# DRAFT ECONOMIC ANALYSIS OF PROPOSED CRITICAL HABITAT DESIGNATION FOR O'AHU PLANTS ISLAND OF O'AHU, HAWAII

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# PREFACE

## 1. CONTENT AND PURPOSE

This report assesses the economic impacts that may result from the designation of critical habitat for the 99 threatened and endangered plant species (plants) on the island of O'ahu in the State of Hawai'i. It was prepared for the U.S. Fish and Wildlife Service (the Service) to help them in their decision regarding designating critical habitat for the O'ahu Plants.

As required by the Endangered Species Act, as amended (the Act), the decision to designate a particular area as critical habitat must take into account the potential economic impact of the critical habitat designation. If the economic analysis reveals that the economic impacts of designating any area as critical habitat outweigh the benefits of designation, then the Service may exclude the area from consideration, unless excluding the area will result in the extinction of the species.

The focus of the economic analysis is on section 7(a)(2) of the Act which requires consultation with the Service and possible project modification for certain projects and activities that may affect a species listed as threatened or endangered, or the habitat of a listed species. The consultations and possible project modifications will have economic impacts which, in this report, are referred to as "section 7 economic impacts" to distinguish them from the economic impacts related to other sections of the Act. Other sections of the Act are outside the scope of this economic analysis.

## 2. ORGANIZATION

This report is organized into six chapters:

— Chapter I: The Listed Plants and Proposed Critical Habitat

This chapter provides relevant information on the plants and the proposed critical habitat units.

— Chapter II: Physical and Socioeconomic Profile of O'ahu

To provide the context for evaluating the economic impacts of the proposed critical habitat designation, this chapter presents a physical description and socioeconomic profile of the island of O'ahu.

— Chapter III: The Endangered Species Act

Relevant information from the Act is presented in Chapter III, including the role of critical habitat designation in protecting threatened and endangered species, requirements for consulting with the Service, and the definition of taking and other restrictions.

— Chapter IV: Existing Protections

This chapter presents relevant information on existing regulations and land management policies that protect wildlife species or their habitats.

— Chapter V: Approach to the Economic Impact Analysis

This chapter gives the general approach used to estimate section 7 economic impacts and indirect economic impacts of the species listing and the critical habitat designation.

— Chapter VI: Economic Costs and Benefits

This chapter discusses planned projects, activities and land uses in the proposed critical habitat units. It also estimates direct and indirect economic costs and benefits, and identifies the effects that can be attributed solely to the critical-habitat provisions of section 7.

After learning about the proposed critical habitat (Chapter I), readers who are already familiar with the island of O'ahu (Chapter II), the Act (Chapter III), existing protections (Chapter IV), or the approach to conducting the economic analysis (Chapter V) may wish to skip these chapters, as appropriate, and proceed to the analysis of economic impacts (Chapter VI).

## 3. TERMINOLOGY

The following Service terminology is *italicized* throughout this document for the benefit of readers who are unfamiliar with it and want to be reminded that the Service has given specific meanings to these words and terms: *Federal involvement, Federal nexus, occupied, unoccupied*, *primary constituent elements, jeopardy, adverse modification,* and *take.* The terms are explained in the body of the report.

## 4. MAPPING ACCURACY

Acreage estimates presented in Table I-1 and used in the text are based on digitized maps and acreage calculations provided by the Service. The data files for these maps were generated by the Service, other Federal agencies, State and county agencies, and private contractors. For the most part, the digitized maps are reasonably accurate at a

scale of 1:24,000. Nevertheless, they are not exact: the mapped locations of certain features (borders, roads, structures, etc.) sometimes deviate from their actual locations; maps from different sources may differ as to the locations of certain features; mapped borders of adjacent parcels may not be in perfect alignment even if they come from the same source; etc. As a result of these mapping discrepancies, some acreage estimates may be incorrect (when a slight discrepancy extends over several miles, the estimate can amount to many acres); area components may not sum to the whole area; and small amounts of land may be included in a proposed critical habitat unit when the intention was to exclude this land (e.g., a small amount of urban or agricultural land may be included inadvertently).

## 5. ECONOMIC CONSULTANTS

The analysis was performed by Decision Analysts Hawaii, Inc. (DAHI), a Hawai'i-based economic consulting firm. DAHI is under contract to Industrial Economics, Inc. (IEc), an economic consulting firm in Cambridge, Massachusetts. Research assistance was provided by Anden Consulting and Shalini Gopalakrishnan, subconsultants to IEc.

# EXECUTIVE SUMMARY

## 1. INTRODUCTION

The purpose of this report is to identify and analyze the potential economic impacts that would result from the proposed critical habitat designation for the listed plant species on O'ahu. Section 4(b)(2) of the Endangered Species Act (the Act) requires the Service to designate critical habitat on the basis of the best scientific and commercial data available after taking into consideration the economic impact and any other relevant impacts of specifying a particular area as critical habitat. The Service may exclude areas from critical habitat designation when the benefits of exclusion outweigh the benefits of including them within critical habitat, provided the exclusion will not result in extinction of the species.

The focus of this economic analysis is on section 7(a)(2) of the Act, which requires Federal agencies to insure that any action authorized, funded, or carried out by the Federal government is not likely to *jeopardize* the continued existence of any endangered or threatened species or result in the destruction or *adverse modification* of critical habitat. Federal agencies are required to consult with the Service whenever they propose a discretionary action that may affect a listed species or its designated critical habitat. Aside from the protections provided under section 7, the Act does not provide other forms of protection to lands designated as critical habitat. Because consultation under section 7 only applies to activities that involve Federal permits, funding or involvement, critical habitat designation will not afford any additional protections under the Act with respect to strictly private activities. This analysis does not address impacts associated with implementation of other sections of the Act.

## 2. PROPOSED CRITICAL HABITAT DESIGNATION

The Service is proposing 24 critical habitat units on O'ahu (Figure ES-1). One unit is divided into two subunits; thus, the total number of units and subunits (referred to throughout this report as "units") is 25. Combined, the proposed critical habitat covers approximately 111,364 acres, most of which is mountainous terrain (Figure ES-2). Nearly half of the land is owned by the Federal, State and county governments; about 90 percent is in the State Conversation District; about 70 percent is managed for conservation and/or protection of the watershed; and about 50 percent is part of the 'elepaio critical habitat (Figure ES-3).

The proposed critical habitat includes: lands used by the U.S. military for training purposes, communications complexes, grazing lands, land for a proposed landfill, portions of existing and planned parks, an area planned for a flood-control project, game hunting areas, irrigation-ditch systems, potable-water systems, power transmission lines, trails and unpaved access roads, some paved roads, a discharge pipe for aquaculture operations, some homes, and a small amount of land zoned for residential development.

Except for a small number of isolated homes, the proposed designation contains no existing or planned residential, resort, commercial, or industrial development.

Finally, the proposed critical habitat includes areas which, according to the Service, will be removed in the final rule because these areas do not contain the *primary constituent elements* essential for the conservation of the plant species. These areas include: 400+ acres of pineapple fields and associated roads, a portion of an arboretum, and a portion of a golf course.

## 3. ECONOMIC IMPACTS

### 3.a. Direct Section 7-Related Costs

For most of the proposed designation and for most activities, implementation of section 7 of the Act would have minor economic impacts for the following reasons:

— Except for communications facilities, a landfill, and a few other projects, little development is planned for most of the proposed critical habitat. This situation reflects the fact that (1) most of the land is unsuitable for development due to the rugged mountain terrain, lack of access, and remote locations; and (2) existing land-use controls severely limit development and most other economic activities in the mountainous regions of O'ahu.

— Some existing and continuing activities involve the operation and maintenance of existing man-made features and structures. These are not subject to the provisions of section 7 because they do not contain the *primary constituent elements* for the plants, and therefore would not be impacted by the designation.

— Some existing and planned projects, land uses, and activities that could affect the proposed critical habitat have no *Federal involvement* that would require section 7 consultation with the Service, and so are not restricted by the requirements of the Act.

— For the anticipated projects and activities that do have *Federal involvement,* many are conservation efforts that will not negatively impact the plants or their habitat, so they will be subject to a minimal level of informal section 7 consultation.

Nevertheless, as summarized in Table ES-1, a number of projects and activities will be subject to section 7 consultation. For each activity, the table summarizes the total costs involved with consultations and the related project modifications, as well as that portion of the costs which would be attributable to just the critical habitat designation. Because of uncertainty, low and high cost estimates are provided.

