging, and breeding activities by nēnē, mōlī, and shorebirds. Additionally, major efforts have been undertaken to reintroduce native plants to this area. Areas on the Point that receive almost all of the Refuge's visitation are hardened and therefore experience very few effects from public use. However, a substantial increase in public use of Crater Hill would increase the potential for erosion and compaction of trails, for crushing of nesting burrows, and for disturbance to native birds using the grasslands and to outplanting of native vegetation. Access to Crater Hill for EE would be limited in frequency and number of participants, guided, and appropriately scheduled to minimize adverse effects.

The several stipulations associated with this use have been designed to greatly reduce the likelihood and magnitude of potential biological effects. Importantly, on the Point—where many EE activities occur—participants would be required to remain behind the perimeter fencing. Elsewhere on the Refuge, visitors would be required to not cross fences and otherwise abide by closed area signage. These use conditions would greatly reduce disturbance to roosting and breeding birds.

Public Use

Almost all visitation to the Refuge occurs on the Point. This area and existing facilities (e.g., parking area, visitor center, and contact station) are relatively small for the visitation the Refuge experiences (from 2010 to 2013, the visitor center averaged about 189,963 visitors per year). The single access road is narrow and the parking areas are small. There is no single-direction drive through of the parking areas (buses and other vehicles must turn around to exit the Refuge). Because of all this, the number and size of vehicles that can be safely accommodated are limited. Additionally, the number of visitors who can simultaneously enjoy a quality wildlife-dependent educational or recreational experience onsite is limited. Consequently, onsite EE activities are typically scheduled from 8:30 a.m. to 10:00 a.m. Peak time for utilization of the Refuge is between 10 a.m. and 2 p.m., with parking overflowing between 11 a.m. and 1 p.m. Earlier EE hours are intended to avoid conflicts with other Refuge visitors by allowing students to depart the Point and the school buses to exit along the narrow

entry road prior to the peak visitation hours. Many of these concerns would be alleviated with the development of a new visitor center and associated facilities and services.

A new visitor center would allow development of larger facilities for EE, plus interpretive exhibits and displays, and a larger bookstore. Changes proposed for the Point, including remodeling of the existing visitor center to provide EE or interpretive exhibits and displays, expanding the scenic view and interpretation at the contact station, and restoring and converting one of the former lighthouse quarters into a living history site would provide a higher quality EE experience for participants. Restoration of habitat underlying the current parking area and maintenance facilities would allow visitors additional opportunities to observe and photograph native wildlife and plants and efforts would be made to increase opportunities for up-close wildlife observation and photography (e.g., with remote cameras and observation/photo blinds). All of these changes would enhance and increase opportunities for EE. As noted above, stipulations associated with these uses would require visitors to remain behind the perimeter fencing on the Point, and not cross fences and otherwise abide by closed area signage elsewhere on the Refuge. These use conditions would greatly reduce potential public safety concerns.

Cultural Resources and Values

The Refuge contains a number of historic and prehistoric resources, including the Kīlauea Point Light Station (the lighthouse and associated Coast Guard facilities on the Point) that was listed on the National Register of Historic Places as an historic district in 1979 (USFWS 2006). It is not expected that environmental education would have any effects on cultural resources.

Public Review and Comment:

Public availability of this CD has been widely announced together with announcement of the availability of the Refuge's draft CCP. The review and comment period has also been the same as for the draft CCP.

Determination:

_____ Use is Not Compatible

____X____ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

General

1. Kīlauea Point NWR is mostly closed to general public use. Information about visitation to the Refuge, including maps clearly depicting open areas and Refuge entry point(s), would be provided to teachers and posted on signs, in kiosks, online, and at other appropriate locations. Travel within the Refuge would be limited to designated roads, parking lots, and trails. In the absence of special permission of the Refuge Manager (for the purpose of these stipulations, the Refuge Manager would be the Project Leader of the Kaua'i National Wildlife Refuge Complex), students, teachers, and chaperones would be prohibited from straying outside the areas depicted on the maps and beyond the closed area signs. For their safety and to minimize disturbance to

roosting and breeding birds, participants in EE programs on the Point would be required to remain behind the perimeter fencing.

2. Refuge facilities are limited in size and sometimes prescheduled, so teachers would be required to contact the Refuge to schedule EE activities at the Refuge at least 3 weeks prior to a proposed visit. Only teachers who had successfully participated in an EE Teach-the-Teacher workshop conducted or condoned by Kaua‘i National Wildlife Refuge Complex would be allowed to lead EE groups at the Refuge.

3. Occasional EE hikes on Crater Hill would require the use of a guide(s) (Refuge staff or trained volunteer), would be limited to individuals 9 years or older (individuals between 9 and 16 years old would require adult accompaniment) and a maximum of 15 visitors per group. Hikes would be routed and scheduled to avoid key breeding areas and seasons by seabirds and nēnē. An injury waiver (i.e., “Release from Injury” form) would be required. The Service would assess erosion and compaction on trails, and wildlife effects of visitation (e.g., disturbance and crushing of burrows) on Crater Hill and elsewhere, and develop solutions to any problems. Potentially, actions could include hardening of trails, rebuilding or rerouting of trails, reducing the frequency of use of trails, rescheduling use of trails, and/or closing trails.

4. In order to avoid harassment, disease, and/or death of native wildlife, or transport of exotic or invasive plant parts, insects, or other undesirable species, individuals participating in EE would be prohibited from bringing dogs or other pets with them to the Point. The exception would be legitimate, leashed guide animals.

5. Environmental education participants would be prohibited from constructing new or maintaining existing structures; from littering, dumping refuse, abandoning equipment or materials, or otherwise discarding any items; and from disturbing or otherwise adversely impacting any prehistoric, historic, or other cultural resources. With the exception of items specifically associated with approved EE curricula, or in the absence of specific, prior written approval of the Refuge Manager, students and teachers would be prohibited from collecting and removing any archaeological or historic artifacts, abiotic or biological specimens or samples, or mementos from the Refuge. The Refuge would provide visitors with information and maintain facilities at the Point (e.g., recycling and trash containers) to encourage recycling of water bottles and other recyclables and discourage littering. Additionally, visitors would continue to be able to recycle Refuge brochures at the entrance fee station.

6. In addition to the stipulations listed here, participants in EE programs would be required to comply with Refuge System-related and other applicable laws, regulations, and policies including “Prohibited Acts” listed in the Code of Federal Regulations (50 C.F.R. 27).

7. No changes could be made to any of these stipulations without specific, prior written approval of the Refuge Manager.

<u>Cultural Resources</u>

1. Consistent with requirements of the National Historic Preservation Act, the Service would undertake appropriate surveys and engage in consultations prior to construction of a new visitor center or other facilities.

Monitoring, Adaptive Management, and Enforcement

1. The Refuge would establish a program to monitor compliance with the stipulations enumerated herein.

2. The Refuge would monitor wildlife and habitat disturbance and other potential impacts, given additional staffing, to determine if these stipulations were resulting in expected and desirable outcomes. The Refuge would apply adaptive management principles to modify stipulations or adjust objectives, as necessary, to achieve desirable results.

3. The Refuge would reserve the right to add to or otherwise modify the stipulations listed herein in order to ensure the continued compatibility of these uses. New or modified stipulations could be instituted as a result of new information generated by ongoing or new studies; new legal, regulatory, or policy requirements; significant changes to the Refuge environment or status of native fish, wildlife, plants, or their habitats; or for other legitimate reasons. Visitors would be appropriately advised of any such changes.

4. The Refuge would also reserve the right to terminate permission for this use if individuals were violating Refuge rules or regulations; if unacceptable impacts were occurring to native fish, wildlife, plants, or their habitats, cultural resources or Refuge facilities, or other Refuge visitors; or for other legitimate reasons.

Justification:

Environmental education is a popular, valuable, and proven program at Kīlauea Point NWR. Service policy states that EE programs can, "…promote understanding and appreciation of natural and cultural resources and their management on all lands and waters in the Refuge System" (Environmental Education, 605 FW 6). Service policy strongly encourages refuge managers to provide quality, compatible EE programs. At Kīlauea Point NWR, it's expected that students and teachers would also enjoy some wildlife observation and photography, and environmental interpretation ancillary to their EE experiences. These are also wildlife-dependent public uses that are to be given special consideration in refuge planning and management.

EE could potentially cause some wildlife disturbance. However, this program has been provided on the Refuge for decades and existing facilities and program management have appropriately minimized public safety concerns and effects upon native wildlife, plants, their habitats, and cultural resources. Most of the EE activities take place within structures or on hardened or otherwise developed areas of the Point that are of limited value to wildlife. If the proposed new visitor center and associated facilities are developed, the quality and capacity of the Refuge's EE program would be measurably enhanced. The stipulations included herein continue the positive efforts of the past and provide additional protection to biological and cultural resources and the public.

Compatibility Standard

In order to be allowed on the Refuge, EE would need to be determined compatible. By allowing this use to occur under the stipulations described above, it is anticipated that wildlife which could be disturbed would find sufficient food resources and resting places so their abundance and use would not be measurably lessened on the Refuge. Additionally, it is anticipated that monitoring, as needed,

would prevent unacceptable or irreversible impacts to fish, wildlife, plants, and their habitats, other public uses, and cultural resources. For the several reasons stated above and consistent with the stipulations described herein, this use would not materially interfere with or detract from maintenance of the Refuge's biological integrity, diversity, and environmental health; fulfillment of Kīlauea Point NWR's purposes; or the Refuge System's mission.

Mandatory Re-Evaluation Date:

____X____ Mandatory 15-year reevaluation date (for wildlife-dependent public uses)

_____ Mandatory 10-year reevaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

____X____ Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

This compatibility determination has being developed and issued concurrent with the CCP and EA for Kīlauea Point NWR.

Compatibility Determination: Environmental Education

Refuge Determination:

Prepared by:	_____ (Signature)	_____ (Date)
Approved by Project Leader, Kaua‘i National Wildlife Refuge Complex:	_____ (Signature)	_____ (Date)

Concurrence:

Refuge Supervisor, Hawaiian and Pacific Islands National Wildlife Refuge Complex:	_____ (Signature)	_____ (Date)
Regional Chief, National Wildlife Refuge System, Pacific Region:	_____ (Signature)	_____ (Date)

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Compatibility Determination

Use: Fishing and Shellfishing

Refuge Name: Kīlauea Point National Wildlife Refuge

County and State: County of Kaua‘i, Hawai‘i

Establishing and Acquisition Authorities:

- Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1948, as amended (16 U.S.C. 667b–667d)
- Refuge Recreation Act of 1962, as amended (16 U.S.C. 460k–460k-4)
- Endangered Species Act of 1973, as amended (16 U.S.C. 1531–1544)
- Kīlauea Point National Wildlife Refuge Expansion Act of 2004 (P.L. 108-481)

Refuge Purpose(s):
The purposes for Kīlauea Point NWR have been identified in historic legal documentation establishing and adding refuge lands and are specified as follows:

> "… particular value in carrying out the national migratory bird management program …" (Transfer of Certain Real Property for Wildlife Conservation Purposes Act)
>
> "… suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors …" (Refuge Recreation Act)
>
> "… to conserve (A) fish or wildlife which are listed as endangered species or threatened species…or (B) plants…" (Endangered Species Act)
>
> "(1) the protection and recovery of endangered Hawaiian water birds and other endangered birds, including the Nene (Hawaiian goose); and (2) the conservation and management of native coastal strand, riparian, and aquatic biological diversity…" (Kīlauea Point National Wildlife Refuge Expansion Act)

National Wildlife Refuge System Mission:

> "The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966 as amended, 16 U.S.C. 668dd–668ee).

Description of Use(s):

This use involves recreational fishing on Kīlauea Point National Wildlife Refuge (NWR, Refuge) in the ocean at Kāhili Quarry (hereafter referred as the Quarry) and in the estuary of Kīlauea River. Included is fishing on a 24-hour basis with hook and line, throw net, spear, or shellfish-gathering. This is the only activity allowed at night on Kilauea Point NWR. Anglers can fish from the shore or

by wading into the surf or into Kīlauea River. Species that could be harvested include, but are not limited to, āholehole (Hawaiian flagtail, *Kuhlia sandvicensis*), akule (big-eye scad, *Selar crumenophthalmus*), ʻamaʻama (striped mullet , *Mugil cephalus*), large-mouth bass (*Micropterus salmoides*), Samoan crab (*Scylla serrata*), halalu (juvenile akule), moi (Pacific threadfin, *Polydactylus sexfilis*), ʻoʻopu (various gobies in the families *Gobiidae* and *Eleotridae*), ʻopae oehaʻa (Hawaiian shrimp, *Macrobrachium grandimanus* aka), ulua (giant trevally, *Caranx ignobilis*, and other jacks of the family Carangidae), and pāpio (ulua under 10 pounds), uouoa (sharpnose mullet, *Neomyxus leuciscus*), and weke (goatfish in the family Mullidae), and oama (juvenile goatfish). The Refuge is currently open for salt water fishing per Refuge-specific regulations for fishing, Hawaiʻi, 50 C.F.R. 32.30. From 2010 to 2013, the number of participants reported ranged from 18–104 per year (USFWS 2014).

Current Use: Anglers access the area by motor vehicle, foot, horse, or bicycle down Kāhili Quarry Road, a rough, unimproved dirt and gravel road; by boat from the ocean or across Kīlauea River; or by wading or swimming across Kīlauea River. Anglers and others can also easily access Kāhili Beach (east of the Quarry across Kīlauea River) and Kīlauea Bay via Wailapa Road, an all-weather road. While on the Quarry site, some anglers have open fires, some bring their pets (usually dogs), and some erect temporary shelters or camp overnight. To access other fishing sites or for other purposes, some anglers and perhaps other visitors also walk north from the Quarry area along the east base of Mōkōlea Point on the rocks adjacent to the ocean. There is no formal trail and the cliff-side vegetation is not fenced through this area. It is expected that anglers enjoy some wildlife observation and photography ancillary to their fishing efforts.

To the west of the Quarry are cliffs that define Mōkōlea Point (hereafter referred to as the Point) and are densely vegetated with naupaka (*Scaevola sericea*) and other plants. The Point has a fence partway up the slope in the main Quarry area. Vegetation extends a short distance below the fence onto the relatively flat Quarry site. The remainder of the Quarry site shows signs of many years of heavy public use, including vehicle use, and has a few scattered trees but little other vegetation. The area has several fire pits, trash, plastic fishing rod holders with their ends encased in concrete, and abandoned motor vehicles. At the south end of the area, between the main road and stream, there are more trees and low vegetation interspersed with additional rutted roads and cleared areas that have been used for camping. The Quarry area is also occasionally used by squatters. There are no designated parking spaces, designated camping sites, potable water, toilets, recycling/garbage cans, or other improvements in the area.

Proposed Use: Under the Preferred Alternative, fishing would continue to be allowed 24 hours a day at Kāhili Quarry in accordance with State regulations, however, overnight camping and fires would be prohibited. It would be expected that anglers would engage in swimming or wading while fishing, depending on the method used. Anglers would be allowed to set up temporary shade or rain shelters during daylight hours only, and to use portable, self-contained camp stoves or barbeques to prepare food. Dogs would be required to be either on-leash or in an enclosed pen (see separate compatibility determination for dog walking). The Refuge proposes no major improvements (e.g., no asphalt or permanent paving) to Kāhili Quarry Road or Kāhili Quarry. Instead, the Refuge proposes to post a sign(s) at the end of pavement on Kāhili Road alerting travelers to the rough road conditions leading to Kāhili Quarry, and advising travelers that the road is not suitable for use by buses, recreational vehicles, or conventional passenger vehicles with modest ground clearance. Travelers would also be advised that camping is prohibited and the area has no drinking water, toilets, or other developed facilities.

The Refuge would appropriately post its jurisdictional boundary in the Quarry area. A new, predator-resistant fence would replace the existing fence and be constructed at the base of vegetation growing down the cliffs defining Mōkōlea Point. The fence line would extend to the ocean at the northern end of the main Quarry area.

This compatibility determination (CD) does not address traditional native Hawaiian fishing at Kīlauea (East) Cove. Instead, see the "Traditional Cultural Practices" CD.

This use is a wildlife-dependent general public use and is to be given special consideration in refuge planning and management (Recreational Fishing, 605 FW 3). When determined compatible on a refuge-specific basis, a wildlife-dependent use becomes a priority public use for that refuge and is to be facilitated and strongly encouraged (National Wildlife Refuge System Administration Act of 1966, as amended, 16 U.S.C. 668dd-668ee).

This CD has been developed and made publicly available concurrent with the comprehensive conservation plan (CCP) and associated environmental assessment (EA) for Kīlauea Point NWR.

Availability of Resources:

Following is an estimate of one-time costs associated with the fishing and shellfishing program.

Projects	Estimated Costs[1]
1. Replacement of existing fence with new predator-resistant fence along the base of vegetation growing down the cliffs defining Mōkōlea Point.	$300,000
2. Posting of jurisdictional boundary with signage and low-profile monuments.	$20,000
3. Installation of new informational and regulatory signage.	$10,000
Total Costs	$330,000

[1] Costs displayed are totals for these changes. Note that many of these changes would also benefit other uses occurring at Kāhili Quarry.

Following is an estimate of annual costs associated with administering this use on the Refuge.

Tasks	Estimated Costs per Year[1]
1. Oversight by GS-13 Project Leader (approximately 10 hours/year).	$600
2. Oversight by GS-12 Deputy Project Leader (approximately 20 hours/year).	$1,000
3. Oversight by GS-9 Supervisory Park Ranger (approximately 80 hours/year).	$2,800
4. Law enforcement by GL-9 Law Enforcement Officer (approximately 120 hours/year).	$4,400
5. Monitoring by GS-11 Biologist (approximately 20 hours/year).	$900
6. Refuge overhead costs associated with the above-listed work.[2]	$2,000
7. Signage and fence maintenance, repair, and materials	$3,000
Total Costs	$14,700

[1] Annual personnel costs = 2014 step 1 salary for appropriate GS level x 12.25% COLA x 40% for benefits.
[2] Overhead costs = salary + benefit costs x 0.22. Overhead expenses include building rent, utilities, equipment and supplies, and support personnel, and do not include salary-related benefits.

The Refuge currently has adequate budget and staff to support the annual costs associated with a limited recreational fishing program on the Refuge.

Anticipated Impacts of the Use(s):

Allowing recreational fishing on the Refuge would not directly conflict with any draft Refuge goals.

Human disturbance has differential effects on wildlife and is dependent upon, among other variables, the species involved and its age; the time of year; the breeding cycle stage (if applicable); the surrounding environment; whether the activity involves vehicles; the intensity, speed, noise, nature, and frequency of the disturbing activity; and the directness of approach to an animal (Blanc et al. 2006, Holmes et al. 2005, Hammitt and Cole 1998, Knight and Cole 1995a, Knight and Cole 1995b). Immediate responses by wildlife to recreational activity can range from behavioral changes including nest abandonment, altered nest placement, change in food habits, physiological changes such as elevated heart rates and increased energetic costs due to flight or flushing, or even death (Belanger and Bedard 1990, Knight and Cole 1995a, Knight and Swaddle 2007, Miller et al. 1998, Miller and Hobbs 2000, Morton et al. 1989, Smith-Castro and Rodewald 2010). The long-term effects are more difficult to assess but may include altered behavior, vigor, productivity or death of individuals; altered population abundance, distribution, or demographics; and altered community species composition and interactions.

Kitaysky et al. (2003) found levels of corticosterone (a major stress hormone) in ʻuaʻu kani at the Refuge to be higher in chicks occupying burrows closer to (within 13 feet of) visitor-use areas. Holmes et al. (2005) found that, even at the recommended minimum approach distance (~16 feet), a single wildlife observer in a Royal penguin (*Eudyptes schlegeli*) colony on Macquarie Island, Australia, triggered vigilance behavior and an increased heart rate in the birds. In another study, Holmes et al. (2007) found that vigilance behavior of Gentoo penguins (*Pygoscelis papua*) increased as the numbers of observers increased. Additional studies in penguin colonies revealed that a slow approach that ended with a visitor sitting quietly and closely observing a bird had little effect on the bird's heart rate, yet a rapid approach that ended with a visitor remaining standing and closely observing a bird resulted in an elevated heart rate (Nimon et al. 1995).

A variety of factors affect flushing distances among waterbirds, including the species involved; the activity the birds are engaged in (e.g., foraging versus nesting); and the type, speed, and noise of disturbance (e.g., approaching birds by walking versus in a motorized boat) (Rodgers and Smith 1997, Rodgers 1991). Flushing of birds or even raising their alert levels (which usually occurs at a greater distance than that for flushing) creates stress and requires animals to expend energy that otherwise would be invested in essential life history activities such as foraging, mating, nesting, brood-rearing, and predator avoidance.

Breeding birds are especially sensitive to human disturbance (Trulio 2005, Hammitt and Cole 1998). A study of visitors to a colony of kittiwakes (*Rissa tridactyla*) and guillemots (*Uria aalge*) revealed that nesting success was influenced by the distance observers were from the birds (positively correlated) and the number of observers involved (negatively correlated) (Beale and Monaghan 2004).

Studies have had mixed results regarding potential habituation of birds and some other taxa to human disturbance. Wildlife are often less disturbed by routine human activities that repeatedly occur along

defined routes (e.g., trails, roads, or water channels), especially frequent disturbance that does not involve direct contact or other threat, compared with those activities that occur irregularly and outside predictable paths/channels (Blanc et al. 2006, Holmes et al. 2007, Knight and Cole 1995b).

In studies of breeding yellow-eyed penguins (*Megadyptes antipodes*), a timid and secretive species, Ratz and Thompson (1999) found that the birds appeared to have habituated to the presence of guided tourists who approached the colony through trenches and closely observed or photographed birds from camouflaged blinds. Jungius and Hirsch (1979) studied seabird colonies and found that birds that were believed to have habituated to tourists and revealed no outward behavioral changes in their presence, nonetheless exhibited stress (as reflected in elevated heartbeat frequencies) when approached by visitors. The scientists speculated that the stress could have a negative effect on breeding. Habituation to some types and levels (intensity and frequency) of human disturbance appears to vary among species, within species, between resident and migratory populations, and potentially between inexperienced and experienced breeders. This makes it difficult to forecast habituation in actual field situations.

Angling would be expected to cause some wildlife disturbance. Seabirds nest in the vegetation at the base of the cliffs at Kāhili Quarry. Nesting birds and their young would be expected to experience stress, possibly flush, and potentially be more vulnerable to predation if anglers approached nesting sites too closely, too quickly, too noisily, in large groups, or with dogs. Distance to the birds would be greatest (and effects would be expected to be lowest) when anglers were fishing on the ocean side of the Quarry. Conversely, potential impacts would be expected to be greatest if anglers spent time on the cliff side of the Quarry where they would be in proximity to the dense vegetation and bird-nesting sites. The several stipulations associated with this use have been designed to greatly reduce the likelihood and magnitude of potential biological effects. The new fencing and signage would reduce the likelihood that anglers would disturb roosting and nesting birds.

Fishing would have direct, lethal effects on individual fish or shellfish, the target game species. The amount of loss would depend on the angling pressure (i.e., the number of anglers, days of effort, catch success). To the extent that anglers engage in catch-and-release practices, the number of individual fish lost per angler would be reduced, but there would still be some percentage of mortality. Angling on the Refuge would be expected to have negligible to minor effects on populations of fish or shellfish because the State of Hawai‘i regulates fishing consistent with sustained yield population management principles.

Fishing tournaments can create significant additional pressure on local fisheries and the surrounding environment. If such activities are conducted as commercial enterprises (e.g., a fee is charged and monetary awards are offered) the tournament could qualify as a commercial use and additional requirements (e.g., permits and fees) could be triggered (Administration of Specialized Uses, 5 RM 17).

‘Īlio-holo-i-ka-uaua and honu are known to use Kaua‘i’s north shore. Critically endangered ‘īlio-holo-i-ka-uaua are especially sensitive to human disturbance (NMFS 2007). Approaching anglers could force hauled-out individuals to move back into the water and seek a new haul-out site, causing them to expend energy and increasing their exposure to predators. Potential disturbance of female adults with pups is of special concern. Seals and threatened green sea turtles could also be injured or potentially killed if they became hooked or entangled in fishing lines or nets (NMFS 2007, NMFS and USFWS 1998).

Anglers and their vehicles can trample native plants, cause soil compaction and/or erosion, and potentially introduce or spread exotic species, including invertebrates, plants, and invasive species. As noted earlier, the Quarry area has received substantial public use for many years. Its naturalness is already seriously compromised and it includes many nonnative plants.

Cultural Resources and Values

Fredericksen and Fredericksen (1989) described the ruins of a sugar-loading complex located on Mōkōlea Point above the fishing areas. However, the same study identified no Hawaiian artifacts from either the historic or prehistoric periods within the affected areas. It is not expected that continued fishing at this site would further impact cultural resources.

Public Review and Comment:

Public availability of this CD has been widely announced together with announcement of the availability of the Refuge's draft CCP. The review and comment period has also been the same as for the draft CCP.

Determination:

_____ Use is Not Compatible

____X____ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

General

1. Anglers would be allowed to bring dogs, but prohibited from bringing cats or other pets with them to fish at Kāhili Quarry. All dogs brought onto the Refuge in this area would be required to be leashed on a short (8-foot maximum) leash or kept in a secure, enclosed pen or crate at all times and would not be allowed to run free. Dogs would not be allowed to accompany pedestrians past the northeastern end of the main Quarry area (refer to map). Additionally, signage would be used to delineate accessible and non-accessible areas.

   In association with their fishing, anglers would be allowed to erect temporary shelters (protections from the sun and/or rain) in the Quarry area during daylight hours only. Camping would be prohibited. Poles and other fishing equipment must be attended at all times. All temporary shelters or other structures must be taken down at the end of each day (sunset to sunrise). Barbeques, and other equipment, supplies, trash, and human and pet waste must be removed from the Quarry area at the end of each angler's stay. Anglers could also bring and use portable stoves or self-contained barbeques (e.g., off-the-ground portable enclosed fires), but not build ground fires or fires in fire rings or pits. When lit, barbeques must be attended at all times. Ashes must be taken off-Refuge.

2. Visitors would be prohibited from use of motorized or other vehicles off designated routes of travel. At the Quarry, designated routes of travel include unimproved Kāhili Quarry Road, the unimproved vehicle access to the unimproved boat slide into Kīlauea River, and the hardened vehicle access and parking area in the core of the Quarry area.

3. In the absence of specific, prior written approval of the Refuge Manager (for the purpose of these stipulations, the Refuge Manager would be the Project Leader of the Kaua‘i National Wildlife Refuge Complex) or unless specifically allowed by State of Hawai‘i fishing regulations, anglers would be prohibited from collecting and removing any archaeological or historic artifacts, abiotic or biological specimens or samples, or mementos from the Refuge.

4. In the absence of specific, prior written approval of the Refuge Manager, anglers would be prohibited from disturbing or otherwise adversely impacting any prehistoric, historic, or other cultural resources on the Refuge.

5. Consistent with Service policy regarding management of nonhazardous solid waste on refuges ("Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6901-6992k) – Solid Waste (Nonhazardous)," 561 FW 5), anglers would be prohibited from littering, dumping refuse, abandoning equipment or materials, or otherwise discarding any items on the Refuge, including unused or excess fishing line, hooks, lures, and bait.

6. In addition to the stipulations listed here anglers would be required to comply with Refuge System-related and other applicable laws, regulations, and policies including "Prohibited Acts" listed in the Code of Federal Regulations (50 C.F.R. 27).

7. No changes could be made to any of these stipulations without specific, prior written approval of the Refuge Manager.

<u>Fishing</u>

1. Anglers would be required to secure and have with them relevant State fishing licenses and any other permits needed to fish in the ocean from the Refuge. Anglers would be required to abide by Hawai‘i Fishing Regulations when fishing on or from the Refuge.

2. Anglers would be allowed to fish at Kāhili Quarry 24 hours a day. Poles and other fishing gear must be attended at all times.

3. Fishing and other activities would not be allowed within 50 yards of ‘īlio-holo-i-ka-uaua or honu, whether these animals are in the water or on shore.

4. In order to reduce the potential for hooking of ‘īlio-holo-i-ka-uaua or honu, anglers would be encouraged to use barbless circle hooks while fishing from the shore.

5. Anglers would be prohibited from constructing new or maintaining existing structures or fixtures (including rod holders) on the Refuge without specific, prior written approval of the Refuge Manager.

6. Prior to holding any fishing tournaments specific and limited to the Refuge, tournament organizers would be required to contact and receive specific, prior written approval of the Refuge Manager, possibly including a permit, payment of fees, and a tournament-specific compatibility determination.

7. Any significant changes to rules for fishing on the Refuge would be appropriately promulgated as Federal regulations. These regulations would be supplemented by Refuge-specific information available onsite or at the Kaua‘i National Wildlife Refuge Complex headquarters office.

Monitoring, Adaptive Management, and Enforcement

1. The Refuge would establish a program to monitor compliance with the stipulations enumerated herein. This would include enforcement of Hawai‘i Fishing Regulations.

2. The Refuge would monitor wildlife and habitat disturbance and other potential impacts, given additional staffing, to determine if these stipulations were resulting in expected and desirable outcomes. The Refuge would apply adaptive management principles to modify stipulations or adjust objectives, as necessary, to achieve desirable results.

3. The Refuge would reserve the right to add to or otherwise modify the stipulations listed herein in order to ensure the continued compatibility of these uses. New or modified stipulations could be instituted as a result of new information generated by ongoing or new studies; new legal, regulatory, or policy requirements; significant changes to the Refuge environment or status of native fish, wildlife, plants, or their habitats; changes to fishing practices; or for other legitimate reasons. Refuge personnel would appropriately advise anglers of any such changes.

4. The Refuge would also reserve the right to terminate or modify privileges to fish at the Refuge if anglers were violating the stipulations listed herein; if unacceptable impacts were occurring to native fish, wildlife, plants, or their habitats, cultural resources, Refuge facilities, or other Refuge visitors; or for other legitimate reasons.

Justification:

By its nature, fishing would have direct, lethal effects on individual fish or shellfish. However, angling on the Refuge would be expected to have negligible to minor effects on populations of fish or shellfish because the State of Hawai‘i regulates fishing consistent with sustained yield population management principles.

Angling would have the potential to cause some disturbance to seabirds and potentially seals and/or turtles. The proposed construction of a new fence at the base of vegetation on the west side of the Quarry area, allowing dogs only in the western portion of the area, and prohibiting cats, other pets, and free-roaming dogs onsite would limit potential disturbance to seabirds roosting or nesting in cliff-side vegetation. Additionally, fishing and associated activities would not be allowed within 50 yards of seals or turtles.

Retaining the rough access road to Kāhili Quarry, not providing drinking water, toilets, or making other improvements onsite, and prohibiting camping and open fires would be expected to continue to limit the number of individuals who fished in this area and the length of their stay. Increased Refuge law enforcement would be expected to reduce violations of rules and regulations, including camping and squatting. Tournament fishing would require special approval of the Refuge Manager.

Fishing is a wildlife-dependent, general public use and is to be given special consideration in refuge planning and management. As noted earlier, it is also expected that anglers would enjoy some

wildlife observation and/or photography ancillary to their fishing efforts. These uses are also wildlife-dependent general public uses that are to be given special consideration in refuge planning and management.

Compatibility Standard

In order to be allowed on the Refuge, angling at Kāhili Quarry would need to be determined compatible. By allowing this use to occur under the stipulations described above, it is anticipated that wildlife which could be disturbed would find sufficient food resources and resting places so their abundance and use would not be measurably lessened on the Refuge. Additionally, it is anticipated that monitoring, as needed, would prevent unacceptable or irreversible impacts to fish, wildlife, plants, and their habitats, other public uses, and cultural resources. For the several reasons stated above and consistent with the stipulations described herein, this use would not materially interfere with or detract from maintenance of the Refuge's biological integrity, diversity, and environmental health; fulfillment of Kīlauea Point's NWR's purposes; or the Refuge System's mission.

Mandatory Re-Evaluation Date:

____X____ Mandatory 15-year reevaluation date (for wildlife-dependent public uses)

_____ Mandatory 10-year reevaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

____X____ Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

This compatibility determination has being developed and issued concurrent with the CCP and EA for Kīlauea Point NWR.

Compatibility Determination: Fishing and Shellfishing

Refuge Determination:

Prepared by:	_____ (Signature)	_____ (Date)
Approved by Project Leader, Kaua‘i National Wildlife Refuge Complex:	_____ (Signature)	_____ (Date)

Concurrence:

Refuge Supervisor, Hawaiian and Pacific Islands National Wildlife Refuge Complex:	_____ (Signature)	_____ (Date)
Regional Chief, National Wildlife Refuge System, Pacific Region:	_____ (Signature)	_____ (Date)

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Compatibility Determination

Use: General Access for Off-Refuge Stream, Beach, and Ocean Uses (Kāhili Quarry)

Refuge Name: Kīlauea Point National Wildlife Refuge

County and State: County of Kaua‘i, Hawai‘i

Establishing and Acquisition Authorities:

- Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1948, as amended (16 U.S.C. 667b–667d)
- Refuge Recreation Act of 1962, as amended (16 U.S.C. 460k–460k-4)
- Endangered Species Act of 1973, as amended (16 U.S.C. 1531–1544)
- Kīlauea Point National Wildlife Refuge Expansion Act of 2004 (P.L. 108-481)

Refuge Purpose(s):
The purposes for Kīlauea Point NWR have been identified in historic legal documentation establishing and adding refuge lands and are specified as follows:

> "… particular value in carrying out the national migratory bird management program …" (Transfer of Certain Real Property for Wildlife Conservation Purposes Act)
>
> "… suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors …" (Refuge Recreation Act)
>
> "… to conserve (A) fish or wildlife which are listed as endangered species or threatened species…or (B) plants…" (Endangered Species Act)
>
> "(1) the protection and recovery of endangered Hawaiian water birds and other endangered birds, including the Nene (Hawaiian goose); and (2) the conservation and management of native coastal strand, riparian, and aquatic biological diversity…" (Kīlauea Point National Wildlife Refuge Expansion Act)

National Wildlife Refuge System Mission:

> "The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966 as amended, 16 U.S.C. 668dd–668ee).

Description of Use(s):

<u>Current Use:</u> This use involves access through Kīlauea Point National Wildlife Refuge (NWR or Refuge) at Kāhili Quarry (hereafter referred to as the Quarry) or near the mouth of Kīlauea River (aka Kāhili Stream) to access off-Refuge areas (Kāhili Beach, Kīlauea Bay and the Kīlauea River) for boating, fishing, and other stream, beach, and ocean uses such as snorkeling, sun bathing, surfing,

swimming, and walking, including dog walking. Uses on the Refuge include driving, walking, riding horses, or bicycling on Kāhili Quarry Road, a rough, unimproved dirt and gravel road; parking vehicles on the Refuge; and launching and loading canoes, kayaks, paddle boards, and surfboards. Canoes, kayaks, paddle boards, surfboards, and perhaps other small watercraft are launched into Kīlauea River near its mouth. This boat launching site is an unimproved slide cut through the dirt bank into the river. Visitors can also easily access Kāhili Beach (east of the Quarry across Kīlauea River) and Kīlauea Bay via Wailapa Road, an all-weather road.

While in the Quarry area, some visitors have open fires, some bring their pets (usually dogs), and some erect temporary shelters or camp overnight. Some visitors also walk north from the Quarry area along the east base of Mōkōlea Point on the rocks adjacent to the ocean. There is no formal trail and the cliff-side vegetation is not fenced through this area. It is expected that boaters, beach goers, and others enjoy some wildlife observation and photography ancillary to their primary activities; however, the core access uses evaluated herein are not wildlife-dependent general public uses.

To the west of the Quarry are cliffs that define Mōkōlea Point (hereafter referred to as the Point) and are densely vegetated with naupaka (*Scaevola sericea*) and other plants. The Point has a fence partway up the slope in the main Quarry area. Vegetation extends a short distance below the fence onto the relatively flat Quarry site. The remainder of the Quarry site shows signs of many years of heavy public use, including vehicle use and has a few scattered trees but little other vegetation. The area has several fire pits, trash, and abandoned motor vehicles. At the south end of the area, between the main road and stream, there are more trees and low vegetation interspersed with additional rutted roads, cleared areas that have been used for camping, and the small boat slide. The Quarry area is also occasionally used by squatters. There are no improvements in the area. There are no designated parking spaces, designated camping sites, potable water, toilets, recycling/garbage cans, or other improvements in the area.

Proposed Use: We propose to continue allowing visitors to access Kāhili Beach, Kīlauea Bay, and the Kīlauea River through the Kāhili Quarry area from 6 a.m. to 5 p.m. daily. Visitors may walk, bicycle, ride horses, and drive motor vehicles on Quarry Road. Off-road travel is prohibited. Visitors may park vehicles, and launch and load canoes, kayaks, paddle boards, and surfboards from the unimproved slide along the Kīlauea River. The Refuge proposes no major improvements (e.g., no asphalt or permanent paving) to Kāhili Quarry Road or the Kāhili Quarry area. Instead, the Refuge proposes to post a sign(s) at the end of pavement on Kāhili Road notifying travelers of Refuge regulations, alerting them about the rough road conditions leading to Kāhili Quarry, and advising them that the road is not suitable for use by buses, recreational vehicles, or conventional passenger vehicles with modest ground clearance. Travelers would also be advised that camping, fires, and off-leash dogs are prohibited on the Refuge, and the area has no drinking water, toilets, or other developed facilities.

The Refuge would appropriately post its jurisdictional boundary in the Quarry area. A new, predator-resistant fence would replace the existing fence and be constructed at the base of vegetation growing down the cliffs defining Mōkōlea Point. The fence line would extend to the ocean at the northern end of the main Quarry area (see map).

This CD has been developed and made publicly available concurrent with the comprehensive conservation plan (CCP) and associated environmental assessment (EA) for Kīlauea Point NWR.

Availability of Resources:

Following is an estimate of one-time costs associated with the fishing and shellfishing program.

Projects	Estimated Costs[1]
1. Replacement of existing fence with new predator-resistant fence along the base of vegetation growing down the cliffs defining Mōkōlea Point.	$300,000
2. Posting of jurisdictional boundary with signage and low-profile monuments.	$20,000
3. Installation of new informational and regulatory signage.	$10,000
Total Costs	$330,000

[1] Costs displayed are totals for these changes. Note that many of these changes would also benefit other uses occurring at Kāhili Quarry.

Following is an estimate of annual costs associated with administering this use on the Refuge.

Tasks	Estimated Costs per Year[1]
1. Oversight by GS-13 Project Leader (approximately 10 hours/year).	$600
2. Oversight by GS-12 Deputy Project Leader (approximately 20 hours/year).	$1,000
3. Oversight by GS-9 Supervisory Park Ranger (approximately 80 hours/year).	$2,800
4. Law enforcement by GL-9 Law Enforcement Officer (approximately 120 hours/year).	$4,400
5. Monitoring by GS-11 Biologist (approximately 20 hours/year).	$900
6. Refuge overhead costs associated with the above-listed work.[2]	$2,000
7. Signage and fence maintenance, repair, and materials	$3,000
Total Costs	$14,700

[1] Annual personnel costs = 2014 step 1 salary for appropriate GS level x 12.25% COLA x 40% for benefits.
[2] Overhead costs = salary + benefit costs x 0.22. Overhead expenses include building rent, utilities, equipment and supplies, and support personnel, and do not include salary-related benefits.

The Refuge currently has adequate budget and staff to support the annual costs associated with a limited amount of visitor access through the Kāhili Quarry area.

Anticipated Impacts of the Use(s):

Allowing recreational access through the Kāhili Quarry area would not directly conflict with any draft Refuge goals.

Human disturbance has differential effects on wildlife and is dependent upon, among other variables, the species involved and its age; the time of year; the breeding cycle stage (if applicable); the surrounding environment; whether the activity involves vehicles; the intensity, speed, noise, nature, and frequency of the disturbing activity; and the directness of approach to an animal (Blanc et al. 2006, Holmes et al. 2005, Hammitt and Cole 1998, Knight and Cole 1995a, Knight and Cole 1995b). Immediate responses by wildlife to recreational activity can range from behavioral changes including nest abandonment, altered nest placement, change in food habits, physiological changes such as elevated heart rates and increased energetic costs due to flight or flushing, or even death (Belanger and Bedard 1990, Knight and Cole 1995a, Knight and Swaddle 2007, Miller et al. 1998, Miller and

Hobbs 2000, Morton et al. 1989, Smith-Castro and Rodewald 2010). The long-term effects are more difficult to assess but may include altered behavior, vigor, productivity or death of individuals; altered population abundance, distribution, or demographics; and altered community species composition and interactions.

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A variety of factors affect flushing distances among waterbirds, including the species involved; the activity the birds are engaged in (e.g., foraging versus nesting); and the type, speed, and noise of disturbance (e.g., approaching birds by walking versus in a motorized boat) (Rodgers and Smith 1997, Rodgers 1991). Flushing of birds or even raising their alert levels (which usually occurs at a greater distance than that for flushing) creates stress and requires animals to expend energy that otherwise would be invested in essential life history activities such as foraging, mating, nesting, brood-rearing, and predator avoidance.

Breeding birds are especially sensitive to human disturbance (Trulio 2005, Hammitt and Cole 1998). A study of visitors to a colony of kittiwakes (*Rissa tridactyla*) and guillemots (*Uria aalge*) revealed that nesting success was influenced by the distance observers were from the birds (positively correlated) and the number of observers involved (negatively correlated) (Beale and Monaghan 2004).

Studies have had mixed results regarding potential habituation of birds and some other taxa to human disturbance. Wildlife are often less disturbed by routine human activities that repeatedly occur along defined routes (e.g., trails, roads, or water channels), especially frequent disturbance that does not involve direct contact or other threat, compared with those activities that occur irregularly and outside predictable paths/channels (Blanc et al. 2006, Holmes et al. 2007, Knight and Cole 1995b).

In studies of breeding yellow-eyed penguins (*Megadyptes antipodes*), a timid and secretive species, Ratz and Thompson (1999) found that the birds appeared to have habituated to the presence of guided tourists who approached the colony through trenches and closely observed or photographed birds from camouflaged blinds. Jungius and Hirsch (1979) studied seabird colonies and found that birds that were believed to have habituated to tourists and revealed no outward behavioral changes in their presence, nonetheless exhibited stress (as reflected in elevated heartbeat frequencies) when approached by visitors. The scientists speculated that the stress could have a negative effect on breeding. Habituation to some types and levels (intensity and frequency) of human disturbance appears to vary among species, within species, between resident and migratory populations, and potentially between inexperienced and experienced breeders. This makes it difficult to forecast habituation in actual field situations.

Walking through the Quarry area and along the ocean-side trail at the east base of Mōkōlea Point would be expected to cause some wildlife disturbance. Seabirds nest in the vegetation at the base of the cliffs at Kāhili Quarry. Nesting birds and their young would be expected to experience stress, possibly flush, and potentially be more vulnerable to predation if visitors approached nesting sites too closely, too quickly, too noisily, in too large of groups, or with dogs. The several stipulations associated with this use have been designed to greatly reduce the likelihood and magnitude of potential biological effects. The new fencing and signage would reduce the likelihood that visitors and their pets would disturb roosting and nesting birds.

‘Īlio-holo-i-ka-uaua and honu are known to use Kaua‘i’s north shore. Critically endangered ‘īlio-holo-i-ka-uaua are especially sensitive to human disturbance (NMFS 2007). Approaching visitors could force hauled-out individuals to move back into the water and seek a new haul-out site, causing them to expend energy and increasing their exposure to predators. Potential disturbance of female adults with pups is of special concern.

Refuge visitors, their vehicles, and pets can trample native plants, cause soil compaction and/or erosion, and potentially introduce or spread exotic species, including invertebrates, plants, and invasive species. As noted earlier, the Quarry area has received substantial public use for many years. Its naturalness is already seriously compromised and it includes many nonnative plants. It is unlikely that continued access through the area would further exacerbate this situation.

Cultural Resources and Values

Fredericksen and Fredericksen (1989) described the ruins of a sugar-loading complex located on Mōkōlea Point above the fishing areas. However, the same study identified no Hawaiian artifacts from either the historic or prehistoric periods within the affected areas. It is not expected that continued fishing at this site would further impact cultural resources.

Public Use

As noted earlier, providing recreational access to off-Refuge areas is not a wildlife-dependent public use and is of lower priority for Refuge management than the fishing and wildlife observation and photography uses that also occur in the Quarry area. These uses have occurred side-by-side in this area for many years. It is not expected that continued access through the Quarry area would adversely impact fishing or other wildlife-dependent public uses at the Refuge.

Public Review and Comment:

Public availability of this CD has been widely announced together with announcement of the availability of the Refuge’s draft CCP. The review and comment period has also been the same as for the draft CCP.

Determination:

_____ Use is Not Compatible

____X____ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

General

1. Access through Kahili Quarry to access Kāhili Beach, Kīlauea Bay, and the Kīlauea River would be allowed from 6 a.m. to 5 p.m. daily. Overnight camping is prohibited. Access outside of daylight hours would require a Special Use Permit.

2. Visitors would be allowed to bring dogs, but prohibited from bringing cats or other pets with them to the Kāhili Quarry area. All dogs brought onto the Refuge in this area would be required to be leashed on a short (8-foot maximum) leash or kept in a secure, enclosed pen or crate at all times and would not be allowed to run free. Dogs would not be allowed to accompany pedestrians past the northeastern end of the main Quarry area (refer to map). Additionally, signage would be used to delineate accessible and nonaccessible areas.

3. When viewing or photographing ʻīlio-holo-i-ka-uaua or honu, whether these animals were in the water or on shore, visitors would be required to maintain a distance of at least 50 yards and limit their viewing/photographing time to 30 minutes (NOAA undated). ʻIlio-holo-i-ka-uaua and honu are listed under both the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA) which have mechanisms to encourage management for population growth and recovery and to prohibit any form of "take," except for limited exceptions authorized under Federal permits. Under the ESA, "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect or attempt to engage in any such conduct. Under the MMPA, "take" includes actions such as hunting, harassing, killing, capturing, injuring and disturbing a marine mammal. There are established civil and criminal penalties for, at a minimum, disturbing ʻīlio-holo-i-ka-uaua or honu by getting too close or staying too long which alter their behavior, thus resulting in take. If ʻīlio-holo-i-ka-uaua or honu display signs of being disturbed, then that 50 yards would be expanded and/or viewing would be minimized or shut down to stop the disturbance and avoid potential take.

4. Visitors would be prohibited from use of motorized or other vehicles off designated routes of travel. At the Quarry, designated routes of travel include unimproved Kāhili Quarry Road, the unimproved vehicle access to the unimproved boat slide into Kīlauea River, and the hardened vehicle access and parking area in the core of the Quarry area.

5. In the absence of specific, prior written approval of the Refuge Manager (for the purpose of these stipulations, the Refuge Manager would be the Project Leader of the Kauaʻi National Wildlife Refuge Complex), visitors would be prohibited from collecting and removing any archaeological or historic artifacts, abiotic or biological specimens or samples, or mementos from the Refuge.

6. In the absence of specific, prior written approval of the Refuge Manager, visitors would be prohibited from disturbing or otherwise adversely impacting any prehistoric, historic, or other cultural resources on the Refuge.

7. Consistent with Service policy regarding management of nonhazardous solid waste on refuges ("Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6901-6992k) – Solid Waste (Nonhazardous)," 561 FW 5), visitors would be prohibited from littering, dumping

refuse, abandoning equipment or materials, or otherwise discarding any items on the Refuge, including glass.

8. In addition to the stipulations listed here, visitors would be required to comply with Refuge System-related and other applicable laws, regulations, and policies including "Prohibited Acts" listed in the Code of Federal Regulations (50 C.F.R. 27).

9. No changes could be made to any of these stipulations without specific, prior written approval of the Refuge Manager.

Monitoring, Adaptive Management, and Enforcement

1. The Refuge would establish a program to monitor compliance with the stipulations enumerated herein.

2. The Refuge would monitor wildlife and habitat disturbance and other potential impacts, given additional staffing, to determine if these stipulations were resulting in expected and desirable outcomes. The Refuge would apply adaptive management principles to modify stipulations or adjust objectives, as necessary, to achieve desirable results.

3. The Refuge would reserve the right to add to or otherwise modify the stipulations listed herein in order to ensure the continued compatibility of these uses. New or modified stipulations could be instituted as a result of new information generated by ongoing or new studies; new legal, regulatory, or policy requirements; significant changes to the Refuge environment or status of native fish, wildlife, plants, or their habitats; changes to access practices; or for other legitimate reasons. Refuge personnel would appropriately advise visitors of any such changes.

4. The Refuge would also reserve the right to terminate or modify privileges to access the stream, ocean, or beach through the Refuge if visitors were violating the stipulations listed herein; if unacceptable impacts were occurring to native fish, wildlife, plants, or their habitats, cultural resources, Refuge facilities, or other Refuge visitors; or for other legitimate reasons.

Justification:

Accessing Kīlauea River, Kīlauea Bay, and Kāhili Beach through the Kāhili Quarry area on the Refuge would have the potential to cause some disturbance to seabirds and potentially seals and/or turtles. The proposed construction of a new fence at the base of vegetation on the west side of the Quarry area, limiting dog use to the western portion of the area, and prohibiting cats, other pets, and free-roaming dogs onsite would limit potential disturbance to seabirds roosting or nesting in cliff-side vegetation. Additionally, visitors would not be allowed within 50 yards of seals or turtles.

Retaining the rough access road to Kāhili Quarry, not providing drinking water, toilets, or making other improvements onsite, and prohibiting camping and open fires would be expected to continue to limit the number of individuals who use this area to access the adjacent stream, ocean, and beach. Visitors could also easily access Kāhili Beach and Kīlauea Bay via Wailapa Road, an all-weather road east of the Quarry across Kīlauea River. Increased Refuge law enforcement would be needed to reduce violations of rules and regulations, including camping and squatting.

Although the core access uses evaluated herein are not wildlife-dependent general public uses, it is expected that visitors would enjoy some wildlife observation and photography ancillary to their primary activities. To the extent this occurred, it would be supportive of one of the Refuge purposes to provide fishing and wildlife-oriented recreation.

Compatibility Standard

In order to be allowed on the Refuge, access through the Kāhili Quarry area would need to be determined compatible. By allowing this use to occur under the stipulations described above, it is anticipated that wildlife which could be disturbed would find sufficient food resources and resting places so their abundance and use would not be measurably lessened on the Refuge. Additionally, it is anticipated that monitoring, as needed, would prevent unacceptable or irreversible impacts to fish, wildlife, plants, and their habitats; other public uses; and cultural resources. For the several reasons stated above and consistent with the stipulations described herein, this use would not materially interfere with or detract from maintenance of the Refuge's biological integrity, diversity, and environmental health; fulfillment of Kīlauea Point's NWR's purposes; or the Refuge System's mission.

Mandatory Re-Evaluation Date:

_____ Mandatory 15-year re-evaluation date (for wildlife-dependent public uses)

____X____ Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

____X____ Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

This compatibility determination has being developed and issued concurrent with the CCP and EA for Kīlauea Point NWR.