As indicated in the table, most of the costs for the consultations and anticipated project modifications will fall on the U.S. military. Most of these project modifications will involve improved fire and weed control to protect the plants and their habitats.

Significant costs are also estimated for game management, watershed projects, conservation projects, communications facilities, and possibly ranching and irrigation-ditch systems. Costs would also be incurred for parks, highways, residential development, and natural disasters.

The bottom of the second page of Table ES-1 shows estimates for the total direct costs for section 7 consultations and project modifications over a 10-year period. As indicated, the total direct cost for both the plant species listings and critical habitat is estimated at $1.1 million to $2.3 million; the amount attributable solely to critical habitat is $308,000 to $1.1 million. The estimated average annual cost and present-value cost are also given in the table.

## 3.b. Indirect Costs

The top portion of the last page of Table ES-1 summarizes the indirect costs of the proposed critical habitat designation. The information consists of a mixture of quantitative estimates and qualitative assessments. The qualitative assessments—which reflect the professional judgments of the economic consultant based on the analyses given in corresponding sections—were used in cases where available information is inadequate for developing meaningful quantitative estimates. As indicated in the table, the indirect costs may very well exceed the direct costs.

Some of the indirect costs could be very high if critical habitat were to seriously compromise or cause the loss of a project or activity. At the same time, the probability of such occurrences could be very low. For example, there is a small probability that critical habitat could result in: (1) a reduction in the amount of land available for public hunting and a loss of benefits to hunters; (2) restrictions on military training that risks national security; (3) the loss of communications facilities that could compromise military communications, civilian communications, or commercial broadcasting; or (4) expensive court-ordered conservation management of lands designated as critical habitat. Also, there is a risk that some future conservation projects could be lost if some landowners cooperate less with the Service because of the designation. Although all of these impacts are possible, none of them are expected.

However, the State and county are likely to incorporate critical habitat into their permitting and approval procedures. Thus, for future unspecified projects, additional costs for environmental reports and some delays are likely, even in the absence of *Federal involvement*. In some cases, critical habitat could result in increased opposition to projects and increased difficulty in obtaining approvals.

This might, in fact, be the case for a 100-acre landfill that is in the planning stages in the proposed critical habitat. If the State or county denies the project because it is deemed to be incompatible with critical habitat, this could cost approximately $1 million and a 2-year delay to find an alternative landfill site and prepare new environmental reports.

The greatest risk of critical habitat involves the overlap with privately owned urban and agricultural land. The risk comes from a State law that mandates the State to initiate redistricting to the State Conservation District of "habitat of rare native species of flora." Redistricting, either initiated by the State or due to a successful lawsuit, would result in a substantial loss in land value. Because landowners, land-use attorneys, investors, and appraisers perceive mandated redistricting as a substantial risk, critical habitat designation is likely to result in a significant loss in property value. However, because there is little experience in Hawai'i with critical habitat, information to accurately estimate the actual loss in value does not exist—there are no comparables in Hawai'i upon which to base a loss in value, and mainland comparables do not apply because of different state environmental and land-use law. The loss in land value is expected to last until more experience is gained with critical habitat or until the issue is resolved in court.

Finally, as noted in Table ES-1, it is expected that a number of landowners will incur costs to investigate the implications of critical habitat.

### 3.c. Direct and Indirect Benefits

The bottom portion of the last page of Table ES-1 summarizes the direct and indirect benefits of the proposed critical habitat designation. As indicated, the summary is entirely qualitative and reflects the professional judgments of the economic consultant based on the analyses given in corresponding sections. Qualitative assessments reflect the paucity of (1) scientific studies on the magnitude of species recovery and changes in the ecosystems resulting from critical habitat designation, and (2) economic studies on the per-unit value of many of the changes. As indicated in the table, some of the benefits may prove to be substantial.

For site-specific projects, some project modifications may provide localized benefits that help conserve populations of listed plants and their immediate habitat.

On a larger scale, project modifications for game management, watershed and conservation projects, and military activities are likely to affect major portions of the moun-

tains and, as a result, provide significant benefits to ecosystems. Many of the project modifications would be designed to reduce the risk of fire, reduce damage to the forest by ungulates, and reduce the introduction of weeds into native forests. Many of the modifications may in fact be minor (e.g., to watershed and conservation projects), but may provide significant benefits over large areas.

The resulting benefits to ecosystems would include: heathier native forests, greater biodiversity, fewer mosquitoes due to fewer pig wallows, enhanced survival of birds and other native wildlife (mosquitoes frequently carry avian malaria and pox), healthier watersheds with greater recharge of the aquifer, less erosion, cleaner and healthier streams and nearshore marine environments, cleaner beaches, etc. In turn, these environmental benefits would enhance the experiences of hikers, birdwatchers, beach visitors, etc.; they would also increase the appeal of mountain tours to visitors.

Other potential benefits include species preservation, related ethnobotanical benefits, and related medicinal/pharmaceutical benefits if one or more species are later discovered to have medicinal value.

For developers, the main advantage of critical habitat designations would apply to areas that are regarded as *occupied* by the Service. By knowing the critical habitat boundaries, and if they have the flexibility, developers can site projects outside the boundaries, thereby avoiding certain issues related to threatened and endangered species. But even if there is no flexibility in siting a project, and assuming *Federal involvement,* developers would know in advance that informal consultations with the Service must take place before proceeding with detailed site plans.

Finally, if critical habitat designation results in increased expenditures for conservation management, and the expenditures are financed from outside Hawai'i—which is likely to be the case for Federally managed lands—then this will contribute to the expansion and diversification of Hawai'i's economy.

### 3.d. Geographic Distribution of Costs and Benefits

Most of the section 7-related direct and indirect benefits of the proposed critical habitat are expected to derive from lands in the Ko'olau and Wai'anae Mountains that are in the State Conservation District. Most of these benefits are expected to derive from project modifications involving military activities, watershed and conservation projects, and game management.

Most of the direct costs will be for consultations and project modifications for these same activities and projects. However, most of the indirect costs—specifically, a loss in property values—will involve privately owned lands in the State Agricultural and Urban Districts.