Compatibility Determination: General Access for Off-Refuge Stream, Beach, and Ocean Uses (Kāhili Quarry)

Refuge Determination:

Prepared by:	_____ (Signature)	_____ (Date)
Approved by Project Leader, Kaua‘i National Wildlife Refuge Complex:	_____ (Signature)	_____ (Date)

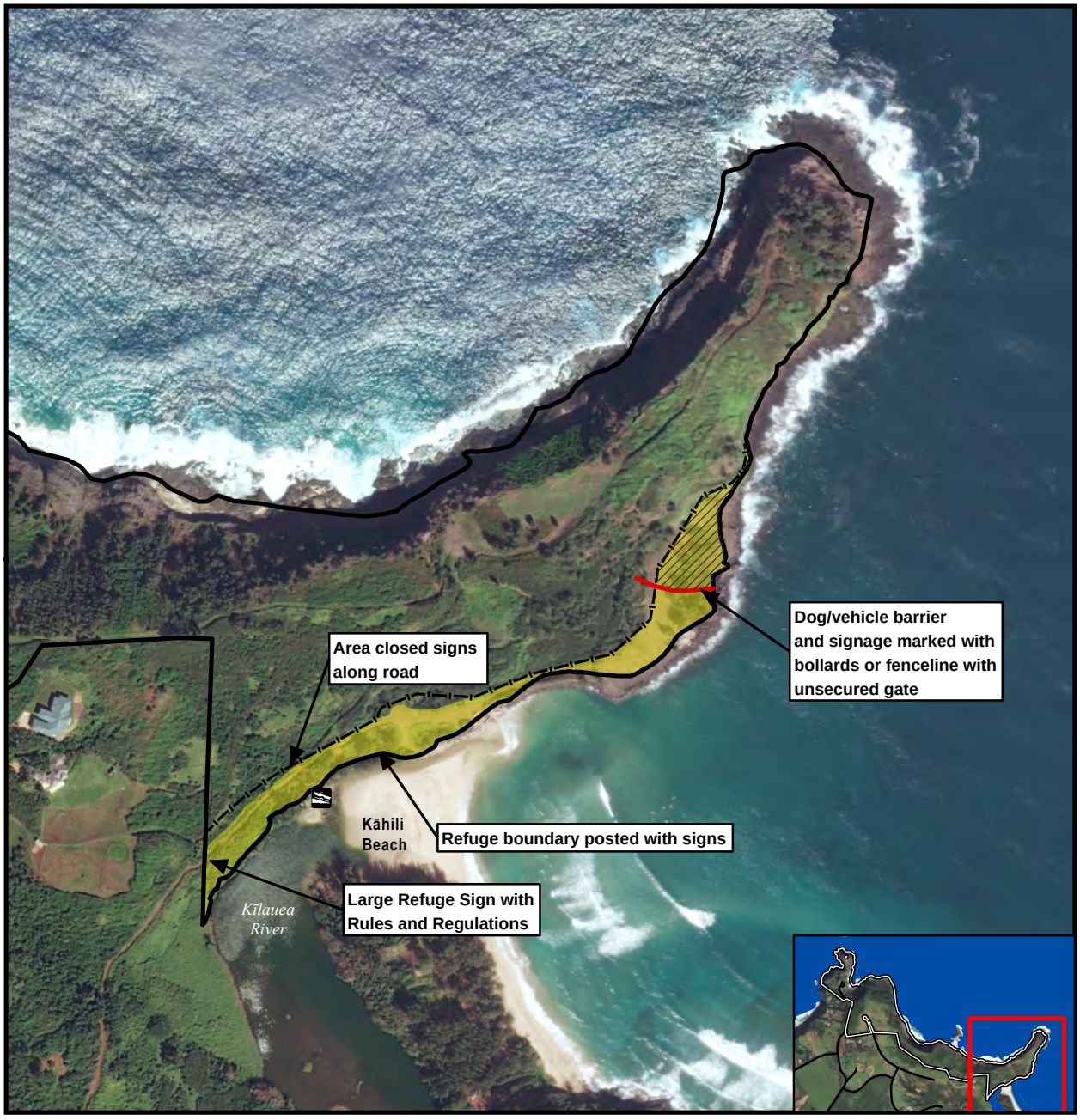
Concurrence:

Refuge Supervisor, Hawaiian and Pacific Islands National Wildlife Refuge Complex:	_____ (Signature)	_____ (Date)
Regional Chief, National Wildlife Refuge System, Pacific Region:	_____ (Signature)	_____ (Date)

DRAFT

U.S. Fish & Wildlife Service

Public Use Common to All Alternatives, Kāhili Quarry/Mōkōlea Point, Kīlauea Point NWR



LEGEND

- Refuge Ownership
- Future Fence Alignment
- Future Dog/Vehicle Barrier

Public Use

- Open to Public
- Unimproved Boat Launch
- No Dogs or Vehicles

N

0 300 600 feet

0 100 200 meters

Map Date: 11/19/2014 File: 11-106-5.mxd
Data: USFWS 2014, DigitalGlobe 2010

USFWS R1 Refuge Information Branch

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Compatibility Determination

Use: Research, Surveys, and Scientific Collections

Refuge Name: Kīlauea Point National Wildlife Refuge

County and State: County of Kaua‘i, Hawai‘i

Establishing and Acquisition Authorities:

- Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1948, as amended (16 U.S.C. 667b–667d)
- Refuge Recreation Act of 1962, as amended (16 U.S.C. 460k–460k-4)
- Endangered Species Act of 1973, as amended (16 U.S.C. 1531–1544)
- Kīlauea Point National Wildlife Refuge Expansion Act of 2004 (P.L. 108-481)

Refuge Purpose(s):
The purposes for Kīlauea Point NWR have been identified in historic legal documentation establishing and adding refuge lands and are specified as follows:

> "… particular value in carrying out the national migratory bird management program …" (Transfer of Certain Real Property for Wildlife Conservation Purposes Act)
>
> "… suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors …" (Refuge Recreation Act)
>
> "… to conserve (A) fish or wildlife which are listed as endangered species or threatened species…or (B) plants…" (Endangered Species Act)
>
> "(1) the protection and recovery of endangered Hawaiian water birds and other endangered birds, including the Nene (Hawaiian goose); and (2) the conservation and management of native coastal strand, riparian, and aquatic biological diversity…" (Kīlauea Point National Wildlife Refuge Expansion Act)

National Wildlife Refuge System Mission:

> "The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966 as amended, 16 U.S.C. 668dd–668ee).

Description of Use(s):

This use involves research, surveys, and scientific collections conducted by non-National Wildlife Refuge System (Refuge System) parties on Kīlauea Point National Wildlife Refuge (NWR or Refuge).

Research refers to a planned, organized, and systematic investigation of a scientific nature. Such studies are designed to determine the cause(s) of observed biotic or abiotic phenomenon over a finite time period, where cause-and-effect relationships usually can be inferred through statistical analyses.

Survey activities include scientific inventories and monitoring of fish, wildlife and plants, public use, and abiotic refuge resources (e.g., soils, water).

Scientific collecting involves gathering of Refuge natural resources or cultural artifacts for scientific purposes. Examples include collection of vegetation, small mammals, and soils; contaminant sampling; adult and larval mosquito trapping/monitoring; and collection and curation of cultural resources.

Refuge staff periodically receive requests from outside parties (e.g., universities, state agencies, other Federal agencies, and nongovernmental organizations) to conduct research, surveys, and scientific collecting on Refuge lands. These project requests can involve a wide range of natural and cultural resources as well as public use management issues, including basic absence/presence surveys, collection of new species for identification, habitat use and life-history requirements for specific species/species groups, practical methods for habitat restoration, extent and severity of environmental contaminants, techniques to control or eradicate pest species, effects of climate change on environmental conditions and associated habitat/wildlife response, modeling of wildlife populations, bioprospecting, and assessing response of habitat/wildlife to disturbance from public uses. Projects may be species-specific, Refuge-specific, or evaluate the relative contribution of Refuge lands to larger landscape (ecoregion, region, flyway, national, and international) issues and trends.

The U.S. Fish and Wildlife Service's (Service's) Research and Management Studies (4 RM 6) and Appropriate Refuge Uses (603 FW1) policies indicate priority for scientific investigatory studies that contribute to the enhancement, protection, use, preservation, and management of native wildlife populations and their habitat as well as their natural diversity. Projects that contribute to Refuge-specific needs for resource management goals and objectives, where applicable, would be given a higher priority over other requests. Attached to this compatibility determination (CD) are examples of high-priority research, survey, and scientific collection topics for Kīlauea Point NWR (Attachment 1).

Research, surveys, and scientific collections on the Refuge would generally be authorized through individual special use permits (SUPs) consistent with Service policy (Administration of Specialized Uses, 5 RM 17).

Projects that represented public or private economic use of the natural resources of the Refuge (e.g., bioprospecting) would need to comply with relevant Federal regulations for such uses (50 C.F.R. 29.1). In such cases, the Refuge would need to first determine that the use contributed to the achievement of Refuge purposes or the Refuge System mission prior to making a determination regarding the project's compatibility.

This programmatic CD has been developed and made publicly available concurrent with the comprehensive conservation plan (CCP) and associated environmental assessment (EA) for Kīlauea Point NWR.

Availability of Resources:

Refuge staff responsibilities for research, surveys, and scientific collections by non-Refuge System entities are primarily limited to the following: review of proposals, preparation of an SUP(s) and other appropriate compliance documents (e.g., Section 7 of the Endangered Species Act of 1973, Section 106 of the National Historic Preservation Act), and monitoring project implementation to ensure that impacts and conflicts remain within acceptable levels (remain compatible) over time. Additional administrative, logistical, and operational support could also be provided depending on each specific request. Estimated costs for one-time (e.g., prepare SUP) and annually recurring tasks by Refuge staff or other Service employees would be determined on a project-by-project basis. Sufficient funding in the Refuge's general operating budget would need to be available to cover expenses for these projects. The terms and conditions for funding and staff support necessary to administer each project on the Refuge would be clearly stated in the SUP(s).

The Refuge has the following staffing and funding to administratively support and monitor research, surveys, and scientific collections that are currently taking place on Kīlauea Point NWR (see table below). Any substantial increase in the number of projects would create a need for additional resources to satisfy administrative and monitoring needs to ensure the projects were implemented in a compatible manner. Any substantial additional costs above those itemized below could result in determining a project not compatible unless expenses were offset by the investigator, sponsoring organization, or other party.

Following is an estimate of annual costs associated with administering this use on the Refuge.

Tasks	Estimated Costs per Year[1]
1. Oversight by GS-13 Project Leader (approximately 20 hours/year).	$1,200
2. Oversight by GS-12 Deputy Project Leader (approximately 20 hours/year).	$1,000
3. Law enforcement by GL-9 Law Enforcement Officer (approximately 20 hours/year).	$700
4. Permit monitoring by GS-11 Biologist (approximately 60 hours/year).	$2,600
5. Refuge overhead costs associated with the above-listed work.[2]	$1,100
6. Special equipment, facilities, improvements, and travel.	
Total Costs	$6,600

[1] Annual personnel costs = 2014 step 1 salary for appropriate GS level x 12.25% COLA x 40% for benefits.
[2] Overhead costs = salary + benefit costs x 0.22. Overhead expenses include building rent, utilities, equipment and supplies, and support personnel, and do not include salary-related benefits.

Anticipated Impacts of the Use(s):

Use of the Refuge to conduct research, surveys, or scientific collecting would generally provide information of benefit to native fish, wildlife, plants, and their habitats or cultural resources. Scientific findings gained through these projects could provide important information regarding life-history needs of species and species groups, as well as identify or refine management actions to achieve natural or cultural resource management objectives. Reducing uncertainty regarding wildlife and habitat responses to refuge management actions undertaken in order to achieve desired outcomes (objectives) is essential for adaptive management (Adaptive Management, 522 DM 1).

Potentially, some projects' methods could impact or conflict with Refuge-specific natural or cultural resources, priority wildlife-dependent public uses, other high-priority research, or Refuge management programs. In such cases, in order for the project to be determined compatible, it would need to be clearly demonstrated that the project's scientific findings would contribute to Refuge management and that the project could not be conducted off-Refuge. The investigator(s) would need to identify methods/strategies in advance to minimize or eliminate potential impacts and conflicts. If unacceptable impacts, including long-term and cumulative impacts, could not be avoided, then the project could not be determined compatible. Projects that represent public or private economic use of the natural resources of any national wildlife refuge (e.g., bioprospecting), in accordance with 16 U.S.C. 715s, must contribute to the achievement of the national wildlife refuge purposes or the National Wildlife Refuge System mission to be compatible (50 CFR 29.1).

Impacts would be project- and site-specific, and they would vary depending upon nature and scope of the field work. Data collection techniques would generally have minimal animal mortality or disturbance, habitat destruction, no introduction of contaminants, or no introduction of nonindigenous species. In contrast, projects involving the collection of biotic samples (plants or animals) or requiring intensive ground-based data or sample collection would have short-term impacts. To reduce impacts, the minimum number of samples (e.g., water, soils, vegetative litter, plants, macroinvertebrates, vertebrates) would be collected for identification and/or experimentation and statistical analysis. Where possible, researchers would coordinate and share collections to reduce sampling needed for multiple projects. For example, if one investigator collects fish for a diet study and another research examines otoliths, then it may be possible to accomplish sampling for both projects with one collection effort.

Investigator(s) obtaining required State or Territorial in addition to Federal collecting permits would also ensure minimal impacts to fish, wildlife, plants, and their habitats. If, even after incorporating the above strategies, projects would result in long-term or cumulative effects, projects would not be compatible. A Section 7 consultation under the Endangered Species Act (16 U.S.C. 1531-1544, 87 Stat. 884, as amended Public Law 93-205) would be required for activities that may affect a federally listed species and/or critical habitat. Only projects that have no effect or would result in not likely to adversely affect determinations would be considered compatible.

Spread of invasive plants and/or pathogens is possible from ground disturbance and/or transportation of project equipment and personnel, but it would be minimized or eliminated by requiring proper cleaning of investigator equipment and clothing as well as quarantine methods, where necessary (Attachment 5). If, after all practical measures are taken and unacceptable spread of invasive species is anticipated to occur, then the project would be found not compatible without a restoration or mitigation plan.

There also could be localized and temporary effects from vegetation trampling, collecting of soil and plant samples, or trapping and handling of wildlife. Impacts may also occur from infrastructure necessary to support a projects (e.g., permanent transects or plot markers, exclosure devices, monitoring equipment, solar panels to power unattended monitoring equipment). Some level of disturbance is expected with these projects, especially if investigator(s) enter areas closed to the public and collect samples or handle wildlife. However, wildlife disturbance (including altered behavior) would usually be localized and temporary in nature. Where long-term or cumulative unacceptable effects cannot be avoided, the project would not be found compatible. Project proposals would be reviewed by Refuge staff and others, as needed, to assess the potential impacts (short-term,

long-term, and cumulative) relative to benefits of the investigation to Refuge management issues and understanding of natural systems.

At least 6 months before initiation of field work (unless an exception is made by prior approval of the Refuge Manager), project investigator(s) must submit a detailed proposal using the format provided in Attachment 2. Project proposals would be reviewed by Refuge staff and others, as needed, to assess the potential impacts (short-term, long-term, and cumulative) relative to benefits of the investigation to Refuge management issues and understanding of natural systems. This assessment would form the primary basis for allowing or denying a specific project. Projects which result in unacceptable Refuge impacts would not be found compatible. If allowed and found compatible after approval, all projects also would be assessed during implementation to ensure impacts and conflicts remain within acceptable levels.

If the proposal is approved, then the Project Leader would issue an SUP(s) with required stipulations (terms and conditions) of the project to avoid and/or minimize potential impacts to Refuge resources as well as conflicts with other public use activities and Refuge field management operations. After approval, projects are monitored during implementation to ensure impacts and conflicts remain within acceptable levels based upon documented stipulations.

The combination of stipulations identified and conditions included in any SUP(s) would ensure that proposed projects contribute to the enhancement, protection, conservation, and management of native wildlife populations and their habitats on the Refuge. As a result, these projects will help fulfill Refuge purposes; contribute to the Refuge System mission; and maintain the biological integrity, diversity, and environmental health of the Refuge.

Projects which are not covered by the CCP (objectives under Goal 3 [Gather scientific information (surveys, research, and assessments) to support adaptive management decisions]) would require additional NEPA documentation.

It is likely that most proposed research, survey, or scientific collection projects would support one or more of the draft Refuge goals, but each would need to be evaluated separately. Projects that were determined supportive of draft Refuge goals and the Refuge System mission would have a greater chance of being found appropriate, determined compatible, and authorized for implementation.

Public Review and Comment:

Public availability of this CD has been widely announced together with announcement of the availability of the Refuge's draft CCP. The review and comment period has also been the same as for the draft CCP.

Determination:

_____ Use is Not Compatible

____X____ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

General

1. Permission to use the Refuge for research, surveys, or scientific collections would be officially authorized through issuance of an SUP. Generally, permits would be issued on a year-to-year basis. SUPs would cover use by a specified individual or organization and could not be assigned or sub-permitted to others (i.e., the permit is not transferable). Annual or other short-term SUPs are preferred; however, some permits will be longer, if needed, to allow completion of the project. All SUPs will have a definite termination date in accordance with 5 RM 17.11. Renewals will be subject to Refuge Manager review and approval based on timely submission of and content in progress reports, compliance with SUP stipulations, and required permits.

   Prior to potential permit renewal, researchers would meet with Refuge staff to share new information, discuss results of monitoring, review compliance with permit conditions, and address other issues. Other meetings would be scheduled as needed.

2. Most of Kīlauea Point NWR is closed to general public use, so SUPs would include maps clearly depicting the areas researchers would be authorized to access and use, including the Refuge entry point(s). Travel within the Refuge would be by designated road or trail. Permittees would be prohibited from straying outside the areas depicted on the maps.

3. In order to reduce conflicts with other approved public uses, especially wildlife-dependent public uses, permittees would not be allowed to use the Point, Upper Overlook and associated parking lot, or Crater Hill for research, surveys, or scientific collections during Refuge special events. The exception to this general stipulation would involve research, surveys, or scientific collections associated with high levels of public use. Special consideration could be made in such situations; however, additional stipulations would likely apply.

4. The Refuge would supply researchers with information about the Refuge; its purposes and goals; natural and cultural resources of concern; open and closed areas, dates, and times; rules and regulations; and any hazardous conditions. Researchers would be responsible for reviewing and understanding this information and ensuring that their colleagues also received, reviewed, and understood this information.

5. Researchers would be prohibited from constructing new or maintaining existing structures on the Refuge without specific, prior written approval of the Refuge Manager.

6. Unless it was an element included in their approved project proposal, researchers and their colleagues would be prohibited from collecting and removing any archaeological or historic artifacts, abiotic or biological specimens or samples, or mementos from the Refuge.

7. Consistent with Service policy regarding management of nonhazardous solid waste on refuges ("Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6901-6992k) – Solid Waste (Nonhazardous)," 561 FW 5), permittees would be prohibited from littering, dumping refuse, abandoning equipment or materials, or otherwise discarding any items on the Refuge.

8. Researchers would be required to hold the United States Government harmless from any damages or injury to the permittee or members of the general public in areas and facilities accessed via the terms of their permit.

9. In addition to the stipulations listed here, the general permit conditions and requirements, and the special permit conditions, researchers and their colleagues would be required to comply with Refuge System-related and other applicable laws, regulations, and policies, including "Prohibited Acts" listed in the Code of Federal Regulations (50 C.F.R. 27).

10. No changes could be made to any of these stipulations without specific, prior written approval of the Refuge Manager.

Research, Surveys, and Scientific Collections

1. The Refuge would issue a call for research proposals twice each year. Proposals received by the stated deadline would be evaluated and considered for approval during the next cycle.

2. At least 6 months before initiation of field work, a researcher(s) would be required to submit a detailed proposal (Attachment 2). Among other things, proposals would need to adhere to scientifically defensible protocols for data collection, where available and applicable.

   Project proposals would be reviewed by Refuge staff and others, as needed. This review would assess—relative to Refuge management issues and understanding of natural systems—the potential impacts (short-term, long-term, and cumulative) of the investigation. This assessment would form the primary basis for determining whether or not the project could be approved.

3. Researchers would be required to submit progress reports at least annually for multiple-year projects. A list of the minimum required elements for these reports is attached (Attachment 3). Final project reports would be due 1 year after completion of the project unless negotiated otherwise with the Refuge Manager.

   Researchers would be required to provide Refuge staff with the following:
   a. An opportunity to review and comment on draft manuscripts prior to their submittal to a scientific journal for consideration for publication;
   b. Copies (reprints) of all publications resulting from a project permitted on the Refuge; and
   c. At the conclusion of the project, raw data (preferably in an electronic database format).

   In all written and oral presentations resulting from projects on the Refuge, researchers would be required to appropriately cite and acknowledge the Refuge System, Kīlauea Point National Wildlife Refuge, and Refuge staff and other Service personnel who supported or contributed to the project.

   Upon completion of the project or annually (at the discretion of the Refuge Manager), researchers would be required to remove all equipment and physical markers (unless required for long-term projects) and restore sites to the Refuge Manager's satisfaction. SUPs would specify conditions for removal and clean-up.

4. Researchers would need to obtain all required local, State, and Federal permits for collections and other purposes.

5. A Section 7 consultation under the Endangered Species Act would be required for all projects and activities that may affect federally listed species and/or critical habitat. Only projects which would have "no effect" or would result in a "not likely to adversely affect" determination would be considered for potential approval.

6. To reduce impacts, the minimum number of samples (e.g., water, soils, vegetative litter, plants, macroinvertebrates, vertebrates, and artifacts) would be collected for identification and/or experimentation and statistical analysis.

   Where possible, researchers would be required to coordinate and share collections. This could reduce sampling needed for multiple projects and any associated mortality and disturbance. For example, if one investigator collected fish for a diet study and another researcher was examining otoliths, then it could be possible to accomplish sampling for both projects with one collection effort.

   All samples collected on Refuge lands or from Refuge waters are the property of the Service even while in the possession of the researcher. Any future work with previously collected samples not clearly identified in the project proposal would require submission of a subsequent proposal for Refuge review and approval. In addition, a new SUP would be required for additional project work. For samples or specimens to be stored at other facilities (e.g., museums), a memorandum of understanding would be necessary (Attachment 4).

7. Except where it was an essential element of an approved research proposal associated with 'īlio-holo-i-ka-uaua or honu to do otherwise, researchers would be required to maintain a distance of at least 50 yards from these animals and limit their viewing/photographing time to 30 minutes.

8. To minimize the introduction and/or spread of exotic plants or animals, diseases, or other pests, sampling equipment and researcher's clothing and vehicles (e.g., ATVs, boats) would need to be thoroughly cleaned (free of dirt and plant material) before being used on the Refuge. Depending on the project, quarantine methods could be necessary (Attachment 5).

9. Researchers would be required to secure approval from the Service prior to use of any pesticide (including uses of herbicides, fungicides, and insecticides) on the Refuge. This would involve researchers submitting to the Refuge Manager a completed Pesticide Use Proposal (PUP) for each proposed pesticide use. These PUPs would need to be submitted at least 60 days prior to proposed use of the pesticide to allow adequate time for evaluation and processing.

10. At any time, Refuge staff could accompany researchers in the field.

11. Researchers would be required to report dead or sick endangered birds or other wildlife to Refuge staff within 24 hours.

Cultural Resources

1. In the absence of specific, prior written approval of the Refuge Manager, researchers and their colleagues would be prohibited from disturbing or otherwise adversely impacting any prehistoric, historic, or other cultural resources on the Refuge. In the event such resources were inadvertently disturbed in the course of conducting otherwise permitted activities, the disturbing activity would need to be immediately discontinued and the Refuge Manager would need to be notified within 24 hours. Collecting and removing any prehistoric or historic artifacts would be prohibited.

Monitoring, Adaptive Management, and Enforcement

1. The Refuge would establish a program to monitor compliance with the stipulations enumerated herein. Violation of any of these stipulations could result in temporary or permanent withdrawal by appropriate Refuge personnel of official permission to continue research, surveys, or scientific collections on the Refuge. Permits could be revoked by the Refuge Manager with 30 days' written notice of noncompliance with these stipulations.

2. The Refuge would also monitor habitat quantity and quality, wildlife use and productivity, water quality, cultural resources, and other relevant endpoints to determine if stipulations associated with research, surveys, and scientific collections were resulting in expected and desirable outcomes. In consultation with researchers, the Refuge would apply adaptive management principles to modify stipulations or adjust objectives, as necessary, to achieve desirable results.

3. The Refuge would reserve the right to add to or otherwise modify the stipulations listed herein in order to ensure the continued compatibility of this use. New or modified stipulations would be instituted as a result of ongoing or new studies; new legal, regulatory, or policy requirements; significant changes to the Refuge environment or status of native fish, wildlife, plants, or their habitats; as a result of mutual agreement with researchers; or for other legitimate reason. Researchers would be advised of new or significantly modified stipulations at least 90 days prior to their becoming effective.

4. The Refuge would also reserve the right to terminate permission for these uses if permittees were violating conditions of their SUP; if unacceptable impacts were occurring to native fish, wildlife, plants, or their habitats, cultural resources or Refuge facilities, or other Refuge visitors; or for other legitimate reasons.

Justification:

Almost all research, surveys, and scientific collections on refuges are inherently valuable to the Service because they expand scientific information available for resource management decisions about fish, wildlife, plants, and their habitats; cultural resources; and/or public use. In many cases, if it were not for the Refuge staff providing access to Refuge lands and waters along with some support, the project would never occur and less scientific information would be available to aid the Service in managing and conserving Refuge resources.

By allowing the use to occur under the stipulations described above, it is anticipated that wildlife which could be disturbed by this use would find sufficient food resources and resting places so their abundance and use would not be measurably lessened on the Refuge. Additionally, it is anticipated

that monitoring, as needed, would prevent unacceptable or irreversible impacts to fish, wildlife, plants, and their habitats; cultural resources; and public use. Where this was not the case, the proposed project would likely not be compatible and would not be authorized for implementation. As a result, potential research, surveys, and scientific collections, consistent with the stipulations described herein, would not materially interfere with or detract from maintenance of the Refuge's biological integrity, diversity, and environmental health; fulfillment of Kīlauea Point NWR's purposes; or the Refuge System's mission.

Mandatory Re-Evaluation Date:

_____ Mandatory 15-year re-evaluation date (for wildlife-dependent public uses)

____X____ Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

____X____ Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

This compatibility determination has being developed and issued concurrent in with the CCP and EA for Kīlauea Point NWR.

Compatibility Determination: Research, Surveys, and Scientific Collections

Refuge Determination:

Prepared by:	_____ (Signature)	_____ (Date)
Approved by Project Leader, Kaua‘i National Wildlife Refuge Complex:	_____ (Signature)	_____ (Date)

Concurrence:

Refuge Supervisor, Hawaiian and Pacific Islands National Wildlife Refuge Complex:	_____ (Signature)	_____ (Date)
Regional Chief, National Wildlife Refuge System, Pacific Region:	_____ (Signature)	_____ (Date)

Attachment 1

High-Priority Research, Surveys, and Scientific Collections

Following are examples of high-priority research, survey, and scientific collection topics for Kīlauea Point NWR. They are not listed in priority order.

- Assess the effectiveness of social and other attraction methods to attract seabirds (e.g., Newell's shearwater and albatrosses) to the Refuge. Determine feasibility of relocating Newell's shearwater chicks to the Refuge.
- Assess the effectiveness of various habitat management techniques in enhancing nēnē nesting habitat on Crater Hill and Mōkōlea Point.
- Monitor and assess the causes of seabird and nēnē mortality.
- Evaluate the ability of various fencing systems to bar access to Crater Hill and Mōkōlea Point by mammalian pests and predators such as cats, dogs, mice, pigs, and rats. Evaluate the effectiveness of trapping, bait stations, shooting, and other methods to reduce onsite pest and predator populations.
- Determine the most effective methods to remove exotic vegetation and restore and maintain native plant species.
- Use pollen core studies and other techniques to reconstruct prehistoric vegetation communities. Continue to explore the most effective techniques to propagate and outplant native plants.
- Design and implement a program(s) to inventory and monitor high-priority plant and animal species and communities, including seabirds and shorebirds, Hawaiian monk seals and green sea turtles, Hawaiian hoary bat, endangered plants, and nonnative pests and predators.
- Map Refuge soils and vegetation communities. Identify important wildlife uses, and problems such as nonnative species and erosion.
- Assess the effects of public use on seabirds and shorebirds, including the effects of new or expanded programs such as hikes on Crater Hill. Develop appropriate mitigation measures.
- Assess the effects of leashed dogs on wildlife use and productivity at Kāhili Quarry.
- Enhance understanding of the effects of commercial uses on compatible recreational and educational public uses, especially wildlife-dependent public uses, and develop appropriate mitigation measures.
- Inventory and assess the status of the Refuge's cultural resources, and enhance knowledge and management with archival research and oral histories.
- Design and implement an appropriate climate change monitoring program for the Refuge.
- Inventory, map, and assess the status of the Refuge's infrastructure.

Attachment 2

FORMAT FOR PROPOSALS TO CONDUCT RESEARCH OR LONG-TERM MONITORING ON NATIONAL WILDLIFE REFUGES

A Special Use Permit (SUP) is required to conduct research and/or long-term monitoring on refuge lands. To receive an SUP, a detailed project proposal using the following format must be submitted to the Refuge Manager approximately 6 months prior to the start of the project.

Title:

Principal Investigator(s):
Provide the name(s) and affiliation(s) of all principal investigator(s) that will be responsible for implementation of the research and/or long-term monitoring described in the proposal. In addition, provide a brief description or attach vitae of expertise for principal investigator(s) germane to work described in the proposal.

Background and Justification:
In a narrative format, describe the following as applicable:

- *The resource management issue (e.g., decline in Pisonia rainforest) and/or knowledge gap regarding ecological function that currently exists with any available background information.*
- *Benefit of project findings (e.g., management implications) to resources associated with the refuge.*
- *Potential consequences if the conservation issue and/or knowledge gap regarding ecological function is not addressed.*

Objectives:
Provide detailed objective(s) for the proposed project.

Methods and Materials:
Provide a detailed description of the methods and materials associated with field and laboratory work (if applicable) to be conducted for the project. Methods should include the following:

- *study area(s);*
- *number of samples;*
- *sampling dates and locations;*
- *sampling techniques; and*
- *data analyses including* ***statistical methods*** *and* ***significance levels****.*

Previously published methods should be cited without explanation; whereas, new or modified techniques should be described in detail. Include number of personnel as well as all facilities and equipment (e.g., vehicles, boats, structures, markers) required to collect samples/data. Provide a clear description of the relationships among study objectives, field methods, and statistical analyses.

Permits:
Identify all State or Territorial and Federal permits required if applicable.

Potential Impacts to Refuge Resources:
Describe potential impacts to threatened or endangered species as well as other refuge plants, wildlife, and fish species that could result from the implementation of project activities on the refuge. Consider the cumulative impacts associated with this project.

Animal Welfare Plan:
If appropriate, attach a copy of the Institutional Animal Care and Use review and/or animal welfare plans that are required by the principle investigator's affiliation.

Partnerships and Funding Sources:
List other participating institutions, agencies, organizations, or individuals as well as the nature and magnitude of their cooperative involvement (e.g., funding, equipment, personnel).

Project Schedule:
Provide estimated initiation and completion dates for field sampling, laboratory work, data analyses, and report/manuscript preparation. If the project is divided into phases to be accomplished separately, provide separate initiation and completion dates for each phase.

Reports and Raw Data:
Establish a schedule for annual progress and final reports; include adequate time for peer review of the final report/manuscript. Draft reports/manuscripts should be submitted to the Refuge Manager for review prior to submission for consideration of publication. At the conclusion of a research study (manuscripts accepted for publication), an electronic copy of the data (e.g., GIS vegetation layers, animal species composition and numbers, genetics) should be provided to the Refuge Manager. For long-term monitoring projects, the Service also requires raw data for management and planning purposes for the Refuge.

Publications:
Describe the ultimate disposition of study results as publications in scientific journals, presentation at professional symposiums, or final reports.

Disposition of Samples:
If the project entails the collection of biotic and/or abiotic (e.g., sediment) samples, then describe their storage. Although the samples may be in the possession of scientists for the purposes of conducting the project in accordance with the SUP, the Service retains ownership of all samples collected on refuge lands. If the samples will be used for subsequent research activities that are not described within the original proposal, a new proposal must be submitted to the Refuge Manager to obtain an SUP before initiation of the follow-up project. After conclusion of the research activities, consult with the Refuge Manager regarding the final disposition of the samples. If specimens will be curated at a museum, then prepare an MOU using the format provided in Attachment 3.

Attachment 3

ANNUAL PROGRESS REPORTS FOR REFUGE RESEARCH AND LONG-TERM MONITORING PROJECTS

Study title:

Fiscal year:

Progress:
In a narrative format, summarize the work that was completed on the study including the number and types of samples collected and/or data analyses.

Important findings:
In narrative format, generally describe any conclusions and/or management recommendations that may be drawn from the work completed to date.

Describe problems encountered:
In narrative format, describe any problems that were encountered during the year and their effects upon the study.

Proposed resolution to problems:
For each problem encountered, describe the actions that have been taken to remediate it.

Preparer:

Date prepared:

Attachment 4

**MEMORANDUM OF UNDERSTANDING
FOR CURATORIAL SERVICES
BETWEEN THE**

**(Name of the Federal agency)
AND THE
(Name of the Repository)**

This Memorandum of Understanding is entered into this (**day**) day of (**month and year**), between the United States of America, acting by and through the (**name of the Federal agency**), hereinafter called the Depositor, and the (**name of the Repository**), hereinafter called the Repository, in the State/Territory of (**name of the State/Territory**).

The Parties do witnesseth that

WHEREAS, the Depositor has the responsibility under Federal law to preserve for future use certain collections of paleontological specimens and/or biological samples as well as associated records, herein called the Collection, listed in Attachment A which is attached hereto and made a part hereof, and is desirous of obtaining curatorial services; and

WHEREAS, the Repository is desirous of obtaining, housing, and maintaining the Collection, and recognizes the benefits which will accrue to it, the public, and scientific interests by housing and maintaining the Collection for study and other educational purposes; and

WHEREAS, the Parties hereto recognize the Federal Government's continued ownership and control over the Collection and any other U.S. Government-owned personal property, listed in Attachment B which is attached hereto and made a part hereof, provided to the Repository, and the Federal Government's responsibility to ensure that the Collection is suitably managed and preserved for the public good; and

WHEREAS, the Parties hereto recognize the mutual benefits to be derived by having the Collection suitably housed and maintained by the Repository;

NOW THEREFORE, the Parties do mutually agree as follows:

1. The Repository shall:

    a. Provide for the professional care and management of the Collection from the (**names of the resources**) sites, assigned (**list site numbers**) site numbers. The collections were recovered in connection with the (**name of the Federal or federally authorized project**) project, located in (**name of the nearest city or town**), (**name of the county, if applicable**) county, in the State/Territory of (**name of the State/Territory**)

    b. Assign as the Curator, the Collections Manager and the Conservator having responsibility for the work under this Memorandum, persons who are qualified

museum professionals and whose expertise is appropriate to the nature and content of the Collection.

c. Begin all work on or about (**month, date and year**) and continue for a period of (**number of years**) years or until sooner terminated or revoked in accordance with the terms set forth herein.

d. Provide and maintain a repository facility having requisite equipment, space, and adequate safeguards for the physical security and controlled environment for the Collection and any other U.S. Government-owned personal property in the possession of the Repository.

e. Not in any way adversely alter or deface any of the Collection except as may be absolutely necessary in the course of stabilization, conservation, scientific study, analysis, and research. Any activity that will involve the intentional destruction of any of the Collection must be approved in advance and in writing by the Depositor.

f. Annually inspect the facilities, the Collection, and any other U.S. Government-owned personal property. Every (**number of years**) years inventory the Collection and any other U.S. Government-owned personal property. Perform only those conservation treatments as are absolutely necessary to ensure the physical stability and integrity of the Collection, and report the results of all inventories, inspections, and treatments to the Depositor.

g. Within five (5) days of discovery, report all instances of and circumstances surrounding loss of, deterioration and damage to, or destruction of the Collection and any other U.S. Government-owned personal property to the Depositor, and those actions taken to stabilize the Collection and to correct any deficiencies in the physical plant or operating procedures that may have contributed to the loss, deterioration, damage, or destruction. Any actions that will involve the repair and restoration of any of the Collection and any other U.S. Government-owned personal property must be approved in advance and in writing by the Depositor.

h. Review and approve or deny requests for access to or short-term loan of the Collection (or a part thereof) for scientific and educational uses. In addition, refer requests for consumptive uses of the Collection (or a part thereof) to the Depositor for approval or denial.

i. Not mortgage, pledge, assign, repatriate, transfer, exchange, give, sublet, discard, or part with possession of any of the Collection or any other U.S. Government-owned personal property in any manner to any third party either directly or indirectly without the prior written permission of the Depositor, and redirect any such request to the Depositor for response. In addition, not take any action whereby any of the Collection or any other U.S. Government-owned personal property shall or may be encumbered, seized, taken in execution, sold, attached, lost, stolen, destroyed, or damaged.

2. The Depositor shall:

    a. On or about (**month, date and year**), deliver or cause to be delivered to the Repository the Collection, as described in Attachment A, and any other U.S. Government-owned personal property, as described in Attachment B.

    b. Assign as the Depositor's Representative having full authority with regard to this Memorandum, a person who meets pertinent professional qualifications.

    c. Every (**number of years**) years, jointly with the Repository's designated representative, have the Depositor's Representative inspect and inventory the Collection and any other U.S. Government-owned personal property and inspect the repository facility.

    d. Review and approve or deny requests for consumptively using the Collection (or a part thereof).

3. Removal of all or any portion of the Collection from the premises of the Repository for scientific or educational purposes; any conditions for handling, packaging and transporting the Collection; and other conditions that may be specified by the Repository to prevent breakage, deterioration, and contamination.

4. The Collection or portions thereof may be exhibited, photographed, or otherwise reproduced and studied in accordance with the terms and conditions stipulated in Attachment C to this Memorandum. All exhibits, reproductions, and studies shall credit the Depositor, and read as follows: "Courtesy of the (**name of the Federal agency**)." The Repository agrees to provide the Depositor with copies of any resulting publications.

5. The Repository shall maintain complete and accurate records of the Collection and any other U.S. Government-owned personal property, including information on the study, use, loan, and location of said Collection which has been removed from the premises of the Repository.

6. Upon execution by both parties, this Memorandum of Understanding shall be effective on this (**day**) day of (**month and year**), and shall remain in effect for **(number of years**) years, at which time it will be reviewed, revised, as necessary, and reaffirmed or terminated. This Memorandum may be revised or extended by mutual consent of both parties, or by issuance of a written amendment signed and dated by both parties. Either party may terminate this Memorandum by providing 90 days' written notice. Upon termination, the Repository shall return such Collection and any other U.S. Government-owned personal property to the destination directed by the Depositor and in such manner to preclude breakage, loss, deterioration, and contamination during handling, packaging, and shipping, and in accordance with other conditions specified in writing by the Depositor. If the Repository terminates, or is in default of, this Memorandum, the Repository shall fund the packaging and transportation costs. If the Depositor terminates this Memorandum, the Depositor shall fund the packaging and transportation costs.

7. Title to the Collection being cared for and maintained under this Memorandum lies with the Federal Government.

IN WITNESS WHEREOF, the Parties hereto have executed this Memorandum.

Signed: (signature of the Federal Agency Official) Date: (date)

Signed: (signature of the Repository Official) Date: (date)

Attachment 3A: Inventory of the Collection

Attachment 3B: Inventory of any other U.S. Government-owned Personal Property

Attachment 3C: Terms and Conditions Required by the Depositor

Attachment 5

ALIEN SPECIES QUARANTINE RESTRICTIONS FOR NATIONAL WILDLIFE REFUGES

A. Introduction

Thank you for your interest in conducting research/monitoring on the refuge(s). To protect wildlife and habitat communities found on the refuge, visitation is carefully regulated and requires that each individual, or group, secure a Special Use Permit (SUP) to gain access to the refuge. Each SUP clearly outlines the responsibilities of each permittee, including specific quarantine policies, which may be more detailed than the policies listed within this document. Details for securing an SUP can be found by contacting the Refuge Manager. Prospective scientific researchers must apply for the SUP at least 6 months prior to their proposed study period.

One of the gravest threats to the refuge(s) is the introduction of alien plant and animal species. The practices described below are complex, but the Service has found them to be effective at greatly reducing additional introductions of invasive species on refuge(s).

B. Definitions

1. **Clothing** - all apparel, including shoes, socks, over and under garments.
2. **Soft gear** - all gear such as books, office supplies, daypacks, fannypacks, packing foam or similar material, camera bags, camera/binocular straps, microphone covers, nets, holding or weighing bags, bedding, tents, luggage, or any fabric or material capable of harboring seeds or insects.
3. **New Clothing/Soft Gear** - new retail items, recently purchased and never used.
4. **Refuge-Dedicated Clothing/Soft Gear** - items that have ONLY been used at the refuge(s), and which have been stored in a quarantined environment between trips to the refuge(s).
5. **Sensitive Gear -** computers, optical equipment, and other sensitive equipment.
6. **Non-Sensitive Equipment and Construction Materials** - building materials, power and hand tools, generators, misc. machinery, etc.
7. **Suitable Plastic Packing Container -** packing containers must be constructed of smooth, durable plastic which can be easily cleaned and will not harbor seeds or insects. Packing containers may be re-used for multiple trips to the refuge(s), but must be thoroughly cleaned before each trip and strictly dedicated to refuge-related projects.
   - Examples of APPROPRIATE plastic packing containers are 5-gallon plastic buckets and plastic totes constructed with a single layer and having a smooth surface. All appropriate packing containers must have tight fitting plastic lids.
   - An example of an INAPPROPRIATE plastic packing container is a US mail tote. Mail totes are typically constructed of cardboard-like plastic that provides a porous multi-layered surface, allowing seeds and insects to easily hitchhike.

C. Special Use Permit (SUP)

All persons requesting use of the refuge(s) must secure an SUP, as described in Section A above, and agree to comply with all refuge requirements to minimize the risk of alien species introductions.

D. Quarantine Inspections

All personal gear, supplies, equipment, machinery, vehicles (e.g., ATVs, trucks, trailers), and vessels (e.g., planes, boats, ships, barges) will be inspected for quarantine compliance by Service staff prior to entering the refuge(s) and again before departing the refuge(s). A concerted effort will be made to ensure that alien pests are not transported. Service staff on the refuge(s) will inspect outbound cargo prior to transport.

E. Prohibited Items (Transport of the following items are strictly prohibited)

1. Rooted plants, cuttings, flowers, and seeds (raw or propagative).
2. Soil, sand, gravel, or any other material that may harbor unwanted plant and animal species.
3. Animals (no exceptions).
4. Cardboard (paper and plastic cardboard harbors seeds and insects).

F. Regulated Items (Transport of the following items are strictly regulated)

1. Food items have the potential to carry alien pests and are therefore selected, packed, and shipped with great care for consumption on the refuge(s). Foods will not be allowed on the refuge(s) without prior authorization.
2. Because wood products often harbor seeds and insect, only treated wood that has been painted or varnished may be allowed on the refuge(s). Approved wood products must also be frozen for 48 hours or fumigated as described in Section K below.

G. Packing Procedures

Ensure that the environment selected for packing has been well cleaned and free of seeds and insects. Keep packing containers closed as much as possible throughout the packing process so insects cannot crawl in before the containers have been securely closed. Quarantine procedures should be performed as close to the transportation date as possible to ensure that pests do not return as hitchhikers on the packing containers.

H. Packing Containers

1. All supplies and gear must be packed and shipped in SUITABLE PLASTIC PACKING CONTAINERS (see Section A for definitions of packing containers). Packing containers must be constructed of smooth, durable plastic that has been thoroughly cleaned prior to use.
2. Packing containers may be re-used for multiple trips to the refuge(s), but must be thoroughly cleaned before each trip and strictly dedicated to refuge-related projects. Cardboard containers are strictly prohibited because they can harbor seeds and insects.

I. Clothing and Soft Gear

1. All persons entering the refuge(s) must have NEW or REFUGE-DEDICATED clothing and soft gear (including all footwear).
    a. Freeze all clothing and soft gear for 48 hours (including both new and refuge-dedicated).
    b. Fumigation under a tarp or in a large container is also an option.

J. Sensitive Equipment

All sensitive gear (e.g., optical equipment, computers, satellite phones, other electronic equipment) must be thoroughly inspected and cleaned.

K. Non-Sensitive Equipment and Construction Materials

1. All non-sensitive equipment, machinery, and construction materials that are water resistant must be steam cleaned or pressure washed to ensure the removal of all dirt, insects, and seeds from external surfaces.
2. All non-water resistant items must be tented and fumigated to kill unwanted pests or frozen for 48 hours.
3. Quarantine procedures should be performed as close to the transportation date as possible to ensure that pests do not return to the equipment or packing containers.

L. Aircraft Quarantine

Aircraft personnel will ensure that the plane has been thoroughly cleaned and free of any alien species prior to flying to refuge(s). The aircraft captain will notify the Service at least 10 full working days prior to all flights departing for the refuge(s) in order to arrange a quarantine inspection of all cargo bound for the refuge(s). Inspections will take place the scheduled day of departure.

M. Commercial Ships and Barges, and Private Sailing and Motor Vessel Quarantine

1. Ship owners or captains will notify the Service at least 10 full working days prior to all vessels departing for the refuge(s) in order to arrange a quarantine inspection of all vessels and cargo bound for the refuge(s). The inspection will be scheduled as close to the departure date as possible.
2. Ship owners or captains will ensure that all ships and barges entering the refuge(s) have had their hulls cleaned of fouling marine/freshwater organisms. The ships and barges must depart for the refuge(s) within 14 days of having had the hulls cleaned. All ship and barge hulls must be re-cleaned should the vessel return to a port for greater than 14 days before returning to the refuge(s). Results of all hull cleanings must be submitted to the Service 2 full working days prior to the vessel departure. Contact the refuge office for additional details.
3. No discharge of ballast water, grey water, sewage, or waste of any kind will be allowed by any vessel within the refuge boundary (e.g., 12-mile territorial sea).

Compatibility Determination

Use: Traditional Cultural Practices (Natural Resource Collecting)

Refuge Name: Kīlauea Point National Wildlife Refuge

County and State: County of Kaua‘i, Hawai‘i

Establishing and Acquisition Authorities:

- Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1948, as amended (16 U.S.C. 667b–667d)
- Refuge Recreation Act of 1962, as amended (16 U.S.C. 460k–460k-4)
- Endangered Species Act of 1973, as amended (16 U.S.C. 1531–1544)
- Kīlauea Point National Wildlife Refuge Expansion Act of 2004 (P.L. 108-481)

Refuge Purpose(s):
The purposes for Kīlauea Point NWR have been identified in historic legal documentation establishing and adding refuge lands and are specified as follows:

> "… particular value in carrying out the national migratory bird management program …" (Transfer of Certain Real Property for Wildlife Conservation Purposes Act)
>
> "… suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors …" (Refuge Recreation Act)
>
> "… to conserve (A) fish or wildlife which are listed as endangered species or threatened species…or (B) plants…" (Endangered Species Act)
>
> "(1) the protection and recovery of endangered Hawaiian water birds and other endangered birds, including the Nene (Hawaiian goose); and (2) the conservation and management of native coastal strand, riparian, and aquatic biological diversity…" (Kīlauea Point National Wildlife Refuge Expansion Act)

National Wildlife Refuge System Mission:

> "The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966 as amended, 16 U.S.C. 668dd–668ee).

Description of Use(s):

This use involves participation in traditional Hawaiian cultural practices on Kīlauea Point National Wildlife Refuge (NWR or Refuge). Such practices include fishing with hook and line, throw net, spear, or shellfish gathering at Kīlauea (East) Cove, and collection of plant materials, feathers, and possibly other natural resources (e.g., stone, shells, bone) from areas of the Refuge that are open to

public use. Participants use these resources for subsistence, ceremonial, decorative, medicinal, or other purposes.

The rocky shore of Kīlauea (East) Cove (hereafter referred to as the Cove) is a traditional native Hawaiian fishing site. Access is from the bluff area on top of the Kīlauea Point (hereafter referred to as the Point) along a narrow trail that descends the Cove's steep cliffs. Currently, anglers pull aside a short section of safety fence to access the trail. Because of concerns regarding safety of the access trail, individuals fishing at this site are required to sign a liability release (attached "Release From Injury") and officially check in with Refuge personnel each day they access the Cove.

Refuge files reveal that fishing at the Cove has occurred year-round and, during the past decade, on an average of approximately 40 days per year. Fishing usually occurs by a single angler or perhaps a few family members at a time. At present, almost all of the fishing is by a handful of individuals with genealogical ties to the local community.

The Refuge is currently open for salt water fishing in designated areas (Refuge-Specific Regulations for Hunting and Fishing, Hawai'i, 50 C.F.R. 32.30). The Refuge boundary along the coast is the highest wash of the waves. Anglers fish at the Cove with hook and line, throw net, spear, or shellfish gathering, and can cast from the shore or wade into the surf. Species that could be harvested at the Cove include, but are not limited to, āholehole (Hawaiian flagtail, *Kuhlia sandvicensis*), akule (big-eye scad, *Selar crumenophthalmus*), halalu (juvenile akule), moi (Pacific threadfin, *Polydactylus sexfilis*), ulua (giant trevally, *Caranx ignobilis*, and other jacks of the family Carangidae), pāpio (ulua under 10 pounds), weke (goatfish in the family Mullidae), and oama (juvenile goatfish).

Examples of natural resources of potential interest for collection include, but are not limited to, hala leaves and fruit seeds for weaving mats and baskets, for thatching, and for leis (*Pandanus spp.*); 'ilima flowers for leis and medicinal purposes (*Sida fallax*); milo wood for woodworking (*Thespesia populnea*); naupaka kahakai flowers and fruits for leis, food, and medicinal purposes (*Scaevola sericea)*; nuts, fronds, and wood of niu (coconut, *Cocos nucifer*) for food, oil, containers, and fiber for cordage, for thatching and weaving baskets, and for woodworking; ti leaves for wrapping food, making clothes, and thatching (*Cordyline fruitcosa*); and possibly other native and naturalized plants (Kāne 1997). Feathers could be gathered, strung, and used to make leis and other items.

Resource collection and access to closed areas are uses not usually available to the general public. Such uses are defined as specialized uses under U.S. Fish and Wildlife Service (Service) policy (Administration of Specialized Uses, 5 RM 17). Official authorization to access the Refuge for these uses would occur through issuance of a special use permit (SUP).

This compatibility determination (CD) has been developed and made publicly available concurrent with the comprehensive conservation plan (CCP) and associated environmental assessment (EA) for Kīlauea Point NWR.

Availability of Resources:

Following is an estimate of annual costs associated with administering this use on the Refuge.

Tasks	Estimated Costs per Year[1]
1. Oversight by GS-13 Project Leader (approximately 10 hours/year).	$600
2. Oversight by GS-12 Deputy Project Leader (approximately 20 hours/year).	$1,000
3. Oversight by GS-9 Supervisory Park Ranger (approximately 20 hours/year).	$700
4. Law enforcement by GL-9 Law Enforcement Officer (approximately 20 hours/year).	$700
5. Permit monitoring by GS-11 Biologist (approximately 10 hours/year).	$400
6. Refuge overhead costs associated with the above-listed work.[2]	$700
7. Signage and fence maintenance, repair, and materials	$3,000
Total Costs	$7,100

[1] Annual personnel costs = 2014 step 1 salary for appropriate GS level x 12.25% COLA x 40% for benefits.
[2] Overhead costs = salary + benefit costs x 0.22. Overhead expenses include building rent, utilities, equipment and supplies, and support personnel, and do not include salary-related benefits.

The Refuge currently has adequate budget and staff to support the limited traditional cultural practices on the Refuge, as described herein.

Anticipated Impacts of the Use(s):

With appropriate stipulations, allowing local kamaʻāina to participate in traditional cultural practices would be consistent with draft Refuge goals 4 and 5.

The vast majority of public use at the Refuge occurs at the Point. Visitors have incredible opportunities to hear and view numerous seabirds as they soar overhead, roost or nest on adjacent cliffs and grassy knolls, and forage in the ocean. Nēnē are routinely seen close up, on the grounds. Nēnē are fairly tolerant of human disturbance, but many seabirds are wary and flush when approached too closely.

Human disturbance has differential effects on wildlife and is dependent upon, among other variables, the species involved and its age; the time of year; the breeding cycle stage (if applicable); the surrounding environment; whether the activity involves vehicles; the intensity, speed, noise, nature, and frequency of the disturbing activity; and the directness of approach to an animal (Blanc et al. 2006, Holmes et al. 2005, Hammitt and Cole 1998, Knight and Cole 1995a, Knight and Cole 1995b). Immediate responses by wildlife to recreational activity can range from behavioral changes including nest abandonment, altered nest placement, change in food habits, physiological changes such as elevated heart rates and increased energetic costs due to flight or flushing, or even death (Belanger and Bedard 1990, Knight and Cole 1995a, Knight and Swaddle 2007, Miller et al. 1998, Miller and Hobbs 2000, Morton et al. 1989, Smith-Castro and Rodewald 2010). The long-term effects are more difficult to assess but may include altered behavior, vigor, productivity, or death of individuals; altered population abundance, distribution, or demographics; and altered community species composition and interactions.

Kitaysky et al. (2003) found levels of corticosterone (a major stress hormone) in ‘ua‘u kani at the Refuge to be higher in chicks occupying burrows closer to (within 13 feet of) visitor-use areas. Holmes et al. (2005) found that, even at the recommended minimum approach distance (~16 feet), a single wildlife observer in a Royal penguin (*Eudyptes schlegeli*) colony on Macquarie Island, Australia, triggered vigilance behavior and an increased heart rate in the birds. In another study, Holmes et al. (2007) found that vigilance behavior of Gentoo penguins (*Pygoscelis papua*) increased as the numbers of observers increased. Additional studies in penguin colonies revealed that a slow approach that ended with a visitor sitting quietly and closely observing a bird had little effect on the bird’s heart rate, yet a rapid approach that ended with a visitor remaining standing and closely observing a bird resulted in an elevated heart rate (Nimon et al. 1995).

A variety of factors affect flushing distances among waterbirds, including the species involved; the activity the birds are engaged in (e.g., foraging versus nesting); and the type, speed, and noise of disturbance (e.g., approaching birds by walking versus in a motorized boat) (Rodgers and Smith 1997, Rodgers 1991). Flushing of birds or even raising their alert levels (which usually occurs at a greater distance than that for flushing) creates stress and requires animals to expend energy that otherwise would be invested in essential life history activities such as foraging, mating, nesting, brood-rearing, and predator avoidance.

Breeding birds are especially sensitive to human disturbance (Trulio 2005, Hammitt and Cole 1998). A study of visitors to a colony of kittiwakes (*Rissa tridactyla*) and guillemots (*Uria aalge*) revealed that nesting success was influenced by the distance observers were from the birds (positively correlated) and the number of observers involved (negatively correlated) (Beale and Monaghan 2004).

Studies have had mixed results regarding potential habituation of birds and some other taxa to human disturbance. Wildlife are often less disturbed by routine human activities that repeatedly occur along defined routes (e.g., trails, roads, or water channels), especially frequent disturbance that does not involve direct contact or other threat, compared with those activities that occur irregularly and outside predictable paths/channels (Blanc et al. 2006, Holmes et al. 2007, Knight and Cole 1995b).

In studies of breeding yellow-eyed penguins (*Megadyptes antipodes*), a timid and secretive species, Ratz and Thompson (1999) found that the birds appeared to have habituated to the presence of guided tourists who approached the colony through trenches and closely observed or photographed birds from camouflaged blinds. Jungius and Hirsch (1979) studied seabird colonies and found that birds that were believed to have habituated to tourists and revealed no outward behavioral changes in their presence, nonetheless exhibited stress (as reflected in elevated heartbeat frequencies) when approached by visitors. The scientists speculated that the stress could have a negative effect on breeding. Habituation to some types and levels (intensity and frequency) of human disturbance appears to vary among species, within species, between resident and migratory populations, and potentially between inexperienced and experienced breeders. This makes it difficult to forecast habituation in actual field situations.

Fishing would have direct, lethal effects on individual fish and shellfish, the target game species. The amount of loss would depend on the angling pressure (i.e., the number of anglers, days of effort, catch success). To the extent that anglers engaged in catch-and-release practices, the number of individual fish lost per angler would be reduced, but there would still be some percentage of mortality. Angling on the Refuge would be expected to have negligible to minor effects on

populations of fish or shellfish because the State of Hawai‘i regulates fishing consistent with sustained yield population management principles.

Angling would also be expected to cause some wildlife disturbance. Walking down and back up the narrow trail that traverses the Cove’s cliffs has the potential to disturb seabirds that use cliff-side vegetation for roosting and nesting. Once on the Cove’s rocky shore, the angler would be separated by substantial vertical distance from such birds and disturbance is less likely. The amount of disturbance would depend on the proximity of the angler to the birds and the duration of his or her presence.

‘Īlio-holo-i-ka-uaua numbers are increasing in the main Hawaiian Islands, especially on and around Ni‘ihau and Kaua‘i (NMFS 2007, Baker and Johanos 2003), and ‘īlio-holo-i-ka-uaua and honu are known to use the Cove’s ocean waters and rocky shore. Critically endangered ‘īlio-holo-i-ka-uaua are especially sensitive to human disturbance (NMFS 2007). Seals can be disturbed by people, vehicles, and dogs; disturbance of female adults with pups is of special concern (Gilmartin 2003). Seals may also injure people. Seals, like other pinnipeds, may be vulnerable to diseases transmitted from livestock, pets, and feral animals (including heartworm, canine distemper, leptospirosis, toxoplasmosis, and brucellosis (Braun 2003)).

Seals haul out on land to rest, molt, or pup. Approaching anglers could force hauled-out seals to move back into the water and seek a new haul-out site, causing them to expend energy and increasing their exposure to predators. Repeated disturbance over time can cause seals to abandon preferred haul-out sites (Gilmartin 2003). It is generally recommended that individuals viewing or photographing seals and sea turtles maintain a distance of at least 50 yards from the animals and limit their viewing/photographing time to no more than 30 minutes (NOAA undated, NOAA Fisheries et al. undated; “Hawai‘i Viewing Guidelines: Overview, Marine Mammal & Sea Turtle Viewing ‘Code of Conduct’” at http://www.nmfs.noaa.gov/pr/education/Hawai‘i/). The base of the Cove where fishing occurs is less than 50 yards wide. Seals and threatened green sea turtles could also be injured or potentially killed if they became hooked or entangled in fishing lines or nets (NMFS 2007, NMFS and USFWS 1998).

Anglers would be expected to cause trampling of native plants, erosion, and potential introduction or spread of exotic species, including invertebrates, plants, and invasive species. These impacts would be focused in the Cove and surrounding cliffs, and could adversely affect native fish, wildlife, plants, and their habitats. The degree of actual effects upon reproduction, survival of individuals, and diversity and abundance of native species (community health) would depend on specific circumstances. In light of the fact that this trail has been in use for many years, and future use is expected to be light, additional impacts of this nature would be expected to be minimal.

To access the Cove trail, anglers pull away a portion of the public safety fence. If this portion of fence is not properly replaced, cats or dogs could access the area outside the fence that is used by seabirds for roosting and nesting, resulting in additional predation.

The effects associated with collection of plants, feathers, and potentially other natural resources would depend on whether collections were made from live plants or birds, whether the species were natives versus exotics, the volume of materials collected, and the areas in which and times of day and year during which the collections occurred. If parts were collected from live plants or birds, the survival of those individuals could be impacted. “Surplus” plant materials, including those that drop

or otherwise break off parent plants and lay decomposing on the ground, and detached bird feathers serve various ecological roles in the environment. Plant parts (e.g., nuts, berries, flowers, and leaves) provide forage for herbivores. Dead and decaying plant parts and feathers are consumed by detritivores and eventually help replenish soil nutrients. Additionally, these materials are used by wildlife for cover and nesting materials. However, if parts were not removed from live organisms and in light of the substantial rainfall and year-round growing period on Kaua‘i (especially on the North Shore), it is unlikely that a modest amount of collection and removal of such materials would measurably impact such ecological cycles or adversely affect associated wildlife values at the Refuge.

A greater impact could result from wildlife disturbance and other indirect effects associated with these collections. If collectors were allowed to freely roam in areas used for foraging, roosting, loafing, or nesting by any of the native species of special management concern, adverse effects could occur. As noted earlier regarding potential effects associated with fishing access, approaching birds too closely raises their alert levels and creates stress. Flushing requires birds to expend energy that would otherwise be invested in essential life history activities such as foraging, mating, nesting, brood-rearing, and predator avoidance. Disturbance can cause nest desertion; impact survival of individual birds, eggs, nestlings, or broods; and alter behavior of nonbreeding birds. Breeding birds are especially sensitive to human disturbance (Trulio 2005).

Additionally, the Refuge has substantial and, in some areas, dense populations of burrow-nesting seabirds. Although some burrows lie on the Point within the area heavily used by Refuge visitors, the vast majority of the burrows are elsewhere, in less disturbed areas of the Refuge. Humans casually walking through nesting colonies could easily crush burrows, destroy nests and eggs, and kill young or adult seabirds. Collectors could also trample native plants, accelerate erosion, and potentially introduce or spread exotic species, including invertebrates, plants, and invasive species. These impacts could adversely affect native fish, wildlife, plants, and their habitats, and would be of special concern in Refuge areas struggling with reestablishment of native plant communities.

Public Use

As noted earlier, anglers pull away a portion of the public safety fence to access the Cove trail. Other Refuge visitors could see anglers crossing through the fence and attempt to do so themselves, creating new safety issues.

If resource collecting occurred in areas readily seen by other Refuge visitors, these other visitors could easily become confused regarding what activities are and are not allowed on the Refuge, and this could increase the amount of unauthorized collections that occurred.

Otherwise, it is not expected that participation in traditional cultural practices by a limited number of Refuge visitors would adversely impact other public use at the Refuge.

Cultural Resources and Values

The Refuge contains a number of historic and prehistoric resources, including the Kīlauea Point Light Station (the lighthouse and associated Coast Guard facilities on the Point) that was listed on the National Register of Historic Places as a historic district in 1979 (USFWS 2006). It is not expected that fishing at Kīlauea (East) Cove, including accessing the site along the cliff trail, or limited

collecting of plant materials, feathers, and possibly other natural resources would have any effects on cultural resources.

The activities discussed herein are of special cultural significance to native Hawaiians, especially those who have genealogical ties to the local community, that is, the Kīlauea and Kāhili Ahupuaʻa or surrounding ahupuaʻa, including Namahana, Kalihiwai, Kalihikai, Waiakalua, and Pīlaʻa (Wilson and Jay 2010). Providing opportunities for such individuals to use the traditional native Hawaiian fishing site at Kīlauea (East) Cove or to collect and use materials from native plants or canoe plants, feathers, and possibly other natural resources for traditional subsistence, ceremonial, decorative, medicinal, or other purposes would support restoration and maintenance of native Hawaiian cultural values.

Public Review and Comment:

Public availability of this CD has been widely announced together with announcement of the availability of the Refuge's draft CCP. The review and comment period has also been the same as for the draft CCP.

Determination:

_____ Use is Not Compatible

____X____ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

General

1. Individuals participating in traditional cultural practices on the Refuge would be allowed to engage in these activities for subsistence, ceremonial, medicinal, decorative, or other similar personal, family, and/or community purposes. Participating in traditional cultural practices on the Refuge for commercial purposes would be prohibited.

2. Prior to participating in traditional cultural practices on the Refuge (including fishing and resource collections), each participant would be issued and need to sign an annual SUP.

3. The existing "Release from Injury" form would undergo a legal review and needed changes would be made, as appropriate. All resource collectors and anglers, including those who have signed the old form, would be required to sign any new form prior to collecting materials from the Refuge or fishing at the Cove in the future.

4. Participation in traditional cultural practices at the Cove would be allowed during daylight hours only, when the Refuge is open to visitation by the general public.

5. In order to avoid harassment, disease, and/or death of native wildlife, or transport of exotic or invasive plant parts, insects, or other undesirable species, individuals participating in traditional cultural practices would be prohibited from bringing dogs or other pets with them onto the Refuge.

6. In the absence of specific, prior written approval of the Refuge Manager (for the purpose of these stipulations, the Refuge Manager would be the Refuge Project Leader of the Kaua‘i National Wildlife Refuge Complex), or unless specifically allowed by State of Hawai‘i fishing regulations, individuals participating in traditional cultural practices would be prohibited from collecting and removing any archaeological or historic artifacts, abiotic or biological specimens or samples, or mementos from the Refuge.

7. Consistent with Service policy regarding management of nonhazardous solid waste on refuges ("Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6901-6992k) – Solid Waste (Nonhazardous)," 561 FW 5), individuals participating in traditional cultural practices would be prohibited from littering, dumping refuse, abandoning equipment or materials, or otherwise discarding any items on the Refuge, including unused or excess fishing line, hooks, lures, and bait.

8. In addition to the stipulations listed here, individuals participating in traditional cultural practices would be required to comply with Refuge System-related and other applicable laws, regulations, and policies including "Prohibited Acts" listed in the Code of Federal Regulations (50 C.F.R. 27).

9. No changes could be made to any of these stipulations without specific, prior written approval of the Refuge Manager.

Fishing

1. Each day an individual wished to fish at the Cove, the individual would first need to officially check in with Refuge personnel to sign in and learn of any changes that could affect their practices that day or into the future. Due to limited area and to ensure trail safety, group size would be limited to a maximum of five individuals.

2. Prior to descending the Cove trail, Refuge personnel would scan the shore and adjacent waters of the Cove for ‘īlio-holo-i-ka-uaua and honu. Fishing would not be allowed if either seals or turtles were present. Additionally, if an angler was already at the Cove and either seals or turtles appeared in Cove waters or on the shore, fishing would need to be discontinued while these animals were present and the angler would need to depart the Cove.

3. In order to minimize potential disturbance to roosting and nesting seabirds, anglers would need to descend and ascend the cliff-side Cove trail in as quickly a manner as they could do so safely.

4. In order to reduce the potential for hooking of ‘īlio-holo-i-ka-uaua or honu, anglers would be encouraged to use barbless circle hooks while fishing from the shore.

5. Anglers would be prohibited from constructing new or maintaining existing structures or fixtures (including rod holders) on the Refuge without specific, prior written approval of the Refuge Manager.

6. The Refuge would install a locked gate with a warning sign along the section of fence used to access the Cove trail. This would minimize the likelihood that unauthorized visitors would access the steep and narrow Cove trail.

7. Any significant changes to rules for fishing on the Refuge would be appropriately promulgated as Federal regulations. These regulations would be supplemented by Refuge-specific information available onsite or at the Kaua‘i National Wildlife Refuge Complex headquarters office.

8. Anglers would be required to abide by Hawai‘i Fishing Regulations when fishing on the Refuge. This includes securing and having with them relevant State fishing licenses and any other permits needed to fish in the ocean from the Refuge.

Resource Collecting

1. Each day an individual wished to make collections on the Refuge, that individual would first need to officially check in with Refuge personnel to sign in and learn of any changes that could affect their practices that day or into the future. Individuals wishing to make collections would be provided a map or shown in person areas approved for collections and areas that were off limits to such activities.

2. Each individual wishing to make collections from migratory birds or species listed under the Endangered Species Act would need to acquire appropriate Federal and State permits, and have those permits with them when collecting on the Refuge.

3. Individuals would be limited to a specific amount of material that could be collected each day. Such limits could vary depending on the species or parts to be collected. No collections of feathers or other animal parts could be made from live animals. No collections could be made from live plants listed under the Endangered Species Act.

Cultural Resources and Values

1. Participation in traditional cultural practices on the Refuge would be limited to individuals of native Hawaiian heritage who have genealogical ties to the local community, that is, the Kīlauea and Kāhili Ahupua‘a or surrounding ahupua‘a including Namahana, Kalihiwai, Kalihikai, Waiakalua, and Pīla‘a (Wilson and Jay 2010).

2. In the absence of specific, prior written approval of the Refuge Manager, individuals participating in traditional cultural practices would be prohibited from disturbing or otherwise adversely impacting any prehistoric, historic, or other cultural resources on the Refuge.

Monitoring, Adaptive Management, and Enforcement

1. The Refuge would establish a program to monitor compliance with the stipulations enumerated herein. This would include enforcement of Hawai‘i Fishing Regulations.

2. The Refuge would monitor fishing, resource collections, wildlife and habitat disturbance, conflicts with other Refuge visitors, and other potential impacts to determine if these stipulations were resulting in expected and desirable outcomes. The Refuge would apply adaptive management principles to modify stipulations or adjust objectives, as necessary, to achieve desirable results.

3. The Refuge would reserve the right to add to or otherwise modify the stipulations listed herein in order to ensure the continued compatibility of these uses. New or modified stipulations could be instituted as a result of new information generated by ongoing or new studies; new legal, regulatory, or policy requirements; significant changes to the Refuge environment or status of native fish, wildlife, plants, or their habitats; changes to fishing practices; or for other legitimate reasons. Refuge personnel would advise individuals participating in traditional cultural practices of any such changes.

4. The Refuge would also reserve the right to terminate permission for these uses if individuals participating in traditional cultural practices were violating conditions of their SUP; if unacceptable impacts were occurring to native fish, wildlife, plants, or their habitats, cultural resources or Refuge facilities, or other Refuge visitors; or for other legitimate reasons.

Justification:

By its nature, fishing would have direct, lethal effects on individual fish and shellfish. However, angling on the Refuge would be expected to have negligible to minor effects on populations of fish or shellfish because of the very limited nature of this use and because the State of Hawaiʻi regulates fishing consistent with sustained yield population management principles.

Angling would have the potential to cause some disturbance to seabirds and potentially seals and/or turtles. Proposed stipulations would limit the duration of any potential disturbance to seabirds using cliff-side vegetation by requiring that anglers descend and ascend the cliff-side Cove trail in as quickly a manner as they could do so safely. Additionally, fishing would not be allowed if either seals or turtles were present.

Fishing at the Cove would remain a safe activity because access would be limited to daylight hours and to individuals who had personal knowledge and a lengthy family history of using this traditional Hawaiian fishing site. A locked gate would deter trail access by other Refuge visitors.

As with fishing at the Cove, it is expected that a limited number of individuals would participate in resource collecting at the Refuge. Refuge personnel would direct collectors away from areas of the Refuge where native plants and animals could be disturbed or destroyed. Additionally, there would be daily collection limits by species or parts, and no collections could be made from live animals or plants listed under the Endangered Species Act. With these stipulations, it is expected that resource collecting would not have a measurable effect on Refuge resources.

Participation in traditional cultural practices on the Refuge would be limited to those individuals of native Hawaiian heritage who have genealogical ties to the Kīlauea and Kāhili Ahupuaʻa or surrounding ahupuaʻa, including Namahana, Kalihiwai, Kalihikai, Waiakalua, and Pīlaʻa. Providing opportunities for traditional cultural practices on the Refuge would support perpetuation of native Hawaiian cultural values.

As noted earlier, one of the purposes of the Refuge is to provide fish and wildlife-oriented recreation. Although the activities discussed herein are of special cultural significance, fishing and resource collecting could also be considered wildlife-oriented recreational activities and therefore could help support achievement of Refuge purposes.

Compatibility Standard

In order to be allowed on the Refuge, traditional cultural practices would need to be determined compatible. By allowing these uses to occur under the stipulations described above, it is anticipated that wildlife which could be disturbed would find sufficient food resources and resting places so their abundance and use would not be measurably lessened on the Refuge. Additionally, it is anticipated that monitoring, as needed, would prevent unacceptable or irreversible impacts to fish, wildlife, plants, and their habitats; other public uses; and cultural resources. For the several reasons stated above and consistent with the stipulations described herein, this use would not materially interfere with or detract from maintenance of the Refuge's biological integrity, diversity, and environmental health; fulfillment of Kīlauea Point NWR's purposes; or the Refuge System's mission.

Mandatory Re-Evaluation Date:

_____ Mandatory 15-year re-evaluation date (for wildlife-dependent public uses)

____X____ Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

____X____ Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

This compatibility determination has being developed and issued concurrent with the CCP and EA for Kīlauea Point NWR.

Compatibility Determination: Traditional Cultural Practices (Natural Resource Collecting)

Refuge Determination:

Prepared by:	_____ (Signature)	_____ (Date)
Approved by Project Leader, Kaua‘i National Wildlife Refuge Complex:	_____ (Signature)	_____ (Date)

Concurrence:

Refuge Supervisor, Hawaiian and Pacific Islands National Wildlife Refuge Complex:	_____ (Signature)	_____ (Date)
Regional Chief, National Wildlife Refuge System, Pacific Region:	_____ (Signature)	_____ (Date)

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Compatibility Determination

Use: Wildlife Observation and Photography, and Interpretation

Refuge Name: Kīlauea Point National Wildlife Refuge

County and State: County of Kaua‘i, Hawai‘i

Establishing and Acquisition Authorities:

- Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1948, as amended (16 U.S.C. 667b–667d)
- Refuge Recreation Act of 1962, as amended (16 U.S.C. 460k–460k-4)
- Endangered Species Act of 1973, as amended (16 U.S.C. 1531–1544)
- Kīlauea Point National Wildlife Refuge Expansion Act of 2004 (P.L. 108-481)

Refuge Purpose(s):
The purposes for Kīlauea Point NWR have been identified in historic legal documentation establishing and adding refuge lands and are specified as follows:

> "… particular value in carrying out the national migratory bird management program …" (Transfer of Certain Real Property for Wildlife Conservation Purposes Act)
>
> "… suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors …" (Refuge Recreation Act)
>
> "… to conserve (A) fish or wildlife which are listed as endangered species or threatened species…or (B) plants…" (Endangered Species Act)
>
> "(1) the protection and recovery of endangered Hawaiian water birds and other endangered birds, including the Nene (Hawaiian goose); and (2) the conservation and management of native coastal strand, riparian, and aquatic biological diversity…" (Kīlauea Point National Wildlife Refuge Expansion Act)

National Wildlife Refuge System Mission:

> "The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966 as amended, 16 U.S.C. 668dd–668ee).

Description of Use(s):

Interpretation is the communication of information about, or the explanation of, the nature, origin, and purpose of historical, natural, or cultural resources, objects, sites, and phenomena using personal or impersonal methods. The National Association for Interpretation defines interpretation to be, "…a mission-based communication process that forges emotional and intellectual connections between the

interests of the audience and the meanings inherent in the resource (http://www.interpnet.com/). For national wildlife refuges, the purposes of interpretation are to convey an understanding of and appreciation for refuge resources, the issues that affect them, and the conservation techniques and programs pursued in their management (Interpretation, 605 FW 7). For purposes of this compatibility determination (CD), interpretation addresses environmental and cultural resources and values.

Observation, photography, and interpretation are often enhanced with the provision of brochures, wildlife and plant lists, interpretive signs and displays, trails, auto tour routes and vehicle pullouts, viewing platforms or towers, viewing equipment, photography or viewing blinds, interpretive presentations and tours, visitor stations or centers, and bookstores or similar retail outlets. Many of these facilities and information sources serve all three activities. In addition, all three activities are often enjoyed together. Information can be conveyed in person, in writing, with images, with sound, and, increasingly, through a diversity of electronic media and devices.

For purposes of this CD, observation and photography include viewing and capturing images of wild plants and animals, wildlife habitats, wildlands, waters, landscapes, cultural resources, and cultural activities; noncommercial recording of all types (e.g., filming, videography, audiography, writing, and drawing or painting); and general nature study and appreciation. Recording of images and audio for commercial purposes is addressed in a separate CD (CD for Commercial Photography and Videography). Observation, photography, and interpretation opportunities offered by commercial tours are addressed in the CD for Ecotourism.

Kīlauea Point NWR provides multiple opportunities for visitors to enjoy observation, photography, and interpretation. Refuge visitors can engage in these activities during open times (10 a.m. to 4 p.m. on Tuesday–Saturday, except Federal holidays) by visiting any of Kīlauea Point National Wildlife Refuge's (NWR or Refuge) open areas, including Kīlauea Point (Point), the cul-de-sac (turnaround) at the end of Kīlauea Road (Overlook), Kāhili Quarry area, and occasionally a trail(s) on Crater Hill. Under Alternative D, the Preferred Alternative identified in the draft comprehensive conservation plan (CCP) and associated environmental assessment (EA), a new offsite visitor center and associated facilities would be constructed and open to general public use. Almost all public use on the Refuge (approximately 500,000 visitors/year) occurs on the Point, the same location for the vast majority of current observation, photography, and interpretation opportunities. This area offers outstanding opportunities for observation and photography of a diversity of native seabirds, nēnē (Hawaiian goose, *Branta sandvicensis*), and sometimes shorebirds, whales, dolphins, seals, and sea turtles; the Kīlauea Point Light Station; and classic Hawaiian coastal scenery, including undeveloped bluffs, the remnant walls of an ancient volcano, rocky beaches, and nearshore ocean and islands.

The Point is approximately 31 acres in size. Facilities on the Point that support observation, photography, and interpretation include the Overlook, access road and two modest parking areas, fee station, visitor center, contact station, outdoor interpretive panels, viewing scopes, trails, perimeter safety fence, restrooms, and recycling and trash receptacles. The visitor center includes indoor interpretive exhibits, a bookstore, and it also sells bottled water. The contact station has displays, information about the Refuge and Lighthouse, and interpretive videos. At the fee station, visitor center, and contact station, visitors can obtain brochures with information about the Refuge and its valuable natural and cultural resources. Visitors can access the Lighthouse on a guided tour, currently offered weekly and on Lighthouse Day. Visitor services provided on a regular basis on the Point include in-person orientation, information, and interpretation by roving volunteer interpreters, binoculars and field guides available to borrow, and a golf cart to provide local transportation for

visitors with disabilities and others wishing assistance. In addition to its regular offerings, the Refuge also provides extra visitor opportunities and services during Refuge special events, such as Lighthouse Day and National Wildlife Refuge Week. During these events, special interpretive guides and hikes (e.g., on Crater Hill and Mōkōlea Point) are offered. Crater Hill includes a rustic trail(s) and two overlooks. The Kīlauea Point Natural History Association (KPNHA, the Refuge cooperating association and friends group) provides substantial staffing support for the visitor services program on the Point. This area is accessed from the town of Kīlauea primarily by automobile via Kīlauea Road. Efforts are continuing to provide a trail connection between Kīlauea Town and the Refuge, and to increase exhibits and workshops focused on wildlife observation and photography. Visitors are assessed a modest fee to enter the main public use area on the Point and a moderate fee would be charged for limited Crater Hill hikes (except during National Wildlife Refuge Week).

Refuge visitors can also enjoy observation and photography ancillary to fishing or other activities at Kāhili Quarry, or associated with invasives control or a habitat restoration work party, or a special tour led by Refuge personnel, a volunteer, or other U.S. Fish and Wildlife Service- (Service) authorized agent. Observation, photography, and interpretation opportunities are also provided through ecotourism operations. Such operations are addressed in a separate CD (CD for Ecotourism).

Under the Preferred Alternative, a new visitor center, transportation hub, and maintenance and other facilities and functions would be developed off the Refuge. This new set of facilities would provide visitor contact, orientation and information, fee collection, restrooms, bookstore/retail space, a multipurpose room, outdoor spaces, administration offices, private vehicle and tour bus parking, public bus stop, shuttle pick up/drop off, and maintenance baseyard (with buildings to store supplies and store and maintain/repair equipment). A location has not been chosen for these new facilities, but they could be sited adjacent to the Refuge boundary or up to 1 mile away, for example, along Kūhiō Highway (Highway 56).

Under this scenario, parking for private automobiles on the Point would be eliminated and visitors would primarily access the Refuge via a shuttle from Kīlauea town and/or the new visitor center. It is also proposed that bicycle parking be provided at the Overlook. If the new visitor center and transportation hub are sited adjacent to the Refuge boundary and Kīlauea Road, the Road could be acquired and gated, so that private vehicles would be prohibited when the Refuge was open.

On the Point, the existing visitor center would be remodeled to provide EE or interpretive exhibits and displays, the scenic view and interpretation at the contact station would be expanded, one of the former lighthouse quarters would be restored and converted into a living history site, another of the former lighthouse quarters would be remodeled to provide basic administrative and volunteer offices, at least one guided interpretive activity would be offered daily, and potentially a limited number of guided interpretive hikes to Crater Hill would be offered. Signage at the Overlook would be enhanced to provide more information and interpretation. In addition, efforts would be made to increase opportunities for up-close wildlife observation and photography (e.g., with remote cameras and observation/photo blinds). As a result of all these changes, it is expected that the number and quality of observation, photography, and interpretive opportunities would substantially increase.

Observation, photography, and interpretation are wildlife-dependent general public uses and are to be given special consideration in refuge planning and management. When determined compatible on a refuge-specific basis, a wildlife-dependent use becomes a priority public use for that refuge and is to be facilitated and strongly encouraged (National Wildlife Refuge System Administration Act).

This compatibility determination (CD) has been developed and made publicly available concurrent with the comprehensive conservation plan (CCP) and associated environmental assessment (EA) for Kīlauea Point NWR.

Availability of Resources:

It is early in the planning process for a potential new visitor center and transportation hub for the Refuge. In addition, these facilities would serve multiple purposes (including administrative and maintenance functions in addition to visitor services), so costs would need to be appropriately allocated among various public uses. Therefore, no estimate is made here of the share of construction, operation, and maintenance costs of this set of facilities supportive of observation, photography, and interpretation.

Following is an estimate of one-time costs associated with the commercially guided tours program.

Projects	Estimated Costs[1]
1. Conversion of visitor center to provide interpretive exhibits and displays.	$200,000
2. Expansion of the scenic view and interpretation at the contact station.	$150,000
3. Restoration and conversion of former lighthouse quarters into a living history site.	$550,000
4. Orientation materials and/or trainings.	$40,000
Total Costs	$940,000

[1] Costs displayed are totals for these changes. Note that many of these changes would also benefit environmental interpretation and education and other uses of the Refuge.

Following is an estimate of other costs associated with administering this use on the Refuge.

Tasks	Estimated Costs per Year[1]
1. Oversight by GS-13 Project Leader (approximately 20 hours/year).	$1,200
2. Oversight by GS-12 Deputy Project Leader (approximately 20 hours/year).	$1,000
3. Administration and oversight by GS-9 Supervisory Park Ranger, including recruiting and training staff and volunteers (approximately 80 hours/year).	$2,900
4. Law enforcement by GL-9 Law Enforcement Officer (approximately 40 hours/year).	$1,500
5. Refuge overhead costs associated with the above-listed work.[2]	$1,300
6. Facility maintenance, repair, and materials	$5,000
7. Supplies (including brochures)	$3,000
Total Costs	$15,900

[1] Annual personnel costs = 2014 step 1 salary for appropriate GS level x 12.25% COLA x 40% for benefits.
[2] Overhead costs = salary + benefit costs x 0.22. Overhead expenses include building rent, utilities, equipment and supplies, and support personnel, and do not include salary-related benefits.

With the substantial support of KPNHA and volunteers, the Refuge has adequate budget and staff to support the current level of observation, photography, and interpretation on the Refuge.

Anticipated Impacts of the Use(s):

In the long term, the proposed offsite new visitor center, transportation hub, maintenance, and other facilities would provide enhanced interpretation opportunities, and wildlife observers and photographers would likely stop in to enjoy its many features because the shuttle for the Point would pick up and drop off visitors here. However, in the absence of site-specific information, attempting to assess many of the anticipated direct and indirect impacts of the construction and operation of these new facilities would be premature. Additionally, these facilities would serve multiple purposes (including administrative and maintenance functions in addition to visitor services), so effects attributable to wildlife observation, photography, and interpretation would be only a portion of the total effects. For these reasons, many of the anticipated impacts of these potential new facilities are beyond the scope of this evaluation and are not addressed herein. More detailed evaluations would need to be undertaken, including site-specific effects analysis in compliance with the National Environmental Policy Act (NEPA), National Historic Preservation Act (NHPA), and other applicable laws and policies. Readers are also referred to the EA accompanying the Refuge CCP for more information.

Wildlife observation, photography, and interpretation activities would support draft Refuge goal numbers 4, 5, and 6. It is expected that these uses would enhance the public's understanding of and appreciation for the importance of conservation; therefore, they would also support the Refuge System mission.

The vast majority of public use, including observation, photography, and interpretation at the Refuge occurs at the Point. Visitors have incredible opportunities to hear and view numerous seabirds as they soar overhead, roost or nest on adjacent cliffs and grassy knolls, and forage in the ocean. Nēnē are routinely seen close up, on the grounds. Nēnē are fairly tolerant of human disturbance, but many seabirds are wary and flush when approached too closely.

The effects of wildlife observation and photography, and environmental interpretation upon wildlife would likely be associated with disturbance. Human disturbance has differential effects on wildlife and is dependent upon, among other variables, the species involved and its age; the time of year; the breeding cycle stage (if applicable); the surrounding environment; whether the activity involves vehicles; the intensity, speed, noise, nature, and frequency of the disturbing activity; and the directness of approach to an animal (Blanc et al. 2006, Holmes et al. 2005, Hammitt and Cole 1998, Knight and Cole 1995a, Knight and Cole 1995b). Immediate responses by wildlife to recreational activity can range from behavioral changes including nest abandonment, altered nest placement, change in food habits, physiological changes such as elevated heart rates and increased energetic costs due to flight or flushing, or even death (Belanger and Bedard 1990, Knight and Cole 1995a, Knight and Swaddle 2007, Miller et al. 1998, Miller and Hobbs 2000, Morton et al. 1989, Smith-Castro and Rodewald 2010). The long-term effects are more difficult to assess but may include altered behavior, vigor, productivity, or death of individuals; altered population abundance, distribution, or demographics; and altered community species composition and interactions.

Kitaysky et al. (2003) found levels of corticosterone (a major stress hormone) in ʻuaʻu kani at the Refuge to be higher in chicks occupying burrows closer to (within 13 feet of) visitor-use areas. Holmes et al. (2005) found that, even at the recommended minimum approach distance (~16 feet), a single wildlife observer in a Royal penguin (*Eudyptes schlegeli*) colony on Macquarie Island, Australia, triggered vigilance behavior and an increased heart rate in the birds. In another study,

Holmes et al. (2007) found that vigilance behavior of Gentoo penguins (*Pygoscelis papua*) increased as the numbers of observers increased. Additional studies in penguin colonies revealed that a slow approach that ended with a visitor sitting quietly and closely observing a bird had little effect on the bird's heart rate, yet a rapid approach that ended with a visitor remaining standing and closely observing a bird resulted in an elevated heart rate (Nimon et al. 1995).

A variety of factors affect flushing distances among waterbirds, including the species involved; the activity the birds are engaged in (e.g., foraging versus nesting); and the type, speed, and noise of disturbance (e.g., approaching birds by walking versus in a motorized boat) (Rodgers and Smith 1997, Rodgers 1991). Flushing of birds or even raising their alert levels (which usually occurs at a greater distance than that for flushing) creates stress and requires animals to expend energy that otherwise would be invested in essential life history activities such as foraging, mating, nesting, brood-rearing, and predator avoidance.

Breeding birds are especially sensitive to human disturbance (Trulio 2005, Hammitt and Cole 1998). A study of visitors to a colony of kittiwakes (*Rissa tridactyla*) and guillemots (*Uria aalge*) revealed that nesting success was influenced by the distance observers were from the birds (positively correlated) and the number of observers involved (negatively correlated) (Beale and Monaghan 2004).

Studies have had mixed results regarding potential habituation of birds and some other taxa to human disturbance. Wildlife are often less disturbed by routine human activities that repeatedly occur along defined routes (e.g., trails, roads, or water channels), especially frequent disturbance that does not involve direct contact or other threat, compared with those activities that occur irregularly and outside predictable paths/channels (Blanc et al. 2006, Holmes et al. 2007, Knight and Cole 1995b).

In studies of breeding yellow-eyed penguins (*Megadyptes antipodes*), a timid and secretive species, Ratz and Thompson (1999) found that the birds appeared to have habituated to the presence of guided tourists who approached the colony through trenches and closely observed or photographed birds from camouflaged blinds. Jungius and Hirsch (1979) studied seabird colonies and found that birds that were believed to have habituated to tourists and revealed no outward behavioral changes in their presence, nonetheless exhibited stress (as reflected in elevated heartbeat frequencies) when approached by visitors. The scientists speculated that the stress could have a negative effect on breeding. Habituation to some types and levels (intensity and frequency) of human disturbance appears to vary among species, within species, between resident and migratory populations, and potentially between inexperienced and experienced breeders. This makes it difficult to forecast habituation in actual field situations.

'Īlio-holo-i-ka-uaua numbers are increasing in the main Hawaiian Islands, especially on and around Ni'ihau and Kaua'i (NMFS 2007, Baker and Johanos 2003). Critically endangered 'īlio-holo-i-ka-uaua are very sensitive to human disturbance (NMFS 2007) and disturbance of female adults with pups is of special concern (Gilmartin 2003). Seals may also injure people. Seals haul out on land to rest, molt, or pup. Approaching observers, photographers, or participants in an interpretation program could force hauled-out seals to move back into the water and seek a new haul-out site, causing them to expend energy and increasing their exposure to predators. Repeated disturbance over time can cause seals to abandon preferred haul-out sites (Gilmartin 2003). It is generally recommended that individuals viewing or photographing seals and sea turtles maintain a distance of at least 50 yards from the animals and limit their viewing/photographing time to 30 minutes (NOAA undated, NOAA

Fisheries et al. undated; "Hawai'i Viewing Guidelines: Overview, Marine Mammal & Sea Turtle Viewing 'Code of Conduct'" at http://www.nmfs.noaa.gov/pr/education/Hawai'i/).

Wildlife disturbance can be a special concern with wildlife observation and photography (Cline et al. 2007, DeLong 2002, Knight and Cole 1995). Observers and photographers often want to enhance their view or photograph by encroaching closer and closer to their subject. This can cause increased stress in wildlife and eventually lead to flushing. If a bird is nesting or brood-rearing, disturbance can cause temporary or permanent nest desertion. Even if only temporary, eggs and nestlings can face survival challenges associated with temperature extremes and predation.

Observers, photographers, or participants in interpretation programs could also cause trampling of native plants, erosion, and introduction or spread of exotic species, including invertebrates, plants, and invasive species. All of these impacts would adversely affect native fish, wildlife, plants, and their habitats, and would be of special concern in Refuge areas struggling with reestablishment of native plant communities. The degree of actual effects upon reproduction, survival of individuals, and diversity and abundance of native species (community health) would depend on specific circumstances.

The Refuge has substantial and, in some areas, dense populations of burrow-nesting seabirds. Although some burrows lie on the Point adjacent to the area heavily used by Refuge visitors, the vast majority of the burrows are elsewhere, in less disturbed areas of the Refuge, such as Crater Hill. Humans casually walking through nesting colonies could easily crush burrows, destroy nests and eggs, and kill young or adult seabirds.

Crater Hill grasslands are primarily composed of nonnative species such as Kikuyu grass (*Pennisetum clandestinum*); however, these areas provide actual and potential habitat for roosting, foraging, and breeding activities by nēnē, mōlī, and shorebirds. Additionally, major efforts have been undertaken to reintroduce native plants to this area. Areas on the Point that receive almost all of the Refuge's visitation and the core of the Kāhili Quarry are hardened and therefore experience very few effects from public use. However, a substantial increase in public use of Crater Hill would increase the potential for erosion and compaction of trails, for crushing of nesting burrows, and for disturbance to native birds using the grasslands, and to outplanting of native vegetation. Crater Hill hikes would be limited in frequency and number of participants, guided, and appropriately scheduled to minimize adverse effects.

The Refuge's Kāhili Quarry area is also open to general public use, including observation and photography. Walking through the Quarry area and along the ocean-side trail at the east base of Mōkōlea Point would be expected to cause some wildlife disturbance. Seabirds nest in the vegetation at the base of the cliffs at Kāhili Quarry. Nesting birds and their young would be expected to experience stress, possibly flush, and potentially be more vulnerable to predation if visitors approached nesting sites too closely, too quickly, too noisily, in too large of groups, or with dogs. The proposed new fencing alignment and north end gate, along with restrictions on dog walking, would greatly reduce public use impacts to wildlife.

The several stipulations associated with these uses have been designed to greatly reduce the likelihood and magnitude of potential biological effects. Importantly, on the Point—where almost all observation, photography, and interpretation occur— visitors would be required to remain behind the perimeter fencing. Elsewhere on the Refuge, visitors would be required to not cross fences and

otherwise abide by closed area signage. These use conditions would greatly reduce disturbance to roosting and breeding birds.

Public Use

The vast majority of visitors to the Refuge enjoy observation, photography, and interpretation on the Point. This area (approximately 31 acres in size) and existing facilities (e.g., parking area, visitor center, and contact station) are relatively small for the visitation the Refuge experiences (approximately 500,000 visitors/year). The single access road is narrow and the parking areas are small. There is no single-direction drive through of the parking areas (vehicles must turn around to exit the Refuge). Because of this, the number and size of vehicles that can be safely accommodated are limited. Additionally, the number of visitors who can simultaneously enjoy a quality wildlife-dependent educational or recreational experience onsite is limited. A new visitor center would allow development of more and higher quality interpretive exhibits and displays and a larger bookstore. The new visitor center could have many more parking spaces than currently provided on the Point, which, along with the shuttle, would allow more visitors to access and enjoy the Point.

Improved signage would reduce the likelihood that visitors wishing to visit the Point would become lost in Kīlauea Town. Restoration of habitat underlying the current parking area and maintenance facilities would allow visitors additional opportunities to observe and photograph native wildlife and plants. As noted above, stipulations associated with these uses would require visitors to remain behind the perimeter fencing on the Point, and not cross fences and otherwise abide by closed area signage elsewhere on the Refuge. These use conditions would greatly reduce potential public safety concerns.

Cultural Resources and Values

The Refuge contains a number of historic and prehistoric resources, including the Kīlauea Point Light Station (the lighthouse and associated Coast Guard facilities on the Point) that was listed on the National Register of Historic Places as a historic district in 1979 (USFWS 2006). It is not expected that observation, photography, and interpretation would have any effects on cultural resources.

Public Review and Comment:

Public availability of this CD has been widely announced together with announcement of the availability of the Refuge's draft CCP. The review and comment period has also been the same as for the draft CCP.

Determination:

_____ Use is Not Compatible

____X____ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

General

1. Until the proposed new visitor center and associated transportation infrastructure are developed

and operating, visitors would continue to access the Point area of the Refuge along the narrow access road and park in one of the small parking areas. Once the parking areas filled, the Refuge would be closed to new vehicles until an existing vehicle had departed.

2. The Point area of the Refuge would be open from 10 a.m. to 4 p.m. on Tuesday–Saturday, except on Federal holidays. Hours and days may be adjusted depending upon the availability of staff and resources. Visitors would be charged a modest entrance fee. For their safety and to minimize disturbance to roosting and breeding birds, visitors to this area would be required to remain behind the perimeter fencing. Similarly, visitors elsewhere on the Refuge would be required to not cross fences and otherwise abide by closed area signage. The Refuge would continue to maintain trails, fences, and adjacent vegetation to ensure safety and enhance wildlife and landscape viewing and photography opportunities. To minimize effects on breeding birds, cutting back of vegetation would be limited from late November through mid-February.

3. Visitors would be informed of desired behaviors when viewing and photographing wildlife. Examples include the "Principles of Ethical Field Practices" developed by the North American Nature Photography Association. Among others, these principles include not distressing or otherwise interfering with animal behaviors, using telephoto lenses to photograph animals, and adherence to local regulatory requirements. Other practices that can reduce wildlife disturbance when observing or photographing include use of observation/photo blinds and use of binoculars or spotting scopes to enable good viewing while maintaining a respectful distance from individuals or colonies. Observers and photographers would be prohibited from using feed or call playback recordings on the Refuge to attract wildlife.

   When viewing or photographing ʻīlio-holo-i-ka-uaua or honu, whether these animals were in the water or on shore, visitors would be requested to maintain a distance of at least 50 yards and limit their viewing/photographing time to 30 minutes (NOAA undated). ʻIlio-holo-i-ka-uaua and honu are listed under both the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA) which have mechanisms to encourage management for population growth and recovery and to prohibit any form of "take," except for limited exceptions authorized under Federal permits. Under the ESA, "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect or attempt to engage in any such conduct. Under the MMPA, "take" includes actions such as hunting, harassing, killing, capturing, injuring and disturbing a marine mammal. There are established civil and criminal penalties for, at a minimum, disturbingʻīlio-holo-i-ka-uaua or honu by getting too close or staying too long which alter their behavior, thus resulting in take. If ʻīlio-holo-i-ka-uaua or honu display signs of being disturbed, then that 50 yards would be expanded and/or viewing would be minimized or shut down to stop the disturbance and avoid potential take.

4. Hikes on Crater Hill would require the use of a guide(s) (Refuge staff or trained volunteer), would be limited to individuals 9 years or older (individuals between 9 and 16 years old would require adult accompaniment) and a maximum of 15 visitors per group, would be offered at a limited frequency, and would be routed and scheduled to avoid key breeding areas and seasons by seabirds and nēnē. With the exception of special, free hikes during National Wildlife Refuge Week, reservations (up to four persons per reservation) would be required and adults (16 years or older) would be charged a moderate fee to join these hikes. An injury waiver (i.e., "Release from Injury" form) would be required. The Service would assess erosion and compaction on trails, and wildlife effects of visitation (e.g., disturbance and crushing of burrows) on Crater Hill and

elsewhere, and develop solutions to any problems. Potentially, actions could include hardening of trails, rebuilding or rerouting of trails, reducing the frequency of use of trails, rescheduling use of trails, and/or closing trails.

5. To ensure that visitors are provided high quality orientation, information, and interpretation, the Refuge would continue to provide comprehensive training, at least annually, to roving volunteer interpreters and other Refuge volunteers.

6. In order to avoid harassment, disease, and/or death of native wildlife, or transport of exotic or invasive plant parts, insects, or other undesirable species, individuals participating in observation, photography, and interpretation would be prohibited from bringing dogs or other pets to the Point. The exceptions would be legitimate, leashed guide animals, and dogs, cats, or other pets contained within a pen or enclosed vehicle (note that the back of an open pickup truck is not an enclosed vehicle).

7. At the Kāhili Quarry area, the Refuge proposes to build a new, predator-resistant fence at the base of vegetation growing down the cliffs defining Mōkōlea Point. The fence line would extend to the ocean at the northern end of the main Quarry area. Visitors would be allowed to bring dogs, but prohibited from bringing cats or other pets with them to the Kāhili Quarry area. All dogs brought onto the Refuge in this area would be required to be leashed or penned at all times and would not be allowed to run free. Dogs would not be allowed to accompany pedestrians past the northeastern end of the main Quarry area.

8. Visitors would be prohibited from constructing new or maintaining existing structures; from littering, dumping refuse, abandoning equipment or materials, or otherwise discarding any items; from disturbing or otherwise adversely impacting any prehistoric, historic, or other cultural resources; or collecting and removing any archaeological or historic artifacts, abiotic or biological specimens or samples, or mementos from the Refuge. The Refuge would provide visitors with information and maintain facilities at the Point (e.g., recycling and trash containers) to encourage recycling of water bottles and other recyclables and discourage littering. Additionally, visitors would continue to be able to recycle Refuge brochures at the entrance fee station.

9. In addition to the stipulations listed here visitors would be required to comply with Refuge System-related and other applicable laws, regulations, and policies including “Prohibited Acts” listed in the Code of Federal Regulations (50 C.F.R. 27).

10. No changes could be made to any of these stipulations without specific, prior written approval of the Refuge Manager (for the purpose of these stipulations, the Refuge Manager would be the Refuge Project Leader of the Kaua‘i National Wildlife Refuge Complex).

<u>Cultural Resources</u>

1. Consistent with requirements of the National Historic Preservation Act, the Service would undertake appropriate surveys and engage in consultations, prior to construction of a new visitor center or other facilities.

Monitoring, Adaptive Management, and Enforcement

1. The Refuge would establish a program to monitor compliance with the stipulations enumerated herein.

2. The Refuge would monitor wildlife and habitat disturbance and other potential impacts, given additional staffing, to determine if these stipulations were resulting in expected and desirable outcomes. The Refuge would apply adaptive management principles to modify stipulations or adjust objectives, as necessary, to achieve desirable results.

3. The Refuge would reserve the right to add to or otherwise modify the stipulations listed herein in order to ensure the continued compatibility of these uses. New or modified stipulations could be instituted as a result of new information generated by ongoing or new studies; new legal, regulatory, or policy requirements; significant changes to the Refuge environment or status of native fish, wildlife, plants, or their habitats; or for other legitimate reasons. Visitors would be appropriately advised of any such changes.

4. The Refuge would also reserve the right to terminate permission for these uses if individuals were violating Refuge rules or regulations; if unacceptable impacts were occurring to native fish, wildlife, plants, or their habitats, cultural resources or Refuge facilities, or other Refuge visitors; or for other legitimate reasons.

Justification:

Service policy states that, "Viewing and photographing wildlife in natural or managed environments should foster a connection between visitors and natural resources" (General Guidelines for Wildlife-Dependent Recreation, 605 FW 1). Policy also advises that wildlife observation and photography can promote understanding and appreciation of natural resources and their management across the Refuge System (Wildlife Observation, 605 FW 4 and Wildlife Photography, 605 FW 5). Participation in Refuge interpretive and informational programs can instill a sense of wonder; cultivate a connection with nature; foster a life-long relationship with a Refuge and the Refuge System; encourage a conservation ethic; and enhance the public's understanding of and appreciation for fish, wildlife, plants, and their habitats, and cultural resources, and Refuge management programs to conserve these valuable resources.

Service policy and Federal law require that wildlife-dependent public uses, including wildlife observation and photography, and environmental interpretation, be given special consideration in refuge planning and management, and opportunities to allow these uses are to be considered in each refuge CCP (Refuge Planning Overview, 602 FW 1 and NWRS Administration Act). When determined compatible on a refuge-specific basis, a wildlife-dependent use, including interpretation, becomes a priority public use for that refuge and is to be facilitated and strongly encouraged.

Visitation figures (fourth highest in the Refuge System) reflect the popularity of the observation, photography, interpretation, and other public use opportunities currently available at Kīlauea Point NWR. Approving these uses for an additional 15 years would continue that tradition and open the way for new and exciting enhancements.

These activities could cause some wildlife disturbance. However, they have been available on the Refuge for decades and existing facilities and program management have appropriately minimized effects upon native wildlife, plants, and their habitats, and cultural resources. The stipulations included herein continue those efforts and provide additional protection.

Compatibility Standard

In order to be allowed on the Refuge, observation, photography, and interpretation would need to be determined compatible. By allowing these uses to occur under the stipulations described above, it is anticipated that wildlife which could be disturbed would find sufficient food resources and resting places so their abundance and use would not be measurably lessened on the Refuge. Additionally, it is anticipated that monitoring, as needed, would prevent unacceptable or irreversible impacts to fish, wildlife, plants, and their habitats; other public uses; and cultural resources. For the several reasons stated above and consistent with the stipulations described herein, these uses would not materially interfere with or detract from maintenance of the Refuge's biological integrity, diversity, and environmental health; fulfillment of Kīlauea Point NWR's purposes; or the Refuge System's mission.