**Figure ES-1. O'ahu Plants, Proposed Critical Habitat**

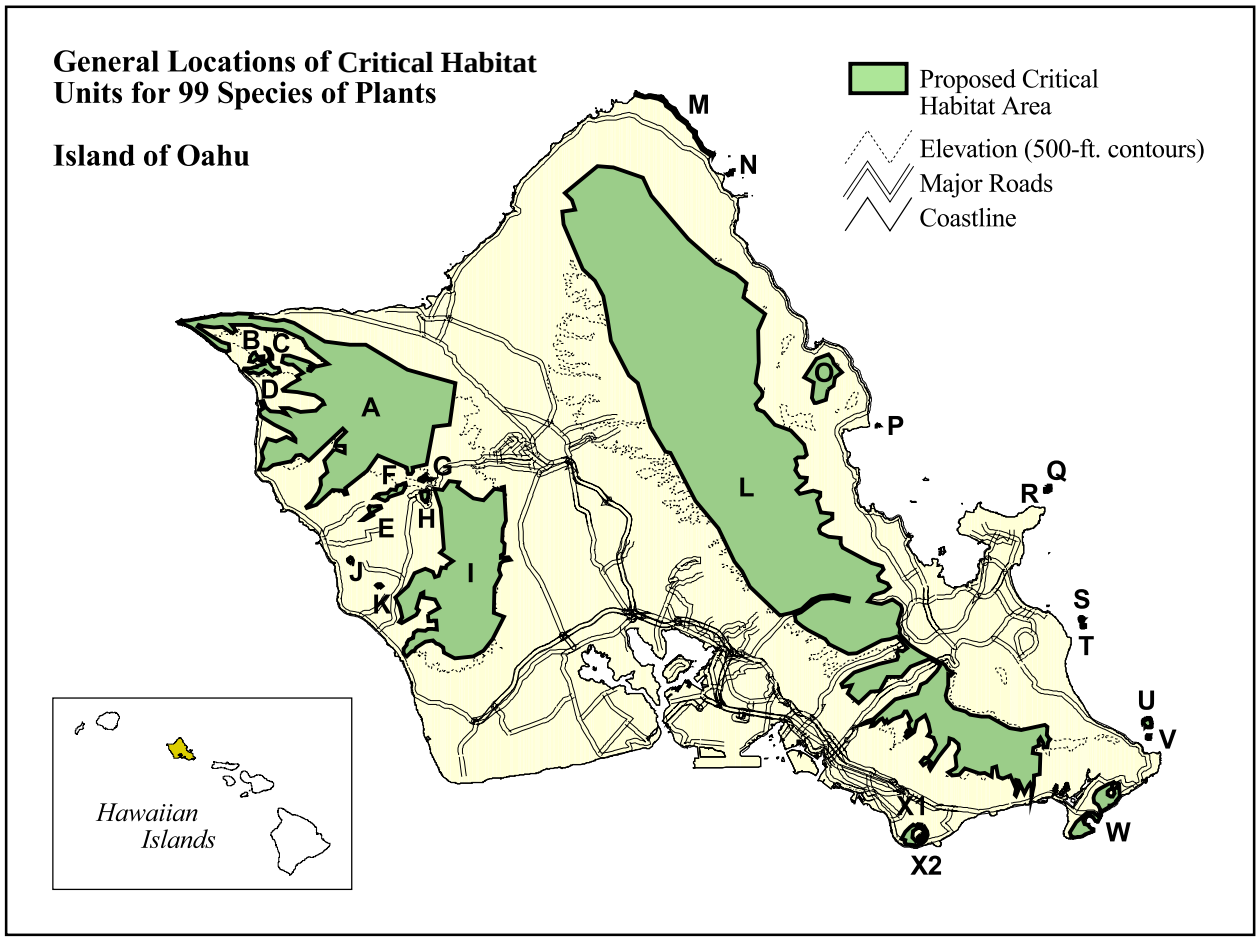

**Figure ES-2. O'ahu Terrain**

**Figure ES-3. O'ahu 'Elepaio Critical Habitat**

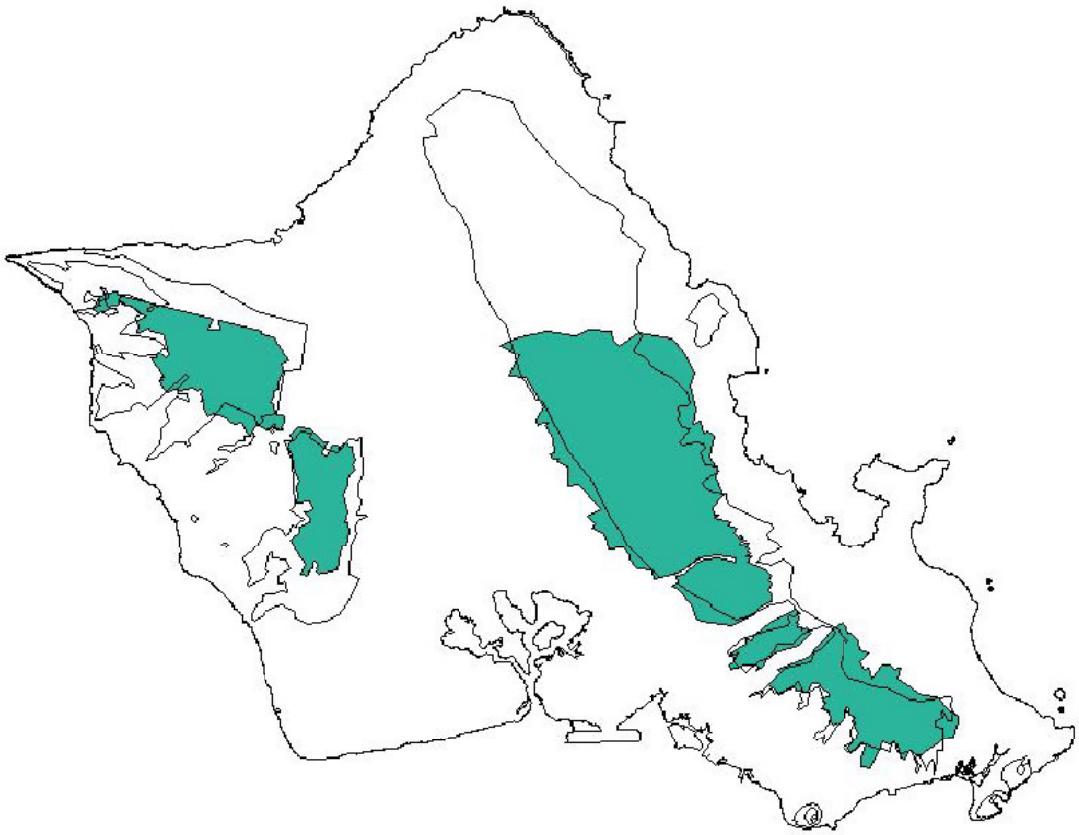

**Table ES-1. Section 7 Costs and Benefits Attributable to the O'ahu Plants Listing and Critical Habitat**
(10-year estimates)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal ne = not estimated

| Item | Total | | Share to CH | |
|---|---|---|---|---|
| | Low | High | Low | High |
| **DIRECT SECTION 7 COSTS** | | | | |
| **Management of Game Hunting** | | | | |
| Consultations | $ 6,400 | $ 12,700 | $ 1,800 | $ 5,800 |
| PMs | $ 37,400 | $ 74,800 | $ - | $ 37,400 |
| **State and County Parks** | | | | |
| Diamond Head, Consultations | $ 8,100 | $ 8,100 | $ - | $ - |
| Diamond Head, PMs | Minor | Minor | Minor | Minor |
| Haiku Valley | $ - | $ - | $ - | $ - |
| Aina Haina Nature Preserve | $ - | $ - | $ - | $ - |
| **Watershed Projects** | | | | |
| Ko'olau Mountains Watershed Partnership, Consultations | $ 15,700 | $ 47,100 | $ 10,500 | $ 31,500 |
| Ko'olau Mountains Watershed Partnership, PMs | Minor | Minor | Minor | Minor |
| BWS West Honolulu Watershed, Consultations | $ 24,500 | $ 24,500 | $ 10,500 | $ 10,500 |
| BWS West Honolulu Watershed, PMs | Minor | Minor | Minor | Minor |
| Ala Wai Watershed Association, Consultations | $ - | $ 31,400 | $ - | $ 21,000 |
| Ala Wai Watershed Association, PMs | Minor | Minor | Minor | Minor |
| **Conservation Projects** | | | | |
| O'ahu Forest NWR, Consultations | $ 5,100 | $ 10,000 | $ - | $ - |
| O'ahu Forest NWR, PMs | Minor | Minor | Minor | Minor |
| James Campbell NWR/Flood Control, Consultations | $ 8,000 | $ 11,900 | $ 8,000 | $ 11,900 |
| James Campbell NWR/Flood Control, PMs | Minor | Minor | Minor | Minor |
| Honouliuli Preserve, Consultations | $ - | $ 49,000 | $ - | $ 21,000 |
| Honouliuli Preserve, PMs | Minor | Minor | Minor | Minor |
| Other Conservation Activities, Consultations | $ 47,100 | $ 157,000 | $ 31,500 | $ 105,000 |
| Other Conservation Activities, PMs | Minor | Minor | Minor | Minor |
| **Communications Facilities** | | | | |
| Palehua, Consultations | $ 81,000 | $ 97,000 | $ 81,000 | $ 97,000 |
| Palehua, PMs | $ - | $ 120,000 | $ - | $ 120,000 |
| Koko Head, Consultations | $ 8,100 | $ 8,100 | $ 8,100 | $ 8,100 |
| Koko Head, PMs | Minor | Minor | Minor | Minor |
| Diamond Head, Consultations | $ 5,200 | $ 5,200 | $ 5,200 | $ 5,200 |
| Diamond Head, PMs | Minor | Minor | Minor | Minor |
| Other Communications Facilities, Consultations | $ 24,300 | $ 186,000 | $ 24,300 | $ 186,000 |
| Other Communications Facilities, PMs | | | | |
| **Power Transmission Lines** | None | None | None | None |
| **Farming** | None | None | None | None |
| **Ranching** | | | | |
| Consultations | $ - | $ 86,100 | $ - | $ 86,100 |
| PMs | | | | |
| **Aquaculture** | None | None | None | None |
| **Irrigation-Ditch Systems** | | | | |
| Consultations | $ - | $ 39,000 | $ - | $ 39,000 |
| PMs | Minor | Minor | Minor | Minor |
| **Potable-Water Systems** | None | None | None | None |

**Table ES-1. Section 7 Costs and Benefits Attributable to the O'ahu Plants Listing and Critical Habitat**
(10-year estimates)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal ne = not estimated

| Item | Total | | Share to CH | |
|---|---|---|---|---|
| | Low | High | Low | High |
| **Highways** | | | | |
| Consultations | $ - | $ 16,200 | $ - | $ 16,200 |
| PMs | Minor | Minor | Minor | Minor |
| **Hiking Trails and Unpaved Access Roads** | None | None | None | None |
| **Ecotourism** | None | None | None | None |
| **Residential Use and Development** | | | | |
| Consultations | $ - | $ 24,300 | $ - | $ 24,300 |
| PMs | Minor | Minor | Minor | Minor |
| **Landfill** | None | None | None | None |
| **U.S. Military** | | | | |
| Army, Dillingham Military Reservation, Consultations | $ 14,400 | $ 15,200 | $ 2,200 | $ 3,000 |
| Army, Dillingham Military Reservation, PMs | Minor | Minor | Minor | Minor |
| Army, Fort Shafter, Consultations | None | None | None | None |
| Army, Kahuku Training Area, Consultations | $ 105,000 | $ 153,300 | $ 15,800 | $ 30,700 |
| Army, Kahuku Training Area, PMs | $ 100,000 | $ 200,000 | $ 15,000 | $ 40,000 |
| Army, Kawailoa Training Area, Consultations | $ 23,000 | $ 41,400 | $ 3,500 | $ 8,300 |
| Army, Kawailoa Training Area, PMs | $ 100,000 | $ 150,000 | $ 15,000 | $ 30,000 |
| Army, Makua Military Reservation, Consultations | $ 16,100 | $ 43,400 | $ 3,900 | $ 21,700 |
| Army, Makua Military Reservation, PMs | Minor | Minor | Minor | Minor |
| Army, Schofield Barracks–West and South Ranges, Consultations | $ 55,700 | $ 75,800 | $ 8,400 | $ 15,200 |
| Army, Schofield Barracks–West and South Range, PMs | $ 200,000 | $ 300,000 | $ 30,000 | $ 60,000 |
| Army, Schofield Barracks–East Ranges, Consultations | $ 39,800 | $ 49,000 | $ 6,000 | $ 9,800 |
| Army, Schofield Barracks–East Range, PMs | $ 100,000 | $ 150,000 | $ 15,000 | $ 30,000 |
| Hawai'i Army National Guard, DH Crater, Consultations | $ 10,500 | $ 10,500 | $ 1,600 | $ 2,100 |
| Hawai'i Army National Guard, DH Crater, PMs | Minor | Minor | Minor | Minor |
| Navy, NAVMAP PH LLL, Consultations | $ 17,700 | $ 26,900 | $ 2,700 | $ 5,400 |
| Navy, NAVMAP PH LLL, PMs | Minor | Minor | Minor | Minor |
| Navy, RTF Lualualei, Consultations | $ 10,500 | $ 10,500 | $ 1,600 | $ 2,100 |
| Navy, RTF Lualualei, PMs | $ 20,000 | $ 40,000 | $ 3,000 | $ 8,000 |
| **Natural Disasters** | | | | |
| Consultations | $ 3,800 | $ 7,500 | $ 3,800 | $ 7,500 |
| PMs | Minor | Minor | Minor | Minor |
| **Total Direct Costs** | **$ 1,087,400** | **$ 2,281,900** | **$ 308,400** | **$ 1,099,800** |
| **Average Annual Direct Costs** | **$ 108,740** | **$ 228,190** | **$ 30,840** | **$ 109,980** |
| **Present Value (7% discount rate)** | **$ 763,744** | **$ 1,602,711** | **$ 216,607** | **$ 772,453** |

**Table ES-1. Section 7 Costs and Benefits Attributable to the O'ahu Plants Listing and Critical Habitat**
(10-year estimates)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal ne = not estimated

| Item | Total | | Share to CH | |
|---|---|---|---|---|
| | Low | High | Low | High |
| **INDIRECT COSTS** | | | | |
| **Management of Game Mammals and Loss of Hunting Lands** | | | | |
| Potential Loss of Benefits to Hunters, Annual | n.e. | n.e. | None | $ 350,000 |
| Probability | n.e. | n.e. | - | Small |
| **Military, Risk to National Security** | n.e. | n.e. | none | Undetermined |
| **Communications Facilities and Services** | | | | |
| Potential Loss of Benefits to Hunters | n.e. | n.e. | None | Large |
| Probability | n.e. | n.e. | - | Small |
| **Landfill** | | | | |
| Potential Cost to find Alternative Site | n.e. | n.e. | None | $ 1,000,000 |
| Probability | n.e. | n.e. | - | Significant |
| **Mandated Conservation Management** | | | | |
| Potential Cost for Land Management, Annual | n.e. | n.e. | None | $ 3,000,000 |
| Loss of Economic Activity (Direct + Indirect Sales), Annual | | | None | $ 1,960,000 |
| Probability | n.e. | n.e. | - | Small |
| **Redistring of Urban and Agricultural Land to Conservation** | | | | |
| Potential Loss of Land Value (court-ordered redistricting) | n.e. | n.e. | None | $ 81,000,000 |
| Probability | n.e. | n.e. | - | Undetermined |
| **State and County Approvals** | | | | |
| Increase in Costs, Delays and Denials | n.e. | n.e. | Minor | Significant |
| **Reduced Property Values** (Mostly reflects the perceived risk of a court-ordered redistricting; continues until resolved in court) | n.e. | n.e. | Significant | Undetermined fraction of $ 91,000,000 |
| **Comdemnation of Property** | n.e. | n.e. | None | None |
| **Costs to Investigate Implications of CH** | n.e. | n.e. | $ 80,000 | $ 400,000 |
| **Loss of Conservation Projects** | n.e. | n.e. | None | Some |
| **DIRECT AND INDIRECT BENEFITS** | | | | |
| **Benefits of Project Modifications for:** | | | | |
| Site-specific Projects | n.e. | n.e. | Significant | Significant |
| Land Management Affecting Large Portions of Mountains | n.e. | n.e. | Significant | Large |
| **Benefits to Developers** (For *occupied* areas, information that allows better project siting and planning) | n.e. | n.e. | Minor | Small |
| **Species Preservation** | | | | |
| Potential Benefits | n.e. | n.e. | Large | Large |
| Probability | n.e. | n.e. | Low | Undetermined |
| **Ethnobotanical Benefits** | | | | |
| Potential Benefits | n.e. | n.e. | Significant | Signficant |
| Probability | n.e. | n.e. | Low | Undetermined |
| **Medicinal/Pharmaceutical Benefits** | | | | |
| Potential Benefits | n.e. | n.e. | None | Large |
| Probability | n.e. | n.e. | - | Undetermined |
| **Benefits to Ecosystem** | n.e. | n.e. | Significant | Large |
| **Ecotourism** | n.e. | n.e. | Small | Significant |
| **Economic Activity Generated by Conservation Management** | n.e. | n.e. | Small | Large |

# THE LISTED PLANTS AND PROPOSED CRITICAL HABITAT * CHAPTER I

Under the Endangered Species Act of 1973, as amended (the Act), the United States Department of the Interior, Fish and Wildlife Service (the Service) proposes to designate critical habitat for threatened and endangered plant species on the island of O'ahu in Hawai'i. This chapter provides information on the listed plants and the proposed critical habitat units, most of which comes from the document "Endangered and Threatened Wildlife and Plants; Designations of Critical Habitat for Plant Species From the Island of O'ahu, HI; Proposed Rule" (the proposed rule), published in the *Federal Register* on May 28, 2002 (67 FR 37108). In addition, the Service provided valuable information for this chapter in the form of overlay resource maps and detailed acreage data.

## 1. THE LISTED PLANTS

The Service proposes critical habitat for 99 threatened and endangered plant species on O'ahu. The proposed rule contains a detailed discussion of the plant taxa, including taxonomy, ecology, habitat requirements, historical and current distribution and threats for each of these species.