Mandatory Re-Evaluation Date:

____X____ Mandatory 15-year reevaluation date (for wildlife-dependent public uses)

_____ Mandatory 10-year reevaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

____X____ Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

This compatibility determination has being developed and issued concurrent with the CCP and EA for Kīlauea Point NWR.

Compatibility Determination: Wildlife Observation and Photography, and Interpretation

Refuge Determination:

Prepared by:	_____ (Signature)	_____ (Date)
Approved by Project Leader, Kaua‘i National Wildlife Refuge Complex:	_____ (Signature)	_____ (Date)

Concurrence:

Refuge Supervisor, Hawaiian and Pacific Islands National Wildlife Refuge Complex:	_____ (Signature)	_____ (Date)
Regional Chief, National Wildlife Refuge System, Pacific Region:	_____ (Signature)	_____ (Date)

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Compatibility Determination

Use: Dog Walking (Kāhili Quarry)

Refuge Name: Kīlauea Point National Wildlife Refuge

County and State: County of Kaua‘i, Hawai‘i

Establishing and Acquisition Authorities:

- Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1948, as amended (16 U.S.C. 667b–667d)
- Refuge Recreation Act of 1962, as amended (16 U.S.C. 460k–460k-4)
- Endangered Species Act of 1973, as amended (16 U.S.C. 1531–1544)
- Kīlauea Point National Wildlife Refuge Expansion Act of 2004 (P.L. 108-481)

Refuge Purpose(s):
The purposes for Kīlauea Point NWR have been identified in historic legal documentation establishing and adding refuge lands and are specified as follows:

> "… particular value in carrying out the national migratory bird management program …" (Transfer of Certain Real Property for Wildlife Conservation Purposes Act)
>
> "… suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors …" (Refuge Recreation Act)
>
> "… to conserve (A) fish or wildlife which are listed as endangered species or threatened species…or (B) plants…" (Endangered Species Act)
>
> "(1) the protection and recovery of endangered Hawaiian water birds and other endangered birds, including the Nene (Hawaiian goose); and (2) the conservation and management of native coastal strand, riparian, and aquatic biological diversity…" (Kīlauea Point National Wildlife Refuge Expansion Act)

National Wildlife Refuge System Mission:

> "The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966 as amended, 16 U.S.C. 668dd–668ee).

Description of Use(s):

<u>Current Use:</u> The public comes to Kāhili Quarry with several objectives, including: (1) fishing or shellfishing; (2) viewing or photographing wildlife; (3) accessing off-Refuge areas for surfing, swimming, kayaking, and other uses; or (4) camping or picnicking. They might bring their dogs with them while engaging in these activities. The Code of Federal Regulations states that no dog shall be

permitted to roam at large on refuge lands (50 CFR 26.21(b)). Kaua‘i County ordinance requires dogs to be on-leash when off the owner’s property (Kaua‘i County Code Leash Law Section 22, Article 2: “Dogs must be under control of the owner by a leash (not more than 8 feet long) when off the owner’s property. Exceptions to this article include seeing-eye dogs trained to assist blind persons, dogs used in an official law enforcement capacity and when dogs are used for hunting or obedience training, tracking or show as long as they are accompanied by their owner. If dogs are found running loose....they are considered stray and in violation of this law.”) However, qualitative observations have shown that a substantial percentage of dogs at Kāhili Quarry, as well as adjacent off-Refuge areas (e.g., Kāhili Beach) are unleashed. Dogs may also be present at night, either accompanying visitors engaged in night fishing or unauthorized overnight camping.

The Quarry area has received substantial public use for many years. Its naturalness is already seriously compromised and it includes many nonnative plants, rendering the overall value of the area to wildlife as low.

Proposed Use: The Refuge proposes to allow people to walk dogs on Kīlauea Point NWR, at the southwestern end of Kāhili Quarry (hereafter referred as the Quarry) while engaging in one or more of the existing wildlife-dependent public uses (fishing, wildlife observation, and photography) or while accessing off-Refuge areas (Kīlauea River, Kīlauea Bay, and Kāhili Beach) for boating, and other stream, beach, and ocean uses such as snorkeling, sun bathing, surfing, swimming, and walking. Dog walking would not be allowed at Kīlauea Point.

Dogs would be required to be either on-leash (8 feet or less) and under control at all times, or in a secure, enclosed pen or crate that is attended at all times. Dogs may not be left in vehicles. Leashed or penned dogs on the designated area would be allowed concurrent with other public use on a year-round basis. Visitors walking their pets on-leash would be required to pick up after their pet(s) and remove all feces from the Refuge. Dogs would not be allowed past the northeastern end of the main Quarry area. The Refuge would appropriately post its jurisdictional boundary in the Quarry area. A new, predator-resistant fence would replace the existing fence and be constructed at the base of vegetation growing down the cliffs defining Mōkōlea Point. The fence line would extend to the ocean at the northern end of the main Quarry area.

The Refuge proposes to post a sign(s) at the end of pavement on Kāhili Road advising visitors that dogs must be on-leash, and that dog feces must be picked up and removed from the Refuge. The northeastern end of the main Quarry area would also be signed to indicated that dogs may not be walked in that area. The Refuge would enforce these regulations through warnings and ticketing by the Complex law enforcement officer. Periodic evaluations will be done to ensure that dog walking does not interfere with compatible, wildlife-dependent uses or impact wildlife resources. Unacceptable levels of violations or disturbance may result in eliminating or restricting dog walking at Kahili Quarry. This CD would be revised within 10 years of this CCP or sooner, to incorporate additional data and new information.

Availability of Resources

Following is an estimate of one-time costs associated with the fishing and shellfishing program.

Projects	Estimated Costs[1]
1. Replacement of existing fence with new predator-resistant fence along the base of vegetation growing down the cliffs defining Mōkōlea Point.	$300,000

Projects	Estimated Costs[1]
2. Posting of jurisdictional boundary with signage and low-profile monuments.	$20,000
3. Installation of new informational and regulatory signage.	$10,000
Total Costs	$330,000

[1] Costs displayed are totals for these changes. Note that many of these changes would also benefit other uses occurring at Kāhili Quarry.

Following is an estimate of annual costs associated with administering this use on the Refuge.

Tasks	Estimated Costs per Year[1]
1. Oversight by GS-13 Project Leader (approximately 10 hours/year).	$600
2. Oversight by GS-12 Deputy Project Leader (approximately 10 hours/year).	$500
3. Oversight by GS-9 Supervisory Park Ranger (approximately 40 hours/year).	$1,400
4. Law enforcement by GL-9 Law Enforcement Officer (approximately 80 hours/year).	$3,000
5. Monitoring by GS-11 Biologist (approximately 20 hours/year).	$900
6. Refuge overhead costs associated with the above-listed work.[2]	$1,300
7. Signage and fence maintenance, repair, and materials	$3,000
Total Costs	$10,700

[1] Annual personnel costs = 2014 step 1 salary for appropriate GS level x 12.25% COLA x 40% for benefits.
[2] Overhead costs = salary + benefit costs x 0.22. Overhead expenses include building rent, utilities, equipment and supplies, and support personnel, and do not include salary-related benefits.

The Refuge currently has adequate budget and staff to support the annual costs associated with dog walking at Kāhili Quarry.

Anticipated Impacts of the Use

Domestic dogs have retained instincts to hunt and chase (Sime 1999) and dogs can chase and kill wildlife (Knight and Cole 1995). Dogs can also disrupt roosting, foraging, and breeding activities among birds, and flush birds from nests (Thomas 2000, Sime 1999). Ground-dwelling birds appear to be most affected. The mere presence of a dog can cause stress (evidenced by an increased heart rate [Knight and Cole 1995]) or other disturbance to wildlife, and when a dog accompanies a human, the dog can exacerbate the disturbance effects of the human. In a study of disturbance to birds in natural areas, Banks and Bryant (2007) found that on-leash dog walking caused significant reductions in species diversity and abundance, substantially more than when humans walked the same trails without dogs. This occurred even in areas where dog walking was frequent. Also, dog walkers are apparently more likely to leave designated paths, which increases the potential for wildlife disturbance. When dogs are running free, off-leash, they cause even more wildlife disturbance than when being walked on-leash (Blanc et al. 2006).

A report prepared for the California Department of Fish and Game found that dog harassment of wildlife is opportunistic and is associated with the concentration of wildlife in a given area (Jones & Stokes 1977). A follow-up study exploring the effects of dog density and wildlife abundance on the frequency of dog-induced wildlife flushes in an area of low vegetative cover suggests that dog-

induced wildlife flushes in this type of habitat are a function of (a) dog-human densities, and (b) wildlife concentration, among other variables (Abraham 2001). In a wildlife-rich environment, with its stimulating sights, sounds, and smells, free-roaming dogs at the Quarry would be expected to disturb and potentially kill seabirds.

Free-roaming dogs can harass, injure, or kill wildlife. On Kaua‘i, free-roaming dogs have killed shearwaters and mōlī at nesting colonies, sometimes in large numbers in a single incident (Hawai‘i Department of Land and Natural Resources 2013a and 2013b). As a result, the Hawai‘i DNR now recommends that all dogs be leashed and all cats kept indoors. As noted above, Kaua‘i County regulations require dogs to be on leashes when off their owners’ property.

‘Īlio-holo-i-ka-uaua and honu are known to use Kaua‘i’s north shore. Critically endangered ‘īlio-holo-i-ka-uaua are especially sensitive to human disturbance (NMFS 2007). Approaching dog-walkers could force hauled-out individuals to move back into the water and seek a new haul-out site, causing them to expend energy and increasing their exposure to predators. Potential disturbance of female adults with pups is of special concern. Dogs have been known to attack, injure and kill ‘īlio-holo-i-ka-uaua, and can potentially transmit diseases to seals (Braun 2003, MMC et al. 2003, NOAA 2014). Dogs can also transport parasites and nonnative seeds into wildlife habitat, and transmit diseases to wildlife (e.g., distemper, parvovirus, rabies, and plague) (Sime 1999, NOAA undated).

Refuge-specific impacts:

Impacts from dog walking can be contained most effectively, mitigating the overall effect on Refuge wildlife and on visitors engaged in wildlife-dependent uses, by ensuring that dogs are always on-leash and remain in designated areas (see map). This public use management strategy will continue to be implemented under the CCP. The Refuge is aware that some visitors already disobey Federal regulations prohibiting free-roaming dogs on Refuges, and county ordinances requiring dogs to be on-leash. Dog-walking and any potential impacts from this public use would be monitored by Refuge law enforcement to ensure it does not interfere or have any negative impacts to compatible, wildlife-dependent uses or wildlife resources.

The Kāhili Quarry area is heavily impacted by past use and has low wildlife value. Therefore, disturbance to wildlife from dogs on-leash is likely to be low.

Public Review and Comment:

Public availability of this CD has been widely announced together with announcement of the availability of the Refuge’s draft CCP. The review and comment period has also been the same as for the draft CCP.

Determination

_____ Use is Not Compatible

____X____ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility

User stipulations

1. Visitors would be allowed to bring dogs to Kāhili Quarry. Dogs would not be allowed past the northeastern end of the main Quarry area (refer to map). Signage would be used to delineate accessible and non-accessible areas. Dogs are not allowed at Kilauea Point. Cats or other pets are prohibited throughout the Refuge.

2. Dogs must be kept leashed (8 feet or less), or in a secure, enclosed pen or crate all times. Dogs may not be left in vehicles.

3. Visitors must pick up and remove their dog(s)' feces from the Refuge.

Administrative stipulations

1. Regulations will be available to the public through a Refuge brochure.

2. Signs will be posted to inform the public of regulations concerning dogs.

Monitoring, Adaptive Management, and Enforcement

1. The Refuge would establish a program to monitor compliance with the stipulations enumerated herein.

2. The Refuge would monitor wildlife and habitat disturbance and other potential impacts, given additional staffing, to determine if these stipulations were resulting in expected and desirable outcomes. The Refuge would apply adaptive management principles to modify stipulations or adjust objectives, as necessary, to achieve desirable results.

3. The Refuge would reserve the right to add to or otherwise modify the stipulations listed herein in order to ensure the continued compatibility of these uses. New or modified stipulations could be instituted as a result of new information generated by ongoing or new studies; new legal, regulatory, or policy requirements; significant changes to the Refuge environment or status of native fish, wildlife, plants, or their habitats; or for other legitimate reasons. Refuge personnel would appropriately advise visitors of any such changes.

4. The Refuge would also reserve the right to terminate or modify privileges to walk dogs on the Refuge if visitors were violating the stipulations listed herein; if unacceptable impacts were occurring to native fish, wildlife, plants, or their habitats, cultural resources, Refuge facilities, or other Refuge visitors; or for other legitimate reasons.

Justification

Dog walking in the Kāhili Quarry area of the Refuge would have the potential to cause disturbance to seabirds, and potentially seals and/or turtles. The proposed construction of a new fence at the base of vegetation on the west side of the Quarry area, limiting dog walking to the western portion of the area, and requiring dogs to be on-leash, would limit potential disturbance to seabirds roosting or

nesting in cliff-side vegetation. Additionally, visitors would not be allowed within 50 yards of seals or turtles.

Dog walking is not a wildlife-dependent use of the Refuge, as defined by statute (16 U.S.C. 668dd et seq.). However, it is expected that visitors would enjoy some wildlife observation and photography ancillary to walking dogs. The Refuge would use this opportunity to reach out to dog owners, to educate them about how to minimize the effects of dogs on wildlife, and to encourage them to observe wildlife and to learn about the National Wildlife Refuge System.

Compatibility Standard

In order to be allowed on the Refuge, dog walking in the Kāhili Quarry area would need to be determined compatible. By limiting dog walking to west side of Kāhili Quarry, and allowing this use to occur under the stipulations described above, it is anticipated that wildlife which could be disturbed would find sufficient food resources and resting places so their abundance and use would not be measurably lessened on the Refuge. Additionally, it is anticipated that monitoring, as needed, would prevent unacceptable or irreversible impacts to fish, wildlife, plants, and their habitats; other public uses; and cultural resources. For the several reasons stated above and consistent with the stipulations described herein, this use would not materially interfere with or detract from maintenance of the Refuge's biological integrity, diversity, and environmental health; fulfillment of Kīlauea Point's NWR's purposes; or the Refuge System's mission.

Mandatory Re-Evaluation Date:

_____ Mandatory 15-year reevaluation date (for wildlife-dependent public uses)

____X____ Mandatory 10-year reevaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

____X____ Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

This compatibility determination has being developed and issued concurrent with the CCP and EA for Kīlauea Point NWR.

Compatibility Determination: Dog Walking (Kāhili Quarry)

Refuge Determination:

Prepared by:	_____ (Signature)	_____ (Date)
Approved by Project Leader, Kaua‘i National Wildlife Refuge Complex:	_____ (Signature)	_____ (Date)

Concurrence:

Refuge Supervisor, Hawaiian and Pacific Islands National Wildlife Refuge Complex:	_____ (Signature)	_____ (Date)
Regional Chief, National Wildlife Refuge System, Pacific Region:	_____ (Signature)	_____ (Date)

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Appendix C. Implementation

C.1 Overview

Implementation of the CCP would require increased funding, which would be sought from a variety of sources. Full implementation would depend on additional congressional allocations and public and private partnerships and grants. There are no guarantees that additional federal funds would be made available to implement any of these projects. Activities and projects identified would be implemented as funds become available.

Many of the infrastructure and facility projects would be eligible for funding through construction or Federal Lands Highway Program funds (i.e., Refuge Roads).

The CCP proposes several projects to be implemented over the next 15 years. Some of these projects are included in the Refuge Management Information Systems (RONS-Refuge Operational Needs System or SAMMS- Service Asset Maintenance Management System) which are used to request funding from Congress. Upon completion of the CCP, new projects that are needed to meet Refuge goals and objectives and legal mandates would be entered into RONS documents or SAMMS databases. Currently, a large backlog of maintenance needs exists on the Refuge. Prioritized staffing needs identified in the RONS would be necessary to implement the CCP to meet Refuge goals and objectives and legal mandates. The SAMMS database documents and tracks repairs, replacements, and maintenance of facilities and equipment. Smaller proposed projects would be implemented as funding allows, and funding would be sought for these projects through a variety of sources.

Unless congressionally directed, annual revenue sharing payments to Kaua‘i County should continue. If the Refuge expands through the purchase of inholdings (privately owned lands within the current approved boundary) or through an expanded Refuge boundary, additional in lieu of tax payments will be made to the County. See the draft CCP/EA Chapter 6 for a summary of the economic effects.

Monitoring activities will be conducted on a percentage of all new and existing projects and activities to document wildlife populations and changes across time, habitat conditions, and responses to management practices. Actual monitoring and evaluation procedures will be detailed in step-down management plans (see below).

C.2 Step-Down Plans

The CCP is one of several necessary plans used by managers, biologists, and staff for Refuge management. The CCP provides guidance in the form of goals, objectives, and strategies for several Refuge program areas, but may lack some of the specifics needed for implementation. All step-down plans require appropriate NEPA compliance, and implementation may require additional county, State, and Federal permits. Project-specific plans, with appropriate NEPA compliance, may be prepared outside of these step-down plans. Step-down plans for the Refuge follow:

- Sign plan;
- Facilities, equipment, and vehicle maintenance plan (includes rotation);
- Safety plan;

- Visitor Services plan (KNWRC-wide);
- Inventory and monitoring plan (2015);
- Cultural/Historic resource management plan (2017);
- Fire management plan (originally done in 2004);
- Master Site Plan;
- Habitat management plan (2016); and
- Plant Restoration Strategy (2016).

C.3 Costs to Implement CCP

The following sections detail both one-time and recurring costs for various projects, by alternative described within the CCP. One-time costs (Table C-1) reflect the initial costs associated with a project, such as the purchase of equipment, contracting services, construction, or other activity. Recurring costs (Tables C-2 and C-3) reflect the future operational and maintenance costs associated with the project. Table C-4 summarizes the total budgets needed to implement the CCP across the different alternatives. The potential funding sources identify both base funding that is appropriated by Congress as part of the Refuge's budget (e.g., 126X series such as 1261, 1262, etc.) and grants/external funds received (e.g., ES, NAWCA, I&M). Note that for both Tables C-1 and C-2, only costs the Refuge is directly responsible for have been identified. For partnering strategies identified, due to the unknown associated costs and timing, these costs have not been identified in the tables below. However some partnering costs have been identified in section C.4 (partnering opportunities).

C.3.1 One-time costs

One-time costs have a start-up cost associated with them, such as purchasing equipment necessary for wildlife and habitat monitoring, or designing, constructing, and installing an interpretive sign. Some cost estimates are for projects that can be completed in 3 years or less. One-time costs can include the cost of temporary or term salary associated with a short-term project. Salary for existing and new positions, and operational costs, are reflected in operational (or recurring) costs.

Funds for one-time costs would be sought through increases in Refuge base funding, special project funds, and grants. Projects listed below in Table C-1 show one-time start-up and implementation costs, such as those associated with building and facility needs, including replacement of buildings, public use facilities, road/trail improvements, and new signs. One-time costs in Table C-1 are also associated with projects such as habitat restoration, research, and infrastructure developments. In many cases, new research projects, because of their relatively high initial establishment cost, are considered one-time projects and include costs of contracting services or hiring a temporary staff position for the short-term project. Some project costs are estimated from past projects and RONS or SAMMS proposals. Others are not yet in any project database and their costs have been estimated, particularly if the scope of the project is unknown at this time due to lack of baseline data.

Table C-1. One-Time Costs (in Thousands).

CCP objective/strategy (5 year interval timeline)	Alt A	Alt B	Alt C	Alt D	Potential Fund Source
Species and Habitat Restoration and Protection					
Obj. 1.1: Explore the possibility of expansion of or additions to the Nihoku Ecosystem Restoration Project predator-proof fence		TBD	TBD	TBD	126x, RO, ISST, ES, KPNHA, grants
Obj. 1.2: Rehabilitate and maintain irrigation system at Crater Hill for native plant establishment		$100	$100	$100	DM, 1113(ES)
Obj. 1.3: Stabilize areas of accelerated erosion identified in the road and trail assessment and analysis		$70	$70	$70	
Surveys, Inventories, Monitoring, and Research					
Obj. 1.3 and 3.3: Conduct a road and trail assessment and analysis and identify problem areas (e.g., accelerated erosion, compaction) and solutions (e.g., water bars, erosion matting, revegetation)	$10	$10	$10	$10	1260 funds
Obj. 1.3 and 3.1: Design and implement a monitoring program for 1–2 indicator species (e.g., ʻāʻ) to detect natural or anthropogenic variation in habitat conditions		$75	$75	$75	1260 funds
Obj. 3.1: Within 1 year, map type and status of all fences and gates (2015)		$8	$8	$8	DM, 1113(ES)
Obj. 3.1: Within first 2–3 years, re-evaluate, develop, or initiate Refuge-specific monitoring plans (protocols, sample designs, and databases) for high-priority taxa (e.g., listed, highly pest, or indicator species, species/species groups of regional concern) within the regional I&M framework; work with USGS Biological Resources Discipline, universities, and other partners to develop efficient systems for synthesis, analysis, and reporting of Refuge monitoring data (2017)		$75	$75	$75	I&M, USGS
Obj. 3.1: Within first 2 years, design and conduct a vegetation monitoring program that will allow for assessment in reaching habitat management objectives (2016)		$0	$0	$0	Costs supported in other strategies
Obj. 3.1: Within first 5 years, conduct a comprehensive inventory of plants, invertebrates, and vertebrates occurring at the Refuge. Use initial inventories as baseline data to assess past and future		$25	$25	$25	I&M, 1113 (ES), USGS

CCP objective/strategy (5 year interval timeline)	Alt A	Alt B	Alt C	Alt D	Potential Fund Source
changes in plant and animal communities (2019)					
Obj. 3.1: Map soils, vegetation, and bird distributions	$65	$65	$65	$65	USGS, NRCS, 1113 (ES)
Obj. 3.1: Develop GIS layers to support biological goals and objectives and I&M program (2019)		$15	$15	$15	USGS, RO, I&M
Obj. 3.1: Conduct early detection and rapid response pest plant species assessment; rank species to target for control		$20	$20	$20	ISST
Obj. 3.2: Investigate effects of visitor activities on survival and reproduction of priority bird species		$75	$75	$75	
Obj. 3.2: Investigate the relative importance of causes of mortality (e.g., predators, disease, vehicle strikes) for nēnē and seabirds of concern		$75	$75	$75	
Obj. 3.2: Investigate daily and seasonal movements of nēnē		$75	$75	$75	
Obj. 3.2: Investigate status and distribution of endemic insects, particularly species of concern		$0	$0	$0	Costs supported in other strategies
Obj. 3.2: Develop survey methods to reliably estimate population size for species of high conservation concern		$40	$40	$40	
Obj. 3.2: Investigate breeding and foraging ecology of nēnē in lowlands		$150	$150	$150	
Obj. 5.1: Prepare a cultural resource overview and management step-down plan of each Refuge by compiling a library of pertinent cultural resource sites, surveys, historical documents, maps, GIS files, etc., and prepare report that presents this information (within 4 years of CCP completion) (2018)	$25	$25	$25	$25	126x, 8081, KPNHA/ Friends
Obj. 5.1: Conduct a field inventory and evaluation of cultural resources identified and predicted by the archival research and communication program described above in concert with the information provided by the cultural resources overview (2018)	$180	$180	$180	$180	126x, 8081, KPNHA/ Friends
Obj. 5.1: Conduct archival research and communication with Native Hawaiian organizations, kūpuna, communities, and institutions to document the stories,	$20	$20	$20	$20	126x, 8081

CCP objective/strategy (5 year interval timeline)	Alt A	Alt B	Alt C	Alt D	Potential Fund Source
occupation, and land use history of the Refuge and to consult on the protection of cultural resources (2024)					
Cultural and Historic Resources					
Obj. 5.2: Prepare and/or update historic structure reports for each element of the Kīlauea Point Light Station (2017)	$25	$25	$25	$25	
Obj. 5.2: Prepare a historic structure treatment plan that addresses the needs, priorities, costs, and schedule for maintenance, restoration, and reuse of each element of the Kīlauea Point Light Station (2019)	$25	$25	$25	$25	
Obj. 5.2: Develop an outreach program and materials so that cultural resource messages become part of events in the area, including the State's Archaeology Month, National Wildlife Refuge Week, and appropriate local festivals		$15	$15	$15	
Facilities Development					
Obj. 4.1: Increase parking capacity at overlook		$500			
Obj. 4.1: Provide bicycle parking at overlook		$10	$10	$10	
Obj. 4.1: Create area for public/tour bus drop-off and optional shuttle pick-up		$30			
Obj. 4.1: Acquire and gate the portion of Kīlauea Road (a county road) from the new welcome and orientation center to its terminus at the current Refuge entrance gate. Vehicular traffic beyond the new center would be limited to administrative, emergency, and residential access when Refuge is open. When Refuge is closed, the road to the scenic overlook is open			$50	$50 (only if property adjacent to road)	
Obj. 4.1: Enhance public parking currently on Refuge (e.g., paving of gravel areas, restriping). Improve pedestrian and vehicle circulation.	$500	$500			
Obj. 4.1: Remove parking currently on Refuge and renovate area for shuttle stop from the visitor welcome and orientation center. Improve pedestrian circulation			$25	$25	

CCP objective/strategy (5 year interval timeline)	Alt A	Alt B	Alt C	Alt D	Potential Fund Source
Obj. 4.2: Redesign and enhance the scenic overlook at the entrance to the Refuge to provide greater orientation and information, increased interpretation	$75	$75	$75	$75	
Obj. 4.2: Establish a ***new onsite Welcome and Orientation Center*** which would include visitor contact, orientation and information, fee collection, restrooms, bookstore/retail, multipurpose room, outdoor spaces, administrative offices, private vehicle and tour bus parking, public bus stop, and shuttle pick-up/drop-off, and pedestrian trail to the overlook			$3,000		
Obj. 4.2: Establish a ***new offsite Welcome and Orientation Center on lands adjacent to or within 1 mile of the Refuge, including within Kīlauea Town,*** which would include the following: visitor contact, orientation and information, fee collection, restrooms, bookstore/retail, multipurpose room, outdoor spaces, administrative offices, private vehicle and tour bus parking, public bus stop, and shuttle pick-up/drop-off				TBD	
Obj. 4.2: Remodel the existing VC, for either EE or new interpretive exhibits and displays. Continue to maintain bookstore operations on the Point (e.g., Quarters #1)		$350			
Obj. 4.2: Re-examine the site layout at Kīlauea Point and evaluate non–site-dependent functions currently located there and ***move as many as feasible and possible off the Point*** (e.g., bookstore, administrative and maintenance functions, equipment storage, fee collection, parking) to improve the visitor experience			$0	TBD	Costs identified in other strategy
Obj. 4.2–4.3: Remodel the existing VC for either EE or new interpretive exhibits and displays. Maintain bookstore operations at the new welcome and orientation center			$200	$200	
Obj. 4.3: Remodel the Contact Station (radio beacon building) to provide expanded interpretation and/or scenic view		$150	$150 (expand scenic view)	$150 (expand scenic view)	
Obj. 4.3: Explore the restoration and conversion of one of the former lighthouse keeper's homes (Quarters #1) to house		$550 (book store)	$550 (living history	$550 (living history	

CCP objective/strategy (5 year interval timeline)	Alt A	Alt B	Alt C	Alt D	Potential Fund Source
other functions (e.g., living history site, bookstore)			site, book store offsite)	site, book store offsite)	
Obj. 4.3, 4.5: Offer a limited number of guided interpretive hikes to Crater Hill designed (location of trail, timing, group size) to have negligible negative effects on breeding birds yet provide a quality experience for visitors			$0	$0	Costs reflected in other strategies
Obj. 4.6: Replace the existing fence with a predator-resistant fence in a modified alignment for approximately 600 feet, following the base of vegetation growing down the cliffs defining Mōkōlea Point	$300	$300	$300	$300	126x, RO, DM, ISST, ES, KPNHA, grants
Obj. 6.1: Enhance/rebuild existing maintenance/facility areas on the Point to expand storage and provide covered, protected area for machines/vehicles	$150	$150 (rebuild)			126x, DM, CI, ENG
Obj. 6.1: Remodel and relocate main Administrative and VS offices to Quarters #2 and #3		$200			
Obj. 6.1: Develop new maintenance baseyard (e.g., storage sheds, bays, pole barns, nursery)			$375 (on-Refuge)	TBD (off-Refuge)	126x,DM,CI ENG
Obj. 6.1: Remodel Quarters #3 for basic administrative and volunteer offices			$100	$100	126x, DM
Public Use/Visitor Services					
Obj. 4.1: Institute a ***mandatory shuttle which would prohibit private vehicles*** from traveling into the Refuge and would require all visitors to use a shuttle system from a visitor welcome and orientation center			TBD	TBD	
Obj. 4.2: Identify and develop methods to provide greater information to visitors prior to entering the Refuge (e.g., volunteers at overlook, cell phone audio tour at overlook, AM radio station, rangers onboard shuttles to the Refuge, operating hours on highway signage)	$200	$200	$200	$200	
Obj. 4.3: Develop orientation materials and/or train Service staff, volunteers, partners and tour operators to ensure	$40	$40	$40	$40	

CCP objective/strategy (5 year interval timeline)	Alt A	Alt B	Alt C	Alt D	Potential Fund Source
understanding of the significant resources and messages that the interpretive program should be addressing					
Obj. 4.4: Update curricula and materials as necessary to ensure that programs support and complement the Service's mission and current initiatives, as well as the Refuge's purposes and goals		$15	$15	$15	
Obj. 4.4: Develop a multifaceted Junior Ranger program to reach young visitors to the Refuge		$10	$10	$10	
Obj. 4.5: Expand program offerings, workshops, activities, and exhibits used to teach and enhance wildlife viewing skills and ethics		$50	$50	$50	
Obj. 4.5: Increase compatible opportunities for up close and personal viewing of wildlife (e.g., remote cameras, observation/photo blinds, guided ranger- and/or volunteer-led hikes)		$25	$25	$25	
Obj. 4.8: Enhance and expand existing volunteer/intern program (e.g., complete needs assessment and create new position descriptions for volunteers and interns, recruit, and train) to a corps of at least 200 volunteers/interns in order to support a greater variety of Refuge programs		$25	$25	$25	
Obj. 4.8: Develop a volunteer program that combines resource management (e.g., pest control, plant restoration) with interpretation (e.g., guided hike and birding on Crater Hill)	$25	$25	$25	$25	
Obj. 6.2: Develop outreach tools (e.g., brochures, Website) specifically for Refuge protection and safety issues and identify methods for circulation (2024)		$10	$10	$10	126x, 8081, KPNHA/ Friends, Grants
Additional Costs					
To support strategies, additional equipment costs include vehicle for staff and field work. Average cost is $35,000.		$350 (10 vehicles)	$350 (10 vehicles)	$350 (10 vehicles)	126x

C.3.2 Annual Operational (Recurring) Costs

Operational costs reflect Refuge spending of base funds allocated each year. These are also known as recurring costs and are usually associated with day-to-day operations and projects that last longer than 3 years. Operational costs use base funding in Service fund code 1260.

Table C-2 displays projected annual operating costs to implement strategies under the CCP. The CCP would require increased funding for new or expanded public uses and facilities, habitat management and restoration activities, and new monitoring needs. This table includes such things as salary and operational expenditures such as travel, training, supplies, utilities, and maintenance costs. Project costs listed in Table C-2 include administrative support for all programs and projects as well as permanent and seasonal staff needed year after year to accomplish each project. These staffing costs are not isolated in this table but are included as part of the entire project cost.

Table C-2. Operational (Recurring) Costs (Annual in Thousands).

CCP objective/strategy (these costs will run through the entire 15 year plan and are annual)	Alt A	Alt B	Alt C	Alt D	Potential Fund source
Species and Habitat Restoration and Protection					
Obj. 1.1: Reduction in pest ironwood and other species by 2–5 acres/year in priority areas (e.g., obstacles to flight, limiting nesting)		$1	$1	$1	126x, RO, ISST, ES, KPNHA, grants
Obj. 1.1: Mowing an additional 2–3 acres of grasslands per year to set back invasive shrub succession, <6 inch vegetation height	$3	$3	$3	$3	126x, RO, ISST, ES, KPNHA, grants
Obj. 1.1: Small-scale outplanting native plants (e.g., ʻāheahea, hala) that provide suitable habitat structure and function for seabirds		$1	$1	$1	DM, 1113 (ES)
Obj. 1.1, 1.2, 2.2: Use IPM strategies including mechanical/physical (e.g., mowing, brush-cutting, excavation, prescribed fire), cultural, chemical (e.g., herbicides), biological, and other suitable techniques to control Christmasberry, lantana, ironwood, and other pest/undesirable plants	$20	$20	$20	$20	126x, RO, ISST, ES, ISST, KPNHA, grants

CCP objective/strategy (these costs will run through the entire 15 year plan and are annual)	Alt A	Alt B	Alt C	Alt D	Potential Fund source
Obj. 1.1, 2.2: If insect threats (e.g., mosquitoes, ants, scale insects) to breeding seabirds are detected during monitoring, use IPM control techniques (e.g., removing potential breeding sites for mosquitoes, ant bait stations (e.g., Fipronil), approved biocontrols, hand removal of infected leaves, granular and spot-treating plants with insecticides (e.g., Sevin ®))	TBD	TBD	TBD	TBD	126x, RO, ISST, ES, ISST, KPNHA, grants
Obj. 1.1-1.2: Maintain or replace 2.7 miles of existing hogwire fencing	$6	$6	$6	$6	126x, RO, ISST, ES, KPNHA, grants
Obj. 1.1-1.2: Live-trapping, shooting, and bait stations to reduce predation on migratory birds by introduced vertebrate pests	$15	$15	$15	$15	126x, RO, ISST, ES, KPNHA, grants
Obj. 1.2: Mowing at a frequency to stimulate vigorous growth of grasses; maintain <4-6 inches tall	$0	$0	$0	$0	Costs covered in other strategies (e.g., 126x, RO, ISST, ES KPNHA,
Obj 1.2: Enhance grasslands with native shrubland plant communities that provide suitable habitat structure and function for nēnē (e.g., naupaka, ‘akoko, nehe for nēnē food and cover)		$5	$5	$5	DM, 1113 (ES)
Obj 2.1: Continue to maintain ‘a‘o colony on the Point (NESH Hill), while increasingly putting emphasis for ‘a‘o recovery on Crater Hill/Mōkōlea Point areas (including the Nihoku Ecosystem Restoration Project area)	TBD	TBD	TBD	TBD	126x, 1113 (ES)
Obj. 2.1: Sustain or expand current distribution of seabirds		$0	$0	$0	Costs covered by other
Obj. 2.1: Re-establish populations of extirpated seabird species		$1,000	$1,000	$1,000	

CCP objective/strategy (these costs will run through the entire 15 year plan and are annual)	Alt A	Alt B	Alt C	Alt D	Potential Fund source
Obj. 2.1: Use social attraction techniques to enhance the ‘a‘o and other seabird populations; monitor for bird and predator responses to stimuli	$20	$20	$20	$20	
Surveys, Inventories, Monitoring, and Research					
Obj. 3.1: Monitor population size of all native breeding birds at least each decade and species of high conservation concern annually (e.g., ‘a‘o, mōlī, nēnē)		$2	$2	$2	
Obj. 3.1: Monitor seabird and nēnē populations and mortality and morbidity		$2	$2	$2	
Obj. 3.1: Monitor response of pest species and habitat to management actions within an adaptive management framework		$2	$2	$2	
Obj. 3.1: Monitor sex structure and demography of the mōlī population using molecular or other techniques		$2	$2	$2	
Obj. 3.1: Monitor effects of visitor activities on wildlife and re-evaluate the program every 5 years		$2	$2	$2	
Obj. 4.2: Every 5 years, evaluate Refuge fees and conduct a visitor survey to evaluate existing programs as well as new programs under development, analyze current and potential Refuge visitor profiles, and explore visitation trends	$300 ($60 every 5 years)	$300 ($60 every 5 year)	$300 ($60 every 5 years)	$300 ($60 every 5 years)	
Obj. 4.3: Every 5–10 years, conduct an analysis of visitation trends and their implications for interpretation	$0	$0	$0	$0	Costs covered under other strategies
Public Use/Visitor Services					
Obj. 4.1: Provide an ***optional shuttle*** into the Refuge from the scenic overlook at the current Refuge entrance. Shuttle would be ***mandatory when Refuge parking at capacity***		$33			
Obj. 4.2: Re-examine the site layout at Kīlauea Point and evaluate non–site-dependent functions currently located there and ***move a limited number off the Point*** (e.g., maintenance functions, some administrative	$80	$80			

CCP objective/strategy (these costs will run through the entire 15 year plan and are annual)	Alt A	Alt B	Alt C	Alt D	Potential Fund source
and equipment storage) to improve the visitor experience					
Obj. 4.3: Continue to provide, on an on-call basis, golf carts to transport visitors who may need assistance getting to the VC or Lighthouse	$16	$16	$16	$16	
Obj. 4.4: Annually disseminate current EE program guidelines and activities offered to all educators within the target audience	$1	$1	$1	$1	
Obj. 4.7: Provide staff with opportunities for outreach training (e.g., outreach basics, building community support, working with news media, congressional operations)		$10	$10	$10	
Facilities Development					
Obj. 6.1: Pursue off-site parking for staff and volunteers	$25	$25			
Maintaining infrastructure as identified under one-time costs table (including Public Use/Visitor Services)	$50	$50	$70	$70	126x

C.3.3 Maintenance Costs

The Refuge maintenance program funding need over the next 15 years is defined as funds needed to repair or replace buildings, equipment, and facilities. Maintenance actions include preventative maintenance; cyclic maintenance; repairs; replacement of parts, components, or items of equipment; adjustments, lubrication, and cleaning (nonjanitorial) of equipment; painting; resurfacing; rehabilitation; special safety inspections; and other actions to assure continuing service and to prevent breakdown. Maintenance costs include the maintenance backlog needs that are due but are as yet unfunded, as well as the increased maintenance need associated with new facilities.

The facilities associated with the Refuge that require maintenance include trails, interpretive panels, regulatory signs, roads, parking lots, fencing, septic systems, water storage takes and distribution systems, and office and other buildings (e.g., nursery, sheds). Major equipment includes vehicles and heavy equipment. Operational (nonproject) maintenance funding for KNWRC is expended on all three Complex refuges including Kīlauea Point NWR and varies significantly by year. Operational funding is determined by station, regional office, and Washington office priorities and allocations.

C.3.4 Staffing

To fulfill Complex visions and Refuge System mission, a full and skilled workforce must be fostered that operates with integrity to achieve their greatest potential in an environment that promotes appreciation, team work, efficient business practices, and effective communication. Current (2014) staffing and proposed staffing to implement the programs detailed within the CCP are shown in Table C-3.

Table C-3. Staffing Costs (Annual). Costs include salary (assumed at Step 1), 12.25 percent COLA and benefits at 40 percent (applicable only to federal employees). Salaries are based on 2014 salary tables (OPM 2014a, OPM 2014b, DCPAS 2014). Note that (*) positions are Complex-wide. As a result, for Complex-wide positions, staffing cost identified is proportional. If multiple grade levels are specified, the full performance level is assumed.

Staff	Alt A	Alt B	Alt C	Alt D	Potential Funding Source
Current Staff					
Project Leader (GS-13)*	$42,804	$42,804	$42,804	$42,804	1261, 1263
Deputy Project Leader (GS-12)*	$35,996	$35,996	$35,996	$35,996	1261, 1263
Wildlife Biologist (GS-11)*	$30,031	$30,031	$30,031	$30,031	1261
Supervisory Park Ranger (GS-9)*	$59,572	$59,572	$59,572	$59,572	8081
Park Ranger (GS-5)	$49,145	$49,145	$49,145	$49,145	8081
Park Ranger (GS-3)	$39,128	$39,128	$39,128	$39,128	8081
Park Ranger (GS-3)	$39,128	$39,128	$39,128	$39,128	8081
Administrative Officer (GS-9)*	$24,822	$24,822	$24,822	$24,822	1261
Administrative Support Assistant (GS-5)*	$16,382	$16,382	$16,382	$16,382	1261
Park Ranger (Law Enforcement Officer) (GL-9)*	$25,649	$25,649	$25,649	$25,649	8081, 1264
Engineer Equipment Operator (Supervisory) (WG-8/10)*	$28,033	$28,033	$28,033	$28,033	1262
Facilities Maintenance Worker (WG-8)	$73,877	$73,877	$73,877	$73,877	8081
Tractor Operator (WG-5)	$58,502	$58,502	$58,502	$58,502	8081
Janitorial Laborer (WG-2)	$25,894	$25,894	$25,894	$25,894	8081
Janitorial Laborer (WG-2)	$25,894	$25,894	$25,894	$25,894	8081
Biological Science Technician (Predator Control) (GS-5)*	$16,382	$16,382	$16,382	$16,382	1262-A111, ES. Could be contracted
Interpretation/biological interns (AmeriCorps)*	$4,662	$4,662	$4,662	$4,662	1261, 8081
Interpretation/biological interns (AmeriCorps)*	$4,662	$4,662	$4,662	$4,662	1261, 8081

Staff	Alt A	Alt B	Alt C	Alt D	Potential Funding Source
Interpretation/biological interns (AmeriCorps)*	$4,662	$4,662	$4,662	$4,662	1261, 8081
Proposed Staff					
*Restoration Ecologist (GS-7/9/11) **		*$30,031*	*Same as B*	*Same as B*	*TBD*
*Biological Science Technician (TERM GS-5/7)**		*$20,292*	*Same as B*	*Same as B*	*TBD*
*Biological Science Technician (TERM GS-5/7)**		*$20,292*	*Same as B*	*Same as B*	*TBD*
*Biological Science Technician (TERM GS-5/7)**		*$20,292*	*Same as B*	*Same as B*	*TBD*
*Mechanic (WG-7/8)**	*$24,626*	*$24,626*	*Same as B*	*Same as B*	*TBD*
*Mechanic (WG-7/8)**	*$24,626*	*$24,626*	*Same as B*	*Same as B*	*TBD*
*Wildlife Refuge Specialist (GS-5/7/9)**		*$24,822*	*Same as B*	*Same as B*	*RONS – 1261; (HAN – FY08 5336)*
*Wildlife Refuge Specialist (GS-5/7/9) **		*$24,822*	*Same as B*	*Same as B*	*RONS – 1261; (HAN – FY08 5336)*
*Park Ranger (Law Enforcement Officer) (GL-5/7/9)**	*$25,649*	*$25,649*	*Same as B*	*Same as B*	*RONS – 1264; FY08-7150 or FY10-1286*
*Cultural Resources Specialist (TERM GS-7)**		*$20,292*	*Same as B*	*Same as B*	*TBD*
*GIS Specialist (GS-5/7/9/11)**	*$30,031*	*$30,031*	*Same as B*	*Same as B*	*TBD*
Environmental Education/Interpretation Specialist (GS-4/5)		*$49,145*	*$49,145*	*$49,145*	*TBD*
Environmental Education/Interpretation Specialist (Americorps)		*$10,000*	*$10,000*	*$10,000*	*AmeriCorps*
Environmental Education/Interpretation Specialist (GS-4/5)			*$49,145*	*$49,145*	*TBD*
Environmental Education/Interpretation Specialist (Americorps)			*$10,000*	*$10,000*	*AmeriCorps*
Environmental Education/Interpretation Specialist (GS-4/5)			*$49,145*	*$49,145*	*TBD*

Staff	Alt A	Alt B	Alt C	Alt D	Potential Funding Source
Environmental Education/Interpretation Specialist (GS-4/5)			*$49,145*	*$49,145*	*TBD*
Environmental Education/Interpretation Specialist (GS-4/5)			*$49,145*	*$49,145*	*TBD*
Maintenance Worker (TERM WG-5/6)		*$63,656*	*$63,656*	*$63,656*	*TBD*
Maintenance Worker (WG-5/6)			*$63,656*	*$63,656*	*TBD*
Maintenance Worker (WG-5/6)			*$63,656*	*$63,656*	*TBD*
Maintenance Worker (WG-6/7/8)	*$73,877*	*$73,877*	*$73,877*	*$73,877*	*TBD*

GS: General Schedule Federal Employee, WG: Wage Grade Federal Employee, GL: Law Enforcement Officers (LEOs)

C.3.5 Budget Summary

Table C-4 summarizes the data from Tables C-1 and C-2 and displays the overall funding needed for KNWRC to implement the CCP across the different alternatives for Kīlauea Point NWR.

Table C-4. Budget Summary (Annual in Thousands).

Budget Category	Alt A		Alt B		Alt C		Alt D	
	One-time cost	**Annual recurring cost**	**One-time cost**	**Annual recurring cost**	**One-time cost**	**Annual recurring cost**	**One-time cost**	**Annual recurring cost**
Species and Habitat Restoration and Protection		$64 x 15 years = $960	$170	$1,071 x 15 years = $16,065	$170	$1,071 x 15 years = $16,065	$170	$1,071 x 15 years =$16,065
Surveys, Inventories, Monitoring, and Research	$300	$20 x 15 years = $300	$933	$30 x 15 years = $450	$933	$30 x 15 years = $450	$933	$30 x 15 years = $450
Cultural Resources	$50		$65		$65		$65	
Public Use/Visitor Services	$265	$97 x 15 years = $1,455	$400	$140 x 15 years = $2,100	$400	$27 x 15 years = $405	$400	$27 x 15 years = $405
Facilities Development	$1,025	$75 x 15 years = $1,125	$2,815	$75 x 15 years = $1,125	$4,835	$70 x 15 years = $1,050	$4,835	$70 x 15 years = $1,050
Additional Costs	$350		$350		$350		$350	

Staffing	$784 x 15 years = $11,761	$1,068 x 15 years = $16,015	$1,402 x 15 years = $21,024	$1,402 x 15 years =$21,024
Total:	**$17,591**	**$40,488**	**$45,747**	**$45,747**

NOTE: For offsite facilities, figures are to be determined (TBD). However, for the purposes of this summary and separate from Tables C-2 and C-3, a cost equivalent to an onsite facility was estimated. For example, the offsite welcome and orientation center under Alternative D was considered the same cost as the onsite welcome and orientation center under Alternative C.

C.4 Partnering Opportunities

Partnerships are an important component of the implementation of this CCP. None of the Kaua‘i refuges have ever been fully funded to accomplish adequate refuge management. Toward this end, we rely on partnering opportunities to assist with this shortfall, both in terms of funding and personnel. Partnering opportunities are reflected in the goals, objectives, and strategies identified in Chapter 2. Coordinated partnership efforts focus on species and habitat restoration and protection; surveys, inventories, and research; visitor services; and cultural/historic resources management. Refuge staff will work to strengthen existing partnerships and will actively look for new partnerships to assist in achieving the goals, objectives, and strategies in this CCP. Current and past partners include Federal and State agencies, nonprofit and nongovernmental organizations, volunteers, and other individuals.

C.5 References

U.S. Department of Defense – Defense Civilian Personnel Advisory Service (DCPAS). 2014. Federal wage system regular and special production facilitating wage rate schedules for the State of Hawai‘i (Island of Kaua‘i) (HI) wage area. http://www.cpms.osd.mil/Content/AF%20Schedules/survey-sch/044/044R-05Aug2014.html

U.S. Office of Personnel Management (OPM). 2014a. Salary table 2014-HI. http://www.opm.gov/policy-data-oversight/pay-leave/salaries-wages/salary-tables/pdf/2014/HI.pdf

U.S. Office of Personnel Management (OPM). 2014b. Salary table 2014-HI (LEO). http://www.opm.gov/policy-data-oversight/pay-leave/salaries-wages/salary-tables/pdf/2014/HI%20(LEO).pdf

Appendix D. Wilderness Review for Kīlauea Point National Wildlife Refuge

D.1 Introduction

D.1.1 Policy and Direction for Wilderness Reviews

U.S. Fish and Wildlife Service (Service) policy (Part 602 FW 3.4 C.(1) (c)) requires that wilderness reviews be completed as part of the Comprehensive Conservation Planning process. This review includes the re-evaluation of refuge lands existing during the initial 10-year review period of The Wilderness Act of 1964, as amended (16 U.S.C. 1131-1136), as well as new lands and waters added to the Refuge System since 1974. A preliminary inventory of the wilderness resources is to be conducted during pre-acquisition planning for new or expanded refuges (341 FW 2.4 B., "Land Acquisition Planning"). Refuge System policy on Wilderness Stewardship (610 FW 1-5) includes guidance for conducting wilderness reviews (610 FW 4 – Wilderness Review and Evaluation).

A wilderness review is the process of determining whether the Service should recommend Refuge System lands and waters to Congress for wilderness designation. The wilderness review process consists of three phases: wilderness inventory, wilderness study, and wilderness recommendation.

Wilderness Inventory

The inventory is a broad look at a refuge to identify lands and waters that meet the minimum criteria for wilderness: size, naturalness, and outstanding opportunities for solitude or primitive and unconfined type of recreation. All areas meeting the criteria are preliminarily classified as Wilderness Study Areas (WSAs). If WSAs are identified, the review proceeds to the study phase.

Wilderness Study

During the study phase, WSAs are further analyzed:

1) for all values ecological, recreational, cultural, economic, symbolic;
2) for all resources, including wildlife, vegetation, water, minerals, soils;
3) for existing and proposed public uses;
4) for existing and proposed refuge management activities within the area; and
5) to assess the refuge's ability to manage and maintain the wilderness character in perpetuity, given the current and proposed management activities. Factors for evaluation may include, but are not limited to, staffing and funding capabilities, increasing development and urbanization, public uses, and safety.

We evaluate at least an "All Wilderness Alternative" and a "No Wilderness Alternative" for each WSA to compare the benefits and impacts of managing the area as wilderness as opposed to managing the area under an alternate set of goals, objectives, and strategies that do not involve wilderness designation. We may also develop "Partial Wilderness Alternatives" that evaluate the benefits and impacts of managing portions of a WSA as wilderness.

In the alternatives, we evaluate:

1) the benefits and impacts to wilderness values and other resources;

2) how each alternative will achieve the purposes of the Wilderness Act and the National Wilderness Preservation System (NWPS);
3) how each alternative will affect achievement of refuge purpose(s) and the refuge's contribution toward achieving the Refuge System mission;
4) how each alternative will affect maintaining and, where appropriate, restoring BIDEH at various landscape scales;
5) other legal and policy mandates; and
6) whether a WSA can be effectively managed as wilderness by considering the effects of existing private rights, land status and Service jurisdiction, refuge management activities and refuge uses, and the need for or possibility of eliminating Section 4(c) prohibited uses.

Wilderness Recommendation

If the wilderness study demonstrates that a WSA meets the requirements for inclusion in the NWPS, a wilderness study report should be written that presents the results of the wilderness review, accompanied by a Legislative Environmental Impact Statement (LEIS). The wilderness study report and LEIS that support wilderness designation are then transmitted through the Secretary of the Interior to the President of the United States, and ultimately to the United States Congress for action. Refuge lands recommended for wilderness consideration by the wilderness study report will retain their WSA status and be managed as "… wilderness according to the management direction in the final CCP until Congress makes a decision on the area or we amended the CCP to modify or remove the wilderness recommendation" (610 FW 4.22B). When a WSA is revised or eliminated, or when there is a revision in "wilderness stewardship direction, we include appropriate interagency and tribal coordination, public involvement, and documentation of compliance with NEPA" (610 FW 3.13).