## 2. PROPOSED CRITICAL HABITAT UNITS

The Service is proposing 24 critical habitat units on O'ahu (Figure ES-1). One unit is divided into two subunits (Units X1 and X2). Thus, the total number of units and

* **Note to Reader:** After learning about the proposed critical habitat in this chapter, readers who are already familiar with the Island of O'ahu (Chapter II), the Act (Chapter III), existing protections (Chapter IV), or the methodology for conducting the economic analysis (Chapter V) may wish to skip these chapters, as appropriate, and proceed to the analysis of economic impacts (Chapter VI).

subunits (referred to throughout this report as "units") on O'ahu is 25. Based on the proposed rule and other sources, this chapter and Table I-1 provide information on the units, including the *primary constituent elements* essential for the conservation of the plant species, excluded features and structures, acreages, general location and terrain, land ownership, existing land management, and existing improvements and activities in the units. The proposed rule provides detailed information on the critical habitat boundaries and the map coordinates of boundary points.

## 3. *PRIMARY CONSTITUENT ELEMENTS*

Each of the proposed critical habitat units provides one or more of the *primary constituent elements* essential for the conservation of the plant species. The Service defines *primary constituent elements* on the basis of the habitat features of the areas where the plant species are reported. Habitat features include the type of plant community, associated native plant species, locale (e.g., steep rocky cliffs, talus slopes, stream banks), and elevation.

## 4. EXCLUDED AREAS, FEATURES AND STRUCTURES

As indicated in the proposed rule, existing man-made features and structures that do not contain one or more of the *primary constituent elements* are excluded from the proposed critical habitat. In addition to the man-made features and structures listed in the proposed rule, the Service has identified additional ones (memoranda to the Service, Washington Office, from the Pacific Islands Fish and Wildlife Office, September 10, 2002 and December 3, 2002). Some of them are small and cannot be excluded easily by remapping unit boundaries. In effect, they are "unmapped holes" that are found inside the boundaries of critical habitat units but are not considered by the Service to be part of the critical habitat. The operation and maintenance of these man-made features and structures generally would not be impacted by critical habitat designation.

The modified list of excluded man-made features and structures follows.

— Buildings

— Fences

— Paved roads, and hiking trails

— Aqueducts and other water system features, including but not limited to, drainage canals, pumping stations, irrigation ditches, pipelines, siphons, tunnels, water tanks, gaging stations, intakes, and wells

— Telecommunications towers and associated structures and equipment, radars, telemetry equipment, and missile launch sites

— Electrical power transmission towers and and associated rights-of-way for power transmission towers and areas lying under sections of power lines that are cleared and maintained regularly.

— Campgrounds and scenic look-outs

— Arboreta and gardens

— *Heiau*

— Airports

— Other paved areas

— Lawns

— Rural residential areas

Also, since the proposed rule was published, the Service has identified large areas that do not contain the *primary constituent elements* for the plants. Consequently, the Service has indicated that the boundaries in the final rule will be remapped as follows:

— Schofield Barracks (Unit A)

The impact area below the firebreak road will be excluded.

— Harold L. Lyon Arboretum (Unit L)

The managed gardens and expansion area will be excluded.

— Air Force Satellite Tracking Facility (Unit A)

The satellite equipment and associated buildings located on Mount Ka'ala will be excluded.

— Developed area of Kahuku, O'ahu (Unit M)

Portions of the Kahuku Golf Course, Turtle Bay Golf Course, and Kahuku residential and commercial community will be excluded.

— Cultivated Farm Lands (Unit I)

Cultivated pineapple fields, temporarily fallowed pineapple fields, fallow sugarcane fields (which may be replanted in pineapple or some other crop), plantation roads, and irrigation reservoirs will be excluded.

## 5. OTHER FEATURES

### 5.a. Acreages

As shown in Table I-1, the total critical habitat land area in the proposed rule is approximately 111,364 acres, which is about 29 percent of the island. However, this estimate overstates the proposed acreage because the total figure includes the "Excluded Areas, Features and Structures" discussed in Section 4 above.

### 5.b. Location and Terrain

Figure ES-1 shows the general locations of the proposed critical habitat units. Detailed maps appear in the proposed rule. The majority of the acreage is uninhabited or sparsely inhabited:

— All or portions of Units A, B, C, D, E, F, G, H and I are in the Wai'anae Mountains. This mountain range forms the western portion of O'ahu, which is the dryer, leeward side of the island. It has large valleys with steep slopes, gulches, and eroded areas. Unit A also extends down to sea level to include Ka'ena Point.

— Units J and K are lowland areas on the Wai'anae coast in the Naval Magazine at Pearl Harbor

— Unit L encompasses the Ko'olau Mountains. This mountain range forms the eastern portion of O'ahu, which is the wetter, windward side of the island. It has high cliffs on the windward side of the range, large valleys with steep slopes, gulches, and areas deeply eroded by streams.

— Unit M extends along the northeastern coastline from Kahuku Point to Makahoa Point;

— Unit O is on the windward side of the island and consists of a steep ridge with sheer cliffs (the ridge is commonly known as "Crouching Lion")

— Unit W is near the southeastern tip of the island and includes the slopes of Koko Head and Koko Crater

— Units X1 and X2, at the south shore of the island O'ahu, include the slopes of Diamond Head Crater as well as a portion of the Crater floor; and

— Units N, P, Q, R, S, T, U, and V are uninhabited islets off the windward coast of O'ahu. All are designated State Seabird Sanctuaries except for Unit P (Mokoli'i Island, also known as Chinaman's Hat).

## 5.c. *Occupied* and *Unoccupied* Areas

The Service considers approximately 39,410 acres (35 percent) of the proposed critical habitat to be *occupied* by the listed plant species and 71,954 acres (65 percent) to be *unoccupied.* The *unoccupied* areas were included in the proposed designation because the Service believes that they are necessary to provide for the long-term survival and conservation of the species. As with the total proposed critical habitat acreage, the 39,410 acres of *occupied* critical habitat overstates the actual amount because it includes the areas to be mapped out in the final rule (see Section 4 above).

## 5.d. Land Ownership

Approximately 15,598 acres (14 percent) in the proposed designation are owned by the Federal government (see Table I-1). The State owns about 31,194 acres (28 percent). The City and County of Honolulu (county) owns approximately 7,228 acres (6 percent). About 1,000 acres (1 percent) are managed by the State Department of Hawaiian Home Lands. The remaining 56,345 acres (51 percent) are privately owned.

These land-ownership acreages differ from those in the proposed rule because of some recent land transfers in Unit L, including the transfer of Waiahole Ditch from a private landowner to the State, the sale of privately owned land to the Service for the O'ahu National Wildlife Refuge, and the sale of privately owned land to the Army for the Kahuku Training Area.

## 5.e. Existing Land Management and Controls

Land in the proposed critical habitat is subject to a variety of existing land-use regulations and land-management programs that govern and, to varying degrees, limit development and other land-use activities. These include Federal programs, State land-use controls and programs, county land-use controls, and land management by various public and private organizations. Applicable regulations and land-management programs are described in Chapter IV.

Table I-1 identifies, by critical habitat unit, the acreage under each type of control or management. Since some of the managed areas overlap with one another (e.g., portions of State Hunting Units are in State Forest Reserves), the percentages in Table I-1 do not always sum to 100 percent.

At the Federal level, approximately 4,772 acres (4 percent) are managed as a National Wildlife Refuge and approximately 13,645 acres (12 percent) are controlled by the Federal government for military use. In addition, 55,277 acres of the O'ahu plants proposed critical habitat (50 percent of the proposed critical habitat) overlaps the designated critical habitat for the O'ahu 'elepaio (see Figure ES-3).

About 100,092 acres (90 percent) of the proposed critical habitat are in the State Conservation District which is subject to State control or management. Development and commercial activity in the Conservation District is generally limited with varying levels of restrictions based on the applicable subzone (see Chapter IV).

In addition to the State restrictions that are placed on land in the Conservation District, some of this land is managed by the State as follows: 1,750 acres (2 percent) are in State Natural Area Reserves (NARs); approximately 19,777 acres (18 percent) are in State Forest Reserves; 2,656 acres (2 percent) are in State Parks; 185 acres (less than 1 percent) are in State Recreation Areas; 307 acres (less than 1 percent) are in a State Monument; 2 acres (less than 1 percent) are State waysides; and 126 acres (less than 1 percent) are in State Seabird Sanctuaries. Approximately 17,661 acres (16 percent) are in State Hunting Units, which are large areas managed for public hunting (see Chapter IV and Appendices VI-A-1 and VI-A-2).

With regard to county management, the land in the State's Urban and Agricultural Districts is subject to county land-use and development controls. These include the county general plan, district plans, zoning, and building-code regulations affecting farm, residential, commercial and industrial development and use. Approximately 10,937 acres (10 percent) of the proposed designation are in the Agricultural District and approximately 392 acres (less than 1 percent) are in the Urban District. In Special Management Areas (SMAs) located along the shoreline, the county has an additional layer of regulation that provides special controls on development, even for land in the State Conservation District (see Chapter IV).

Approximately 72,000 acres of the Ko'olau Mountains are managed as a watershed partnership, and about 3,485 acres (3 percent of the proposed designation) are in the Honouliuli Preserve which is privately managed by the Nature Conservancy of Hawai'i (TNCH) (see Chapter IV).

## 5.f. Existing Improvements and Activities

At the bottom of Table I-1, the section entitled "Improvements/Activities" indicates the presence or absence of existing improvements and activities found in each of the proposed critical habitat units.

None of the units contains significant residential, resort, commercial, or industrial development. However, the proposed critical habitat does include a large communications complex, some pineapple land, considerable grazing land, and a portion of a golf course. These are discussed in Chapter VI.

**Table I-1. Information on the Proposed Critical Habitat**

| Item | Units | All Units Total | All Units Share | Unit A | Unit B | Unit C | Unit D | Unit E |
|---|---|---|---|---|---|---|---|---|
| **Total Area [1.2]** | | 111,364 | | 21,013 | 83 | 35 | 271 | 94 |
| **Area Occupied By Listed Plants** | | 39,410 | 35% | 12,009 | 83 | 35 | 198 | 42 |
| **Land Ownership** | | | | | | | | |
| Federal | Acres | 15,598 | 14% | 2,036 | - | - | - | - |
| State | Acres | 31,194 | 28% | 11,253 | 83 | 35 | 271 | - |
| State DHHL | Acres | 1,000 | 1% | - | - | - | - | 94 |
| County | Acres | 7,228 | 6% | 3,025 | - | - | - | - |
| Private Owners | Acres | 56,345 | 51% | 4,698 | - | - | - | - |
| **Federally Controlled or Managed** | | | | | | | | |
| Military | Acres | 13,645 | 12% | 3,844 | - | - | - | - |
| National Wildlife Refuge | Acres | 4,772 | 4% | - | - | - | - | - |
| FWS, 'Elepaio Critical Habitat | Acres | 55,277 | 50% | 9,753 | 3 | 15 | 104 | - |
| **State-Controlled or Managed** | | | | | | | | |
| Conservation District | Acres | 100,092 | 90% | 15,387 | 83 | 15 | 271 | 92 |
| Protective | Acres | 30,787 | 28% | 5,145 | - | - | - | - |
| Limited | Acres | 5,697 | 5% | 625 | 71 | 0 | 206 | 92 |
| Resource | Acres | 60,446 | 54% | 8,718 | 0 | 15 | 62 | - |
| General | Acres | 2,386 | 2% | 123 | 12 | - | 3 | - |
| Special | Acres | 777 | 1% | 777 | - | - | - | - |
| Natural Area Reserves (NARs) | Acres | 1,750 | 2% | 1,750 | - | - | - | - |
| Forest Reserves | Acres | 19,777 | 18% | 5,396 | 8 | 15 | 22 | - |
| State Parks | Acres | 2,656 | 2% | 298 | 75 | - | 22 | - |
| State Recreation Areas | Acres | 185 | 0.2% | - | - | - | - | - |
| State Monuments | Acres | 307 | 0.3% | - | - | - | - | - |
| State Wayside | Acres | 2 | 0.0% | - | - | - | - | - |
| State Seabird Sanctuaries | Acres | 126 | 0.1% | - | - | - | - | - |
| Hunting Units | Acres | 17,661 | 16% | 7,456 | - | 35 | - | - |
| **County-Controlled or Managed** | | | | | | | | |
| Agricultural District | Acres | 10,937 | 10% | 5,466 | - | 20 | - | 2 |
| Urban | Acres | 392 | 0.4% | 160 | - | - | - | - |
| **Other Management** | | | | | | | | |
| Watershed Partnership | Acres | 72,000 | 65% | - | - | - | - | - |
| THNC Preserve | Acres | 3,485 | 3% | - | - | - | - | - |
| **Improvements/Activities** | | | | | | | | |
| Paved Roads | Present | | | Yes | - | - | - | - |
| Unpaved Rds or 4-wd Trails | Present | | | Yes | - | - | - | - |
| Hiking Trails | Present | | | Yes | Yes | Yes | - | - |
| Water Improvements | Present | | | Yes | - | - | - | - |
| Communication Complexes | Present | | | Yes | - | - | - | - |
| Power Transmission Lines | Present | | | Yes | - | - | - | - |
| Campgrounds and Scenic Lookouts | Present | | | Yes | - | - | - | - |
| Botanical Gardens & Arboretum | Present | | | - | - | - | - | - |
| Farming/Ranching | Present | | | Yes | - | - | - | - |
| Water Systems | Present | | | Yes | - | - | - | - |
| Homes, Cabins, Other Structures | Present | | | Yes | - | - | - | - |
| Golf Course | Present | | | - | - | - | - | - |
| Military Training/Safety Zone | Present | | | Yes | - | - | - | - |
| Hunting, State-Managed Lands | Present | | | Yes | - | Yes | - | - |

1. Entries may not sum to totals due to rounding, slight acreage discrepancies, and overlapping land-management areas.
2. Acreage estimate overstates the actual critical habitat area (see text).

**Table I-1. Information on the Proposed Critical Habitat**

| Item | Units | Unit F | Unit G | Unit H | Unit I | Unit J | Unit K | Unit L |
|---|---|---|---|---|---|---|---|---|
| **Total Area [1.2]** | | 200 | 40 | 68 | 12,623 | 25 | 18 | 74,301 |
| **Area Occupied By Listed Plants** | | 193 | 40 | 59 | 5,257 | 25 | 18 | 20,847 |
| **Land Ownership** | | | | | | | | |
| Federal | Acres | 91 | 40 | 68 | 2,258 | 25 | 18 | 11,060 |
| State | Acres | 72 | - | - | 1,943 | - | - | 16,643 |
| State DHHL | Acres | 37 | - | - | 869 | - | - | - |
| County | Acres | - | - | - | 1 | - | - | 3,359 |
| Private Owners | Acres | - | - | - | 7,552 | - | - | 43,239 |
| **Federally Controlled or Managed** | | | | | | | | |
| Military | Acres | 91 | 40 | 59 | 3,065 | 25 | 18 | 6,503 |
| National Wildlife Refuge | Acres | - | - | - | - | - | - | 4,771 |
| FWS, 'Elepaio Critical Habitat | Acres | 1 | 14 | - | 5,702 | - | - | 39,683 |
| **State-Controlled or Managed** | | | | | | | | |
| Conservation District | Acres | 144 | 40 | 68 | 8,416 | - | - | 73,208 |
| Protective | Acres | 78 | - | - | 432 | - | - | 25,000 |
| Limited | Acres | 66 | 5 | 68 | 2,189 | - | - | 2,055 |
| Resource | Acres | - | 34 | - | 5,463 | - | - | 44,808 |
| General | Acres | - | - | - | 331 | - | - | 1,345 |
| Special | Acres | - | - | - | - | - | - | - |
| Natural Area Reserves (NARs) | Acres | - | - | - | - | - | - | - |
| Forest Reserves | Acres | 63 | - | - | 781 | - | - | 13,490 |
| State Parks | Acres | - | - | - | - | - | - | 1,806 |
| State Recreation Areas | Acres | - | - | - | - | - | - | 185 |
| State Monuments | Acres | - | - | - | - | - | - | - |
| State Wayside | Acres | - | - | - | - | - | - | 2 |
| State Seabird Sanctuaries | Acres | - | - | - | - | - | - | - |
| Hunting Units | Acres | - | - | - | - | - | - | 9,950 |
| **County-Controlled or Managed** | | | | | | | | |
| Agricultural District | Acres | 56 | - | - | 4,183 | 25 | 18 | 1,017 |
| Urban | Acres | - | - | - | 24 | - | - | 124 |
| **Other Management** | | | | | | | | |
| Watershed Partnership | Acres | - | - | - | - | - | - | 70,934 |
| THNC Preserve | Acres | - | - | - | 3,485 | - | - | - |
| **Improvements/Activities** | | | | | | | | |
| Paved Roads | Present | - | - | - | Yes | - | - | Yes |
| Unpaved Rds or 4-wd Trails | Present | - | - | - | Yes | - | - | Yes |
| Hiking Trails | Present | - | - | - | Yes | - | - | Yes |
| Water Improvements | Present | - | - | - | Yes | - | - | Yes |
| Communication Complexes | Present | - | - | - | Yes | - | - | Yes |
| Power Transmission Lines | Present | - | - | - | Yes | - | - | Yes |
| Campgrounds and Scenic Lookouts | Present | - | - | - | - | - | - | Yes |
| Botanical Gardens & Arboretum | Present | - | - | - | - | - | - | Yes |
| Farming/Ranching | Present | - | - | - | Yes | - | - | - |
| Water Systems | Present | - | - | - | Yes | - | - | Yes |
| Homes, Cabins, Other Structures | Present | - | - | - | Yes | - | - | Yes |
| Golf Course | Present | - | - | - | - | - | - | - |
| Military Training/Safety Zone | Present | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Hunting, State-Managed Lands | Present | - | - | - | - | - | - | Yes |