D.1.2 Criteria for Evaluating Lands for Possible Inclusion in the National Wilderness Preservation System

The Wilderness Act of 1964, as amended (16 U.S.C. 1131-1136), provides the following description of wilderness:

> "A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act as an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions..."

The following criteria for identifying areas as wilderness are outlined in Section 2(c) of the Act and are further expanded upon in Refuge System policy (610 FW 4). The first three criteria are evaluated during the wilderness inventory phase; the fourth criterion is evaluated during the wilderness study phase:

1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;
2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation;
3) has at least 5,000 acres of land or is of a sufficient size as to make practicable its preservation and use in an unimpaired condition; and

4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

Criterion 3 is further defined in Section 3(c) of the Act as (1) a roadless area of 5,000 contiguous acres or more, or (2) a roadless island. Roadless is defined as the absence of improved roads suitable and maintained for public travel by means of 4-wheeled motorized vehicles that are intended for highway use.

D.2 Wilderness Inventory

The following constitutes the wilderness inventory phase of the wilderness review for Kīlauea Point National Wildlife Refuge (NWR or Refuge).

D.2.1 Process of Analysis

The following evaluation process was used in identifying the suitability of the Refuge units for wilderness designation:

- Determination of Refuge unit sizes;
- Assessment of the units' capacity to provide opportunities for solitude or primitive and unconfined recreation; and
- Assessment of "naturalness" of Refuge units.

More detail on the actual factors considered and used for each assessment step follows:

Unit Size: Roadless areas meet the size criteria if any one of the following standards apply:

- An area with over 5,000 contiguous acres solely in Service ownership.
- A roadless island of any size. A roadless island is defined as an area surrounded by permanent waters or an area that is markedly distinguished from the surrounding lands by topographical or ecological features.
- An area of less than 5,000 contiguous Federal acres that is of sufficient size as to make practicable its preservation and use in an unimpaired condition, and of a size suitable for wilderness management.
- An area of less than 5,000 contiguous Federal acres that is contiguous with a designated wilderness, recommended wilderness, or area under wilderness review by another Federal wilderness managing agency, such as the Forest Service, National Park Service, or Bureau of Land Management.

Inventory Unit A consists of the entire Kīlauea Point NWR (acquired lands only, Figure E-1), which consists of 199 acres.

This unit does not meet the criteria identified above as it is not over 5,000 contiguous acres, is not a roadless island, is not an area of sufficient size as to make its preservation in accordance with wilderness management, and is not contiguous with any other wilderness areas (existing or potential) as there are no adjacent Federal land owners.

Outstanding Solitude or Primitive or Unconfined Recreation.

A designated wilderness area must provide outstanding opportunities for solitude, or a primitive and unconfined type of recreation. Possession of only one of these outstanding opportunities is sufficient for an area to qualify as wilderness, and it is not necessary for one of these outstanding opportunities to be available on every acre. Furthermore, an area does not have to be open to public use and access to qualify under these criteria.

Opportunities for solitude refers to the ability of a visitor to be alone and secluded from other visitors in the area. Primitive and unconfined recreation means nonmotorized, dispersed outdoor recreation activities that are compatible and do not require developed facilities or mechanical transport. Primitive recreation activities may provide opportunities to experience challenge and risk, self-reliance, and adventure.

Inventory Unit A contains a portion that is open to the general public and is the fourth most visited Refuge in the Refuge System, with about 400–500,000 visitors annually. There are several structures, including facilities listed on the National Historic Register, that are onsite. The portion of the Refuge closed to the general public has some facilities that include a radio tower, water storage, and protective fencing. In addition this portion of the Refuge is maintained by staff to provide habitat for endangered nēnē and nesting seabirds. This includes fence maintenance, mowing of grasses, invasive weed management, and predator control. Additionally, adjacent to the Refuge on the east side is a popular beach area where people often surf, camp, picnic, fish, and participate in other recreational activities. Due to this, Inventory Unit A does not offer opportunities for solitude or primitive and unconfined recreation.

Naturalness and Wildness: the area generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable.

This criterion must be evaluated in the context of current natural conditions and societal values and expectations without compromising the original intent of the Wilderness Act. It is well recognized that there are few areas remaining on the planet that could be truly classified as primeval or pristine, with even fewer, if any, existing in the conterminous United States. Likewise, few areas exist that do not exhibit some impact from anthropogenic influences, be it noise, light, or air pollution, water quality or hydrological manipulations, past and current land management practices, road or trails, suppression of wildfires, invasions by pest species of plants and animals, or public uses. While allowing for the near-complete pervasiveness of modern society on the landscape, the spirit of the Wilderness Act is to protect lands that still retain the wilderness qualities of being: (1) natural, (2) untrammeled, (3) undeveloped. These three qualities are cornerstones of wilderness character. For areas proposed or designated as wilderness, wilderness character must be monitored to determine baseline conditions and thereafter be periodically monitored to assess the condition of these wilderness qualities. Proposed and designated wilderness areas by law and policy are required to maintain wilderness character through management and/or restoration in perpetuity.

Defining the first two qualities (natural and untrammeled) requires a knowledge and understanding of the ecological systems which are being evaluated as potential wilderness. Ecological systems comprise three primary attributes—composition, structure, function. Composition is the components that make up an ecosystem, such as the habitat types, native species of plants and animals, and abiotic (physical and chemical) features. These contribute to the diversity of the area. Structure is the

spatial arrangement of the components that contribute to the complexity of the area. Composition and structure are evaluated to determine the naturalness of the area. Function is the processes that result from the interaction of the various components both temporally and spatially, and the disturbance processes that shape the landscape. These processes include but are not limited to predator-prey relationships, insect and disease outbreaks, nutrient and water cycles, decomposition, fire, windstorms, flooding, and both general and cyclic weather patterns. Ecological functions are evaluated to determine the wildness or untrammeled quality of the area.

The third quality assessment is whether an area is undeveloped. Undeveloped refers to the absence of permanent structures such as roads, buildings, dams, fences, and other human alterations to the landscape. Exceptions can be made for historic structures or structures required for safety or health considerations, providing they are made of natural materials and are relatively unobtrusive on the landscape.

General guidelines used for evaluating areas for wilderness potential during this wilderness inventory process include:

1) The area should provide a variety of habitat types and associated abiotic features, as well as a nearly complete complement of native plants and wildlife indicative of those habitat types. Pest species should compose a negligible portion of the landscape.
2) The area should be spatially complex (vertically and/or horizontally) and exhibit all levels of vegetation structure typical of the habitat type, have an interspersion of these habitats, and provide avenues for plant and wildlife dispersal.
3) The area should retain the basic natural functions that define and shape the associated habitats including, but not limited to, flooding regimes, fire cycles, unaltered hydrology and flowage regimes, and basic predator-prey relationships, including herbivory patterns.
4) Due to their size, islands may not meet the habitat guidelines in 1 and 2 above. Islands should, however, exhibit the natural cover type with which they evolved and continue to be shaped and modified by natural processes. Islands should be further analyzed during the study portion of the review if they provide habitat for a significant portion of a population, or key life-cycle requirements for any resources of concern, or listed species.
5) Potential wilderness areas should be relatively free of permanent structures or human alterations. Areas may be elevated to the study phase if existing structures or alterations can be removed or remediated within a reasonable timeframe, and prior to wilderness recommendation to the Secretary of the Interior.

Inventory Unit A does provide a variety of habitat types and associated abiotic features, but is a fairly degraded habitat due to the presence of invasive species, so a nearly complete complement of native plants and wildlife does not exist. The unit is not spatially complex nor does it exhibit all levels of vegetation structure typical of the habitat type. Basic natural functions are retained; however, there are several permanent structures and human alterations that will not be removed due to historic properties. The land bears substantial human alterations given its past history as a U.S. Coast Guard and Army facility and ranching/plantation operations. Consequently, Inventory Unit A does not meet this criterion.

Evaluation of Supplemental Values

Supplemental values are defined by the Wilderness Act as “ecological, geological, or other features of scientific, educational, scenic, or historic value.”

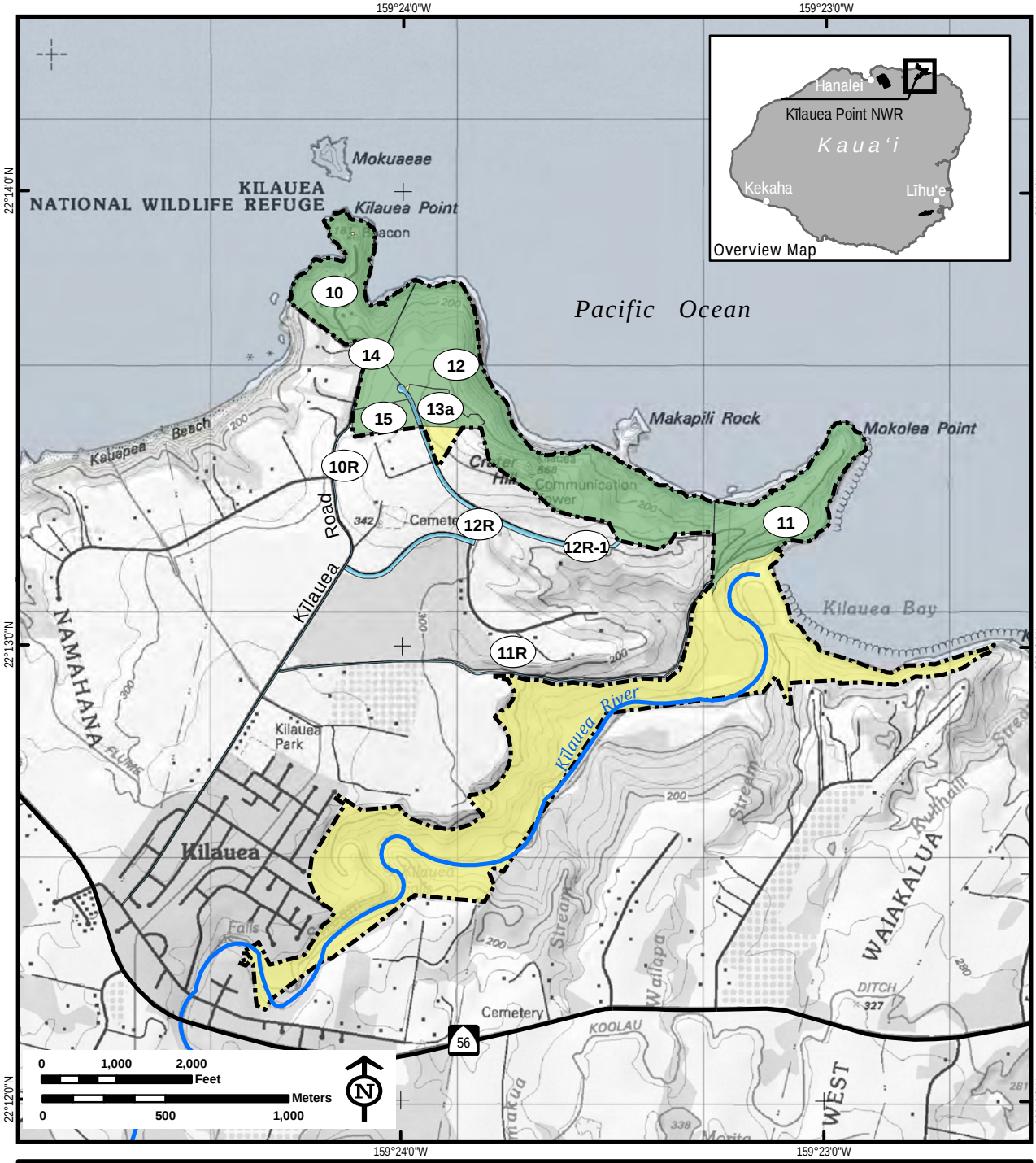
Inventory Unit A has ecological value as it supports breeding populations of endangered nēnē, and efforts to establish breeding populations of the endangered Newell's shearwater have been ongoing. The area is also home to several species of seabirds that are rarely found in the main Hawaiian Islands due to loss of habitat and predators such as cats and rats. As a result, Inventory Unit A has large educational values as it is the only place where viewing such wildlife can be done accessibly by the general public. Several school groups each year area also brought to the Refuge. There are several structures at the Refuge that are listed on the National Historic Register, lending it the historic value. The vast views of the coastline from the peninsula provide its scenic value.

D.2.2 Inventory Summary and Conclusion

Based on the analysis conducted above, Inventory Unit A does not meet the wilderness inventory criterion, therefore no wilderness study is recommended.

Wilderness Inventory Analysis	**Inventory Unit A:** KPNWR (199 ac)
(1) Has at least 5,000 ac of land or is of sufficient size to make practicable its preservation and use in an unconfined condition, or is a roadless island.	No
(2) Generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable.	No
(3a) Has outstanding opportunities for solitude.	No
(3b) Has outstanding opportunities for a primitive and unconfined type of recreation.	No
(4) Contains ecological, geological, or other features of scientific, educational, scenic, or historical value.	Yes (ecological, historic, educational, and scenic values)
Parcel qualifies as a wilderness study area (meets criteria 1, 2 & 3a, or 3b).	No

Figure D-1. Land Status, Kīlauea Point NWR.



LEGEND

- Approved Acquisition Boundary
- Inholding
- Acquired: Fee
- Acquired: Road Easement
- Highways
- Rivers

The spatial and positional accuracy of land status features vary depending on the elements of the legal description and the accuracy of the source data. We strive to improve the accuracy of our boundaries and do so when better base data or surveys are available.

Approved acquisition boundaries represent the extent of lands authorized by Congress for purchase by the USFWS for inclusion into the National Wildlife Refuge System. Inholdings are lands within this boundary that have not been, and might not ever be, acquired.

Map Date: 9/16/2014 File: 11-065-3.mxd

Title: Land Status, Kilauea Point
USFWS R1 Refuge Information Branch

The back sides of maps are blank to improve readability.

Appendix E. Biological Resources of Concern

E.1 Introduction

Management direction of individual refuges is driven by refuge purposes and statutory mandates, coupled with species and habitat priorities. Management on a refuge should first and foremost address the individual refuge purposes. Additionally, management should address maintenance and, where appropriate, restoration of biological integrity, diversity, and environmental health as well as management for National Wildlife Refuge System (NWRS) Resources of Concern. In this approach, a refuge contributes to the goals of the NWRS (601 FW 1) and achievement of the NWRS Mission.

In concert with this approach, and as an initial step in planning, the planning team identified resources of concern for Kīlauea Point National Wildlife Refuge (NWR or Refuge). As defined in the Policy on Habitat Management Plans (620 FW 1), resources of concern are:

> "all plant and/or animal species, species groups, or communities specifically identified in refuge purpose(s), System mission, or international, national, regional, State, or ecosystem conservation plans or acts. For example, waterfowl and shorebirds are a resource of concern on a refuge whose purpose is to protect 'migrating waterfowl and shorebirds.' Federal or State threatened and endangered species on that same refuge are also a resource of concern under terms of the respective endangered species acts (620 FW 1.4G)."

To provide a framework for development of goals and objectives in the CCP, the planning team identified resources of concern, following the process outlined in the handbook Identifying Refuge Resources of Concern and Management Priorities: A Handbook (USFWS 2008b).

E.2 Comprehensive Resources of Concern

A comprehensive list of potential resources of concern for the Kaua'i National Wildlife Refuge Complex (KNWRC or Complex) was created early in the planning process. The team identified species, species groups, and communities of concern, based upon a review of the Kīlauea Point, Hanalei, and Hulē'ia Refuges's establishing history and purposes (see Section 1.6 of the CCP), a description of the key habitat types existing at each Refuge and a review of numerous conservation plans (see Section 1.7 of the CCP), many of which highlight priority species or habitats for conservation. The Comprehensive Resources of Concern list for the Complex is contained in Table E-1.

Table E-1. Kaua‘i National Wildlife Refuge Complex comprehensive resources of concern.

Species/Habitat	Refuge(s) Purpose Species	Indicator of Biological Integrity, Diversity, and Environmental Health	Federally listed Threatened or Endangered	State-listed Threatened or Endangered	Birds of Conservation Concern (BCC) Bird Conservation Region #67 (Table 36)	Birds of Management Concern	BCC – Region 1 (Table 39)	Waterbird Plan Category	HI Comprehensive Wildlife Conservation Strategy (CWCS)	U.S. Pacific Islands Regional Shorebird Conservation Plan	Recovery Plans	North American Waterfowl Management Plan	Natural Heritage Program Rank
Birds													
Moli/Laysan albatross (*Phoebastria immutabilis*)	X	X			X	F		H	X				G3
Ka‘upu/Black-footed albatross (*Phoebastria nigripes*)	X	X	Co	T	X	F	X	HI	X				G3/ G4
‘A‘o/Newell’s shearwater (*Puffinus auricularis newelli*)	X	X	T	T		T/E		HI	X		X		G2/ T2
‘Ua‘u kani/Wedge-tailed shearwater (*Puffinus pacificus*)	X	X							X				G4/ G5
Koa‘e‘ula/Red-tailed tropicbird (*Phaethon rubricauda*)	X	X							X				G4/ G5
Koa‘e‘kea/White-tailed tropicbird (*Phaethon lepturus*)	X	X						H	X				G5
‘A/Red-footed booby (*Sula sula*)	X	X						H	X				G5
‘A/Brown booby (*Sula leucogaster*)	X	X						H	X				G5
Iwa/Great frigatebird (*Fregata minor palmerstoni*)	X	X							X				G4
‘Ou/Bulwer’s petrel (*Bulweria bulwerii*)									X				G4
Great blue heron (*Ardea herodias*)													G5
‘Au‘ku‘u/Black-crowned night-heron (*Nycticorax nycticorax*)									X				G5
White-faced ibis (*Plegadis chihi*)													G5
Greater white-fronted goose (*Anser albifrons*)						X						X	G5
Canada goose (*Branta canadensis*)						F						X	G5
Cackling goose (*Branta hutchinsii*)						F						X	G5
Nēnē/Hawaiian goose (*Branta sandvicensis*)	X	X	E	E		T/E			X		X	X	G1
Black brant (*Branta bernicla nigricans*)						F						X	G5

Table E-1. Kaua‘i National Wildlife Refuge Complex comprehensive resources of concern.

Species/Habitat	Refuge(s) Purpose Species	Indicator of Biological Integrity, Diversity, and Environmental Health	Federally listed Threatened or Endangered	State-listed Threatened or Endangered	Birds of Conservation Concern (BCC) Bird Conservation Region #67 (Table 36)	Birds of Management Concern	BCC – Region 1 (Table 39)	Waterbird Plan Category	HI Comprehensive Wildlife Conservation Strategy (CWCS)	U.S. Pacific Islands Regional Shorebird Conservation Plan	Recovery Plans	North American Waterfowl Management Plan	Natural Heritage Program Rank
Eurasian wigeon (*Anas penelope*)												X	G5
American wigeon (*Anas americana*)						X			X			X	G5
Eurasian teal (*Anas crecca*)												X	G5
Green-winged teal (*Anas carolinensis*)						X						X	G5
Mallard (*Anas platyrhynchos*)						X						X	G5
Laysan duck (*Anas laysanensis*)			E	E		T/E			X		X	X	G1
Koloa maoli/Hawaiian duck (*Anas wyvilliana*)	X	X	E	E		T/E			X		X	X	G1
Northern pintail (*Anas acuta*)						X			X			X	G5
Garganey (*Anas querquedula*)												X	G5
Blue-winged teal (*Anas discors*)						X						X	G5
Cinnamon teal (*Anas cyanoptera*)						X						X	G5
Northern shoveler (*Anas clypeata*)						X			X			X	G5
Canvasback (*Aythya valisineria*)						X						X	G5
Redhead (*Aythya americana*)						X						X	G5
Ring-necked duck (*Aythya collaris*)		X				X						X	G5
Tufted duck (*Aythya fuligula*)		X										X	G5
Greater scaup (*Aythya marila*)		X				F						X	G5
Lesser scaup (*Aythya affinis*)		X				F			X			X	G5
Bufflehead (*Bucephala albeola*)		X										X	G5
Northern harrier (*Circus cyaneus*)													G5
Peregrine falcon (*Falco peregrinus*)			DL			X	X						G4
‘Alae‘ula/Hawaiian moorhen (*Gallinula chloropus sandvicensis*)	X	X	E	E		T/E			X		X		G5/ T2

Table E-1. Kaua‘i National Wildlife Refuge Complex comprehensive resources of concern.

Species/Habitat	Refuge(s) Purpose Species	Indicator of Biological Integrity, Diversity, and Environmental Health	Federally listed Threatened or Endangered	State-listed Threatened or Endangered	Birds of Conservation Concern (BCC) Bird Conservation Region #67 (Table 36)	Birds of Management Concern	BCC – Region 1 (Table 39)	Waterbird Plan Category	HI Comprehensive Wildlife Conservation Strategy (CWCS)	U.S. Pacific Islands Regional Shorebird Conservation Plan	Recovery Plans	North American Waterfowl Management Plan	Natural Heritage Program Rank
‘Alae ke‘oke‘o/Hawaiian coot (*Fulica alai*)	X	X	E	E		T/E			X		X		G2
Ae‘o/Hawaiian stilt (*Himantopus mexicanus knudseni*)	X	X	E	E		T/E			X	5	X		G5/ T2
Kōlea/Pacific golden-plover (*Pluvialis fulva*)									X	5			G5
Black-bellied plover (*Pluvialis squatarola*)													G5
Semipalmated plover (*Charadrius semipalmatus*)													G5
Killdeer (*Charadrius vociferus*)													G5
Black-tailed godwit (*Limosa limosa*)													
Bar-tailed godwit (*Limosa lapponica*)						X							G5
Marbled godwit (*Limosa lapponica*)						F	X						G5
Whimbrel (*Numenius phaeopus*)						X	X						G5
Kioea/Bristle-thighed curlew (*Numenius tahitiensis*)			Co		X	X	X		X	5			G2
Marsh sandpiper (*Tringa stagnatilis*)													
Greater yellowlegs (*Tringa melanoleuca*)													G5
Lesser yellowlegs (*Tringa flavipes*)						X							
Solitary sandpiper (*Tringa solitaria*)						X							G5
Spotted sandpiper (*Actitis macularia*)													
‘Ulili/Wandering tattler (*Tringa incana*)									X	4			
‘Akekeke/Ruddy turnstone (*Arenaria interpres*)									X	3			G5
Wilson's phalarope (*Phalaropus tricolor*)													G5
Red phalarope (*Phalaropus fulicarius*)													G5
Wilson's snipe (*Gallinago delicate*)						X							

Table E-1. Kaua‘i National Wildlife Refuge Complex comprehensive resources of concern.

Species/Habitat	Refuge(s) Purpose Species	Indicator of Biological Integrity, Diversity, and Environmental Health	Federally listed Threatened or Endangered	State-listed Threatened or Endangered	Birds of Conservation Concern (BCC) Bird Conservation Region #67 (Table 36)	Birds of Management Concern	BCC – Region 1 (Table 39)	Waterbird Plan Category	HI Comprehensive Wildlife Conservation Strategy (CWCS)	U.S. Pacific Islands Regional Shorebird Conservation Plan	Recovery Plans	North American Waterfowl Management Plan	Natural Heritage Program Rank
Short-billed dowitcher (*Limnodromus griseus*)						X	X						G5
Long-billed dowitcher (*Limnodromus scolopaceus*)													G5
Red knot (*Calidris canutus*)						F	X						G4
Hunakai/Sanderling (*Calidris alba*)									X				G5
Semipalmated sandpiper (*Calidris pusilla*)													G5
Western sandpiper (*Calidris mauri*)													G5
Red-necked stint (*Calidris ruficollis*)													G5
Least sandpiper (*Calidris minutilla*)													G5
Pectoral sandpiper (*Calidris melanotos*)													G5
Sharp-tailed sandpiper (*Calidris acuminata*)													
Dunlin (*Calidris alpina*)													G5
Curlew sandpiper (*Calidris ferruginea*)													G5?
Stilt sandpiper (*Micropalama himantopus*)													
Ruff (*Philomachus pugnax*)													G5
Caspian tern (*Sterna caspia*)													G5
Arctic tern (*Sterna paradisaea*)								H					G5
Least tern (*Sterna antillarum*)													G4
Pueo/Short-eared owl (*Asio flammeus sandwichensis*)		X	Co	E	X	X	X		X				G5/ T2
Plants													
Alula (*Brighamia insignis*)			E	E					X		X		G1
Oha‘i (*Sesbania tomentosa*)	X	X	E	E					X		X		G2
Loulu (*Pritchardia napaliensis*)	X	X	E	E					X		X		

Table E-1. Kaua‘i National Wildlife Refuge Complex comprehensive resources of concern.

Species/Habitat	Refuge(s) Purpose Species	Indicator of Biological Integrity, Diversity, and Environmental Health	Federally listed Threatened or Endangered	State-listed Threatened or Endangered	Birds of Conservation Concern (BCC) Bird Conservation Region #67 (Table 36)	Birds of Management Concern	BCC – Region 1 (Table 39)	Waterbird Plan Category	HI Comprehensive Wildlife Conservation Strategy (CWCS)	U.S. Pacific Islands Regional Shorebird Conservation Plan	Recovery Plans	North American Waterfowl Management Plan	Natural Heritage Program Rank
Native plants	X	X							X				
Mammals													
Ilio-holo-i-ka-uaua/Hawaiian monk seal (*Monachus schauinslandi*)	X	X	E	E					X		X		G2
‘Ōpe‘ape‘a/ Hawaiian hoary bat (*Lasiurus cinereus semotus*)	X	X	E	E					X		X		G2 / T2
Reptiles													
Honu/Pacific green turtle (*Chelonia mydas*)	X	X	T	T					X		X		G3
Hawksbill turtle (*Eretmochelys imbricata*)	X	X	E	E					X		X		G3
Freshwater Fish													
O‘opu alamo‘o (*Lentipes concolor*)			Co	Co					X				

Federal Status
T = Threatened
E = Endangered
C = Candidate
Co = Species of Concern
NFS = No federal status
DL = Delisted

State Status
T = Threatened
E = Endangered
Co = Species of Concern

BMC Designations: F = Focal species; X = Birds of management concern; T/E = Threatened or Endangered
Waterbird Plan Category of Conservation (listed **only** categories above High): HI = Highly Imperiled; H= High Concern
Shorebird Plan Area Importance: 5 = Area of high importance, supporting hemispheric populations; 4 = Area of high importance especially within the flyway; 3 = Area is within the primary range of the species but birds present in low abundance relative to other areas
North American Waterfowl Management Plan: Listed **only** species mentioned in the plan with breeding population objectives or listed habitat to restore/enhance
Natural Heritage Program Ranks: G1 = Critically imperiled; G2 = Species secure; G3 = Vulnerable; G4 = Apparently secure; G5 = Species secure; T2 = Subspecies imperiled

E.3 Priority Resources of Concern

The Priority Resources of Concern for Kīlauea Point NWR (Table E-2) were selected from the Comprehensive Resources of Concern list as particular indicators by which to gauge habitat conditions. The Priority Resources of Concern table includes focal species, including birds, fish, reptiles, amphibians, invertebrates, and plants that were selected as representatives or indicators for the overall condition of important Refuge habitats. Most of the biological emphasis of the CCP is focused on maintaining and restoring these priority resources.

Several different conservation focal species may be listed for specific habitats to cover the variety of habitat structures and plant associations. In addition, species with specific "niche" ecological requirements may be listed as a focal species. Other species utilizing the habitat are generally expected to benefit as a result of management for the focal species.

Definitions for the column headings in Table E-2 are as follows:

- **Focal Species:** Species selected as representatives or indicators for the overall condition of the conservation target. In situations where the conservation target may include a broad variety of habitat structures and plant associations, several different conservation focal species may be listed. In addition, species with specific "niche" ecological requirements may be listed as a focal species. Management will be focused on attaining conditions required by the focal species. Other species utilizing the conservation target are generally expected to benefit as a result of management for the focal species.
- **Habitat Type:** The general habitat description utilized by the focal species.
- **Habitat Structure:** The specific and measurable habitat attributes considered necessary to support the focal species.
- **Life History Requirement:** The general season of use for the focal species.
- **Other Benefiting Species:** Other species that are expected to benefit from management for the selected focal species. The list is not comprehensive; see the Table of Potential Resources of Concern for the Refuge for a more complete list.

Table E-2. Kīlauea Point NWR priority resources of concern.

Focal Resources	Habitat Type	Habitat Structure	Life History Requirements	Other Benefiting Species
Mōlī/kaʻupu (albatrosses)	Coastal mixed woodland-grassland	Variable. Large windward sandy, grassy, or shrubby areas with open runways for take-off and landing.	Breeding, prospecting	ʻUaʻu kani, nēnē, koaʻe ʻula, ʻā, ʻiwa, kōlea and other shorebirds, associated native plant and insect communities
ʻAʻo/ʻuaʻu kani (shearwaters)	Coastal mixed woodland-grassland and sea cliff	Substrates with good soil or root structure, or sub-canopy layer for burrowing, rock and root crevices, with open flight corridors.	Breeding, prospecting	Nēnē, koaʻe ʻula, koaʻe kea, ʻa, ʻiwa, ʻou, associated native plant and insect communities

Focal Resources	Habitat Type	Habitat Structure	Life History Requirements	Other Benefiting Species
ʻĀ/ʻiwa (red-footed booby and frigatebird)	Coastal mixed woodland-grassland, sea cliff, and beach strand	Variable. Woody vegetation >1.5–3 ft tall	Breeding, roosting, prospecting	Koaʻe ʻula, koaʻe kea, ʻa, ʻiwa, ʻou, ʻaʻo, ʻuaʻu kani, associated native plant and insect communities
Nēnē/pueo	Coastal mixed woodland-grassland, sea cliff	Sward-forming grass-legume mix with high moisture content, managed <6 inches tall. Shrublands with an open understory, forage value, adjacent to grasslands.	Breeding, roosting, foraging	ʻUaʻu kani, koaʻe ʻula, mōlī, kaʻupu, kōlea, kioea, and other shorebirds, associated native plant and insect communities
ʻIlio-holo-i-ka-uaua/ honu	Beach strand	Protected, un-vegetated or sparsely-vegetated beaches with little to no human activity.	Hauling out and nursing (ʻilio-holo-i-ka-uaua), basking (honu)	Migratory shorebirds, ʻiwa, ʻā, and rare native coastal plant communities.

E.4 References

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Appendix F. Statement of Compliance

STATEMENT OF COMPLIANCE
for Implementation of the
Kīlauea Point National Wildlife Refuge, Kaua‘i County, Hawai‘i
Comprehensive Conservation Plan

The following Executive orders and legislative acts have been reviewed as they apply to implementation of the Kīlauea Point National Wildlife Refuge Comprehensive Conservation Plan.

Coastal Zone Management Act, Section 307. Section 307(c)(1) of the Coastal Zone Management Act of 1972, as amended, requires each Federal agency conducting or supporting activities directly affecting the coastal zone to conduct or support those activities in a manner which is, to the maximum extent practicable, consistent with approved state coastal management programs.

Endangered Species Act of 1973. This Act provides for the conservation of threatened and endangered species of fish, wildlife, and plants by Federal action and by encouraging the establishment of state programs. It provides for the determination and listing of endangered and threatened species and the designation of critical habitats. CCP implementation is expected to result in supporting listed species and their recovery. Section 7 requires refuge managers to perform consultations before initiating projects which affect or may affect endangered species. The Refuge will conduct consultations under Section 7 of the Endangered Species Act for any Refuge management program actions that have the potential to affect listed species.

Executive Order 11988. Floodplain Management. Under this order Federal agencies “shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by flood plains.” The CCP is consistent with Executive Order 11988 because CCP implementation would protect floodplains from adverse impacts as a result of modification or destruction.

Executive Order 12372. Intergovernmental Review. Coordination and consultation with affected Tribal, local and State governments, other Federal agencies, and the landowners has been completed through personal contact by the Refuge manager and Supervisors, and Service planners.

Executive Order 12898. Federal Actions to Address Environmental Justice in Minority and Low-Income Populations. All Federal actions must address and identify, as appropriate, disproportionally high and adverse human health or environmental effects of its programs, policies, and activities on minority populations, low-income populations, and Indian Tribes in the United States. The CCP was evaluated and no adverse human health or environmental effects were identified for minority or low-income populations, Indian Tribes, or anyone else.

Executive Order 13186. Responsibilities of Federal Agencies to Protect Migratory Birds. The CCP is consistent with Executive Order 13186 because the CCP and National

Environmental Policy Act analyses evaluate the effects of agency actions on migratory birds and, through its proposed actions, supports conservation of these species.

Executive Order 13112 Responsibilities of Federal Agencies Pertaining to Invasive Species. This EO requires federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.

Federal Noxious Weed Act of 1975. The Federal Noxious Weed Act of 1975 (7 USC 2801-2814, January 3, 1975, as amended, 1988 and 1994) provides for the control and management of nonnative weeds that injure of have the potential to injure the interests of agriculture and commerce, wildlife resources, or the public health.

Integrated Pest Management, 517 DM 1 and 7 RM 14. In accordance with 517 DM 1 and 7 RM 14, an integrated pest management (IPM) approach has been adopted to eradicate, control, or contain pest and invasive species. In accordance with 517 DM 1, only pesticides registered with the EPA in full compliance with the Federal Insecticide, Fungicide, and Rodenticide Act and as provided in regulations, orders, or permits issued by EPA may be applied on lands and waters under Refuge jurisdiction.

Migratory Bird Treaty Act. Established in 1918, with subsequent amendments and provisions following, this Act protects birds migrating between the U.S. and Canada, Mexico, Russia, and Japan. This Act makes it illegal for people to “take” migratory birds, their eggs, feathers, or nests (take is any means or in any manner, any attempt at hunting, pursuing, wounding, killing, possessing, or transporting any migratory bird, nest, egg, or part thereof).

National Environmental Policy Act (1969). The planning process has been conducted in accordance with NEPA Implementing Procedures, Department of the Interior and Service procedures, and has been performed in coordination with the affected public.

An environmental assessment (EA) was prepared that integrated the CCP into the NEPA document and process. The draft CCP/EA was released for a 30-day public comment period. The affected public was notified of the availability of the draft CCP/EA through a Federal Register notice, news release to local media outlets, the Service’s Refuge and Refuge planning websites, and a planning update. Copies of the draft CCP/EA and/or planning update were distributed to an extensive mailing list.

The CCP is programmatic in many respects and specific details of certain projects and actions cannot be determined until a later date, depending on funding and implementation schedules. Certain projects or actions may require additional NEPA compliance.

National Historic Preservation Act (1966). Implementation of the CCP should not affect cultural resources. The Service will comply with the NHPA if any management actions have the potential to affect any historic properties which may be present.

National Wildlife Administration Act of 1966, as amended by The National Wildlife Refuge System Improvement Act of 1997 (16 U.S.C. 668dd-668ee). Appropriate Use

Findings and Compatibility Determinations have been prepared and can be found under Appendices A and B of this CCP.

Wilderness Act. The Service has evaluated the suitability of the Refuge for wilderness designation and recommended no wilderness study.

Refuge Supervisor, Hawaiian and Pacific Islands National Wildlife Refuge	Date

Appendix G. Integrated Pest Management (IPM) Program

G.1 Background

IPM is an interdisciplinary approach utilizing methods to prevent, eliminate, contain, and/or control pest species in concert with other management activities on refuge lands and waters to achieve wildlife and habitat management goals and objectives. IPM is also a scientifically based, adaptive management process where available scientific information and best professional judgment of the refuge staff as well as other resource experts would be used to identify and implement appropriate management strategies that can be modified and/or changed over time to ensure effective, site-specific management of pest species to achieve desired outcomes. In accordance with 43 CFR 46.145, adaptive management would be particularly relevant where long-term impacts may be uncertain and future monitoring would be needed to make adjustments in subsequent implementation decisions. After a tolerable pest population (threshold) is determined considering achievement of refuge resource objectives and the ecology of pest species, one or more methods, or combinations thereof, would be selected that are feasible, efficacious, and most protective of non-target resources, including native species (fish, wildlife, and plants), and Service personnel, Service authorized agents, volunteers, and the public. Staff time and available funding would be considered when determining feasibility/practicality of various treatments.

IPM techniques to address pests are presented as CCP strategies (see Chapter 2 of this CCP) in an adaptive management context to achieve refuge resource objectives. In order to satisfy requirements for IPM planning as identified in the Director's Memo (dated September 9, 2004) entitled *Integrated Pest Management Plans and Pesticide Use Proposals: Updates, Guidance, and an Online Database*, the following elements of an IPM program have been incorporated into this CCP:

- Habitat and/or wildlife objectives that identify pest species and appropriate thresholds to indicate the need for and successful implementation of IPM techniques; and
- Monitoring before and/or after treatment to assess progress toward achieving objectives including pest thresholds.

Where pesticides would be necessary to address pests, this appendix provides a structured procedure to evaluate potential effects of proposed uses involving ground-based applications to refuge biological resources and environmental quality in accordance with effects analyses (environmental consequences) of this CCP. Only pesticide uses that likely would cause minor, temporary, or localized effects to refuge biological resources and environmental quality with appropriate best management practices (BMPs), where necessary, would be allowed for use on the Refuge.

This appendix does not describe the more detailed process to evaluate potential effects associated with aerial applications of pesticides.

G.2 Pest Management Laws and Policies

In accordance with Service policy 569 FW 1 (Integrated Pest Management), plant, invertebrate, and vertebrate pests on units of the National Wildlife Refuge System can be controlled to ensure balanced wildlife and fish populations in support of refuge-specific wildlife and habitat management

objectives. Pest control on Federal (refuge) lands and waters also is authorized under the following legal mandates:

- National Wildlife Refuge System Administration Act of 1966, as amended (16 USC 668dd-668ee);
- Plant Protection Act of 2000 (7 USC 7701 *et seq*.);
- Noxious Weed Control and Eradication Act of 2004 (7 USC 7781-7786, Subtitle E);
- Federal Insecticide, Fungicide, and Rodenticide Act of 1996 (7 USC 136-136y);
- National Invasive Species Act of 1996 (16 USC 4701);
- Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (16 USC 4701);
- Food Quality Protection Act of 1996 (7 USC 136);
- Executive Order 13148, Section 601(a);
- Executive Order 13112; and
- Animal Damage Control Act of 1931 (7 USC 426-426c, 46 Stat. 1468).

Pests are defined as "…living organisms that may interfere with the site-specific purposes, operations, or management objectives or that jeopardize human health or safety" from Department policy 517 DM 1 (Integrated Pest Management Policy). Similarly, 569 FW 1 defines pests as "…invasive plants and introduced or native organisms that may interfere with achieving our management goals and objectives on or off our lands, or that jeopardize human health or safety." 517 DM 1 also defines an invasive species as "a species that is nonnative to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health." Throughout the remainder of this CCP, the terms pest and invasive species are used interchangeably because both can prevent/impede achievement of refuge wildlife and habitat objectives and/or degrade environmental quality.

In general, control of pests (vertebrate or invertebrate) on the Refuge would conserve and protect the nation's fish, wildlife, and plant resources as well as maintain environmental quality. From 569 FW 1, animal or plant species that are considered pests may be managed if the following criteria are met[1]:

- Threat to human health and well being or private property, the acceptable level of damage by the pest has been exceeded, or State or local government has designated the pest as noxious;
- Detrimental to resource objectives as specified in a refuge resource management plan (e.g., comprehensive conservation plan, habitat management plan), if available; and
- Control would not conflict with attainment of resource objectives or the purpose(s) for which the Refuge was established.

The specific justifications for pest management activities on the Refuge are the following:

- Protect human health and well being;
- Prevent substantial damage to important to refuge resources;
- Protect newly introduced or re-establish native species;
- Control nonnative (exotic) species in order to support existence for populations of native species;
- Prevent damage to private property; and

[1] Note that during the 15-year life span of the CCP, policies, such as 569 FW 1, may be updated and revised. As such, the Refuge will comply with the most updated Service policies related to IPM.

- Provide the public with quality, compatible wildlife-dependent recreational opportunities.

In accordance with Service policy 620 FW 1 (Habitat Management Plans), there are additional management directives regarding invasive species found on the Refuge:

- "We are prohibited by Executive Order, law, and policy from authorizing, funding, or carrying out actions that are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere."
- "Manage invasive species to improve or stabilize biotic communities to minimize unacceptable change to ecosystem structure and function and prevent new and expanded infestations of invasive species. Conduct refuge habitat management activities to prevent, control, or eradicate invasive species…"

Animal species damaging/destroying Federal property and/or detrimental to the management program of a refuge may be controlled as described in 50 CFR 31.14 (Official Animal Control Operations).

Trespass and feral animals also may be controlled on refuge lands. Based upon 50 CFR 28.43 (Destruction of Dogs and Cats), dogs and cats running at large on a national wildlife refuge and observed in the act of killing, injuring, harassing or molesting humans or wildlife may be disposed of in the interest of public safety and protection of the wildlife. Feral animals should be disposed by the most humane method(s) available and in accordance with relevant Service directives (including Executive Order 11643). Disposed wildlife specimens may be donated or loaned to public institutions. Donation or loans of resident wildlife species will only be made after securing State approval (50 CFR 30.11 [Donation and Loan of Wildlife Specimens]). Surplus wildlife specimens may be sold alive or butchered, dressed and processed subject to federal and state laws and regulations (50 CFR 30.12 [Sale of Wildlife Specimens]).

G.3 Strategies

To fully embrace IPM as identified in 569 FW 1, the following strategies, where applicable, would be carefully considered on the Refuge for each pest species.

G.3.1 Prevention

This is the most effective and least expensive long-term management option for pests. It encompasses methods to prevent new introductions or the spread of the established pests to uninfested areas. It requires identifying potential routes of invasion to reduce the likelihood of infestation. Hazard Analysis and Critical Control Points (HACCP) planning can be used to determine if current management activities on a refuge may introduce and/or spread invasive species in order to identify appropriate BMPs for prevention. See http://www.haccp-nrm.org/ for more information about HACCP planning.

Prevention may include source reduction, using pathogen-free or weed-free seeds or fill; exclusion methods (e.g., barriers) and/or sanitation methods (e.g., wash stations) to prevent re-introductions by various mechanisms including vehicles, personnel, and loose livestock. Because invasive species are frequently the first to establish newly disturbed sites, prevention would require a reporting mechanism for early detection of new pest occurrences with quick response to eliminate any new

satellite pest populations. Prevention would require consideration of the scale and scope of land management activities that may promote pest establishment within uninfested areas or promote reproduction and spread of existing populations. Along with preventing initial introduction, prevention would involve halting the spread of existing infestations to new sites (Mullin et al. 2000). The primary reason of prevention would be to keep pest-free lands or waters from becoming infested. Executive Order 11312 emphasizes the priority for prevention with respect to managing pests.

The following are methods to prevent the introduction and/or spread of pests on refuge lands:

- Before beginning ground-disturbing activities (e.g., disking, scraping), inventory and prioritize pest infestations in project operating areas and along access routes. Refuge staff would identify pest species on-site or within reasonably expected potential invasion vicinity. Where possible, the refuge staff would begin project activities in uninfested areas before working in pest-infested areas.
- The refuge staff would locate and use pest-free project staging areas. They would avoid or minimize travel through pest-infested areas, or restrict to those periods when spread of seed or propagules of invasive plants would be least likely.
- The refuge staff would determine the need for, and when appropriate, identify sanitation sites where equipment can be cleaned of pests. Where possible, the refuge staff would clean equipment before entering lands at on-refuge approved cleaning site(s). This practice does not pertain to vehicles traveling frequently in and out of the project area that will remain on roadways. Seeds and plant parts of pest plants would need to be collected, where practical. The refuge staff would remove mud, dirt, and plant parts from project equipment before moving it into a project area.
- The refuge staff would clean all equipment, before leaving the project site, if operating in areas infested with pests. The refuge staff would determine the need for, and when appropriate, identify sanitation sites where equipment can be cleaned.
- Refuge staff, their authorized agents, and refuge volunteers would, where possible, inspect, remove, and properly dispose of seed and parts of invasive plants found on their clothing and equipment. Proper disposal means bagging the seeds and plant parts and then properly discarding of them (e.g., incinerating).
- The refuge staff would evaluate options, including closure, to restrict the traffic on sites with on-going restoration of desired vegetation. The refuge staff would revegetate disturbed soil (except travel ways on surfaced projects) to optimize plant establishment for each specific site. Revegetation may include topsoil replacement, planting, seeding, fertilization, liming, and weed-free mulching as necessary. The refuge staff would use native material, where appropriate and feasible. The refuge staff would use certified weed-free or weed-seed-free hay or straw where certified materials are reasonably available.
- The refuge staff would provide information, training, and appropriate pest identification materials to permit holders and recreational visitors. The refuge staff would educate them about pest identification, biology, impacts, and effective prevention measures.
- The refuge staff would inspect borrowed material for invasive plants prior to use and transport onto and/or within refuge lands.
- The refuge staff would consider invasive plants in planning for road maintenance activities.
- The refuge staff would restrict off-road travel to designated routes.

The following would be methods to prevent the introduction and/or spread of pests into refuge waters:

- The refuge staff would inspect boats (including air boats), trailers, and other boating equipment and where possible, remove any visible plants, animals, or mud before leaving any waters or boat launching facilities. Where possible, staff would drain water from motor, live well, bilge, and transom wells while on land before leaving the site. If possible, the refuge staff would wash and dry boats, downriggers, anchors, nets, floors of boats, propellers, axles, trailers, and other boating equipment to kill pests not visible at the boat launch.

These prevention methods to minimize/eliminate the introduction and/or spread of pests were taken verbatim or slightly modified from Appendix E of the U.S. Forest Service's *Preventing and Managing Invasive Plants Final Environmental Impact Statement* (2005).

G.3.2 Mechanical/Physical Methods

These methods would remove and destroy, disrupt the growth of, or interfere with the reproduction of pest species. For plants species, these treatments can be accomplished by hand, hand tool (manual), or power tools (mechanical) and include pulling, grubbing, digging, tilling/disking, cutting, swathing, grinding, shearing, girdling, mowing, and mulching of the pest plants.

For animal species, Service employees or their authorized agents could use mechanical/physical methods (including trapping) to control pests as a refuge management activity. Based upon 50 CFR 31.2, trapping can be used on a refuge to reduce surplus wildlife populations for a "balanced conservation program" in accordance with Federal or state laws and regulations. In some cases, non-lethally trapped animals would be relocated to off-refuge sites with prior approval from the state.

Each of these tools would be efficacious to some degree and applicable to specific situations. In general, mechanical controls can effectively control annual and biennial pest plants. However, to control perennial plants, the root system has to be destroyed or it would resprout and continue to grow and develop. Mechanical controls are typically not capable of destroying a perennial plant's root system. Although some mechanical tools (e.g., disking, plowing) may damage root systems, they may stimulate regrowth producing a denser plant population that may aid in the spread depending upon the target species. In addition, steep terrain and soil conditions would be major factors that can limit the use of many mechanical control methods.

Some mechanical control methods (e.g., mowing), used in combination with herbicides, can be a very effective technique to control perennial species. For example, mowing perennial plants followed sequentially by treating the plant regrowth with a systemic herbicide often would improve the efficacy of the herbicide compared to herbicide only treatment.

G.3.3 Cultural Methods

These methods would involve manipulating habitat to increase pest mortality by reducing its suitability to the pest. Cultural methods could include water-level manipulation, mulching, changing planting dates to minimize pest impact, prescribed burning (facilitate revegetation, increase herbicide efficacy, and remove litter to assist in emergence of desirable species), flaming with propane torches, trap crops, crop rotations that would include non-susceptible crops, moisture management, addition of beneficial insect habitat, reducing clutter, proper trash disposal, planting or seeding desirable

species to shade or out-compete invasive plants, applying fertilizer to enhance desirable vegetation, prescriptive grazing, and other habitat alterations.

G.3.4 Biological Control Agents

Classical biological control would involve the deliberate introduction and management of natural enemies (parasites, predators, or pathogens) to reduce pest populations. Many of the most ecologically or economically damaging pest species in the United States originated in foreign countries. These newly introduced pests, which are free from natural enemies found in their country or region of origin, may have a competitive advantage over cultivated and native species. This competitive advantage often allows introduced species to flourish, and they may cause widespread economic damage to crops or out compete and displace native vegetation. Once the introduced pest species population reaches a certain level, traditional methods of pest management may be cost prohibitive or impractical. Biological controls typically are used when these pest populations have become so widespread that eradication or effective control would be difficult or no longer practical.

Biological control has advantages as well as disadvantages. Benefits would include reducing pesticide usage, host specificity for target pests, long-term self-perpetuating control, low cost/acre, capacity for searching and locating hosts, synchronizing biological control agents to hosts' life cycles, and the unlikelihood that hosts will develop resistance to agents. Disadvantages would include the following: limited availability of agents from their native lands, the dependence of control on target species density, slow rate at which control occurs, biotype matching, the difficulty and expense of conflicts over control of the target pest, and host specificity when host populations are low.

A reduction in target species populations from biological controls is typically a slow process, and efficacy can be highly variable. It may not work well in a particular area although it does work well in other areas. Biological control agents would require specific environmental conditions to survive over time. Some of these conditions are understood; whereas, others are only partially understood or not at all.

Biological control agents will not completely eradicate a target pest. When using biological control agents, residual levels of the target pest typically are expected; the agent population level or survival would be dependent upon the density of its host. After the pest population decreases, the population of the biological control agent would decrease correspondingly. This is a natural cycle. Some pest populations (e.g., invasive plants) would tend to persist for several years after a biological control agent becomes established due to seed reserves in the soil, inefficiencies in the agents search behavior, and the natural lag in population buildup of the agent.

The full range of pest groups potentially found on refuge lands and waters would include diseases, invertebrates, vertebrates, and invasive plants (most common group). Often it is assumed that biological control would address many if not most of these pest problems. There are several well-documented success stories of biological control of invasive species in Hawai‘i, including banana poka and Eurythrina gall wasps. However, historically, each new introduction of a biological control agent in the United States has only about a 30% success rate (Coombs et al. 2004).

Introduced species without desirable close relatives in the United States would generally be selected as biological controls. Natural enemies that are restricted to one or a few closely related plants in their country of origin are targeted as biological controls (Center et al. 1997, Hasan and Ayres 1990).

The refuge staff would ensure introduced agents are approved by the applicable authorities. Except for a small number of formulated biological control products registered by USEPA under FIFRA, most biological control agents are regulated by the U.S. Department of Agriculture (USDA)-Animal Plant Health Inspection Service, Plant Protection and Quarantine (APHIS-PPQ). State departments of agriculture and, in some cases, county agricultural commissioners or weed districts, have additional approval authority.

Federal permits (USDA-APHIS-PPQ Form 526) are required to import biocontrols agents from another state. Form 526 may be obtained by writing:

USDA-APHIS-PPQ
Biological Assessment and Taxonomic Support
4700 River Road, Unit 113
Riverdale, MD 20737

Or through the internet at:

http://www.aphis.usda.gov/plant_health/permits/organism/plantpest_howtoapply.shtml

The Service strongly supports the development, and legal and responsible use of appropriate, safe, and effective biological control agents for nuisance and non-indigenous or pest species.

State and county agriculture departments may also be sources for biological control agents or they may have information about where biological control agents may be obtained. Commercial sources should have an Application and Permit to Move Live Plant Pests and Noxious Weeds (USDA-PPQ Form 226 USDA-APHIS-PPQ, Biological Assessment and Taxonomic Support, 4700 River Road, Unit 113, Riverdale, MD 20737) to release specific biological control agents in a state and/or county. Furthermore, certification regarding the biological control agent's identity (genus, specific epithet, sub-species and variety) and purity (e.g., parasite free, pathogen free, and biotic and abiotic contaminants) should be specified in purchase orders.