1. Entries may not sum to totals due to rounding, slight acreage discrepancies, and overlapping land-management areas.
2. Acreage estimate overstates the actual critical habitat area (see text).

**Table I-1. Information on the Proposed Critical Habitat**

| Item | Units | Unit M | Unit N | Unit O | Unit P | Unit Q | Unit R | Unit S |
|---|---|---|---|---|---|---|---|---|
| **Total Area [1.2]** | | 246 | 12 | 1,066 | 3 | 3 | 15 | 12 |
| **Area Occupied By Listed Plants** | | - | - | 334 | 3 | - | - | - |
| **Land Ownership** | | | | | | | | |
| Federal | Acres | - | - | - | - | - | - | - |
| State | Acres | 0.02 | 12 | 455 | - | 3 | 15 | 12 |
| State DHHL | Acres | - | - | - | - | - | - | - |
| County | Acres | - | - | - | 3 | - | - | - |
| Private Owners | Acres | 245 | - | 611 | - | - | - | - |
| **Federally Controlled or Managed** | | | | | | | | |
| Military | Acres | - | - | - | - | - | - | - |
| National Wildlife Refuge | Acres | 0.4 | - | - | - | - | - | - |
| FWS, 'Elepaio Critical Habitat | Acres | - | - | - | - | - | - | - |
| **State-Controlled or Managed** | | | | | | | | |
| Conservation District | Acres | 22 | 12 | 1,066 | 3 | 3 | 15 | 12 |
| Protective | Acres | - | 12 | - | 3 | 3 | 15 | 12 |
| Limited | Acres | - | - | - | - | - | - | - |
| Resource | Acres | - | - | 1,066 | - | - | - | - |
| General | Acres | 22 | - | - | - | - | - | - |
| Special | Acres | - | - | - | - | - | - | - |
| Natural Area Reserves (NARs) | Acres | - | - | - | - | - | - | - |
| Forest Reserves | Acres | - | - | - | - | - | - | - |
| State Parks | Acres | - | - | 455 | - | - | - | - |
| State Recreation Areas | Acres | 0.02 | - | - | - | - | - | - |
| State Monuments | Acres | - | - | - | - | - | - | - |
| State Wayside | Acres | - | - | - | - | - | - | - |
| State Seabird Sanctuaries | Acres | - | 12 | - | - | - | 15 | 12 |
| Hunting Units | Acres | - | - | 220 | - | - | - | - |
| **County-Controlled or Managed** | | | | | | | | |
| Agricultural District | Acres | 149 | - | 1 | - | - | - | - |
| Urban | Acres | 76 | - | - | - | - | - | - |
| **Other Management** | | | | | | | | |
| Watershed Partnership | Acres | - | - | 1,066 | - | - | - | - |
| THNC Preserve | Acres | - | - | - | - | - | - | - |
| **Improvements/Activities** | | | | | | | | |
| Paved Roads | Present | Yes | - | - | - | - | - | - |
| Unpaved Rds or 4-wd Trails | Present | Yes | - | - | - | - | - | - |
| Hiking Trails | Present | - | - | Yes | - | - | - | - |
| Water Improvements | Present | - | - | - | - | - | - | - |
| Communication Complexes | Present | - | - | - | - | - | - | - |
| Power Transmission Lines | Present | - | - | - | - | - | - | - |
| Campgrounds and Scenic Lookouts | Present | - | - | - | - | - | - | - |
| Botanical Gardens & Arboretum | Present | - | - | - | - | - | - | - |
| Farming/Ranching | Present | - | - | - | - | - | - | - |
| Water Systems | Present | - | - | - | - | - | - | - |
| Homes, Cabins, Other Structures | Present | - | - | - | - | - | - | - |
| Golf Course | Present | Yes | - | - | - | - | - | - |
| Military Training/Safety Zone | Present | - | - | - | - | - | - | - |
| Hunting, State-Managed Lands | Present | - | - | Yes | - | - | - | - |

1. Entries may not sum to totals due to rounding, slight acreage discrepancies, and overlapping land-management areas.
2. Acreage estimate overstates the actual critical habitat area (see text).

**Table I-1. Information on the Proposed Critical Habitat**

| Item | Units | Unit T | Unit U | Unit V | Unit W | Unit X1 | Unit X2 |
|---|---|---|---|---|---|---|---|
| **Total Area [1.2]** | | 9 | 67 | 10 | 839 | 290 | 21 |
| **Area Occupied By Listed Plants** | | - | - | - | 197 | 56 | 14 |
| **Land Ownership** | | | | | | | |
| Federal | Acres | - | - | - | - | - | - |
| State | Acres | 9 | 67 | 10 | - | 290 | 21 |
| State DHHL | Acres | - | - | - | - | - | - |
| County | Acres | - | - | - | 839 | - | - |
| Private Owners | Acres | - | - | - | 0.1 | - | - |
| **Federally Controlled or Managed** | | | | | | | |
| Military | Acres | - | - | - | - | - | - |
| National Wildlife Refuge | Acres | - | - | - | - | - | - |
| FWS, 'Elepaio Critical Habitat | Acres | - | - | - | - | - | - |
| **State-Controlled or Managed** | | | | | | | |
| Conservation District | Acres | 9 | 67 | 10 | 837 | 289 | 21 |
| Protective | Acres | 9 | 67 | 10 | - | - | - |
| Limited | Acres | - | - | - | 318 | - | - |
| Resource | Acres | - | - | - | - | 258 | 20 |
| General | Acres | - | - | - | 518 | 32 | 0.4 |
| Special | Acres | - | - | - | - | - | - |
| Natural Area Reserves (NARs) | Acres | - | - | - | - | - | - |
| Forest Reserves | Acres | - | - | - | - | - | - |
| State Parks | Acres | - | - | - | - | - | - |
| State Recreation Areas | Acres | - | - | - | - | - | - |
| State Monuments | Acres | - | - | - | - | 286 | 21 |
| State Wayside | Acres | - | - | - | - | - | - |
| State Seabird Sanctuaries | Acres | 9 | 67 | 10 | - | - | - |
| Hunting Units | Acres | - | - | - | - | - | - |
| **County-Controlled or Managed** | | | | | | | |
| Agricultural District | Acres | - | - | - | - | - | - |
| Urban | Acres | - | - | - | 8 | 0.4 | - |
| **Other Management** | | | | | | | |
| Watershed Partnership | Acres | - | - | - | - | - | - |
| THNC Preserve | Acres | - | - | - | - | - | - |
| **Improvements/Activities** | | | | | | | |
| Paved Roads | Present | - | - | - | Yes | Yes | - |
| Unpaved Rds or 4-wd Trails | Present | - | - | - | Yes | Yes | - |
| Hiking Trails | Present | - | - | - | Yes | Yes | - |
| Water Improvements | Present | - | - | - | Yes | - | - |
| Communication Complexes | Present | - | - | - | Yes | Yes | - |
| Power Transmission Lines | Present | - | - | - | - | - | - |
| Campgrounds and Scenic Lookouts | Present | - | - | - | Yes | Yes | - |
| Botanical Gardens & Arboretum | Present | - | - | - | - | - | - |
| Farming/Ranching | Present | - | - | - | - | - | - |
| Water Systems | Present | - | - | - | - | - | - |
| Homes, Cabins, Other Structures | Present | - | - | - | - | Yes | - |
| Golf Course | Present | - | - | - | - | - | - |
| Military Training/Safety Zone | Present | - | - | - | - | Yes | Yes |
| Hunting, State-Managed Lands | Present | - | - | - | - | - | - |

1. Entries may not sum to totals due to rounding, slight acreage discrepancies, and overlapping land-management areas.
2. Acreage estimate overstates the actual critical habitat area (see text).