Biological control agents are subject to 7 RM 8 (Exotic Species Introduction and Management). In addition, the refuge staff would follow the International Code of Best Practice for Classical Biological Control of Weeds (http://wiki.bugwood.org/Code_of_Best_Practices) as ratified by delegates to the X International Symposium on Biological Control of Weeds, Bozeman, MT, July 9, 1999. This code identifies the following:

- Release only approved biological control agents;
- Use the most effective agents;
- Document releases; and
- Monitor for impact to the target pest species, nontarget species, and the environment.

Biological control agents formulated as pesticide products and registered by the USEPA (e.g., *Bti*) are also subject to PUP review and approval (see below).

A record of all releases would be maintained with date(s), location(s), and environmental conditions of the release site(s); the identity, quantity, and condition of the biological control agents released; and other relevant data and comments such as weather conditions. Systematic monitoring to determine the establishment and effectiveness of the release is also recommended.

The NEPA documents regarding biological and other environmental effects of biological control agents prepared by another federal agency, where the scope is relevant to evaluation of releases on refuge lands, would be reviewed. Possible source agencies for such NEPA documents include the Bureau of Land Management, U.S. Forest Service, National Park Service, U.S. Department of Agriculture-Animal and Plant Health Inspection Service, and the military services. It might be appropriate to incorporate by reference parts or all of existing document(s) from the review. Incorporating by reference (43 CFR 46.135) is a technique used to avoid redundancies in analysis. It also can reduce the bulk of a Service NEPA document, which only must identify the documents that are incorporated by reference. In addition, relevant portions must be summarized in the Service NEPA document to the extent necessary to provide the decision maker and public with an understanding of relevance of the referenced material to the current analysis.

G.3.5 Pesticides

The selective use of pesticides would be based upon pest ecology (including mode of reproduction), the size and distribution of its populations, site-specific conditions (e.g., soils, topography), known efficacy under similar site conditions, and the capability to utilize best management practices (BMPs) to reduce/eliminate potential effects to non-target species, sensitive habitats, and potential to contaminate surface and groundwater. All pesticide usage (pesticide, target species, application rate, and method of application) would comply with the applicable federal (FIFRA) and state regulations pertaining to pesticide use, safety, storage, disposal, and reporting. Before pesticides can be used to eradicate, control, or contain pests on refuge lands and waters, pesticide use proposals (PUPs) would be prepared and approved in accordance with 569 FW 1. The PUP records would provide a detailed, time-, site-, and target-specific description of the proposed use of pesticides on the Refuge. All PUPs would be created, approved or disapproved, and stored in the Pesticide Use Proposal System (PUPS), which is a centralized database only accessible on the Service's intranet (https://systems.fws.gov/pups). Only Service employees would be authorized to access PUP records for a refuge in this database.

Application equipment would be selected to provide site-specific delivery to target pests while minimizing/eliminating direct or indirect (e.g., drift) exposure to non-target areas and degradation of surface and groundwater quality. Where possible, target-specific equipment (e.g., backpack sprayer, wiper) would be used to treat target pests. Other target-specific equipment to apply pesticides would include soaked wicks or paint brushes for wiping vegetation and lances, hatchets, or syringes for direct injection into stems. Granular pesticides may be applied using seeders or other specialized dispensers. In contrast, aerial spraying (e.g., fixed wing or helicopter) would only be used where access is difficult (remoteness) and/or the size/distribution of infestations precludes practical use of ground-based methods.

Because repeated use of one pesticide may allow resistant organisms to survive and reproduce, multiple pesticides with variable modes of action would be considered for treatments on refuge lands and waters. This is especially important if multiple applications within years and/or over a growing season likely would be necessary for habitat maintenance and restoration activities to achieve resource objectives. Integrated chemical and non-chemical controls also are highly effective, where practical, because pesticide-resistant organisms can be removed from the site.

Cost may not be the primary factor in selecting a pesticide for use on a refuge. If the least expensive pesticide would potentially harm natural resources or people, then a different product would be selected, if available. The most efficacious pesticide available with the least potential to degrade

environment quality (soils, surface water, and groundwater) as well as least potential effect to native species and communities of fish, wildlife, plants, and their habitats would be acceptable for use on refuge lands in the context of an IPM approach.

G.3.6 Habitat Restoration/Maintenance

Restoration and/or proper maintenance of refuge habitats associated with achieving wildlife and habitat objectives would be essential for long-term prevention, eradication, or control (at or below threshold levels) of pests. Promoting desirable plant communities through the manipulation of species composition, plant density, and growth rate is an essential component of invasive plant management (Masters et al. 1996, Masters and Sheley 2001, Brooks et al. 2004). The following three components of succession could be manipulated through habitat maintenance and restoration: site availability, species availability, and species performance (Cox and Anderson 2004). Although a single method (e.g., herbicide treatment) may eliminate or suppress pest species in the short term, the resulting gaps and bare soil create niches that are conducive to further invasion by the species and/or other invasive plants. On degraded sites where desirable species are absent or in low abundance, revegetation with native/desirable grasses, forbs, and legumes may be necessary to direct and accelerate plant community recovery, and achieve site-specific objectives in a reasonable time frame. The selection of appropriate species for revegetation would be dependent on a number of factors including resource objectives and site-specific, abiotic factors (e.g., soil texture, precipitation/temperature regimes, and shade conditions). Seed availability and cost, ease of establishment, seed production, and competitive ability also would be important considerations.

G.4 Priorities for Treatments

For many refuges, the magnitude (number, distribution, and sizes of infestations) of pest problems is too extensive and beyond the available capital resources to effectively address during any single field season. To manage pests in the Refuge, it would be essential to prioritize treatment of infestations. Highest priority treatments would be focused on early detection and rapid response to eliminate infestations of new pests, if possible. This would be especially important for aggressive pests potentially impacting species, species groups, communities, and/or habitats associated refuge purpose(s), Refuge System resources of concern (Federally listed species, migratory birds, selected marine mammals, and interjurisdictional fish), and native species for maintaining/restoring biological integrity, diversity, and environmental health.

The next priority would be treating established pests that appear in one or more previously uninfested areas. Moody and Mack (1988) demonstrated through modeling that small, new outbreaks of invasive plants eventually would infest an area larger than the established, source population. They also found that control efforts focusing on the large, main infestation rather than the new, small satellites reduced the chances of overall success. The lowest priority would be treating large infestations (sometimes monotypic stands) of well-established pests. In this case, initial efforts would focus upon containment of the perimeter followed by work to control/eradicate the established infested area. If containment and/or control of a large infestation is not effective, then efforts would focus upon halting pest reproduction or managing source populations. Maxwell et al. (2009) found treating fewer populations that are sources represents an effective long-term strategy to reduce of total number of invasive populations and decreasing meta-population growth rates.

Although State listed noxious weeds would always of high priority for management, other pest species known to cause substantial ecological impact would also be considered. For example, short-spined kiawe may not be listed by a State as noxious, but it can greatly alter fire regimes in the coastal dryland shrub habitat resulting in large monotypic stands that displace native bunch grasses, forbs, and shrubs. Pest control would likely require a multi-year commitment from Refuge staff. Essential to the long-term success of pest management would be pre- and post-treatment monitoring, assessment of the successes and failures of treatments, and development of new approaches when proposed methods do not achieve desired outcomes.

G.5 Best Management Practices (BMPs)

The BMPs can minimize or eliminate possible effects associated with pesticide usage to non-target species and/or sensitive habitats as well as degradation of water quality from drift, surface runoff, or leaching. Based upon the Department of the Interior Pesticide Use Policy (517 DM 1) and the Service Integrated Pest Management Policy and Responsibilities (30 AM 12), the use of applicable BMPs (where feasible) also would likely ensure that pesticide uses may not adversely affect federally listed species and/or their critical habitats through determinations made using the process described in 50 CFR part 402.

The following are BMPs pertaining to mixing/handling and applying pesticides for all ground-based treatments of pesticides, which would be considered and utilized, where feasible, based upon target- and site-specific factors and time-specific environmental conditions. Although not listed below, the most important BMP to eliminate/reduce potential impacts to non-target resources would be an IPM approach to prevent, control, eradicate, and contain pests.

G.5.1 Pesticide Handling and Mixing

- As a precaution against spilling, spray tanks would not be left unattended during filling.
- All pesticide containers would be triple rinsed and the rinsate would be used as water in the sprayer tank and applied to treatment areas.
- All pesticide spray equipment would be properly cleaned. Where possible, rinsate would be used as part of the makeup water in the sprayer tank and applied to treatment areas.
- The refuge staff would dispose of triple-rinsed pesticide containers per label directions.
- All unused pesticides would be properly discarded at a local “safe send” collection.
- Pesticides and pesticide containers would be lawfully stored, handled, and disposed of in accordance with the label and in a manner safeguarding human health, fish, and wildlife and prevent soil and water contaminant.
- The refuge staff would consider the water quality parameters (e.g., pH, hardness) that are important to ensure greatest efficacy where specified on the pesticide label.
- All pesticide spills would be addressed immediately using procedures identified in the refuge spill response plan.

G.5.2 Applying Pesticides

- Pesticide treatments would only be conducted by or under the supervision of Service personnel and non-Service applicators with the appropriate state or Bureau of Land

Management certification to safely and effectively conduct these activities on refuge lands and waters.

- The refuge staff would comply with all federal, state, and local pesticide use laws and regulations as well as Department, Service, and Refuge System pesticide-related policies. For example, the refuge staff would use application equipment and apply rates for the specific pest(s) identified on the pesticide label as required under FIFRA.
- Before each treatment season and prior to mixing or applying any product for the first time each season, all applicators would review the labels, MSDSs, and Pesticide Use Proposal (PUPs) for each pesticide, determining the target pest, appropriate mix rate(s), PPE, and other requirements listed on the pesticide label.
- A 1-foot no-spray buffer from the water's edge would be used, where applicable and where it does not detrimentally influence effective control of pest species.
- Use low-impact herbicide application techniques (e.g., spot treatment, cut stump, oil basal, Thinvert system applications) rather than broadcast foliar applications (e.g., boom sprayer, other larger tank wand applications), where practical.
- Use low-volume rather than high-volume foliar applications where low-impact methods above are not feasible or practical, to maximize herbicide effectiveness and ensure correct and uniform application rates.
- Applicators would use and adjust spray equipment to apply the coarsest droplet size spectrum with optimal coverage of the target species while reducing drift.
- Applicators would use the largest droplet size that results in uniform coverage.
- Applicators would use drift reduction technologies such as low-drift nozzles, where possible.
- Where possible, spraying would occur during low (average<7 mph and preferably 3-5 mph) and consistent direction wind conditions with moderate temperatures (typically <85°F).
- Where possible, applicators would avoid spraying during inversion conditions (often associated with calm and very low wind conditions) that can cause large-scale herbicide drift to non-target areas.
- Equipment would be calibrated regularly to ensure that the proper rate of pesticide is applied to the target area or species.
- Spray applications would be made at the lowest height for uniform coverage of target pests to minimize/eliminate potential drift.
- If windy conditions frequently occur during afternoons, spraying (especially boom treatments) would typically be conducted during early morning hours.
- Spray applications would not be conducted on days with >30% forecast for rain within 6 hours, except for pesticides that are rapidly rain fast (e.g., glyphosate in 1 hour) to minimize/eliminate potential runoff.
- Where possible, applicators would use drift retardant adjuvants during spray applications, especially adjacent to sensitive areas.
- Where possible, applicators would use a non-toxic dye to aid in identifying target area treated as well as potential over spray or drift. A dye can also aid in detecting equipment leaks. If a leak is discovered, the application would be stopped until repairs can be made to the sprayer.
- For pesticide uses associated with cropland and facilities management, buffers, as appropriate, would be used to protect sensitive habitats, especially wetlands and other aquatic habitats.
- When drift cannot be sufficiently reduced through altering equipment set up and application techniques, buffer zones may be identified to protect sensitive areas downwind of

applications. The refuge staff would only apply adjacent to sensitive areas when the wind is blowing the opposite direction.

- Applicators would utilize scouting for early detection of pests to eliminate unnecessary pesticide applications.
- The refuge staff would consider timing of application so native plants are protected (e.g., senescence) while effectively treating invasive plants.
- Rinsate from cleaning spray equipment after application would be recaptured and reused or applied to an appropriate pest plant infestation.
- Application equipment (e.g., sprayer, all-terrain vehicle, tractor) would be thoroughly cleaned and personal protective equipment (PPE) would be removed/disposed of on-site by applicators after treatments to eliminate the potential spread of pests to uninfested areas.
- Cleaning boots (or use rubber boots to aid in sanitation) and brush off clothing in a place where monitoring is feasible to control for new seed transportation.

G.6 Safety

G.6.1 Personal Protective Equipment

All applicators would wear the specific personal protective equipment (PPE) identified on the pesticide label. The appropriate PPE will be worn at all times during handling, mixing, and applying. PPE can include the following: disposable (e.g., Tyvek) or laundered coveralls; gloves (latex, rubber, or nitrile); rubber boots; and/or an NIOSH-approved respirator. Because exposure to concentrated product is usually greatest during mixing, extra care should be taken while preparing pesticide solutions. Persons mixing these solutions can be best protected if they wear long gloves, an apron, footwear, and a face shield.

Coveralls and other protective clothing used during an application would be laundered separately from other laundry items. Transporting, storing, handling, mixing and disposing of pesticide containers will be consistent with label requirements, USEPA and OSHA requirements, and Service policy.

If a respirator is necessary for a pesticide use, then the following requirements would be met in accordance with Service safety policy: a written Respirator Program, fit testing, physical examination (including pulmonary function and blood work for contaminants), and proper storage of the respirator.

G.6.2 Notification

The restricted entry interval (REI) is the time period required after the application at which point someone may safely enter a treated area without PPE. Refuge staff, authorized management agents of the Service, volunteers, and members of the public who could be in or near a pesticide treated area within the stated re-entry time period on the label would be notified about treatment areas. Posting would occur at any site where individuals might inadvertently become exposed to a pesticide during other activities on the Refuge. Where required by the label and/or state-specific regulations, sites would also be posted on its perimeter and at other likely locations of entry. The refuge staff would also notify appropriate private property owners of an intended application, including any private individuals who have requested notification. Special efforts would be made to contact nearby individuals who are beekeepers or who have expressed chemical sensitivities.

G.6.3 Medical Surveillance

Medical surveillance may be required for Service personnel and approved volunteers who mix, apply, and/or monitor use of pesticides (see 242 FW 7 [Pesticide Users] and 242 FW 4 [Medical Surveillance]). In accordance with 242 FW 7.12A, Service personnel would be medically monitoring if one or more of the following criteria is met: exposed or may be exposed to concentrations at or above the published permissible exposure limits or threshold limit values (see 242 FW 4); use pesticides in a manner considered "frequent pesticide use"; or use pesticides in a manner that requires a respirator (see 242 FW 14 for respirator use requirements). In 242 FW 7.7A, "**Frequent Pesticide Use** means when a person applying pesticide handles, mixes, or applies pesticides, with a Health Hazard rating of 3 or higher, for 8 or more hours in any week or 16 or more hours in any 30-day period." Under some circumstances, individuals may be medically monitored who use pesticides infrequently (see Section G.7.7), experience an acute exposure (sudden, short-term), or use pesticides with a health hazard ranking of 1 or 2. This decision would consider the individual's health and fitness level, the pesticide's specific health risks, and the potential risks from other pesticide-related activities. Refuge cooperators (e.g., cooperative farmers) and other authorized agents (e.g., state and county employees) would be responsible for their own medical monitoring needs and costs.

Standard examinations (at refuge expense) of appropriate refuge staff would be provided by the nearest certified occupational health and safety physician as determined by Federal Occupational Health.

G.6.4 Certification and Supervision of Pesticide Applicators

Appropriate refuge staff or approved volunteers handling, mixing, and/or applying or directly supervising others engaged in pesticide use activities would be trained and state or federally (BLM) licensed to apply pesticides to refuge lands or waters. In accordance with 242 FW 7.18A and 569 FW 1.10B, certification is required to apply restricted use pesticides based upon USEPA regulations. For safety reasons, all individuals participating in pest management activities with general use pesticides also are encouraged to attend appropriate training or acquire pesticide applicator certification. The certification requirement would be for a commercial or private applicator depending upon the state. New staff unfamiliar with proper procedures for storing, mixing, handling, applying, and disposing of herbicides and containers would receive orientation and training before handling or using any products. Documentation of training would be kept in the files at the refuge office.

G.6.5 Record Keeping

Labels and Material Safety Data Sheets

Pesticide labels and material safety data sheets (MSDSs) would be maintained at the refuge shop and laminated copies in the mixing area. These documents also would be carried by field applicators, where possible. A written reference (e.g., note pad, chalk board, dry erase board) for each tank to be mixed would be kept in the mixing area for quick reference while mixing is in progress. In addition, approved PUPs stored in the PUPS database typically contain website links (URLs) to pesticide labels and MSDSs.

Pesticide Use Proposals (PUPs)

A PUP would be prepared for each proposed pesticide use associated with annual pest management on refuge lands and waters. A PUP would include specific information about the proposed pesticide use including the common and chemical names of the pesticide(s), target pest species, size and location of treatment site(s), application rate(s) and method(s), and federally listed species determinations, where applicable.

In accordance with Service guidelines (Director's memo [December 12, 2007]), refuge staff may receive up to five-year approvals for Washington Office and field reviewed proposed pesticide uses based upon meeting identified criteria including an approved IPM plan, where necessary (see http://www.fws.gov/contaminants/Issues/IPM.cfm). For a refuge, an IPM plan (requirements described herein) can be completed independently or in association with a CCP or a habitat management plant (HMP) if IPM strategies and potential environmental effects are adequately addressed within appropriate NEPA documentation.

The PUPs would be created, approved or disapproved, and stored as records in the Pesticide Use Proposal System (PUPS), which is centralized database on the Service's intranet (https://systems.fws.gov/pups). Only Service employees can access PUP records in this database.

Pesticide Usage

In accordance with 569 FW 1, the refuge Project Leader would be required to maintain records of all pesticides annually applied on lands or waters under refuge jurisdiction. This would encompass pesticides applied by other Federal agencies, state and county governments, non-government applicators including cooperators and their pest management service providers with Service permission. For clarification, pesticide means all insecticides, insect and plant growth regulators, desiccants, herbicides, fungicides, rodenticides, acaricides, nematicides, fumigants, avicides, and piscicides.

The following usage information can be reported for approved PUPs in the PUPS database:

- Pesticide trade name(s);
- Active ingredient(s);
- Total acres treated;
- Total amount of pesticides used (lbs. or gallons);
- Total amount of active ingredient(s) used (lbs.);
- Target pest(s); and
- Efficacy (% control) .

To determine whether treatments are efficacious (eradicating, controlling, or containing the target pest) and achieving resource objectives, habitat and/or wildlife response would be monitored both pre- and post-treatment, where possible. Considering available annual funding and staffing, appropriate monitoring data regarding characteristics (attributes) of pest infestations (e.g., area, perimeter, degree of infestation-density, % cover, density) as well as habitat and/or wildlife response to treatments may be collected and stored in a relational database (e.g., Refuge Habitat Management Database), preferably a geo-referenced data management system (e.g., Refuge Lands GIS [RLGIS]) to facilitate data analyses and subsequent reporting. In accordance with adaptive management, data analysis and interpretation would allow treatments to be modified or changed over time, as

necessary, to achieve resource objectives considering site-specific conditions in conjunction with habitat and/or wildlife responses. Monitoring could also identify short- and long-term impacts to natural resources and environmental quality associated with IPM treatments in accordance with adaptive management principles identified in 43 CFR 46.145.

G.7 Evaluating Pesticide Use Proposals

Pesticides would only be used on refuge lands for habitat management as well as croplands/facilities maintenance after approval of a PUP. In general, proposed pesticide uses on refuge lands would only be approved where there would likely be minor, temporary, or localized effects to fish and wildlife species as well as minimal potential to degrade environmental quality. Potential effects to listed and non-listed species would be evaluated with quantitative ecological risk assessments and other screening measures. Potential effects to environmental quality would be based upon pesticide characteristics of environmental fate (water solubility, soil mobility, soil persistence, and volatilization) and other quantitative screening tools. Ecological risk assessments as well as characteristics of environmental fate and potential to degrade environmental quality for pesticides would be documented in Chemical Profiles (see Section G.7.5). These profiles would include threshold values for quantitative measures of ecological risk assessments and screening tools for environmental fate that represent minimal potential effects to species and environmental quality. In general, only pesticide uses with appropriate BMPs (see Section G.4) for habitat management and cropland/facilities maintenance on refuge lands that would potentially have minor, temporary, or localized effects on refuge biological and environmental quality (threshold values not exceeded) would be approved.

G.7.1 Overview of Ecological Risk Assessment

An ecological risk assessment process would be used to evaluate potential adverse effects to biological resources as a result of a pesticide(s) proposed for use on refuge lands. It is an established quantitative and qualitative methodology for comparing and prioritizing risks of pesticides and conveying an estimate of the potential risk for an adverse effect. This quantitative methodology provides an efficient mechanism to integrate best available scientific information regarding hazard, patterns of use (exposure), and dose-response relationships in a manner that is useful for ecological risk decision-making. It would provide an effective way to evaluate potential effects where there is missing or unavailable scientific information (data gaps) to address reasonable, foreseeable adverse effects in the field as required under 40 CFR Part 1502.22. Protocols for ecological risk assessment of pesticide uses on the Refuge were developed through research and established by the U.S. Environmental Protection Agency (2004). Assumptions for these risk assessments are presented in Section G.7.2.3.

The toxicological data used in ecological risk assessments are typically results of standardized laboratory studies provided by pesticide registrants to the USEPA to meet regulatory requirements under FIFRA. These studies assess the acute (lethality) and chronic (reproductive) effects associated with short- and long-term exposure to pesticides on representative species of birds, mammals, freshwater fish, aquatic invertebrates, and terrestrial and aquatic plants. Other effects data publicly available would also be utilized for risk assessment protocols described herein. Toxicity endpoint and environmental fate data are available from a variety of resources. Some of the more useful resources can be found at the end of Section G.7.5.

Table G-1. Ecotoxicity Tests Used to Evaluate Potential Effects to Birds, Fish, and Mammals to Establish Toxicity Endpoints for Risk Quotient Calculations

Species Group	Exposure	Measurement Endpoint
Bird	Acute	Median Lethal Concentration (LC_{50})
	Chronic	No Observed Effect Concentration (NOEC) or No Observed Adverse Effect Concentration (NOAEC)[1]
Fish	Acute	Median Lethal Concentration (LC_{50})
	Chronic	No Observed Effect Concentration (NOEC) or No Observed Adverse Effect Concentration (NOAEC)[2]
Mammal	Acute	Oral Lethal Dose (LD_{50})
	Chronic	No Observed Effect Concentration (NOEC) or No Observed Adverse Effect Concentration (NOAEC)[3]

[1]Measurement endpoints typically include a variety of reproductive parameters (e.g., number of eggs, number of offspring, eggshell thickness, and number of cracked eggs).
[2]Measurement endpoints for early life stage/life cycle typically include embryo hatch rates, time to hatch, growth, and time to swim-up.
[3]Measurement endpoints include maternal toxicity, teratogenic effects or developmental anomalies, evidence of mutagenicity or genotoxicity, and interference with cellular mechanisms such as DNA synthesis and DNA repair.

G.7.2 Determining Ecological Risk to Fish and Wildlife

The potential for pesticides used on the Refuge to cause direct adverse effects to fish and wildlife would be evaluated using USEPA's Ecological Risk Assessment Process (USEPA 2004). This deterministic approach, which is based upon a two-phase process involving estimation of environmental concentrations and then characterization of risk, would be used for ecological risk assessments. This method integrates exposure estimates (estimated environmental concentration [EEC] and toxicological endpoints [e.g., LC_{50} and oral LD_{50}]) to evaluate the potential for adverse effects to species groups (birds, mammals, and fish) representative of legal mandates for managing units of the Refuge System. This integration is achieved through risk quotients (RQs) calculated by dividing the EEC by acute and chronic toxicity values selected from standardized toxicological endpoints or published effect (Table G-1).

$$RQ = EEC/Toxicological\ Endpoint$$

The level of risk associated with direct effects of pesticide use would be characterized by comparing calculated RQs to the appropriate Level of Concern (LOC) established by USEPA (1998 [Table G-2]). The LOC represents a quantitative threshold value for screening potential adverse effects to fish and wildlife resources associated with pesticide use. The following are four exposure-species group scenarios that would be used to characterize ecological risk to fish and wildlife on the Refuge: acute-listed species, acute-nonlisted species, chronic-listed species, and chronic-nonlisted species.

Acute risk would indicate the potential for mortality associated with short-term dietary exposure to pesticides immediately after an application. For characterization of acute risks, median values from LC_{50} and LD_{50} tests would be used as toxicological endpoints for RQ calculations. In contrast, chronic risks would indicate the potential for adverse effects associated with long-term dietary exposure to pesticides from a single application or multiple applications over time (within a season and over years). For characterization of chronic risks, the no observed concentration (NOAEC) or no observed effect concentration (NOEC) for reproduction would be used as toxicological endpoints for RQ calculations. Where available, the NOAEC would be preferred over a NOEC value.

Listed species are those federally designated as threatened, endangered, or proposed in accordance with the Endangered Species Act of 1973 (16 USC 1531-1544, 87 Stat. 884, as amended-Public Law 93-205). For listed species, potential adverse effects would be assessed at the individual level because loss of individuals from a population could detrimentally impact a species. In contrast, risks to nonlisted species would consider effects at the population level. A RQ<LOC would indicate the proposed pesticide use "may affect, not likely to adversely affect" individuals (listed species) and it would not pose an unacceptable risk for adverse effects to populations (non-listed species) for each taxonomic group (Table G-2). In contrast, a RQ>LOC would indicate a "may affect, likely to adversely affect" for listed species and it would also pose unacceptable ecological risk for adverse effects to nonlisted species.

Table G-2. Presumption of Unacceptable Risk for Birds, Fish, and Mammals (USEPA 1998)

Risk Presumption		Level of Concern	
		Listed Species	Non-listed Species
Acute	Birds	0.1	0.5
	Fish	0.05	0.5
	Mammals	0.1	0.5
Chronic	Birds	1.0	1.0
	Fish	1.0	1.0
	Mammals	1.0	1.0

Environmental Exposure

Following release into the environment through application, pesticides would experience several different routes of environmental fate. Pesticides which would be sprayed can move through the air (e.g., particle or vapor drift) and may eventually end up in other parts of the environment such as non-target vegetation, soil, or water. Pesticides applied directly to the soil may be washed off the soil into nearby bodies of surface water (e.g., surface runoff) or may percolate through the soil to lower soil layers and groundwater (e.g., leaching) (Baker and Miller 1999, Pope et al. 1999, Butler et al. 1998, Ramsay et al. 1995, EXTOXNET 1993). Pesticides which would be injected into the soil may also be subject to the latter two fates. The aforementioned possibilities are by no means complete, but it does indicate movement of pesticides in the environment is very complex with transfers occurring continually among different environmental compartments. In some cases, these exchanges occur not only between areas that are close together, but it also may involve transportation of pesticides over long distances (Barry 2004, Woods 2004).

Terrestrial Exposure

The estimated environmental concentration (ECC) for exposure to terrestrial wildlife would be quantified using an USEPA screening-level approach (USEPA 2004). This screening-level approach is not affected by product formulation because it evaluates pesticide active ingredient(s). This approach would vary depending upon the proposed pesticide application method: spray or granular.

Terrestrial – Spray Application

For spray applications, exposure would be determined using the Kanaga nomogram method (USEPA 2005a, USEPA 2004, USEPA 2012, Pfleeger et al. 1996) through the USEPA's Terrestrial Residue Exposure model (T-REX) version 1.2.3 (USEPA 2005b). To estimate the maximum (initial) pesticide

residue on short grass (<20 cm tall) as a general food item category for terrestrial vertebrate species, T-REX input variables would include the following from the pesticide label: maximum pesticide application rate (pounds active ingredient [acid equivalent]/acre) and pesticide half-life (days) in soil. Although there are other food item categories (tall grasses; broadleaf plants and small insects; and fruits, pods, seeds and large insects), short grass was selected because it would yield maximum EECs (240 ppm per lb. ai/acre) for worst-case risk assessments. Short grass is not representative of forage for carnivorous species (e.g., raptors), but it would characterize the maximum potential exposure through the diet of avian and mammalian prey items. Consequently, this approach would provide a conservative screening tool for pesticides that do not biomagnify.

For RQ calculations in T-REX, the model would require the weight of surrogate species and Mineau scaling factors (Mineau et al. 1996). For example, body weights of bobwhite quail and mallard are included in T-REX by default, but body weights of other organisms (Table G-3) would be entered manually. The Mineau scaling factor accounts for small-bodied bird species that may be more sensitive to pesticide exposure than would be predicted only by body weight. Mineau scaling factors would be entered manually with values ranging from 1 to 1.55 that are unique to a particular pesticide or group of pesticides. If specific information to select a scaling factor is not available, then a value of 1.15 would be used as a default. Alternatively, zero would be entered if it is known that body weight does not influence toxicity of pesticide(s) being assessed. The upper bound estimate output from the T-REX Kanaga nomogram would be used as an EEC for calculation of RQs. This approach would yield a conservative estimate of ecological risk.

Table G-3. Average Body Weight of Selected Terrestrial Wildlife Species Frequently Used in Research to Establish Toxicological Endpoints (Dunning 1984)

Species	Body Weight (kg)
Mammal (15 g)	0.015
House sparrow	0.0277
Mammal (35 g)	0.035
Starling	0.0823
Red-winged blackbird	0.0526
Common grackle	0.114
Japanese quail	0.178
Bobwhite quail	0.178
Rat	0.200
Rock dove (aka pigeon)	0.542
Mammal (1,000 g)	1.000
Mallard	1.082
Ring-necked pheasant	1.135

Terrestrial – Granular Application

Granular pesticide formulations and pesticide-treated seed would pose a unique route of exposure for avian and mammalian species. The pesticide is applied in discrete units which birds or mammals might ingest accidentally with food items or intentionally as in the case of some bird species actively seeking and picking up gravel or grit to aid digestion or seed as a food source. Granules may also be consumed by wildlife foraging on earthworms, slugs or other soft-bodied soil organisms to which the granules may adhere.

Terrestrial wildlife RQs for granular formulations or seed treatments would be calculated by dividing the maximum milligrams of active ingredient (a.i.) exposed (e.g., EEC) on the surface of an area equal to 1 square foot by the appropriate LD_{50} value multiplied by the surrogate's body weight (Table G-3). An adjustment to surface area calculations would be made for broadcast, banded, and in-furrow applications. An adjustment also would be made for applications with and without incorporation of the granules. Without incorporation, it would be assumed that 100% of the granules remain on the soil surface available to foraging birds and mammals. Press wheels push granules flat with the soil surface, but they are not incorporated into the soil. If granules are incorporated in the soil during band or T-band applications or after broadcast applications, it would be assumed only 15% of the applied granules remain available to wildlife. It would be assumed that only 1% of the granules are available on the soil surface following in-furrow applications.

EECs for pesticides applied in granular form and as seed treatments would be determined considering potential ingestion rates of avian or mammalian species (e.g., 10-30% body weight/day). This would provide an estimate of maximum exposure that may occur as a result of granule or seed treatment spills such as those that commonly occur at end rows during application and planting. The availability of granules and seed treatments to terrestrial vertebrates would also be considered by calculating the loading per unit area (LD_{50}/ft^2) for comparison to USEPA Level of Concerns (USEPA 1998). The T-REX version 1.2.3 (USEPA 2005) contains a submodel which automates Kanaga exposure calculations for granular pesticides and treated seed.

The following formulas will be used to calculate EECs depending upon the type of granular pesticide application:

- In-furrow applications assume a typical value of 1% granules, bait, or seed remain unincorporated.

mg a.i./ft.^{2} = [(lbs. product/acre)(% a.i.)(453,580 mg/lbs)(1% exposed))] / {[(43,560 ft.^{2}/acre)/(row spacing (ft.))] / (row spacing (ft.)}

or

mg a.i./ft^2 = [(lbs product/1,000 ft. row)(% a.i.)(1,000 ft row)(453,580 mg/lb.)(1% exposed)

EEC = [(mg a.i./ft.^{2})(% of pesticide biologically available)]

- Incorporated banded treatments assume that 15% of granules, bait, and seeds are unincorporated.

mg a.i./ft.^{2} = [(lbs. product/1,000 row ft.)(% a.i.)(453,580 mg/lb.)(1-% incorporated)] / (1,000 ft.)(band width (ft.))

$$EEC = [(mg\ a.i./ft.^2)(\%\ of\ pesticide\ biologically\ available)]$$

- Broadcast treatment without incorporation assumes 100% of granules, bait, seeds are unincorporated.

$$mg\ a.i./ft.^2 = [(lbs.\ product/acre)(\%\ a.i.)(453{,}590\ mg/lb.)] / (43{,}560\ ft.^2/acre)$$
$$EEC = [(mg\ a.i./ft.^2)(\%\ of\ pesticide\ biologically\ available)]$$

Where:

- *% of pesticide biologically available = 100% without species specific ingestion rates*
- *Conversion for calculating mg a.i./ft.^{2} using ounces: 453,580 mg/lb. /16 = 28,349 mg/oz.*

The following equation would be used to calculate a RQ based on the EEC calculated by one of the above equations. The EEC would be divided by the surrogate LD_{50} toxicological endpoint multiplied by the body weight (Table G-3) of the surrogate.

$$RQ = EEC / [LD_{50}\ (mg/kg) * body\ weight\ (kg)]$$

As with other risk assessments, a RQ>LOC would be a presumption of unacceptable ecological risk. A RQ<LOC would be a presumption of acceptable risk with only minor, temporary, or localized effects to species.

Aquatic Exposure

Exposures to aquatic habitats (e.g., wetlands, meadows, ephemeral pools, water delivery ditches) would be evaluated separately for ground-based pesticide treatments of habitats managed for fish and wildlife compared with cropland/facilities maintenance. The primary exposure pathway for aquatic organisms from any ground-based treatments likely would be particle drift during the pesticide application. However, different exposure scenarios would be necessary as a result of contrasting application equipment and techniques as well as pesticides used to control pests on agricultural lands (especially those cultivated by cooperative farmers for economic return from crop yields) and facilities maintenance (e.g., roadsides, parking lots, trails) compared with other managed habitats on the Refuge. In addition, pesticide applications may be done <25 feet of the high water mark of aquatic habitats for habitat management treatments; whereas, no-spray buffers (≥25 feet) would be used for croplands/facilities maintenance treatments.

Habitat Treatments

For the worst-case exposure scenario to non-target aquatic habitats, EECs (Table G-4) would be would be derived from Urban and Cook (1986) that assumes an intentional overspray to an entire, non-target water body (1-foot depth) from a treatment <25 feet from the high water mark using the max application rate (acid basis [see above]). However, use of BMPs for applying pesticides (see Section G.4.2) would likely minimize/eliminate potential drift to non-target aquatic habitats during actual treatments. If there would be unacceptable (acute or chronic) risk to fish and wildlife with the simulated 100% overspray (RQ>LOC), then the proposed pesticide use may be disapproved or the PUP would be approved at a lower application rate to minimize/eliminate unacceptable risk to aquatic organisms (RQ=LOC).

Table G-4. Estimated Environmental Concentrations (ppb) of Pesticides in Aquatic Habitats (1 foot depth) Immediately after Direct Application (Urban and Cook 1986)

Lbs/acre	EEC (ppb)
0.10	36.7
0.20	73.5
0.25	91.9
0.30	110.2
0.40	147.0
0.50	183.7
0.75	275.6
1.00	367.5
1.25	459.7
1.50	551.6
1.75	643.5
2.00	735.7
2.25	827.6
2.50	919.4
3.00	1103.5
4.00	1471.4
5.00	1839
6.00	2207
7.00	2575
8.00	2943
9.00	3311
10.00	3678

Cropland/Facilities Maintenance Treatments

Field drift studies conducted by the Spray Drift Task Force, which is a joint project of several agricultural chemical businesses, were used to develop a generic spray drift database. From this database, the AgDRIFT computer model was created to satisfy USEPA pesticide registration spray drift data requirements and as a scientific basis to evaluate off-target movement of pesticides from particle drift and assess potential effects of exposure to wildlife. Several versions of the computer model have been developed (i.e., v2.01 through v2.10). The Spray Drift Task Force AgDRIFT® model version 2.01 (SDTF 2003, AgDRIFT 2001) would be used to derive EECs resulting from drift of pesticides to refuge aquatic resources from ground-based pesticide applications >25 feet from the high water mark. The Spray Drift Task Force AgDRIFT model is publicly available at http://www.agdrift.com. At this website, click “AgDRIFT 2.0” and then click “Download Now” and follow the instructions to obtain the computer model.

The AgDRIFT model is composed of submodels called tiers. Tier I Ground submodel would be used to assess ground-based applications of pesticides. Tier outputs (EECs) would be calculated with AgDRIFT using the following input variables: max application rate (acid basis [see above]), low

boom (20 inches), fine to medium droplet size, EPA-defined wetland, and a ≥25-foot distance (buffer) from treated area to water.

Use of Information on Effects of Biological Control Agents, Pesticides, Degradates, and Adjuvants

NEPA documents regarding biological and other environmental effects of biological control agents, pesticides, degradates, and adjuvants prepared by another federal agency, where the scope would be relevant to evaluation of effects from pesticide uses on refuge lands, would be reviewed. Possible source agencies for such NEPA documents would include the Bureau of Land Management, U.S. Forest Service, National Park Service, U.S. Department of Agriculture-Animal and Plant Health Inspection Service, and the military services. It might be appropriate to incorporate by reference parts or all of existing document(s). Incorporating by reference (40 CFR 1502.21) is a technique used to avoid redundancies in analysis. It also would reduce the bulk of a Service NEPA document, which only would identify the documents that are incorporated by reference. In addition, relevant portions would be summarized in the Service NEPA document to the extent necessary to provide the decision maker and public with an understanding of relevance of the referenced material to the current analysis.

In accordance with the requirements set forth in 43 CFR 46.135, the Service would specifically incorporate through reference ecological risk assessments prepared by the U.S. Forest Service (http://www.fs.fed.us/foresthealth/management/fhm-invasives-plants.shtml) and Bureau of Land Management (http://www.blm.gov/wo/st/en/prog/more/veg_eis.html). These risk assessments and associated documentation also are available in total with the administrative record for the Final Environmental Impact Statement entitled *Pacific Northwest Region Invasive Plant Program – Preventing and Managing Invasive Plants* (USFS 2005) and *Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic EIS* (PEIS) (Bureau of Land Management 2007). In accordance with 43 CFR 46.120(d), use of existing NEPA documents by supplementing, tiering to, incorporating by reference, or adopting previous NEPA environmental analyses would avoid redundancy and unnecessary paperwork.

As a basis for completing "Chemical Profiles" for approving or disapproving refuge PUPs, ecological risk assessments for the following herbicide and adjuvant uses prepared by the U.S. Forest Service would be incorporated by reference:

- 2,4-D
- Chlorsulfuron
- Clopyralid
- Dicamba
- Glyphosate
- Imazapic
- Imazapyr
- Metsulfuron methyl
- Picloram
- Sethoxydim
- Sulfometuron methyl
- Triclopyr
- Nonylphenol polyethylate (NPE) based surfactants

As a basis for completing "Chemical Profiles" for approving or disapproving refuge PUPs, ecological risk assessments for the following herbicide uses as well as evaluation of risks associated with pesticide degradates and adjuvants prepared by the Bureau of Land Management would be incorporated by reference:

- Bromacil
- Chlorsulfuron
- Diflufenzopyr
- Diquat
- Diuron
- Fluridone
- Imazapic
- Overdrive (diflufenzopyr and dicamba)
- Sulfometuron methyl
- Tebuthiuron
- Pesticide degradates and adjuvants (*Appendix D – Evaluation of risks from degradates, polyoxyethylene-amine (POEA) and R-11, and endocrine disrupting chemicals*)

Assumptions for Ecological Risk Assessments

There are a number of assumptions involved with the ecological risk assessment process for terrestrial and aquatic organisms associated with utilization of the USEPA's (2004) process. These assumptions may be risk neutral or may lead to an over- or underestimation of risk from pesticide exposure depending upon site-specific conditions. The following describes these assumptions, their application to the conditions typically encountered, and whether or not they may lead to recommendations that are risk neutral, underestimate, or overestimate ecological risk from potential pesticide exposure.

- Indirect effects would not be evaluated by ecological risk assessments. These effects include the mechanisms of indirect exposure to pesticides: consuming prey items (fish, birds, or small mammals), reductions in the availability of prey items, and disturbance associated with pesticide application activities.
- Exposure to a pesticide product can be assessed based upon the active ingredient. However, exposure to a chemical mixture (pesticide formulation) may result in effects that are similar or substantially different compared to only the active ingredient. Non-target organisms may be exposed directly to the pesticide formulation or only various constituents of the formulation as they dissipate and partition in the environment. If toxicological information for both the active ingredient and formulated product are available, then data representing the greatest potential toxicity would be selected for use in the risk assessment process (USEPA 2004). As a result, this conservative approach may lead to an overestimation of risk characterization from pesticide exposure.
- Because toxicity tests with listed or candidate species or closely related species are not available, data for surrogate species would be most often used for risk assessments. Specifically, bobwhite quail and mallard duck are the most frequently used surrogates for evaluating potential toxicity to federally listed avian species. Bluegill sunfish, rainbow trout, and fathead minnow are the most common surrogates for evaluating toxicity for freshwater fishes. However, sheep's head minnow can be an appropriate surrogate marine species for coastal environments. Rats and mice are the most common surrogates for evaluating toxicity

for mammals. Interspecies sensitivity is a major source of uncertainty in pesticide assessments. As a result of this uncertainty, data are selected for the most sensitive species tested within a taxonomic group (birds, fish, and mammals) given the quality of the data is acceptable. If additional toxicity data for more species of organisms in a particular group are available, the selected data will not be limited to the species previously listed as common surrogates.

- The Kanaga nomogram outputs maximum EEC values that may be used to calculate an average daily concentration over a specified interval of time, which is referred to as a time-weighted-average (TWA). The maximum EEC would be selected as the exposure input for both acute and chronic risk assessments in the screening-level evaluations. The initial or maximum EEC derived from the Kanaga nomogram represents the maximum expected instantaneous or acute exposure to a pesticide. Acute toxicity endpoints are determined using a single exposure to a known pesticide concentration typically for 48 to 96 hours. This value is assumed to represent ecological risk from acute exposure to a pesticide. On the other hand, chronic risk to pesticide exposure is a function of pesticide concentration and duration of exposure to the pesticide. An organism's response to chronic pesticide exposure may result from either the concentration of the pesticide, length of exposure, or some combination of both factors. Standardized tests for chronic toxicity typically involve exposing an organism to several different pesticide concentrations for a specified length of time (days, weeks, months, years or generations). For example, avian reproduction tests include a 10-week exposure phase. Because a single length of time is used in the test, time response data are usually not available for inclusion into risk assessments. Without time response data it is difficult to determine the concentration which elicited a toxicological response.
- Using maximum EECs for chronic risk estimates may result in an overestimate of risk, particularly for compounds that dissipate rapidly. Conversely, using TWAs for chronic risk estimates may underestimate risk if it is the concentration rather than the duration of exposure that is primarily responsible for the observed adverse effect. The maximum EEC would be used for chronic risk assessments although it may result in an overestimate of risk. TWAs may be used for chronic risk assessments, but they will be applied judiciously considering the potential for an underestimate or overestimate of risk. For example, the number of days exposure exceeds a Level of Concern may influence the suitability of a pesticide use. The greater the number of days the EEC exceeds the Level of Concern translates into greater the ecological risk. This is a qualitative assessment, and is subject to reviewer's expertise in ecological risk assessment and tolerance for risk.
- The length of time used to calculate the TWA can have a substantial effect on the exposure estimates and there is no standard method for determining the appropriate duration for this estimate. The T-REX model assumes a 21-week exposure period, which is equivalent to avian reproductive studies designed to establish a steady-state concentration for bioaccumulative compounds. However, this does not necessarily define the true exposure duration needed to elicit a toxicological response. Pesticides, which do not bioaccumulate, may achieve a steady-state concentration earlier than 21 weeks. The duration of time for calculating TWAs will require justification and it will not exceed the duration of exposure in the chronic toxicity test (approximately 70 days for the standard avian reproduction study). An alternative to using the duration of the chronic toxicity study is to base the TWA on the application interval. In this case, increasing the application interval would suppress both the estimated peak pesticide concentration and the TWA. Another alternative to using TWAs would be to consider the number of days that a chemical is predicted to exceed the LOC.

- Pesticide dissipation is assumed to be first-order in the absence of data suggesting alternative dissipation patterns such as bi-phasic. Field dissipation data would generally be the most pertinent for assessing exposure in terrestrial species that forage on vegetation. However, these data are often not available and it can be misleading particularly if the compound is prone to "wash-off." Soil half-life is the most common degradation data available. Dissipation or degradation data that would reflect the environmental conditions typical of refuge lands would be utilized, if available.
- For species found in the water column, it would be assumed that the greatest bioavailable fraction of the pesticide active ingredient in surface waters is freely dissolved in the water column.
- Actual habitat requirements of any particular terrestrial species are not considered, and it is assumed that species exclusively and permanently occupy the treated area, or adjacent areas receiving pesticide at rates commensurate with the treatment rate. This assumption would produce a maximum estimate of exposure for risk characterization. This assumption would likely lead to an overestimation of exposure for species that do not permanently and exclusively occupy the treated area (USEPA 2004).
- Exposure through incidental ingestion of pesticide contaminated soil is not considered in the USEPA risk assessment protocols. Research suggests <15% of the diet can consist of incidentally ingested soil depending upon species and feeding strategy (Beyer et al. 1994). An assessment of pesticide concentrations in soil compared to food item categories in the Kanaga nomogram indicates incidental soil ingestion would not likely increase dietary exposure to pesticides. Inclusion of soil into the diet would effectively reduce the overall dietary concentration compared to the present assumption that the entire diet consists of a contaminated food source (Fletcher et al. 1994). An exception to this may be soil-applied pesticides in which exposure from incidental ingestion of soil may increase. Potential for pesticide exposure under this assumption may be underestimated for soil-applied pesticides and overestimated for foliar-applied pesticides. The concentration of a pesticide in soil would likely be less than predicted on food items.
- Exposure through inhalation of pesticides is not considered in the USEPA risk assessment protocols. Such exposure may occur through three potential sources: spray material in droplet form at time of application, vapor phase with the pesticide volatilizing from treated surfaces, and airborne particulates (soil, vegetative matter, and pesticide dusts). The USEPA (1990) reported exposure from inhaling spray droplets at the time of application is not an appreciable route of exposure for birds. According to research on mallards and bobwhite quail, respirable particle size (particles reaching the lung) in birds is limited to maximum diameter of 2 to 5 microns. The spray droplet spectra covering the majority of pesticide application scenarios indicate that less than 1% of the applied material is within the respirable particle size. This route of exposure is further limited because the permissible spray drop size distribution for ground pesticide applications is restricted to ASAE medium or coarser drop size distribution.
- Inhalation of a pesticide in the vapor phase may be another source of exposure for some pesticides under certain conditions. This mechanism of exposure to pesticides occurs post application, and it would pertain to those pesticides with a high vapor pressure. The USEPA is currently evaluating protocols for modeling inhalation exposure from pesticides including near-field and near-ground air concentrations based upon equilibrium and kinetics-based models. Risk characterization for exposure with this mechanism is unavailable.
- The effect from exposure to dusts contaminated with the pesticide cannot be assessed generically as partitioning issues related to application site soils and chemical properties of the applied pesticides render the exposure potential from this route highly situation specific.

- Dermal exposure may occur through three potential sources: direct application of spray to terrestrial wildlife in the treated area or within the drift footprint, incidental contact with contaminated vegetation, or contact with contaminated water or soil. Interception of spray and incidental contact with treated substrates may pose risk to avian wildlife (Driver et al. 1991). However, available research related to wildlife dermal contact with pesticides is extremely limited, except dermal toxicity values are common for some mammals used as human surrogates (rats and mice). The USEPA is currently evaluating protocols for modeling dermal exposure. Risk characterization may be underestimated for this route of exposure, particularly with high- risk pesticides such as some organophosphates or carbamate insecticides. If protocols are established by the USEPA for assessing dermal exposure to pesticides, they will be considered for incorporation into pesticide assessment protocols.
- Exposure to a pesticide may occur from consuming surface water, dew or other water on treated surfaces. Water soluble pesticides have the potential to dissolve in surface runoff and puddles in a treated area may contain pesticide residues. Similarly, pesticides with lower organic carbon partitioning characteristics and higher solubility in water have a greater potential to dissolve in dew and other water associated with plant surfaces. Estimating the extent to which such pesticide loadings to drinking water occurs is complex and would depend upon the partitioning characteristics of the active ingredient, soils types in the treatment area, and the meteorology of the treatment area. In addition, the use of various water sources by wildlife is highly species-specific. Currently, risk characterization for this exposure mechanism is not available. The USEPA is actively developing protocols to quantify drinking water exposures from puddles and dew. If and when protocols are formally established by the USEPA for assessing exposure to pesticides through drinking water, these protocols will be incorporated into pesticide risk assessment protocols.
- Risk assessments are based upon the assumption that the entire treatment area would be subject to pesticide application at the rates specified on the label. In most cases, there is potential for uneven application of pesticides through such plausible incidents such as changes in calibration of application equipment, spillage, and localized releases at specific areas in or near the treated field that are associated with mixing and handling and application equipment as well as applicator skill. Inappropriate use of pesticides and the occurrence of spills represent a potential underestimate of risk. It is likely not an important factor for risk characterization. All pesticide applicators are required to be certified by the state in which they apply pesticides. Certification training includes the safe storage, transport, handling, and mixing of pesticides; equipment calibration; and proper application with annual continuing education.
- The USEPA relies on Fletcher (1994) for setting the assumed pesticide residues in wildlife dietary items. The USEPA (2004) "believes that these residue assumptions reflect a realistic upper-bound residue estimate, although the degree to which this assumption reflects a specific percentile estimate is difficult to quantify." Fletcher's (1994) research suggests that the pesticide active ingredient residue assumptions used by the USEPA represent a 95th percentile estimate. However, research conducted by Pfleeger et al. (1996) indicates USEPA residue assumptions for short grass was not exceeded. Baehr and Habig (2000) compared USEPA residue assumptions with distributions of measured pesticide residues for the USEPA's UTAB database. Overall residue selection level will tend to overestimate risk characterization. This is particularly evident when wildlife individuals are likely to have selected a variety of food items acquired from multiple locations. Some food items may be contaminated with pesticide residues whereas others are not contaminated. However, it is important to recognize differences in species feeding behavior. Some species may consume

whole above-ground plant material, but others will preferentially select different plant structures. Also, species may preferentially select a food item although multiple food items may be present. Without species specific knowledge regarding foraging behavior characterizing ecological risk other than in general terms is not possible.

- Acute and chronic risk assessments rely on comparisons of wildlife dietary residues with LC_{50} or NOEC values expressed as concentrations of pesticides in laboratory feed. These comparisons assume that ingestion of food items in the field occurs at rates commensurate with those in the laboratory. Although the screening assessment process adjusts dry-weight estimates of food intake to reflect the increased mass in fresh-weight wildlife food intake estimates, it does not allow for gross energy and assimilative efficiency differences between wildlife food items and laboratory feed. Differences in assimilative efficiency between laboratory and wild diets suggest that current screening assessment methods are not accounting for a potentially important aspect of food requirements.
- There are several other assumptions that can affect non-target species not considered in the risk assessment process. These include possible additive or synergistic effects from applying two or more pesticides or additives in a single application, co-location of pesticides in the environment, cumulative effects from pesticides with the same mode of action, effects of multiple stressors (e.g., combination of pesticide exposure, adverse abiotic and biotic factors) and behavioral changes induced by exposure to a pesticide. These factors may exist at some level contributing to adverse effects to non-target species, but they are usually characterized in the published literature in only a general manner limiting their value in the risk assessment process.
- It is assumed that aquatic species exclusively and permanently occupy the water body being assessed. Actual habitat requirements of aquatic species are not considered. With the possible exception of scenarios where pesticides are directly applied to water, it is assumed that no habitat use considerations specific for any species would place the organisms in closer proximity to pesticide use sites. This assumption produces a maximum estimate of exposure or risk characterization. It would likely be realistic for many aquatic species that may be found in aquatic habitats within or in close proximity to treated terrestrial habitats. However, the spatial distribution of wildlife is usually not random because wildlife distributions are often related to habitat requirements of species. Clumped distributions of wildlife may result in an under- or over-estimation of risk depending upon where the initial pesticide concentration occurs relative to the species or species habitat.
- For species found in the water column, it would be assumed that the greatest bioavailable fraction of the pesticide active ingredient in surface waters is freely dissolved in the water column. Additional chemical exposure from materials associated with suspended solids or food items is not considered because partitioning onto sediments likely is minimal. Adsorption and bioconcentration occurs at lower levels for many newer pesticides compared with older more persistent bioaccumulative compounds. Pesticides with RQs close to the listed species level of concern, the potential for additional exposure from these routes may be a limitation of risk assessments, where potential pesticide exposure or risk may be underestimated.
- Mass transport losses of pesticide from a water body (except for losses by volatilization, degradation and sediment partitioning) would not be considered for ecological risk assessment. The water body would be assumed to capture all pesticide active ingredients entering as runoff, drift, and adsorbed to eroded soil particles. It would also be assumed that pesticide active ingredient is not lost from the water body by overtopping or flow-through, nor is concentration reduced by dilution. In total, these assumptions would lead to a near

maximum possible water-borne concentration. However, this assumption would not account for the potential to concentrate pesticide through the evaporative loss. This limitation may have the greatest impact on water bodies with high surface-to-volume ratios such as ephemeral wetlands, where evaporative losses are accentuated and applied pesticides have low rates of degradation and volatilization.

- For acute risk assessments, there would be no averaging time for exposure. An instantaneous peak concentration would be assumed, where instantaneous exposure is sufficient in duration to elicit acute effects comparable to those observed over more protracted exposure periods (typically 48 to 96 hours) tested in the laboratory. In the absence of data regarding time-to-toxic event, analyses and latent responses to instantaneous exposure, risk would likely be overestimated.
- For chronic exposure risk assessments, the averaging times considered for exposure are commensurate with the duration of invertebrate life-cycle or fish-early life stage tests (e.g., 21-28 days and 56-60 days, respectively). Response profiles (time to effect and latency of effect) to pesticides likely vary widely with mode of action and species and should be evaluated on a case-by-case basis as available data allow. Nevertheless, because the USEPA relies on chronic exposure toxicity endpoints based on a finding of no observed effect, the potential for any latent toxicity effects or averaging time assumptions to alter the results of an acceptable chronic risk assessment prediction is limited. The extent to which duration of exposure from water-borne concentrations overestimate or underestimate actual exposure depends on several factors. These include the following: localized meteorological conditions, runoff characteristics of the watershed (e.g., soils, topography), the hydrological characteristics of receiving waters, environmental fate of the pesticide active ingredient, and the method of pesticide application. It should also be understood that chronic effects studies are performed using a method that holds water concentration in a steady state. This method is not likely to reflect conditions associated with pesticide runoff. Pesticide concentrations in the field increase and decrease in surface water on a cycle influenced by rainfall, pesticide use patterns, and degradation rates. As a result of the dependency of this assumption on several undefined variables, risk associated with chronic exposure may in some situations underestimate risk and overestimate risk in others.
- There are several other factors that can affect non-target species not considered in the risk assessment process. These would include the following: possible additive or synergistic effects from applying two or more pesticides or additives in a single application, co-location of pesticides in the environment, cumulative effects from pesticides with the same mode of action, effects of multiple stressors (e.g., combination of pesticide exposure, adverse abiotic [not pesticides] and biotic factors), and sub-lethal effects such as behavioral changes induced by exposure to a pesticide. These factors may exist at some level contributing to adverse effects to non-target species, but they are not routinely assessed by regulatory agencies. Therefore, information on the factors is not extensive limiting their value for the risk assessment process. As this type of information becomes available, it would be included, either quantitatively or qualitatively, in this risk assessment process.
- USEPA is required by the Food Quality Protection Act to assess the cumulative risks of pesticides that share common mechanisms of toxicity, or act the same within an organism. Currently, USEPA has identified four groups of pesticides that have a common mechanism of toxicity requiring cumulative risk assessments. These four groups are: the organophosphate insecticides, N-methyl carbamate insecticides, triazine herbicides, and chloroacetanilide herbicides.

G.7.3 Pesticide Mixtures and Degradates

Pesticide products are usually a formulation of several components generally categorized as active ingredients and inert or other ingredients. The term active ingredient is defined by the FIFRA as preventing, destroying, repelling, or mitigating the effects of a pest, or it is a plant regulator, defoliant, desiccant, or nitrogen stabilizer. In accordance with FIFRA, the active ingredient(s) must be identified by name(s) on the pesticide label along with its relative composition expressed in percentage(s) by weight. In contrast, inert ingredient(s) are not intended to affect a target pest. Their role in the pesticide formulation is to act as a solvent (keep the active ingredient is a liquid phase), an emulsifying or suspending agent (keep the active ingredient from separating out of solution), or a carrier (such as clay in which the active ingredient is impregnated on the clay particle in dry formulations). For example, if isopropyl alcohol would be used as a solvent in a pesticide formulation, then it would be considered an inert ingredient. FIFRA only requires that inert ingredients identified as hazardous and associated percent composition, and the total percentage of all inert ingredients must be declared on a product label. Inert ingredients that are not classified as hazardous are not required to be identified.

The USEPA (September 1997) issued Pesticide Regulation Notice 97-6, which encouraged manufacturers, formulators, producers, and registrants of pesticide products to voluntarily substitute the term “other ingredients” for “inert ingredients” in the ingredient statement. This change recognized that all components in a pesticide formulation potentially could elicit or contribute to an adverse effect on non-target organisms and, therefore, are not necessarily inert. Whether referred to as “inerts” or “other ingredients,” these constituents within a pesticide product have the potential to affect species or environmental quality. The USEPA categorizes regulated inert ingredients into the following four lists (http://www.epa.gov/opprd001/inerts/index.html):

- List 1 – Inert Ingredients of Toxicological Concern
- List 2 – Potentially Toxic Inert Ingredients
- List 3 – Inerts of Unknown Toxicity
- List 4 – Inerts of Minimal Toxicity

Several of the List 4 compounds are naturally-occurring earthen materials (e.g., clay materials, simple salts) that would not elicit toxicological response at applied concentrations. However, some of the inerts (particularly the List 3 compounds and unlisted compounds) may have moderate to high potential toxicity to aquatic species based on MSDSs or published data.

Comprehensively assessing potential effects to non-target fish, wildlife, plants, and/or their habitats from pesticide use is a complex task. It would be preferable to assess the cumulative effects from exposure to the active ingredient, its degradates, and inert ingredients as well as other active ingredients in the spray mixture. However, it would only be feasible to conduct deterministic risk assessments for each component in the spray mixture singly. Limited scientific information is available regarding ecological effects (additive or synergistic) from chemical mixtures that typically rely upon broadly encompassing assumptions. For example, the U.S. Forest Service (2005) found that mixtures of pesticides used in land (forest) management likely would not cause additive or synergistic effects to non-target species based upon a review of scientific literature regarding toxicological effects and interactions of agricultural chemicals (ATSDR 2004). Moreover, information on inert ingredients, adjuvants, and degradates is often limited by the availability of and access to reliable toxicological data for these constituents.

Toxicological information regarding "other ingredients" may be available from sources such as the following:

- TOMES (a proprietary toxicological database including USEPA's IRIS, the Hazardous Substance Data Bank, the Registry of Toxic Effects of Chemical Substances [RTECS]).
- USEPA's ECOTOX database, which includes AQUIRE (a database containing scientific papers published on the toxic effects of chemicals to aquatic organisms).
- TOXLINE (a literature searching tool).
- Material Safety Data Sheets (MSDSs) from pesticide suppliers.
- Other sources such as the Farm Chemicals Handbook.

Because there is a lack of specific inert toxicological data, inert(s) in a pesticide may cause adverse ecological effects. However, inert ingredients typically represent only a small percentage of the pesticide spray mixture, and it would be assumed that negligible effects would be expected to result from inert ingredient(s).

Although the potential effects of degradates should be considered when selecting a pesticide, it is beyond the scope of this assessment process to consider all possible breakdown chemicals of the various product formulations containing an active ingredient. Degradates may be more or less mobile and more or less hazardous in the environment than their parent pesticides (Battaglin et al. 2003). Differences in environmental behavior (e.g., mobility) and toxicity between parent pesticides and degradates would make assessing potential degradate effects extremely difficult. For example, a less toxic and more mobile, bioaccumulative, or persistent degradate may have potentially greater effects on species and/or degrade environmental quality. The lack of data on the toxicity of degradates for many pesticides would represent a source of uncertainty for assessing risk.

A USEPA-approved label specifies whether a product can be mixed with one or more pesticides. Without product-specific toxicological data, it would not be possible to quantify the potential effects of these mixtures. In addition, a quantitative analysis could only be conducted if reliable scientific information allowed a determination of whether the joint action of a mixture would be additive, synergistic, or antagonistic. Such information would not likely exist unless the mode of action would be common among the chemicals and receptors. Moreover, the composition of and exposure to mixtures would be highly site- and/or time-specific and, therefore, it would be nearly impossible to assess potential effects to species and environmental quality.

To minimize or eliminate potential negative effects associated with applying two or more pesticides as a mixture, the use would be conducted in accordance with the labeling requirements. Labels for two or more pesticides applied as a mixture should be completely reviewed, where products with the least potential for negative effects would be selected for use on the Refuge. This is especially relevant when a mixture would be applied in a manner that may already have the potential for an effect(s) associated with an individual pesticide (e.g., runoff to ponds in sandy watersheds). Use of a tank mix under these conditions would increase the level of uncertainty in terms of risk to species or potential to degrade environmental quality.

Adjuvants generally function to enhance or prolong the activity of pesticide. For terrestrial herbicides, adjuvants aid in the absorption into plant tissue. Adjuvant is a broad term that generally applies to surfactants, selected oils, anti-foaming agents, buffering compounds, drift control agents, compatibility agents, stickers, and spreaders. Adjuvants are not under the same registration requirements as pesticides and the USEPA does not register or approve the labeling of spray

adjuvants. Individual pesticide labels identify types of adjuvants approved for use with it. In general, adjuvants compose a relatively small portion of the volume of pesticides applied. Selection of adjuvants with limited toxicity and low volumes would be recommended to reduce the potential for the adjuvant to influence the toxicity of the pesticide.

G.7.4 Determining Effects to Soil and Water Quality

The approval process for pesticide uses would consider potential to degrade water quality on and off refuge lands. A pesticide can only affect water quality through movement away from the treatment site. After application, pesticide mobilization can be characterized by one or more of the following (Kerle et al. 1996):

- Attach (sorb) to soil, vegetation, or other surfaces and remain at or near the treated area;
- Attach to soil and move off-site through erosion from runoff or wind;
- Dissolve in water that can be subjected to runoff or leaching.

As an initial screening tool, selected chemical characteristics and rating criteria for a pesticide can be evaluated to assess potential to enter ground and/or surface waters. These would include the following: persistence, sorption coefficient (K_{oc}), groundwater ubiquity score (GUS), and solubility.

Persistence, which is expressed as half-life (t½), represents the length of time required for 50% of the deposited pesticide to degrade (completely or partially). Persistence in the soil can be categorized as the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days (Kerle et al. 1996). Half-life data are usually available for aquatic and terrestrial environments.

Another measure of pesticide persistence is dissipation time (DT_{50}). It represents the time required for 50% of the deposited pesticide to degrade and move from a treated site; whereas, half-life describes the rate for degradation only. As for half-life, units of dissipation time are usually expressed in days. Field or foliar dissipation time is the preferred data for use to estimate pesticide concentrations in the environment. However, soil half-life is the most common persistence data cited in published literature. If field or foliar dissipation data are not available, soil half-life data may be used. The average or representative half-life value of most important degradation mechanism will be selected for quantitative analysis for both terrestrial and aquatic environments.

Mobility of a pesticide is a function of how strongly it is adsorbed to soil particles and organic matter, its solubility in water, and its persistence in the environment. Pesticides strongly adsorbed to soil particles, relatively insoluble in water, and not environmentally persistent would be less likely to move across the soil surface into surface waters or to leach through the soil profile and contaminate groundwater. Conversely, pesticides that are not strongly adsorbed to soil particles, are highly water soluble, and are persistent in the environment would have greater potential to move from the application site (off-site movement).

The degree of pesticide adsorption to soil particles and organic matter (Kerle et al. 1996) is expressed as the soil adsorption coefficient (K_{oc}). The soil adsorption coefficient is measured as micrograms of pesticide per gram of soil (µg/g) that can range from near zero to the thousands. Pesticides with higher K_{oc} values are strongly absorbed to soil and, therefore, would be less subject to movement.

Water solubility describes the amount of pesticide that will dissolve in a known quantity of water. The water solubility of a pesticide is expressed as milligrams of pesticide dissolved in a liter of water

(mg/L or parts per million [ppm]). Pesticide with solubility <0.1 ppm are virtually insoluble in water, 100-1000 ppm are moderately soluble, and >10,000 ppm highly soluble (USGS 2000). As pesticide solubility increases, there would be greater potential for off-site movement.

The Groundwater Ubiquity Score (GUS) is a quantitative screening tool to estimate a pesticide's potential to move in the environment. It utilizes soil persistence and adsorption coefficients in the following formula.

$$GUS = log_{10}(t_{½}) \times [4 - log_{10}(K_{oc})]$$

The potential pesticide movement rating would be based upon its GUS value. Pesticides with a GUS <0.1 would considered to have an extremely low potential to move toward groundwater. Values of 1.0-2.0 would be low, 2.0-3.0 would be moderate, 3.0-4.0 would be high, and >4.0 would have a very high potential to move toward groundwater.

Water solubility describes the amount of pesticide dissolving in a specific quantity of water, where it is usually measured as mg/L or ppm. Solubility is useful as a comparative measure because pesticides with higher values are more likely to move by runoff or leaching. GUS, water solubility, t½, and K_{oc} values are available for selected pesticides from the OSU Extension Pesticide Properties Database at http://npic.orst.edu/ppdmove.htm. Many of the values in this database were derived from the SCS/ARS/CES Pesticide Properties Database for Environmental Decision Making (Wauchope et al. 1992).

Soil properties influence the fate of pesticides in the environment. The following six properties are mostly likely to affect pesticide degradation and the potential for pesticides to move off-site by leaching (vertical movement through the soil) or runoff (lateral movement across the soil surface).

- Permeability is the rate of water movement vertically through the soil. It is affected by soil texture and structure. Coarse textured soils (e.g., high sand content) have a larger pore size and they are generally more permeable than fine textured soils (i.e., high clay content). The more permeable soils would have a greater potential for pesticides to move vertically down through the soil profile. Soil permeability rates (inches/hour) are usually available in county soil survey reports.
- Soil texture describes the relative percentage of sand, silt, and clay. In general, greater clay content with smaller the pore size would lower the likelihood and rate water that would move through the soil profile. Clay also serves to adsorb (bind) pesticides to soil particles. Soils with high clay content would absorb more pesticide than soils with relatively low clay content. In contrast, sandy soils with coarser texture and lower water holding capacity would have a greater potential for water to leach through them.
- Soil structure describes soil aggregation. Soils with a well-developed soil structure have looser, more aggregated, structure that would be less likely to be compacted. Both characteristics would allow for less restricted flow of water through the soil profile resulting in greater infiltration.
- Organic matter would be the single most important factor affecting pesticide adsorption in soils. Many pesticides are adsorbed to organic matter which would reduce their rate of downward movement through the soil profile. Also, soils high in organic matter would tend to hold more water, which may make less water available for leaching.
- Soil moisture affects how fast water would move through the soil. If soils are already wet or saturated before rainfall or irrigation, excess moisture would runoff rather than infiltrate into

the soil profile. Soil moisture also would influence microbial and chemical activity in soil, which affects pesticide degradation.

- Soil pH would influence chemical reactions that occur in the soil which in turn determines whether or not a pesticide will degrade, rate of degradation, and, in some instances, which degradation products are produced.

Based upon the aforementioned properties, soils most vulnerable to groundwater contamination would be sandy soils with low organic matter. In contrast, the least vulnerable soils would be well-drained clayey soils with high organic matter. Consequently, pesticides with the lowest potential for movement in conjunction with appropriate best management practices (see below) would be used in an IPM framework to treat pests while minimizing effects to non-target biota and protecting environmental quality.

Along with soil properties, the potential for a pesticide to affect water quality through runoff and leaching would consider site-specific environmental and abiotic conditions including rainfall, water table conditions, and topography (Huddleston 1996).

- Water is necessary to separate pesticides from soil. This can occur in two basic ways. Pesticides that are soluble move easily with runoff water. Pesticide-laden soil particles can be dislodged and transported from the application site in runoff. The concentration of pesticides in the surface runoff would be greatest for the first runoff event following treatment. The rainfall intensity and route of water infiltration into soil, to a large extent, determine pesticide concentrations and losses in surface runoff. The timing of the rainfall after application also would have an effect. Rainfall interacts with pesticides at a shallow soil depth (¼ to ½ inch), which is called the mixing zone (Baker and Miller 1999). The pesticide/water mixture in the mixing zone would tend to leach down into the soil or runoff depending upon how quickly the soil surface becomes saturated and how rapidly water can infiltrate into the soil. Leaching would decrease the amount of pesticide available near the soil surface (mixing zone) to runoff during the initial rainfall event following application and subsequent rainfall events.
- Terrain slope would affect the potential for surface runoff and the intensity of runoff. Steeper slopes would have greater potential for runoff following a rainfall event. In contrast, soils that are relatively flat would have little potential for runoff, except during intense rainfall events. In addition, soils in lower areas would be more susceptible to leaching as a result of receiving excessive water from surrounding higher elevations.
- Depth to groundwater would be an important factor affecting the potential for pesticides to leach into groundwater. If the distance from the soil surface to the top of the water table is shallow, pesticides would have less distance to travel to reach groundwater. Shallower water tables that persist for longer periods would be more likely to experience groundwater contamination. Soil survey reports are available for individual counties. These reports provide data in tabular format regarding the water table depths and the months during which it persists. In some situations, a hard pan exists above the water table that would prevent pesticide contamination from leaching.

G.7.5 Determining Effects to Air Quality

Pesticides may volatilize from soil and plant surfaces and move from the treated area into the atmosphere. The potential for a pesticide to volatilize is determined by the pesticide's vapor pressure which would be affected by temperature, sorption, soil moisture, and the pesticide's water solubility.

Vapor pressure is often expressed in mm Hg. To make these numbers easier to compare, vapor pressure may be expressed in exponent form ($I \times 10^{-7}$), where I represents a vapor pressure index. In general, pesticides with I<10 would have a low potential to volatilize; whereas, pesticides with I>1,000 would have a high potential to volatilize (Oregon State University 1996). Vapor pressure values for pesticides are usually available in the pesticide product MSDS or the USDA Agricultural Research Service (ARS) pesticide database.

G.7.6 Preparing a Chemical Profile

The following instructions would be used by Service personnel to complete Chemical Profiles for pesticides. Specifically, profiles would be prepared for pesticide active ingredients (e.g., glyphosate, imazapic) that would be contained in one or more trade name products that are registered and labeled with USEPA. All information fields under each category (e.g., Toxicological Endpoints, Environmental Fate) would be completed for a Chemical Profile. If no information is available for a specific field, then "No data are available in references" would be recorded in the profile. Available scientific information would be used to complete Chemical Profiles. Each entry of scientific information would be shown with applicable references.

Completed Chemical Profiles would provide a structured decision-making process utilizing quantitative assessment/screening tools with threshold values (where appropriate) that would be used to evaluate potential biological and other environmental effects to refuge resources. For ecological risk assessments presented in these profiles, the "worst-case scenario" would be evaluated to determine whether a pesticide could be approved for use considering the maximum single application rate specified on pesticide labels for habitat management and croplands/facilities maintenance treatments pertaining to refuges. Where the "worst-case scenario" likely would only result in minor, temporary, and localized effects to listed and non-listed species with appropriate BMPs (see Section G.5), the proposed pesticide's use in a PUP would have a scientific basis for approval under any application rate specified on the label that is at or below rates evaluated in a Chemical Profile. In some cases, the Chemical Profile would include a lower application rate than the maximum labeled rate in order to protect refuge resources. As necessary, Chemical Profiles would be periodically updated with new scientific information or as pesticides with the same active ingredient are proposed for use on the Refuge in PUPs.

Throughout this section, threshold values (to prevent or minimize potential biological and environmental effects) would be clearly identified for specific information presented in a completed Chemical Profile. Comparison with these threshold values provides an explicit scientific basis to approve or disapprove PUPs for habitat management and cropland/facilities maintenance on refuge lands. In general, PUPs would be approved for pesticides with Chemical Profiles where there would be no exceedances of threshold values. However, BMPs are identified for some screening tools that would minimize/eliminate potential effects (exceedance of the threshold value) as a basis for approving PUPs.

Date: Service personnel would record the date when the Chemical Profile is completed or updated. Chemical Profiles (e.g., currently approved pesticide use patterns) would be periodically reviewed and updated, as necessary. The most recent review date would be recorded on a profile to document when it was last updated.

Trade Name(s): Service personnel would accurately and completely record the trade name(s) from the pesticide label, which includes a suffix that describes the formulation (e.g., WP, DG, EC, L, SP,

I, II or 64). The suffix often distinguishes a specific product among several pesticides with the same active ingredient. Service personnel would record a trade name for each pesticide product with the same active ingredient.

Common chemical name(s): Service personnel would record the common name(s) listed on the pesticide label or material safety data sheet (MSDS) for an active ingredient. The common name of a pesticide is listed as the active ingredient on the title page of the product label immediately following the trade name, and the MSDS, Section 2: Composition/Information on Ingredients. A Chemical Profile is completed for each active ingredient.

Pesticide Type: Service personnel would record the type of pesticide for an active ingredient as one of the following: herbicide, desiccant, fungicide, fumigant, growth regulator, insecticide, piscicide, or rodenticide.

EPA Registration Number(s): This number (EPA Reg. No.) appears on the title page of the label and MSDS, Section 1: Chemical Product and Company Description. It is not the EPA Establishment Number that is usually located near it. Service personnel would record the EPA Reg. No. for each trade name product with an active ingredient based upon PUPs.

Pesticide Class: Service personnel would list the general chemical class for the pesticide (active ingredient). For example, malathion is an organophosphate and carbaryl is a carbamate.

CAS (Chemical Abstract Service) Number: This number is often located in the second section (Composition/Information on Ingredients) of the MSDS. The MSDS table listing components usually contains this number immediately prior to or following the % composition.

Other Ingredients: From the most recent MSDS for the proposed pesticide product(s), Service personnel would include any chemicals in the pesticide formulation not listed as an active ingredient that are described as toxic or hazardous, or regulated under the Superfund Amendments and Reauthorization Act (SARA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Toxic Substances Control Act (TSCA), Occupational Safety and Health Administration (OSHA), State Right-to-Know, or other listed authorities. These are usually found in MSDS sections titled “Hazardous Identifications,” “Exposure Control/Personal Protection,” and “Regulatory Information.” If concentrations of other ingredients are available for any compounds identified as toxic or hazardous, then Service personnel would record this information in the Chemical Profile by trade name. MSDS(s) may be obtained from the manufacturer, manufacturer’s website or from an on-line database maintained by Crop Data Management Systems, Inc. (see list below).

G.7.7 Toxicological Endpoints

Toxicological endpoint data would be collected for acute and chronic tests with mammals, birds, and fish. Data would be recorded for species available in the scientific literature. If no data are found for a particular taxonomic group, then “No data are available in references” would be recorded as the data entry. Throughout the Chemical Profile, references (including toxicological endpoint data) would be cited using parentheses (#) following the recorded data.

Mammalian LD_{50}: For test species in the scientific literature, Service personnel would record available data for oral lethal dose (LD_{50}) in mg/kg-bw (body weight) or ppm-bw. Most common test

species in scientific literature are the rat and mouse. The lowest LD_{50} value found for a rat would be used as a toxicological endpoint for dose-based RQ calculations to assess acute risk to mammals (see Table G-1 in Section G.7.1).

Mammalian LC_{50}: For test species in the scientific literature, Service personnel would record available data for dietary lethal concentration (LC_{50}) as reported (e.g., mg/kg-diet or ppm-diet). Most common test species in scientific literature are the rat and mouse. The lowest LC_{50} value found for a rat would be used as a toxicological endpoint for diet-based RQ calculations to assess acute risk (see Table G-1 in Section G.7.1).

Mammalian Reproduction: For test species listed in the scientific literature, Service personnel would record the test results (e.g., Lowest Observed Effect Concentration [LOEC], Lowest Observed Effect Level [LOEL], No Observed Adverse Effect Level [NOAEL], No Observed Adverse Effect Concentration [NOAEC]) in mg/kg-bw or mg/kg-diet for reproductive test procedure(s) (e.g., generational studies [preferred], fertility, new born weight). Most common test species available in scientific literature are rats and mice. The lowest NOEC, NOAEC, NOEL, or NOAEL test results found for a rat would be used as a toxicological endpoint for RQ calculations to assess chronic risk (see Table G-1 in Section G.7.1).

Avian LD_{50}: For test species available in the scientific literature, Service personnel would record values for oral lethal dose (LD_{50}) in mg/kg-bw or ppm-bw. Most common test species available in scientific literature are the bobwhite quail and mallard. The lowest LD_{50} value found for an avian species would be used as a toxicological endpoint for dose-based RQ calculations to assess acute risk (see Table G-1 in Section G.7.1).

Avian LC_{50}: For test species available in the scientific literature, Service personnel would record values for dietary lethal concentration (LC_{50}) as reported (e.g., mg/kg-diet or ppm-diet). Most common test species available in scientific literature are the bobwhite quail and mallard. The lowest LC_{50} value found for an avian species would be used as a toxicological endpoint for dietary-based RQ calculations to assess acute risk (see Table G-1 in Section G.7.1).

Avian Reproduction: For test species available in the scientific literature, Service personnel would record test results (e.g., LOEC, LOEL, NOAEC, NOAEL) in mg/kg-bw or mg/kg-diet consumed for reproductive test procedure(s) (e.g., early life cycle, reproductive). Most common test species available in scientific literature are the bobwhite quail and mallard. The lowest NOEC, NOAEC, NOEL, or NOAEL test results found for an avian species would be used as a toxicological endpoint for RQ calculations to assess chronic risk (see Table G-1 in Section G.7.1).

Fish LC_{50}: For test freshwater or marine species listed in the scientific literature, Service personnel would record a LC_{50} in ppm or mg/L. Most common test species available in the scientific literature are the bluegill, rainbow trout, and fathead minnow (marine). Test results for many game species may also be available. The lowest LC_{50} value found for a freshwater fish species would be used as a toxicological endpoint for RQ calculations to assess acute risk (see Table G-1 in Section G.7.1).

Fish Early Life Stage (ELS)/Life Cycle: For test freshwater or marine species available in the scientific literature, Service personnel would record test results (e.g., LOEC, NOAEL, NOAEC, LOAEC) in ppm for test procedure(s) (e.g., early life cycle, life cycle). Most common test species available in the scientific literature are bluegill, rainbow trout, and fathead minnow. Test results for other game species may also be available. The lowest test value found for a fish species (preferably

freshwater) would be used as a toxicological endpoint for RQ calculations to assess chronic risk (see Table G-1 in Section G.7.1).

Other: For test invertebrate as well as non-vascular and vascular plant species available in the scientific literature, Service personnel would record LC_{50}, LD_{50}, LOEC, LOEL, NOAEC, NOAEL, or EC_{50} (environmental concentration) values in ppm or mg/L. Most common test invertebrate species available in scientific literature are the honey bee and the water flea (*Daphnia magna*). Green algae (*Selenastrum capricornutum*) and pondweed (*Lemna minor*) are frequently available test species for aquatic non-vascular and vascular plants, respectively.

G.7.8 Ecological Incident Reports

After a site has been treated with pesticide(s), wildlife may be exposed to these chemical(s). When exposure is high relative to the toxicity of the pesticides, wildlife may be killed or visibly harmed (incapacitated). Such events are called ecological incidents. The USEPA maintains a database (Ecological Incident Information System) of ecological incidents. This database stores information extracted from incident reports submitted by various federal and state agencies and non-government organizations. Information included in an incident report is date and location of the incident, type, and magnitude of effects observed in various species, use(s) of pesticides known or suspected of contributing to the incident, and results of any chemical residue and cholinesterase activity analyses conducted during the investigation.

Incident reports can play an important role in evaluating the effects of pesticides by supplementing quantitative risk assessments. All incident reports for pesticide(s) with the active ingredient and associated information would be recorded.

G.7.9 Environmental Fate

Water Solubility: Service personnel would record values for water solubility (S_w), which describes the amount of pesticide that dissolves in a known quantity of water. S_w is expressed as mg/L (ppm). Pesticide S_w values would be categorized as one of the following: insoluble <0.1 ppm, moderately soluble = 100 to 1000 ppm, highly soluble >10,000 ppm (USGS 2000). As pesticide S_w increases, there would be greater potential to degrade water quality through runoff and leaching.

S_w would be used to evaluate potential for bioaccumulation in aquatic species [see **Octanol-Water Partition Coefficient (K_{ow})** below].

Soil Mobility: Service personnel would record available values for soil adsorption coefficient (K_{oc} [µg/g]). It provides a measure of a chemical's mobility and leaching potential in soil. K_{oc} values are directly proportional to organic content, clay content, and surface area of the soil. K_{oc} data for a pesticide may be available for a variety of soil types (e.g., clay, loam, sand).

K_{oc} values would be used in evaluating the potential to degrade groundwater by leaching (see **Potential to Move to Groundwater** below).

Soil Persistence: Service personnel would record values for soil half-life (t½), which represents the length of time (days) required for 50% of the deposited pesticide to degrade (completely or partially) in the soil. Based upon the t½ value, soil persistence would be categorized as one of the following:

non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days (Kerle et al. 1996).

Threshold for Approving PUPs:

If soil t½ ≤100 days, then a PUP would be approved without additional BMPs to protect water quality.

If soil t½ >100 days, then a PUP would only be approved with additional BMPs specifically to protect water quality. One or more BMPs such as the following would be included in the ***Specific Best Management Practices (BMPs)*** *section to minimize potential surface runoff and leaching that can degrade water quality:*

- *Do not exceed one application per site per year.*
- *Do not use on coarse-textured soils where the ground water table is <10 feet and average annual precipitation >12 inches.*
- *Do not use on steep slopes if substantial rainfall is expected within 24 hours or ground is saturated.*

Along with K_{oc}, soil t½ values would be used in evaluating the potential to degrade groundwater by leaching (see **Potential to Move to Groundwater** below).

Soil Dissipation: Dissipation time (DT_{50}) represents the time required for 50% of the deposited pesticide to degrade and move from a treated site; whereas, soil t½ describes the rate for degradation only. As for t½, units of dissipation time are usually expressed in days. Field dissipation time would be the preferred data for use to estimate pesticide concentrations in the environment because it is based upon field studies compared to soil t½, which is derived in a laboratory. However, soil t½ is the most common persistence data available in the published literature. If field dissipation data are not available, soil half-life data would be used in a Chemical Profile. The average or representative half-life value of most important degradation mechanism would be selected for quantitative analysis for both terrestrial and aquatic environments.

Based upon the DT_{50} value, environmental persistence in the soil also would be categorized as one of the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days.

Threshold for Approving PUPs:

If soil DT_{50} ≤100 days, then a PUP would be approved without additional BMPs to protect water quality.

If soil DT_{50} >100 days, then a PUP would only be approved with additional BMPs specifically to protect water quality. One or more BMPs such as the following would be included in the ***Specific Best Management Practices (BMPs)*** *section to minimize potential surface runoff and leaching that can degrade water quality:*

- *Do not exceed one application per site per year.*
- *Do not use on coarse-textured soils where the ground water table is <10 feet and average annual precipitation >12 inches.*

- *Do not use on steep slopes if substantial rainfall is expected within 24 hours or ground is saturated.*

Along with K_{oc}, soil DT_{50} values (preferred over soil t½) would be used in evaluating the potential to degrade groundwater by leaching (see Potential to Move to Groundwater below), if available.

Aquatic Persistence: Service personnel would record values for aquatic t½, which represents the length of time required for 50% of the deposited pesticide to degrade (completely or partially) in water. Based upon the t½ value, aquatic persistence would be categorized as one of the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days (Kerle et al. 1996).

Threshold for Approving PUPs:

If aquatic t½ ≤100 days, then a PUP would be approved without additional BMPs to protect water quality.

If aquatic t½ >100 days, then a PUP would only be approved with additional BMPs specifically to protect water quality. One or more BMPs such as the following would be included in the ***Specific Best Management Practices (BMPs)*** *section to minimize potential surface runoff and leaching that can degrade water quality:*

- *Do not exceed one application per site per year.*
- *Do not use on coarse-textured soils where the ground water table is <10 feet and average annual precipitation >12 inches.*
- *Do not use on steep slopes if substantial rainfall is expected within 24 hours or ground is saturated.*

Aquatic Dissipation: Dissipation time (DT_{50}) represents the time required for 50% of the deposited pesticide to degrade or move (dissipate); whereas, aquatic t½ describes the rate for degradation only. As for t½, units of dissipation time are usually expressed in days. Based upon the DT_{50} value, environmental persistence in aquatic habitats also would be categorized as one of the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days.

Threshold for Approving PUPs:

If aquatic DT_{50} ≤100 days, then a PUP would be approved without additional BMPs to protect water quality.

If aquatic DT_{50} >100 days, then a PUP would only be approved with additional BMPs specifically to protect water quality. One or more BMPs such as the following would be included in the ***Specific Best Management Practices (BMPs)*** *section to minimize potential surface runoff and leaching that can degrade water quality:*

- *Do not exceed one application per site per year.*
- *Do not use on coarse-textured soils where the ground water table is <10 feet and average annual precipitation >12 inches.*
- *Do not use on steep slopes if substantial rainfall is expected within 24 hours or ground is saturated.*

Potential to Move to Groundwater: Groundwater Ubiquity Score (GUS) = $\log_{10}$(soil t ½) x [4 – $\log_{10}(K_{oc})$]. If a DT_{50} value is available, it would be used rather than a t ½ value to calculate a GUS score. Based upon the GUS value, the potential to move toward groundwater would be recorded as one of the following categories: extremely low potential <1.0, low—1.0 to 2.0, moderate—2.0 to 3.0, high—3.0 to 4.0, or very high >4.0.

Threshold for Approving PUPs:

If GUS ≤4.0, then a PUP would be approved without additional BMPs to protect water quality.

If GUS >4.0, then a PUP would only be approved with additional BMPs specifically to protect water quality. One or more BMPs such as the following would be included in the ***Specific Best Management Practices (BMPs)*** *section to minimize potential surface runoff and leaching that can degrade water quality:*

- *Do not exceed one application per site per year.*
- *Do not use on coarse-textured soils where the ground water table is <10 feet and average annual precipitation >12 inches.*
- *Do not use on steep slopes if substantial rainfall is expected within 24 hours or ground is saturated.*

Volatilization: Pesticides may volatilize (evaporate) from soil and plant surfaces and move off-target into the atmosphere. The potential for a pesticide to volatilize is a function of its vapor pressure that is affected by temperature, sorption, soil moisture, and the pesticide's water solubility. Vapor pressure is often expressed in mm Hg. To make these values easier to compare, vapor pressure would be recorded by Service personnel in exponential form ($I \times 10^{-7}$), where I represents a vapor pressure index. In general, pesticides with I<10 would have low potential to volatilize; whereas, pesticides with I >1,000 would have a high potential to volatilize (Oregon State University 1996). Vapor pressure values for pesticides are usually available in the pesticide product MSDS or the USDA Agricultural Research Service (ARS) pesticide database (see References).

Threshold for Approving PUPs:

If I ≤1,000, then a PUP would be approved without additional BMPs to minimize drift and protect air quality.

If I >1,000, then a PUP would only be approved with additional BMPs specifically to minimize drift and protect air quality. One or more BMPs such as the following would be included in the ***Specific Best Management Practices (BMPs)*** *section to reduce volatilization and potential to drift and degrade air quality:*

- *Do not treat when wind velocities are <2 or >10 mph with existing or potential inversion conditions.*
- *Apply the large-diameter droplets possible for spray treatments.*
- *Avoid spraying when air temperatures >85°F.*
- *Use the lowest spray height possible above target canopy.*
- *Where identified on the pesticide label, soil incorporate pesticide as soon as possible during or after application.*

Octanol-Water Partition Coefficient (K_{ow}): The octanol-water partition coefficient (K_{ow}) is the concentration of a pesticide in octanol and water at equilibrium at a specific temperature. Because octanol is an organic solvent, it is considered a surrogate for natural organic matter. Therefore, K_{ow} would be used to assess potential for a pesticide to bioaccumulate in tissues of aquatic species (e.g., fish). If K_{ow} >1,000 or S_w<1 mg/L and soil t½>30 days, then there would be high potential for a pesticide to bioaccumulate in aquatic species such as fish (USGS 2000).

Threshold for Approving PUPs:

If there is not a high potential for a pesticide to bioaccumulate in aquatic species, then the PUP would be approved.

If there is a high potential to bioaccumulate in aquatic species (K_{ow}>1,000 or S_w<1 mg/L and soil t½>30 days), then the PUP would not approved, except under unusual circumstances where approval would only be granted by the Washington Office.

Bioaccumulation/Bioconcentration: The physiological process where pesticide concentrations in tissue would increase in biota because they are taken and stored at a faster rate than they are metabolized or excreted. The potential for bioaccumulation would be evaluated through bioaccumulation factors (BAFs) or bioconcentration factors (BCFs). Based upon BAF or BCF values, the potential to bioaccumulate would be recorded as one of the following: low – 0 to 300, moderate – 300 to 1,000, or high >1,000 (Calabrese and Baldwin 1993).

Threshold for Approving PUPs:

If BAF or BCF≤1,000, then a PUP would be approved without additional BMPs.

If BAF or BCF>1,000, then a PUP would not approved, except under unusual circumstances where approval would only be granted by the Washington Office.

Worst-Case Ecological Risk Assessment

Max Application Rates (acid equivalent): Service personnel would record the highest application rate of an active ingredient (ae basis) for habitat management and cropland/facilities maintenance treatments in this data field of a Chemical Profile. These rates can be found in Table CP.1 under the column heading "Max Product Rate – Single Application (lbs/acre – AI on acid equiv basis)." This table would be prepared for a Chemical Profile from information specified in labels for trade name products identified in PUPs. If these data are not available in pesticide labels, then write "NS" for "not specified on label" in this table.

EECs: An estimated environmental concentration (ECC) represents potential exposure to fish and wildlife (birds and mammals) from using a pesticide. EECs would be derived by Service personnel using an USEPA screening-level approach (USEPA 2004). For each max application rate [see description under **Max Application Rates (acid equivalent)**], Service personnel would record 2 EEC values in a Chemical Profile; these would represent the worst-case terrestrial and aquatic exposures for habitat management and croplands/facilities maintenance treatments. For terrestrial and aquatic EEC calculations, see description for data entry under **Presumption of Unacceptable Risk/Risk Quotients**, which is the next field for a Chemical Profile.

Presumption of Unacceptable Risk/Risk Quotients: Service personnel would calculate and record acute and chronic risk quotients (RQs) for birds, mammals, and fish using the provided tabular formats for habitat management and/or cropland/facilities maintenance treatments. RQs recorded in a Chemical Profile would represent the worst-case assessment for ecological risk. See Section G.7.2 for discussion regarding the calculations of RQs.

For aquatic assessments associated with habitat management treatments, RQ calculations would be based upon selected acute and chronic toxicological endpoints for fish and the EEC would be derived from Urban and Cook (1986) assuming 100% overspray to an entire 1-foot deep water body using the max application rate (ae basis [see above]).

For aquatic assessments associated with cropland/facilities maintenance treatments, RQ calculations would be done by Service personnel based upon selected acute and chronic toxicological endpoints for fish and an EEC would be derived from the aquatic assessment in AgDRIFT® model version 2.01 under Tier I ground-based application with the following input variables: max application rate (acid basis [see above]), low boom (20 inches), fine to medium/coarse droplet size, 20 swaths, EPA-defined wetland, and 25-foot distance (buffer) from treated area to water.

See Section G.7.2.1.2 for more details regarding the calculation of EECs for aquatic habitats for habitat management and cropland/facilities maintenance treatments.

For terrestrial avian and mammalian assessments, RQ calculations would be done by Service personnel based upon dietary exposure, where the "short grass" food item category would represent the worst-case scenario. For terrestrial spray applications associated with habitat management and cropland/facilities maintenance treatments, exposure (EECs and RQs) would be determined using the Kanaga nomogram method through the USEPA's T-REX version 1.2.3. T-REX input variables would include the following: max application rate (acid basis [see above]) and pesticide half-life (days) in soil to estimate the initial, maximum pesticide residue concentration on general food items for terrestrial vertebrate species in short (<20 cm tall) grass.

For granular pesticide formulations and pesticide-treated seed with a unique route of exposure for terrestrial avian and mammalian wildlife, see Section G.7.2 for the procedure that would be used to calculate RQs.

All calculated RQs in both tables would be compared with Levels of Concern (LOCs) established by USEPA (see Table G-2 in Section G.7.2). If a calculated RQ exceeds an established LOC value (in brackets inside the table), then there would be a potential for an acute or chronic effect (unacceptable risk) to federally listed (T&E) species and nonlisted species. See Section G.7.2 for detailed descriptions of acute and chronic RQ calculations and comparison to LOCs to assess risk.

Threshold for Approving PUPs:

If RQs≤LOCs, then a PUP would be approved without additional BMPs.

If RQs>LOCs, then a PUP would only be approved with additional BMPs specifically to minimize exposure (ecological risk) to bird, mammal, and/or fish species. One or more BMPs such as the following would be included in the ***Specific Best Management Practices (BMPs)*** *section to reduce potential risk to non-listed or listed species:*

- *Lower application rate and/or fewer number of applications so RQs≤LOCs*
- *For aquatic assessments (fish) associated with cropland/facilities maintenance, increase the buffer distance beyond 25 feet so RQs≤LOCs.*

Justification for Use: Service personnel would describe the reason for using the pesticide based control of specific pests or groups of pests. In most cases, the pesticide label will provide the appropriate information regarding control of pests to describe in the section.

Specific Best Management Practices (BMPs): Service personnel would record specific BMPs necessary to minimize or eliminate potential effects to non-target species and/or degradation of environmental quality from drift, surface runoff, or leaching. These BMPs would be based upon scientific information documented in previous data fields of a Chemical Profile. Where necessary and feasible, these specific practices would be included in PUPs as a basis for approval.

If there are no specific BMPs that are appropriate, then Service personnel would describe why the potential effects to refuge resources and/or degradation of environmental quality is outweighed by the overall resource benefit(s) from the proposed pesticide use in the BMP section of the PUP. See Section G.4 of this document for a complete list of BMPs associated with mixing and applying pesticides appropriate for all PUPs with ground-based treatments that would be additive to any necessary, chemical-specific BMPs.

References: Service personnel would record scientific resources used to provide data/information for a chemical profile. Use the number sequence to uniquely reference data in a chemical profile.

The following on-line data resources are readily available for toxicological endpoint and environmental fate data for pesticides:

1. California Product/Label Database. Department of Pesticide Regulation, California Environmental Protection Agency. (http://www.cdpr.ca.gov/docs/label/labelque.htm#regprods)

2. ECOTOX database. Office of Pesticide Programs, U.S. Environmental Protection Agency, Washington, D.C. (http://cfpub.epa.gov/ecotox/)

3. Extension Toxicology Network (EXTOXNET) Pesticide Information Profiles. Cooperative effort of University of California-Davis, Oregon State University, Michigan State University, Cornell University and University of Idaho through Oregon State University, Corvallis, Oregon. (http://extoxnet.orst.edu/pips/ghindex.html)

4. FAO specifications and evaluations for plant protection products. Pesticide Management Unit, Plant Protection Services, Food and Agriculture Organization, United Nations.

5. Human health and ecological risk assessments. Pesticide Management and Coordination, Forest Health Protection, U.S. Department of Agriculture, U.S. Forest Service.

6. Pesticide Chemical Fact Sheets. Clemson University Pesticide Information Center. (http://www.clemson.edu/extension/pest_ed/safety_ed_prog/label_msds/factshee.html)

7. Pesticide Fact Sheets. Published by Information Ventures, Inc. for Bureau of Land Management, Department of Interior; Bonneville Power Administration, U.S. Department of Energy; and Forest Service, U.S. Department of Agriculture.

8. Pesticide Fact Sheets. National Pesticide Information Center. (http://npic.orst.edu/npicfact.htm)

9. Pesticide Fate Database. U.S. Environmental Protection Agency, Washington, D.C. (http://www.epa.gov/opp00001/science/efed_databasesdescription.htm).

10. Pesticide product labels and material safety data sheets. Crop Data Management Systems, Inc. (CDMS) (http://www.cdms.net/pfa/LUpdateMsg.asp) or multiple websites maintained by agrichemical companies.

11. Registered Pesticide Products (Oregon database). Oregon Department of Agriculture. (http://oda.state.or.us/dbs/pest_productsL2K/search.lasso)

12. Regulatory notes. Pest Management Regulatory Agency, Health Canada, Ontario, Canada. (http://www.hc-sc.gc.ca/pmra-arla/)

13. Reptile and Amphibian Toxicology Literature. Canadian Wildlife Service, Environment Canada, Ontario, Canada. (http://publications.gc.ca/site/eng/96287/publication.html)

14. Specific Chemical Fact Sheet – New Active Ingredients, Biopesticide Fact Sheet and Registration Fact Sheet. U.S. Environmental Protection Agency, Washington, DC. (http://www.epa.gov/oppbppd1/biopesticides/)

15. Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas. The Invasive Species Initiative. The Nature Conservancy. (https://www.wilderness.net/toolboxes/documents/invasive/Weed%20Control%20Methods%20Handbook.pdf)

16. Wildlife Contaminants Online. U.S. Geological Survey, Department of Interior, Washington, DC. (http://www.pwrc.usgs.gov/contaminants-online/)

17. One-liner database. 2000. U.S. Environmental Protection Agency, Office of Pesticide Programs, Washington, DC.

Chemical Profile

Date:			
Trade Name(s):		**Common Chemical Name(s):**	
Pesticide Type:		**EPA Registration Number:**	
Pesticide Class:		**CAS Number:**	
Other Ingredients:			

Toxicological Endpoints

Mammalian LD_{50}:	
Mammalian LC_{50}:	
Mammalian Reproduction:	
Avian LD_{50}:	
Avian LC_{50}:	
Avian Reproduction:	
Fish LC_50:	
Fish ELS/Life Cycle:	
Other:	

Ecological Incident Reports

Environmental Fate

Water solubility (S_w):	

Soil Mobility (K_{oc}):	
Soil Persistence (t½):	
Soil Dissipation (DT_{50}):	
Aquatic Persistence (t½):	
Aquatic Dissipation (DT_{50}):	
Potential to Move to Groundwater (GUS score):	
Volatilization (mm Hg):	
Octanol-Water Partition Coefficient (K_{ow}):	
Bioaccumulation/Bioconcentration:	**BAF:** **BCF:**

Worst Case Ecological Risk Assessment

Max Application Rate (ai lbs/acre – ae basis)	**Habitat Management:** **Croplands/Facilities Maintenance:**
EECs	**Terrestrial (Habitat Management):** **Terrestrial (Croplands/Facilities Maintenance):** **Aquatic (Habitat Management):** **Aquatic (Croplands/Facilities Maintenance):**

Habitat Management Treatments:

Presumption of Unacceptable Risk		**Risk Quotient (RQ)**	
		Listed (T&E) Species	**Nonlisted Species**
Acute	Birds	[0.1]	[0.5]
	Mammals	[0.1]	[0.5]
	Fish	[0.05]	[0.5]
Chronic	Birds	[1]	[1]
	Mammals	[1]	[1]
	Fish	[1]	[1]

Cropland/Facilities Maintenance Treatments:

Presumption of Unacceptable Risk		**Risk Quotient (RQ)**	
		Listed (T&E) Species	**Nonlisted Species**
Acute	Birds	[0.1]	[0.5]
	Mammals	[0.1]	[0.5]
	Fish	[0.05]	[0.5]
Chronic	Birds	[1]	[1]
	Mammals	[1]	[1]
	Fish	[1]	[1]

Justification for Use:	
Specific Best Management Practices (BMPs):	
References:	

Table CP.1 Pesticide Name

Trade Name[a]	Treatment Type[b]	Max Product Rate – Single Application (lbs/acre or gal/acre)	Max Product Rate -Single Application (lbs/acre - AI on acid equiv basis)	Max Number of Applications Per Season	Max Product Rate Per Season (lbs/acre/ season or gal/acre/ season)	Minimum Time Between Applications (Days)

[a]From each label for a pesticide identified in pesticide use proposals (PUPs), Service personnel would record application information associated with possible/known uses on Service lands.
[b]Treatment type: H – habitat management or CF – cropland/facilities maintenance. If a pesticide is labeled for both types of treatments (uses), then record separate data for H and CF applications.

G.10 References

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Appendix H. Common Acronyms and Abbreviations

ABC	American Bird Conservancy
Ac	Acres
Administration Act	National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee)
AHPA	Archaeological and Historic Preservation Act
ARPA	Archaeological Resources Protection Act
ATS	Alternative Transportation Study
ATSDR	Agency for Toxic Substances and Disease Registry
AUF	Appropriate Use Findings
BIDEH	Biological Integrity, Diversity, and Environmental Health
BMP	Best Management Practices
CCP	Comprehensive Conservation Plan
CD	Compatibility Determination
CEQ	White House Council on Environmental Quality
CFR	Code of Federal Regulations
CO_2	Carbon Dioxide
CWCS	Comprehensive Wildlife Conservation Strategy
DLNR	Department of Land and Natural Resources
DM	Departmental Manual
DFM	Deferred Maintenance
DO	U.S. Fish and Wildlife Service Director's Order
DOFAW	Division of Forestry and Wildlife
Draft CCP/EA	Draft Comprehensive Conservation Plan and Environmental Assessment
EA	Environmental Assessment
EE	Environmental Education
ENSO	El Niño Southern Oscillation
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act of 1973
FHWA	Federal Highways Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FONSI	Finding of No Significant Impact
FW	U.S. Fish and Wildlife Service Manual
FY	Fiscal Year
Ft	Feet (Foot)
GHG	Greenhouse Gases
HDOE	Hawai‘i Department of Education
HEEA	Hawai‘i Environmental Education Alliance
HELP	Hawai‘i Environmental Literacy Plan
HIHWNMS	Hawaiian Islands Humpback Whale National Marine Sanctuary
HPINWRC	Hawaiian and Pacific Islands National Wildlife Refuge Complex
I&M	Inventory and Monitoring
IBA	Important Bird Area
Improvement Act	National Wildlife Refuge System Improvement Act of 1997
In	Inch(es)

IPCC	Intergovernmental Panel on Climate Change
IPM	Integrated Pest Management
KNWRC	Kaua‘i National Wildlife Refuge Complex
KPNHA	Kīlauea Point Natural History Association
LE	Law Enforcement
LEIS	Legislative Environmental Impact Statement
LWCF	Land and Water Conservation Fund
MBCA	Migratory Bird Conservation Act
MBTA	Migratory Bird Treaty Act
MGR	Median Gross Rent
Mi	Mile(s)
MMS	Maintenance Management System
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NAGPRA	Native American Graves Repatriation Act
NAS	National Audubon Society
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NRCS	USDA Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
NWPS	National Wilderness Preservation System
NWRS or Refuge System	National Wildlife Refuge System
RM	National Wildlife Refuge System Manual
OHA	Office of Hawaiian Affairs
ORV	Off-road Vehicles
PICCC	Pacific Islands Climate Change Cooperative
PIFWO	Pacific Islands Fish and Wildlife Office
PUP	Pesticide Use Proposal
RAPP	Refuge Annual Performance Plan
RHPO	Regional Historic Preservation Officer
RO	Regional Office
RONS	Refuge Operational Needs System
RRS	Refuge Revenue Sharing
SAMMS	Service Asset Maintenance and Management System
SCORP	State Comprehensive Outdoor Recreation Plan
SDMP	Step-down Management Plan
SHPO	State Historic Preservation Office
SLR	Sea Level Rise
SOC	Species of Concern
SUP	Special Use Permit
T&E	Threatened and Endangered
TAG	Transportation Assistance Group
TBD	To Be Determined
USFWS, FWS, the Service	U.S. Fish and Wildlife Service

USC	United States Code
USGS	U.S. Geological Survey
WSA	Wilderness Study Area

Appendix I. CCP Team Members and Public Involvement

I.1 CCP Team Members

The draft CCP/EA was developed and prepared primarily by a core team made up of local Refuge staff and Regional Office staff. The core team sought expertise and review from professionals from several different agencies and organizations. The List of Preparers below includes core team members as well as the people who wrote specific portions of the plan. Many others provided assistance in developing and reviewing the draft CCP/EA and associated products and in providing advice through the planning process. These people are captured in the List of Reviewers and Advisors.

Table I-1. List of Preparers (in alphabetical order).

Name and title	CCP Contributions
Noreen Bautista, Administrative Officer, KNWRC	Developer/reviewer: visitor services goals/objectives/strategies; analysis; budget
Shayna Carney, Acting Visitor Services Manager, KNWRC (departed 2011)	Writer/reviewer: lead on visitor services goals/objectives/strategies; affected environment and environmental consequences; research/analysis
Liz Cruz, Geographer/GIS Specialist, RO *replaced,* David Hoy, Geographer/GIS Specialist, RO	GIS data gathering and analysis (e.g., habitats and vegetation, infrastructure, public use, alternatives development); development of maps for public involvement and documents
Catherine Cullinane-Thomas, Economist, Policy Analysis & Science Assistance Branch, Fort Collins Science Center/US Geological Survey	Writer/analysis: affected environment and environmental consequences (economics)
Padraic Gallagher, Park Ranger (previously Administrative Assistant), KNWRC	Developer/reviewer: cultural and historic goals/objectives/strategies; CCP mailing list; administrative support for workshops, meetings, and public open houses
Sandra Hall, External Affairs, HPINWRC	Layout and reviewer of planning updates; assisted with formatting of CCP document
Lynne Koontz, Economist, Policy Analysis & Science Assistance Branch, Fort Collins Science Center/US Geological Survey	Writer/analysis: affected environment and environmental consequences (economics)
Laurie Miskimins, Transportation Planner, Federal Highways Administration-Central Federal Lands Highway Division	Writer/analysis: affected environment and environmental consequences
Michael Mitchell, Deputy Project Leader, KNWRC	Writer/reviewer: biological and maintenance and facilities goals/objectives/strategies, affected environment and environmental consequences; assist coordination with staff and public/partners; reviewed AUFs/CDs
Steve Moore, Big Foot Consulting	Writer of environmental consequences and appendices A and B

Name and title	CCP Contributions
Robert Petersen, Facilities and Maintenance, KPNWR *replaced,* Ron Langdon, Facilities and Maintenance (departed 2008)	Writer/reviewer: maintenance and facilities goals/objectives/strategies, affected environment and environmental consequences
Sheri Saari, Park Ranger, KPNWR (departed)	Writer/reviewer: visitor services goals/objectives/strategies; writer: affected environment
Natalie Sexton, Policy Analysis & Science Assistance Branch, Fort Collins Science Center/US Geological Survey	Writer/analysis: affected environment and environmental consequences (social)
Chadd Smith, Facilities and Maintenance, Hanalei and Hulēʻia NWRs	Assisted with public open houses and participated in development of goals and objectives
Shannon Smith, Project Leader, KNWRC *replaced,* Mike Hawkes, Project Leader, KNWRC (departed 2008)	Decision-maker and document quality reviewer; public involvement and communications (including coordination of Federal, State, County, partner, and community organizations); compatibility determinations and implementation; overall guidance for CCP development and coordination with staff
Khem So, Conservation Planner, RO, *replaced* Christine Ogura, Natural Resource Planner, HPINWRC (departed 2013) *replaced,* Bill Perry, Refuge Conservation Planner, HPINWRC (departed 2010) *replaced,* Charlie Pelizza, Refuge Conservation Planner, HPINWRC (departed 2008)	CCP team leader responsible for regional and Honolulu office coordination and process and policy guidance for CCP development; CCP schedule manager; facilitator of team, partner, and public meetings/workshops; document and related product management (including planning record), format and review; writer of affected environment and environmental consequences and planning updates; public involvement and communications
Andrew Swan, Park Ranger, KPNWR (departed 2010)	Developer: visitor services goals/objectives/strategies; writer: affected environment
Kimberly Uyehara, Biologist, KNWRC *replaced,* Brenda Zaun, Biologist, KNWRC (departed 2008)	Writer/reviewer: lead on biological goals/objectives/strategies, biological component on affected environment and related environmental consequences; biological resources of concern, taxa lists and habitats, integrated pest management; research/analysis; coordinate with biological and natural resource management partners; reviewed AUFs/CDs
Jennifer Waipa, Supervisory Park Ranger, KPNWR	Writer/reviewer: lead on cultural and historic goals/objectives/strategies, affected environment, and environmental consequences

Table I-2. List of Reviewers and Advisors (in alphabetical order).

Name and title	CCP Contributions
Marie Bruegmann, Botanist, Ecological Services, USFWS-PIFWO	Reviewer of plant restoration strategies
Joe Engler, Assistant Regional Biologist, RO	Review of biological goals/objectives/strategies; AUFs and CDs; IPM
Bridgette Flanders-Wanner, Assistant Regional Refuge Biologist and Regional IPM Coordinator, RO	Lead reviewer of biological goals/objectives/strategies; AUFs and CDs; IPM
Kevin Foerster, Regional Chief of Refuges, RO *replaced,* Robin West, Regional Chief of Refuges, RO (retired 2014)	Major decisions on CCP direction, CCP/EA and Federal Register Notice approvals
Glenda Franich, Visitor Services and Communication, RO, *replaced,* Patrick Stark, Visitor Services and Communication, RO (departed)	Document and related products (e.g., planning update) print management; CCP cover design
Holly Freifeld, Biologist, Division of Migratory Birds and Habitat Programs, RO (departed)	Reviewer of biological goals/objectives/strategies
Ben Harrison, Deputy Regional Chief of Refuges (formerly Division Chief, Natural and Cultural Resources), RO (retired 2014)	CCP Advisor, reviewer of policy, AUF, CDs, environmental consequences, and wilderness
Jeff Holm, Chief, Branch of Transportation, RO	Review of transportation-related goals/objective/strategies
Charles Houghten, Division Chief, Realty and Refuge Information, RO	CCP Advisor for planning policy and guidance; reviewer; coordination with other divisions and the Washington, DC, office
Jean Kenyon, Regional Inventory and Monitoring Specialist, (RO-Honolulu)	Reviewer of biological inventory and monitoring strategies
Kay Kier-Haggenjos, Writer/Editor, RO	Technical edit review and processing of Federal Register notices; review and processing of document and related products (e.g., planning updates); website management
Kevin Kilbride, Regional Inventory and Monitoring Coordinator, RO	Reviewer of biological goals/objectives/strategies; AUFs and CDs; IPM
Nicole McCarthy, Writer/Editor, RO	Technical edit of document; assist with public comment period coordination
Scott McCarthy, Branch Chief, Planning, RO	CCP Advisor for planning policy and guidance; planning workload priorities; coordination with other divisions
Mike Marxen, Branch Chief ,Visitor Services, RO	Visitor Services review and guidance on public use goals/objectives/strategies; assistance with related alternatives development workshop

Name and title	CCP Contributions
Don Palawski, Deputy Project Leader, HPINWRC (retired), Jerry Leinecke, Deputy Project Leader, HPINWRC (retired 2009)	Assist with Regional Office coordination; reviewer of document and related products; guidance on overall process and components
Charles Parrott, Realty Specialist, RO	Realty analysis, review of related sections in document, assisted with verifying map accuracy
Fred Paveglio, Branch Chief Refuge Biology, RO (retired 2010)	Development and review of biological goals/objectives
Anan Raymond, Regional Archaeologist, RO	Review of cultural and historic resources goals/objectives/strategies and affected environment and environmental consequences
Andre Raine, Coordinator, Kaua‘i Endangered Seabird Recovery Project	Review of biological objectives and strategies
Barry Stieglitz, Project Leader, HPINWRC	Decision-maker; reviewer of document and related products
Robyn Thorson, Regional Director, RO	Final decision-maker, CCP/EA and Federal Register Notice approvals
Jared Underwood, Zone Inventory and Monitoring Biologist, HPINWRC	Reviewer of biological inventory and monitoring strategies
Lee Ann Woodward, Resource Contaminants Specialist, Pacific Reefs NWRC	Reviewer of contaminants section in affected environments

I.2 Summary of Public Involvement

The initial CCP planning process for the Kaua‘i National Wildlife Refuge Complex, which includes the three national wildlife refuges Hanalei, Hulē‘ia, and Kīlauea Point, began in 2007. A core team and an expanded team was formed to guide development of the CCP. However, CCP development was not restricted to just these teams: we held workshops and meetings with local, State, and Federal agencies, elected officials, community groups, Refuge users, nonprofit organizations, and others. Additionally, public scoping occurred during 2009–2010 and over 80 people participated. This helped us to further identify issues and priorities to consider during CCP development (see Chapter 1). Another public open house to share the draft alternatives we developed was held in August 2011; over 20 people participated during the public comment period. We provided planning updates throughout the development of the draft CCP/EA, which allowed for comment opportunities to assist with alternatives development. Following is a brief summary of public involvement:

- September 28, 2009 – Federal Register Notice announcing a notice of intent to prepare the draft CCP/EA and public open house meetings;
- October 8, 2009 – Talk story session at Hanalei;
- November 4, 2009 – Talk story session at Kīlauea;
- January 2010 – Planning Update 1 announcing the official start of public scoping with public open house meetings, summarizing talk story sessions already held, and previewing preliminary issues and goals for CCP consideration;
- January 12, 2010 – Talk story session at Hulē‘ia;

- January 22, 2010 – News release to announce public open house meetings;
- January 26, 2010 – Public open house at Līhu‘e Public Library;
- January 28, 2010 – Public open house at Kīlauea Elementary School;
- February 2011 – Planning Update 2 summarized the public scoping efforts and outlined the next steps in CCP development;
- March 21–25, 2011 – Alternative Transportation Workshop with various agencies (County, State, Federal);
- August 10, 2011 – Public open house to share initial draft alternatives developed;
- 2010-2011 – Refuge staff also held specific meetings to provide updates and discuss management considerations with partners and interested parties (e.g., Division of Forestry and Wildlife, KPNHA, NOAA, elected officials).

Distribution and notification of the opportunities above was done using multiple methods including news releases, a mail/email list of over 500 people—interested individuals, kūpuna, local conservation and interest groups, research organizations, Native Hawaiian organizations, and local, State, and Federal government agencies and elected officials—community and association events and meetings, and a CCP-specific website (http://www.fws.gov/refuge/Kilauea_Point/what_we_do/planning.html).

The draft CCP/EA reflects this extensive public involvement in all chapters as issues identified and related goals/objectives/strategies. The alternatives drafted were shaped by the feedback received during public involvement. The following table summarizes the comments heard during public scoping and identifies where or how it was addressed in the draft CCP/EA.

Table I-3. Summary of Scoping Comments.

Issue	Where/How Addressed in Draft CCP/EA
Focus visitors at Kīlauea Point NWR with smaller-scale opportunities at Hanalei NWR	Visitor use has been focused at Kīlauea Point NWR (see Chapter 2 for the preferred alternative)
Concern about being overrun by tours to raise money for the Refuge	It is not the intent of the Refuge to grow visitation. It is our desire to provide high-quality visitor experiences. For this reason, the Refuge’s preferred alternative is D, which would allow more focused visitation that is managed in a quality way (see Chapter 2)
Ensure there are ample opportunities for young people on the Refuge	We would provide opportunities through environmental education as well as research/partnership strategies to involve young people (see Chapter 2)
Other visitor services opportunities: expansion of hiking opportunities at all three refuges and an interpretive person at both the Kīlauea Point NWR and Hanalei NWR overlooks	Interpretive hiking opportunities and increased interpretation with more available staff are identified as strategies under several of the alternatives proposed for visitor services, including the preferred alternative (see Chapter 2)
Partnerships with specific organizations such as local high schools and the Kaua‘i Community College	This has been incorporated as part of research and partnerships (see Chapter 2)

Issue	Where/How Addressed in Draft CCP/EA
Develop additional outreach and education opportunities (e.g., web cams and a virtual tour on the Refuge website)	These opportunities are identified in Chapter 2
Add a goal of evaluating expansion of the sites to include other important habitats on the island or adjacent to existing Refuge areas	At this time, given the 15-year horizon of this plan and the fact that the Refuge already underwent an expansion process in 2007, there are no strategies for additional expansion for habitat purposes identified. However, we will continue to work with willing sellers to acquire the current inholdings. Please see Chapter 2 under Common to All Alternatives under acquisition of inholdings.
Develop a walking trail up Crater Hill for wildlife and sunset viewing and a parking lot for sunset viewing	Crater Hill interpretive hikes are listed under several of the alternatives (including the preferred). Sunset viewing was considered but not developed (see Chapter 2 for reasoning on both issues)
Create pedestrian or bicycle access path or lane to the lighthouse	A pedestrian path was identified under some alternatives as well as providing bike parking at the overlook. However, neither are offered directly to the lighthouse (see Chapter 2)
Enhance the overlook including public toilets, trash cans, and signage	See Chapter 2 related to the objective 4.2, improving visitor information and orientation
The Service should consider having a more formal visitor center/facility at Kīlauea Point NWR	This is identified in alternatives C and D, the preferred alternative. See Chapter 2
The Service should incorporate and interpret Hawaiian culture, potential to do cultural demonstrations for fishing	Better integration of Native Hawaiian culture into our interpretive program is identified in Goal 5 in Chapter 2
Enhance community partnerships, especially in the areas of transportation planning at Kīlauea Point NWR	See Chapter 2 where several partnering strategies have been identified. Additionally, the draft CCP/EA was developed using previous transportation planning initiatives such as the Alternative Transportation Study and Transportation Assistance Group (TAG), which involved community participation
Implement small-scale improvements to improve traffic congestion and visitor safety	This is a Common to All Alternatives strategy and can be seen in Chapter 2 as part of implementing some of the recommendations which came out of TAG
Kīlauea Point NWR's expansion should continue in coordination with willing sellers	It is Service policy to work with willing sellers. Please see Chapter 2 under Common to All Alternatives under acquisition of inholdings
Fishing outside of the normal operating hours. Fish do not run at 10 a.m.; sunset and sunrise are key fishing times	Fishing is addressed in the related compatibility determination, which can be found in Appendix B
Protection of important historic properties and consideration of moving the administrative facilities to adjacent lands and restoring historic structures. This would provide an opportunity to interpret	Please see Goal 5 for protection of historic properties and Goal 4 where the moving of administrative facilities and interpretation are proposed under alternatives C and D (see Chapter 2)

Issue	Where/How Addressed in Draft CCP/EA
the history of Kīlauea Point, including the light station	
Closing the Refuge, will that really make a difference to wildlife; [Closing the refuge] Resources and employees (healthier for longevity) need rest; Very important to close 1 day/week (Sunday suggested), will set [positive] precedent; Would like to see Refuge opened 7 days a week if at all possible	Due to flat and declining budgets, starting in February 2014, the Service reduced the days that Kīlauea Point proper is opened to the general public from 7 to 5 days a week. The Refuge is closed each Sunday and Monday. After a trial period of 1 year, the visitation days will be reassessed to see if it would be possible to reopen on a 6- or 7-day-a-week schedule. However, closures will continue to be a management option depending upon the availability of staff and resources.
Keep the bookstore on the Point	This is one option offered in two out of the four alternatives considered
Possibly expand current [visitor services] footprint (e.g., interactive exhibits)	This is identified under several of the alternatives proposed, including the preferred alternative
Increase wildlife, not tourism; Purpose of Kīlauea Point NWR is for the birds (it doesn't have to be Disneyland); Getting cars out of there will set an example for fragile places; Maintain historical and biological integrity of the Point (Point cannot deal with 10–15% increase in visitation); Restore center of "where the birds live" – more meaningful than closing the Refuge for 1 day/week; Taking things off the Point is very good; Wildlife first, no Crater Hill hikes; Keeping areas free of human disturbance (e.g., Crater Hill hikes). Any hikes during nēnē breeding season and red-footed booby breeding are of concern as hikes will be negative and these birds are generally sensitive to human disturbance. Keep current Crater Hill access status (only for maintenance, biological monitoring, one or two time periods during as NWRS week). Other parts of Kīlauea Point NWR are managed for visitors and EE so Mōkōlea Point and Crater Hill should be for habitats and native plants/seabirds; Concern over concentration of time, attention, and resources going into VS program, possibly at the expense of biological program. Should not go away from primary purpose and mission (conservation, management and restoration of habitat and biological resources)	Our preferred alternative focuses on increasing wildlife at the Refuge, while minimizing impacts of visitor use. As stated previously, it is not the intent of the Refuge to grow visitation or to turn it into a Disneyland-like venue. It is our desire to provide quality (not quantity) visitor experiences. For this reason, the Refuge's preferred alternative would allow more focused visitation that is managed in a quality way (see Chapter 2). Interpretive hikes are still considered in our alternatives as they help to build biological knowledge as well as conservation support for Refuge management Mōkōlea Point and Crater Hill are not open to the general public in any of the alternatives. Interpretive hikes would only be allowed on Crater Hill in limited numbers and not during important breeding seasons or other sensitive times of the year. Additionally, these hikes would be guided by Refuge-authorized personnel

Issue	Where/How Addressed in Draft CCP/EA
No buildings on Crater Hill/ Building on Crater Hill corner is an encroachment on habitat, therefore Alt D is better	Our preferred alternative does not build on Crater Hill, though this strategy is still retained in Alternative C
Building on Service-owned property would require less overall funding to move the project forward, location is closer to the Refuge and this might benefit both staff and visitors	This strategy was kept, but is not our preferred
Secondary hub should be in commercial area; Pavilion's property better alternative; If the Visitor Center (VC) location were on the highway in the area behind the existing VC and a new bypass road was constructed, I would support this alternative; Do not like a site in Kīlauea Town Center (Refuge/ Lighthouse is a "stand alone" site and should have its own unique and separate [site] from the town location); Buy agricultural park from county along Kahili Rock quarry road and place VC/trans hub there	Actual location would be identified in a separate planning process should the alternative containing these strategies be selected and funding made available to proceed. Efforts would be made to coordinate the location with potential bypass (see Chapter 2 paragraph on the bypass issue)
Consider combining the hub with other entities (NOAA-Haena State Park); Expand the area to be considered out to 3 miles to include Princeville airport; Shuttles from 2 miles away are another expenditure that would have to be paid for from Refuge funds or by increased fees; deters visitors, takes time away from visitor vacation day, and typically less time would be spent on the Refuge because spent shuttling to and from	Every effort would be made to partner with other initiatives in the area, however, it was determined that looking within 1 mile of the Refuge boundary would allow visitors to have a better visitor experience by being closer to the Refuge and its resources and fulfill our objective of providing "quality" visitor services
Will there be snacks at the VC? Bids for local Kīlauea vendors [should be sought]. Should be available to local family. [Bids should go to local vendors and local families.] KPNHA bookstore should incorporate a café (coffee, snack, drinks—this would provide an opportunity to talk over experience just had); Movie booths in new VC; what type of shuttle and will there be a related park and ride; Could charge a small fee for Lighthouse tours; Could charge a small fee for Crater Hill tours	These details will be identified in a separate planning process should the alternative containing these strategies be selected and funding made available to proceed
Would like to see history of WWII on Crater Hill (offer guided hikes 2–3x/day)	See Goals 4 and 5 in Chapter 2. Though the history of WWII would not necessarily be the sole focus of proposed interpretive hikes, it would be woven into the narrative

Issue	Where/How Addressed in Draft CCP/EA
Utilize other surfaces that are porous and still ADA/Reduce asphalt if possible	See alternatives C and D for reducing cars on the Point. Also note that Goal 4 wording identifies "Ensure that visitors and kamaʻāina of all ages and abilities feel welcome"
Like objectives in goals 1 and 3 (habitat restoration, predator control), a predator control staff person is important; Recruit more volunteers to work on habitat	For staffing and funding information, please see Appendix C. Volunteers are identified as important in supporting Refuge management. See Chapter 2
Provide direct trail access to the overlook area in Sea Cliff (not through gated subdivision for sunset viewing and or environmental viewing)	This access is already provided for non-vehicular users
Provide safe public access to Rock Quarry by fixing road access way	The road to this area is owned by multiple entities. The Refuge maintains its portion of the road and is open to partnering with the other landowners for road repairs to allow for safe public access
Crater Hill – install a boardwalk and have information stops along the way. Self-tours and the boardwalk would keep people off the Hill itself	Boardwalks would be difficult to maintain given the sea salt and windy environment. Interpretive hikes, given the species present, will be conducted by a Refuge-authorized agent to ensure a quality experience, while minimizing biological impacts
Erect some small, elevated areas on all sides of the Point where children could get a better view. A clear plastic barrier could be used for protection	Current viewfinders already have a step-up for children attached to them and binoculars are also provided
Feasibility was a common comment with everyone	Please see Appendix C for funding information and cost comparisons between alternatives

Appendix J. Kīlauea Point NWR Species Lists

Partial list of species that occur at Kīlauea Point NWR

Status: End = Endemic, Ind = Indigenous, Mig = Migratory, Pol = Polynesian introduced, Int = Introduced, E = Endangered, T = Threatened, C = Candidate, SOC = Species of Concern, R = Rare

PLANTS

Family	Scientific Name	Common Name	Hawaiian Name	Status
Dicots				
Acanthaceae - Acanthus	*Asystasia gangetica*	Chinese violet		Int
Acanthaceae - Acanthus	*Barleria repens*	Barleria		Int
Acanthaceae - Acanthus	*Justicia betonica*	White shrimp plant		Int
Acanthaceae - Acanthus	*Pseuderanthemum carruthersii*	Golden eldorado		Int
Acanthaceae - Acanthus	*Thunbergia fragrans*	Sweet clock-vine		Int
Aizoaceae - Fig-marigold	*Sesuvium portulacastrum*	Sea purslane	‘ākulikuli	Ind
Aizoaceae - Fig-marigold	*Tetragonia tetragonioides*	New Zealand spinach		Int
Amaranthaceae - Amaranth	*Amaranthus viridis*	Slender amaranth	pakai, `āheahea	Int
Anacardiaceae - Mango	*Schinus terebinthifolius*	Christmasberry	wilelaiki	Int
Apocynaceae - Dogbane	*Allamanda cathartica*	Yellow allamanda		Int
Apocynaceae - Dogbane	*Thevetia peruviana*	Be-still tree, yellow oleander, lucky nut		Int
Araliaceae - Ivy	*Schefflera actinophylla*	Octopus tree		Int
Araliaceae - Ivy	*Tetraplasandra kavaiensis*		‘ohe‘ohe	End
Asteraceae - Sunflower	*Ageratum conyzoides*	Tropic ageratum	maile hohono, maile honohono, maile kula	Int
Asteraceae - Sunflower	*Aster subulatus var. sandwicensis*	Annual saltmarsh aster		Int
Asteraceae - Sunflower	*Bidens alba var. radiata*	Beggartick		Int
Asteraceae - Sunflower	*Bidens pilosa*		kī, kī nehe, kī pipili, nehe	Int
Asteraceae - Sunflower	*Conyza bonariensis*	Hairy horseweed		Int
Asteraceae - Sunflower	*Cyanthillium cinereum*	Little ironweed		Int
Asteraceae - Sunflower	*Eclipta prostrata*	False daisy		Int
Asteraceae - Sunflower	*Emilia fosbergii*		pualele	Int

Family	Scientific Name	Common Name	Hawaiian Name	Status
Asteraceae - Sunflower	*Erigeron bellioides*	Daisy fleabane		Int
Asteraceae - Sunflower	*Lipochaeta lobata*		nehe	End
Asteraceae - Sunflower	*Lipochaeta succulenta*		nehe	End
Asteraceae - Sunflower	*Parthenium hysterophorus*	Santa Maria		Int
Asteraceae - Sunflower	*Pluchea carolinensis*	Sourbush		Int
Asteraceae - Sunflower	*Pluchea indica*	Indian fleabane, Indian pluchea		Int
Asteraceae - Sunflower	*Pluchea x fosbergii*	Marsh fleabane		Int
Asteraceae - Sunflower	*Pseudognaphalium sp.*	Gnaphalium		Int
Asteraceae - Sunflower	*Sonchus oleraceus*		pualele	Int
Asteraceae - Sunflower	*Sphagneticola trilobata*	Bay Biscayne Creeping-oxeye		Int
Asteraceae - Sunflower	*Synedrella nodiflora*	Node weed		Int
Asteraceae - Sunflower	*Xanthium strumarium var. canadense*	cocklebur		Int
Bignoniaceae - Bignonia	*Tabebuia sp.*	Trumpet tree		Int
Boraginaceae - Borage	*Carmona retusa*	Fukien tea		Int
Boraginaceae - Borage	*Cordia subcordata*		kou	Ind
Brassicaceae - Mustard	*Cardamine flexuosa*	Bittercress		Int
Brassicaceae - Mustard	*Lepidium virginicum*	Peppergrass		Int
Campanulaceae - Bellflower	*Cyanea sp.*	Cyanea	hāhā	End
Campanulaceae - Bellflower	*Hippobroma longiflora*	Star of bethlehem		Int
Caricaceae - Papaya	*Carica papaya*	Papaya	mīkana, hē‘ī, milikana, papaia	Int
Casuarinaceae - She-oak	*Casuarina equisetifolia*	Common ironwood	paina	Int
Chenopodiacea - Goosefoot	*Chenopodium murale*	Lamb's quarters	`āheahea	Int
Chenopodiacea - Goosefoot	*Chenopodium oahuense*		`āheahea, ahea, `āhewahewa, alaweo, `āweoweo, kāha`iha`i	End
Clusiaceae - Mangosteen	*Clusia rosea*	Autograph tree		Int
Combretaceae - Combretums	*Terminalia catappa*	Tropical or Indian almond	false kamani, kamani haole, kamani `ula	Int

Family	Scientific Name	Common Name	Hawaiian Name	Status
Convolvulaceae - Morning glory	*Ipomoea obscura*	Obscure morning glory		Int
Convolvulaceae - Morning glory	*Ipomoea pes-caprae*	Beach morning glory	pohuehue	Ind
Convolvulaceae - Morning glory	*Jaquemontia ovalifolia sandwicensis*		pā`ūohi`iaka, kākuaohi`iaka, kaupo`o	End
Crassulaceae - Orpine	*Kalanchoe pinnata*	Air plant	ʻoliwa kū kahakai	Int
Euphorbiaceae - Spurge	*Aleurites moluccana*	Kukui nut		Int
Euphorbiaceae - Spurge	*Chamaesyce celastroides var. celastroides*		`akoko, koko, `ekoko, kōkōmālei	End
Euphorbiaceae - Spurge	*Chamaesyce celastroides var. stokesii*		`akoko, koko, `ekoko, kōkōmālei	End
Euphorbiaceae - Spurge	*Codiaeum variegatum*	Croton		Int
Euphorbiaceae - Spurge	*Euphorbia hypericifolia*	Graceful spurge		Int
Euphorbiaceae - Spurge	*Euphorbia serpens*	Matted sandmat		Int
Euphorbiaceae - Spurge	*Euphorbia thymifolia*	Spurge		Int
Euphorbiaceae - Spurge	*Pedilanthus tithymaloides*	Slipper flower		Int
Euphorbiaceae - Spurge	*Phyllanthus debilis*	Niruri		Int
Euphorbiaceae - Spurge	*Ricinus communis*	Castor bean		Int
Fabaceae - Pea	*Acacia koa*		koa, koaiʻa	End
Fabaceae - Pea	*Canavalia cathartica*		maunaloa	Int
Fabaceae - Pea	*Chamaecrista nictitans*	Partridge pea		Int
Fabaceae - Pea	*Crotalaria incana*	Fuzzy rattle pod		Int
Fabaceae - Pea	*Desmanthus pernambucanus*	Slender mimosa		Int
Fabaceae - Pea	*Desmodium incanum*	Spanish clover		Int
Fabaceae - Pea	*Desmodium triflorum*	Tick clover		Int
Fabaceae - Pea	*Leucaena leucocephala*	Lead tree	ēkoa, haole koa, koa haole, lilikoa	Int
Fabaceae - Pea	*Mimosa pudica*	Sensitive plant, sleeping grass	pua hilahila	Int
Fabaceae - Pea	*Neonotonia wightii*	Glycine		Int
Fabaceae - Pea	*Senna pendula*	Pendant senna		Ind

Family	Scientific Name	Common Name	Hawaiian Name	Status
Fabaceae - Pea	*Vigna marina*	Beach pea	nanea, mohihihi, lemuoma-kili	Ind
Goodeniaceae - Goodenia	*Scaevola sericea*		naupaka kahakai, huahekili, naupaka kai	Ind
Lamiaceae - Mint	*Hyptis pectinata*	Comb hyptis		Int
Lamiaceae - Mint	*Stachys arvensis*	Staggerweed		Int
Malvaceae - Hibiscus	*Abutilon grandifolium*	Hairy abutilon		Int
Malvaceae - Hibiscus	*Hibiscus rosa-sinensis*	Hibiscus		Int
Malvaceae - Hibiscus	*Hibiscus tiliaceus*	Sea rosemallow	hau	Pol?
Malvaceae - Hibiscus	*Malvastrum coromandelianum subsp. Coromandelianum*	False mallow		Int
Malvaceae - Hibiscus	*Sida acuta*	Sida		Int
Malvaceae - Hibiscus	*Sida ciliaris*	Red ilima		Int
Malvaceae - Hibiscus	*Sida fallax*		‘ilima	Ind
Malvaceae - Hibiscus	*Sida rhombifolia*	Cuban jute		Int?
Moraceae - Mulberry	*Ficus elastica*	Rubber tree		Int
Moraceae - Mulberry	*Ficus microcarpa*	Chinese banyan tree		Int
Myoporaceae - Myoporum	*Myoporum sandwicense*	Bastard sandalwood	naio, naeo, naieo	Ind
Myrtaceae - Myrtle	*Metrosideros polymorpha*		‘ōhi‘a lehua	End
Myrtaceae - Myrtle	*Psidium cattleianum*	Strawberry guava		Int
Myrtaceae - Myrtle	*Psidium guajava*	Common guava	kuawa, kuawa ke‘oke‘o, kuawa lemi, kuawa momona, puawa	Int
Myrtaceae - Myrtle	*Syzygium cumini*	Java plum		Int
Nyctaginaceae - Four-o'clock	*Boerhavia coccinea*	Boerhavia		Int
Nyctaginaceae - Four-o'clock	*Boerhavia repens*	Alena	alena	Ind
Nyctaginaceae - Four-o'clock	*Bougainvillea sp.*	Bougainvillea		Int

Family	Scientific Name	Common Name	Hawaiian Name	Status
Nyctaginaceae - Four-o'clock	*Mirabilis jalapa*	Four-oclock		Int
Oleaceae - Olive	*Noronhia emarginata*	Madagascar olive		Int
Oxalidaceae - Wood sorrel	*Oxalis corniculata*	Yellow wood sorrel	‘ihi ‘ai, ‘ihi ‘awa	Pol?
Passifloraceae - Passion flower	*Passiflora edulis*	Passion fruit, purple granadilla	liliko‘i	Int
Passifloraceae - Passion flower	*Passiflora foetida*	Love-in-a-mist	lani wai, pōha-pōha	Int
Passifloraceae - Passion flower	*Passiflora laurifolia*	Yellow granadilla		Int
Phytolaccaceae - Pokeberry	*Rivina humilis*	Coral berry		Int
Plantaginaceae - Plantain	*Plantago lanceolata*	Narrow-leaved or English plantain		Int
Plantaginaceae - Plantain	*Plantago major*	Broad-leaved or common plantain	laukahi, kūhēkili	Int
Portulacaceae - Purslane	*Portulaca lutea*		‘ihi	Ind
Portulacaceae - Purslane	*Portulaca oleracea*	Pigweed	‘ākulikuli kula	Int
Portulacaceae - Purslane	*Portulaca pilosa*		‘ākulikuli	Int
Primulaceae - Primrose	*Anagallis arvensis*	Scarlet pimpernel		Int
Primulaceae - Primrose	*Ardisia elliptica*	Shoebutton ardisia		Int
Rhizophoraceae - Mangrove	*Rhizophora mangle*	American mangrove, red mangrove		Int
Rosaceae - Rose	*Osteomeles anthyllidifolia*		‘ūlei	Ind
Rubiaceae - Coffee	*Morinda citrifolia*	Indian mulberry	noni	Pol
Rubiaceae - Coffee	*Richardia brasiliensis*			Int
Rutaceae - Rue	*Citrus x latifolia*	Tahitian lime		Int
Sapindaceae - Soapberry	*Cupaniopsis anacardioides*	Carrot wood		Int
Sapotaceae - Sapodilla	*Chrysophyllum oliviforme*	Satin leaf		Int
Scrophulariaceae - Figwort	*Bacopa monnieri*	Water hyssop	‘ae‘ae	Ind
Solanaceae - Nightshade	*Lycium sandwicense*		‘ōhelo kai, ‘ae‘ae	Ind
Solanaceae - Nightshade	*Nicotiana tabacum*	Tobacco	paka	Int
Solanaceae - Nightshade	*Physalis peruviana*	Cape gooseberry	pohā, pa‘ina	Int
Solanaceae - Nightshade	*Solanum americanum*	Glossy nightshade	pōpolo, ‘olohua polopolo	Ind?
Solanaceae - Nightshade	*Solanum seaforthianum*	Vining solanum		Int

Family	Scientific Name	Common Name	Hawaiian Name	Status
Sterculiaceae - Cacao	*Waltheria indica*		‘uhaloa	Ind?
Urticaceae - Nettle	*Cecropia obtusifolia*	Guarumo, trumpet tree		Int
Urticaceae - Nettle	*Pilea microphylla*	Artillery plant, rockweed		Int
Verbenaceae - Verbena	*Lantana camara*	Lantana	lā‘au kalakala, lākana, mikinolia hihiu, mikinolia hohono, mikinolia kukū	Int
Verbenaceae - Verbena	*Stachytarpheta dichotoma*		ōwī, oī	Int
Verbenaceae - Verbena	*Verbena litoralis*		ōwī, oī, ha‘uoi	Int
Verbenaceae - Verbena	*Vitex rotundifolia*	Beach vitex	kolokolo kahakai, hinahina kolo, mānawana wa, māwanawa na, pōhinahina	Ind
Monocots				
Agavaceae - Agave	*Cordyline fruticosa*	Ti	kī	Pol
Araceae - Philodendron	*Epipremnum pinnatum*	Golden pothos, taro vine		Int
Araceae - Philodendron	*Philodendron sp.*	Philodendron		Int
Araceae - Philodendron	*Syngonium sp.*	Syngonium		Int
Arecaceae - Palm	*Chrysalidocarpus lutescens*	Areca palm		Int
Arecaceae - Palm	*Cocos nucifera*	Coconut palm	niu, ololani	Pol
Arecaceae - Palm	*Dypsis decaryi*	Triangle palm		Int
Arecaceae - Palm	*Pritchardia thurstonii*	Fiji fan palm		Int
Arecaceae - Palm	*Veitchia merrillii*	Manila palm		Int
Asparagaceae - Asparagus	*Asparagus densiflorus*	Asparagus fern		Int
Asparagaceae - Asparagus	*Dracaena marginata*	Money tree		Int
Asparagaceae - Asparagus	*Sansevieria trifasciata*	Mother in law's tongue		Int
Cannaceae - Canna	*Canna indica*	Indian shot, canna	ali‘ipoe	Nat
Commelinaceae - Spiderwort	*Commelina diffusa*	Honohono grass		Int

Family	Scientific Name	Common Name	Hawaiian Name	Status
Cyperaceae - Sedge	*Cyperus involucratus*	Umbrella sedge		Int
Cyperaceae - Sedge	*Cyperus javanicus*		‘ahu‘awa, ‘ehu‘awa	Ind
Cyperaceae - Sedge	*Cyperus phleoides*	Cyperus		End
Cyperaceae - Sedge	*Cyperus polystachyos*			Ind
Cyperaceae - Sedge	*Cyperus rotundus*	Purple nut sedge		Int
Cyperaceae - Sedge	*Fimbristylis cymosa*		mau‘u ‘aki‘aki	Ind
Cyperaceae - Sedge	*Kyllinga brevifolia*	Green kyllinga		Int
Liliaceae - Lily	*Crinum asiaticum*	Spider lily		Int
Liliaceae - Lily	*Hippeastrum striatum*	Barbados lily		Int
Pandanaceae - Screw Pine	*Pandanus tectorius*	Pandanus	hala, pū hala	Ind
Poaceae - Grass	*Andropogon bicornis*	West Indian foxtail		Int
Poaceae - Grass	*Bothriochloa pertusa*	Pitted beardgrass		Int
Poaceae - Grass	*Chloris barbata*	Swollen fingergrass		Int
Poaceae - Grass	*Chrysopogon aciculatus*	Golden beardgrass	mānienie ‘ula, pi‘ipi‘i	Ind?
Poaceae - Grass	*Cynodon dactylon*	Bermuda grass	mānienie, mānienie haole	Int
Poaceae - Grass	*Digitaria ciliaris*	Henry's crab grass	kūkaepua‘a	Int
Poaceae - Grass	*Digitaria insularis*	Sourgrass		Int
Poaceae - Grass	*Eleusine indica*	Wiregrass	mānienie ali‘i	Int
Poaceae - Grass	*Eragrostis pectinacea*	Carolina lovegrass		Int
Poaceae - Grass	*Melinis minutiflora*	Molasses grass		Int
Poaceae - Grass	*Panicum torridum*		kākonakona, hākonakona	End
Poaceae - Grass	*Paspalum conjugatum*	Hilo grass	mau‘u	Int
Poaceae - Grass	*Paspalum dilatatum*	Dallis grass		Int
Poaceae - Grass	*Paspalum vaginatum*	Seashore paspalum		Int
Poaceae - Grass	*Pennisetum clandestinum*	Kikuyu grass		Int
Poaceae - Grass	*Setaria parviflora*	Yellow foxtail		Int
Poaceae - Grass	*Sporobolus africanus*	Smutgrass, African dropseed		Int
Poaceae - Grass	*Sporobolus pyramidatus*	Dropseed		Int
Poaceae - Grass	*Stenotaphrum secundatum*	St. Augustine grass, buffalo grass	‘aki‘aki haole, mānienie	Int

Family	Scientific Name	Common Name	Hawaiian Name	Status
Poaceae - Grass	*Urochloa maxima*	Guinea grass		Int
Poaceae - Grass	*Urochloa mutica*	California grass		Int
Ferns				
Nephrolepidaceae - Sword fern	*Nephrolepis brownii*	Asian sword fern		Int
Polypodiaceae	*Phymatosorus grossus*	Maile scented fern	lauae	Int

INVERTEBRATES

Order	Family	Scientific Name	Common Name	Hawaiian Name	Status
Gastropoda					
Stylomattophora	Achatinidae	*Achatina fulica*	Giant African snail		Int
Insecta					
Odonata	Aeschnidae	*Anax junius*	Green darner	pinao	Ind
Lepidoptera	Cosmopterigidae	*Trissodoris honorariella*	Pandanus hole cutter moth		Int
Lepidoptera	Crambidae	*Mestolobes sp.*			End
Lepidoptera	Crambidae	*Omiodes blackburni*	Coconut leaf roller		End
Lepidoptera	Crambidae	*Spolodea recurvalis*	Beet webworm moth		Int
Lepidoptera	Hesperiidae	*Hylephila phyleus*	Fiery skipper butterfly		Int
Lepidoptera	Lycaenidae	*Lampides boeticus*	Bean butterfly		Int
Lepidoptera	Lycaenidae	*Strymon bazochii*	Lesser lantana butterfly		Int
Lepidoptera	Lycaenidae	*Zizina otis*	Lesser grass blue butterfly		Int
Lepidoptera	Pieridae	*Pieris rapae*	Cabbage butterfly		Int
Lepidoptera	Sphingidae	*Agrius vanillae*	Passion vine butterfly		Int
Hymenoptera	Apidae	*Ceratina cf. dentipes*	Small carpenter bee		Int
Hymenoptera	Apidae	*Ceratina smaragdula*	Indian bee		Int
Hymenoptera	Chalcidae	*Megastigmus transvaalensis*	Christmasberry seed feeding wasp		Int
Hymenoptera	Colletidae	*Hylaeus connectens*	Hawaiian yellow-faced bee		End
Hymenoptera	Colletidae	*Hylaeus sp.*			Int
Hymenoptera	Formicidae	*Anoplolepis gracilipes*	Long-legged ant (crazy ant)		Int
Hymenoptera	Formicidae	*Monomorium floricola*			Int

Order	Family	Scientific Name	Common Name	Hawaiian Name	Status
Hymenoptera	Formicidae	*Pheidole megacephala*	Big-headed ant		Int
Hymenoptera	Formicidae	*Plagiolepis alluaudi*			Int

REPTILES & AMPHIBIANS

Family	Scientific Name	Common Name	Hawaiian Name	Status
Cheloniidae	*Chelonia mydas*	Green sea turtle	honu	Ind, T
Bufonidae - True Toads	*Bufo marinus*	Cane toad		Int
Ranidae - True Frogs	*Rana catesbeiana*	American bullfrog		Int

BIRDS

Family	Scientific Name	Common Name	Hawaiian Name	Status
Diomedeidae - Albatrosses	*Phoebastria immutabilis*	Laysan albatross	mōlī	Mig
Diomedeidae - Albatrosses	*Phoebastria nigripes*	Black-footed albatross	ka‘upu	Mig, C
Procellariidae - Petrels & Shearwaters	*Fulmarus glacialis*	Northern Fulmar		Mig
Procellariidae - Petrels & Shearwaters	*Pterodroma neglecta*	Kermadec petrel		Mig
Procellariidae - Petrels & Shearwaters	*Pterodroma sandwichensis*	Hawaiian petrel	‘ua‘u	End, Mig, E
Procellariidae - Petrels & Shearwaters	*Pterodroma hypoleuca*	Bonin Petrel		Mig
Procellariidae - Petrels & Shearwaters	*Bulweria bulwerii*	Bulwer's petrel	‘ou	Mig
Procellariidae - Petrels & Shearwaters	*Puffinus pacificus*	Wedge-tailed shearwater	ua‘u	Mig
Procellariidae - Petrels & Shearwaters	*Puffinus griseus*	Sooty shearwater		Mig
Procellariidae - Petrels & Shearwaters	*Puffinus nativitatis*	Christmas shearwater		Mig
Procellariidae - Petrels & Shearwaters	*Puffinus auricularis newelli*	Newell's (Townsend's) shearwater	‘a‘o	End, Mig, T
Phaethontidae - Tropicbirds	*Phaethon lepturus*	White-tailed tropicbird	koa‘e kea	Mig
Phaethontidae - Tropicbirds	*Phaethon aethereus*	Red-billed tropicbird		Mig
Phaethontidae - Tropicbirds	*Phaethon rubricaudai*	Red-tailed tropicbird	koa‘e ula	Mig
Sulidae - Boobies	*Sula dactylatra*	Masked booby	‘ā	Mig
Sulidae - Boobies	*Sula leucogaster*	Brown booby	‘ā	Mig
Sulidae - Boobies	*Sula sula*	Red-footed booby	‘ā	Mig

Family	Scientific Name	Common Name	Hawaiian Name	Status
Fregatidae - Frigatebirds	*Fregata minor*	Great frigatebird	‘iwa	Mig
Fregatidae - Frigatebirds	*Fregata ariel*	Lesser frigatebird		Mig
Ardeidae - Herons	*Bubulcus ibis*	Cattle egret		Int
Ardeidae - Herons	*Nycticorax nycticorax*	Black-crowned night-heron	‘auku‘u	Ind
Anatidae - Geese & Ducks	*Chen carulescens*	Snow goose		Mig
Anatidae - Geese & Ducks	*Branta hutchinsii*	Cackling goose		Mig
Anatidae - Geese & Ducks	*Branta sandvicensis*	Hawaiian goose	nēnē	End, E
Accipitridae - Hawks & Eagles	*Pandion haliaetus*	Osprey		Mig
Accipitridae - Hawks & Eagles	*Circus cyaneus*	Northern harrier		Mig
Accipitridae - Hawks & Eagles	*Aquila chrysaetos*	Golden eagle		Mig
Accipitridae - Hawks & Eagles	*Haliaeetus albicilla*	White-tailed eagle		Mig
Falconidae - Falcons	*Falco peregrinus*	Peregrine falcon		Mig
Phasianidae - Pheasants & Chukars	*Gallus gallus*	Red junglefowl	moa	Int
Phasianidae - Pheasants & Chukars	*Francolinus francolinus*	Black Francolin		Int
Phasianidae - Pheasants & Chukars	*Phasianus colchicus*	Ring-necked pheasant		Int
Charadriidae - Plovers	*Pluvialis fulva*	Pacific golden-plover	kōlea	Mig
Scolopacidae - Sandpipers & Waders	*Tringa incanus*	Wandering tattler	‘ūlilī	Mig
Scolopacidae - Sandpipers & Waders	*Numenius tahitiensis*	Bristle-thighed curlew	kioea	Mig, C
Scolopacidae - Sandpipers & Waders	*Arenaria interpres*	Ruddy turnstone	‘akekeke	Mig
Scolopacidae - Sandpipers & Waders	*Calidris alba*	Sanderling	hunakai	Mig
Laridae - Gulls & Terns	*Stercorarius pomarinus*	Pomarine jaeger		Mig
Laridae - Gulls & Terns	*Larus delawarensis*	Ring-billed gull		Mig
Laridae - Gulls & Terns	*Larus hyperboreus*	Glaucous gull		Mig
Laridae - Gulls & Terns	*Sterna lunata*	Gray-backed tern	'pākalakala	Ind, Mig
Laridae - Gulls & Terns	*Sterna fuscata*	Sooty tern	‘ewa‘ewa	Ind, Mig
Laridae - Gulls & Terns	*Anous stolidus*	Brown noddy	noio kōhā	Ind
Laridae - Gulls & Terns	*Anous minutus melanogenys*	Black (Hawaiian) noddy	noio, 'eki'eki	End
Laridae - Gulls & Terns	*Gygis alba*	White tern	manu-o-kū	Ind

Family	Scientific Name	Common Name	Hawaiian Name	Status
Columbidae - Pigeons & Doves	*Columba livia*	Rock dove		Int
Columbidae - Pigeons & Doves	*Streptopelia chinensis*	Spotted dove		Int
Columbidae - Pigeons & Doves	*Geopelia striata*	Zebra dove		Int
Tytonidae - Barn Owls	*Tyto alba*	Barn owl		Int
Strigidae - Typical Owls	*Asio flammeus sandwichensis*	Hawaiian short-eared owl	pueo	End
Sylviidae - Bush-warblers	*Cettia diphone*	Japanese bush-warbler		Int
Turdidae - Thrushes	*Copsychus malabaricus*	White-rumped shama		Int
Timaliidae - Babblers	*Garrulax canorus*	Hwamei (Melodious laughingthrush)		Int
Zosteropidae - White-eyes	*Zosterops japonicus*	Japanese white-eye		Int
Mimidae - Mockingbirds	*Mimus polyglottos*	Northern mockingbird		Int
Sturnidae - Starlings & Mynas	*Acridotheres tristis*	Common myna		Int
Emberizidae - Sparrows	*Paroaria coronata*	Red-crested cardinal		Int
Cardinalidae - Cardinals	*Cardinalis cardinalis*	Northern cardinal		Int
Icteridae - Meadowlarks	*Sturnella neglecta*	Western meadowlark		Int
Fringillidae - Finches	*Carpodacus mexicanus*	House finch		Int
Passeridae - Old World Sparrows	*Passer domesticus*	House sparrow		Int
Estrildidae - Waxbills & Mannikins	*Lonchura cantans*	African silverbill		Int
Estrildidae - Waxbills & Mannikins	*Lonchura punctulata*	Nutmeg mannikin		Int
Estrildidae - Waxbills & Mannikins	*Lonchura atricapilla*	Chestnut munia		Int
Estrildidae - Waxbills & Mannikins	*Padda oryzivora*	Java sparrow		Int

MAMMALS

Family	Scientific Name	Common Name	Hawaiian Name	Status
Muridae - Mice, rats, voles	*Mus musculus*	House mouse	‘iole li‘ili'i	Int
Muridae - Mice, rats, voles	*Rattus exulans*	Polynesian rat	‘iole	Pol
Muridae - Mice, rats, voles	*Rattus norvegicus*	Norway rat	‘iole-po‘o-wai	Int
Muridae - Mice, rats, voles	*Rattus rattus*	Black rat	‘iole-nui	Int
Vespertillionidae -	*Lasiurus cinereus*	Hawaiian hoary bat	‘ōpe‘ape‘a	End, E

Vesper bats	*semotus*			
Felidae - Cats	*Felis catus*	Cat	pōpoki	Int
Canidae - Dogs, foxes, jackals	*Canis lupus familiaris*	Dog	‘īlio	Int
Phocidae - Earless seals	*Monachus schauinslandi*	Hawaiian monk seal	‘īlio-holo-i-kauaua	End, E
Suidae - Pigs, hogs, boars	*Sus scrofa*	Common wild boar	pua‘a	Int
Balaenopteridae - Rorqual whales	*Megaptera novaeangliae*	Humpback whale	koholā	Mig
Delphinidae - Dolphins	*Stenella longirostris longirostris*	Spinner dolphin	nai'a	Ind
Delphinidae - Dolphins	*Tursiops truncatus gillii*	Pacific bottlenose	nai'a	Ind

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National Wildlife Refuge System Information
1 800/344 WILD

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