# PHYSICAL AND SOCIOECONOMIC PROFILE OF O'AHU * CHAPTER II

To provide the context for evaluating the economic impacts of the proposed critical habitat designation, this section presents a physical description and socioeconomic profile of the island of O'ahu.

## 1. PHYSICAL DESCRIPTION OF O'AHU

O'ahu lies near the middle of the Hawaiian chain, with the islands of Kaua'i and Ni'ihau to the northwest, and Moloka'i, Maui, Lana'i, Kaho'olawe, and Hawai'i lying to the southeast (see Figure ES-1).

The third oldest and third largest of the eight major Hawaiian islands, O'ahu is 597 square miles in land area. It consists of four main geomorphologic features: the Wai'anae Range and the Ko'olau Range (two shield volcanoes), the Schofield Plateau, and the coastal plain (see Figure ES-2).

Aligned perpendicular to the prevailing northeast tradewinds, the 22-mile-long Wai'anae Range forms the western portion of the island, while the 37-mile-long Ko'olau Range forms the eastern portion. Huge valleys have been carved into the Wai'anae Range, while the Ko'olau Range is deeply eroded by streams and has high cliffs along most of its eastern side. The highest point on O'ahu, Mt. Ka'ala in the Wai'anae Range, is 4,025 feet, while the highest point on the Ko'olau Range is Pu'u Konahuanui at 3,105 feet.

The two mountain ranges produce distinctive windward and leeward climates. Annual rainfall exceeds 250 inches per year on the crest of the Ko'olau Range, while leeward coastal areas receive less than 20 inches of rainfall annually. Typical of older and eroded areas, Oahu's two mountain ranges host highly diverse regional flora.

* **Note to Reader:** Readers who are already familiar with the Island of O'ahu may wish to skip this chapter and proceed to the next background-information chapters (Chapters III through V), or to the economic analysis (Chapter VI).

## 2. SOCIOECONOMIC PROFILE

Table II-1 summarizes economic and demographic information about the City and County of Honolulu (the county), which encompasses the entire island of O'ahu, as well as the uninhabited Northwest Hawaiian Islands.

### 2.a. Population and Distribution

In 2000, O'ahu had an estimated population of 876,156 residents, accounting for 72 percent of the State's population of 1,211,537 residents. Because of slow economic growth during the 1990s, O'ahu experienced slow population growth: up just 4.8 percent for the resident population.

Most O'ahu residents live on the south side of the island east of Pearl Harbor, in residential areas located on the coastal plains, in valleys, and on the lower portions of mountain ridges that separate valleys. Residential areas elsewhere on O'ahu are on coastal plains and valleys surrounding the island, and in the southern half of the Central O'ahu plain. There are no residential communities in the Wai'anae and Ko'olau ranges.

### 2.b. Primary Economic Activities

The economy of O'ahu is driven primarily by (1) its role as the government, service, commercial, and transportation center for the State; (2) a large visitor industry; (3) military activities; (4) agriculture; and (5) high-technology activities.

#### 2.b.(1) Government, Service, Commercial and Transportation Center

With its superb natural harbors, dry leeward climate, and abundant freshwater streams descending from the Ko'olau Range, Honolulu became the government, service, commercial and transportation center for the Hawaiian Islands by the early 1800s.

Continuing in this role to the present, Honolulu serves as the government center of the State, housing most of Hawai'i's State and Federal offices. It is also the primary center for legal, financial, accounting, medical and other professional services. And Honolulu Harbor and the Honolulu International Airport serve as the primary transportation hubs for the Hawaiian Islands, resulting in Honolulu being the primary distribution and commercial center for the State. Also, Honolulu is the home of the main campus of the University of Hawai'i as well as of most of Hawai'i's private universities and colleges.

### 2.b.(2) Tourism

Tourism is the dominant economic activity on O'ahu. The island hosted about 4.7 million visitors in 2000 and had an average daily visitor population of about 84,910 tourists (Table II-1). Of the visitors present, approximately 90.1 percent were U.S. visitors, while most of the remainder were Japanese. Visitor expenditures on Oahu totaled approximately $5.8 billion in 2000.

However, tourism declined during the 1990s due to the recession in California in the early part of the decade, the prolonged economic recession in Japan, and increased competition from the Neighbor Islands and visitor destinations elsewhere in the world. The annual number of visitors and the visitor census were down 2.8 percent and 9.8 percent, respectively, since 1990. The smaller decline in the visitor census was due to a shift in the mix of visitors, with more American visitors and fewer Japanese: the duration of stay is longer for Americans.

Until the terrorist attacks of September 11, 2001, O'ahu's visitor industry was on the rebound. Contributing factors included: (1) the robust economic growth in California and other western states, (2) a new convention center, and (3) aggressive marketing.

Nearly all of the resorts and hotels on O'ahu are located in or near Waikiki, or on the south shore of the island. However, there is one major resort on the southwest shore, and another on the north shore.

### 2.b.(3) Military

The military has been a major contributor to O'ahu's economy since the late 1930s, surpassing plantation agriculture in economic importance in the 1940s and being surpassed by tourism in the 1960s. Statewide defense expenditures totaled $4.4 billion, up 31.5 percent since 1990. Most of these expenditures were on O'ahu.

In 2000, 40,796 military personnel and 42,533 military dependents were stationed in Hawai'i, most of whom lived on O'ahu. However, the numbers are down about 28 percent since 1990.

### 2.b.(4) Agriculture

For nearly a century, sugar and pineapple were the economic mainstays on O'ahu, with sugar plantations located mostly in the lower elevations on the north and south shores, and pineapple plantations located at the higher elevations in the saddle between the Wai'anae and Ko'olau Ranges. The last two sugar plantations on O'ahu closed in the early and mid-1990s, but two large pineapple plantations (Dole and Del Monte) remain,

although their canneries have been closed. Pineapple is now cultivated for the fresh and fresh-chill markets, which is possible because of low backhaul rates and frequent service to the U.S. mainland for both ships and aircraft. Much of the pineapple is carried in the holds of wide-bodied aircraft serving the visitor industry.

While plantation agriculture decreased significantly on O'ahu since the early-1990s, many of the former sugarcane fields have been replanted in diversified crops (i.e., all crops other than sugarcane or pineapple). Diversified crops include: vegetables, watermelons and other fruits, seed corn, *taro*, and flowers and nursery products. Most of the agricultural land that is unsuitable for growing crops is used for grazing.

In 2000, agricultural sales on O'ahu totaled $184.5 million, up slightly from 1990. While the economic significance of agriculture on O'ahu is now small in comparison to tourism and the military, it remains a major user of land and water.

Irrigation water for agriculture comes directly or indirectly from rainfall in the mountainous watershed areas. In the early 1900s, elaborate water systems were built in the mountains to supply water to surgarcane plantations. These systems, which are still in use, include high-elevation water tunnels and stream diversions to capture large volumes of water, and ditch systems to deliver the water to farm areas many miles away. Thus, the watershed and water systems are of critical importance to the survival of agriculture on O'ahu.

### 2.b.(5) High-Technology Activities

O'ahu has a growing high-technology industry based on a combination of natural advantages and links to various research organizations, most of which are based at the University of Hawai'i, Manoa. Major initiatives include (1) biotechnology (covering tropical agriculture, marine biology, biomedical technology, functional genomics, biomanufacturing, etc.).; (2) health care (covering education, telemedicine, health information technology; etc.); (3) natural resources and the environment (covering aquaculture, materials research, environmental and other sensors, environmental remediation, environmental information management systems, etc.); and (4) information technology (covering call centers for Asian markets, software, advanced information systems, etc.).

## 2.c. Labor Force and Employment

In 2000, Oahu's civilian labor force numbered about 423,500 workers, up 5.3 percent since 1990. Employment reached 407,600 workers in 2000, up 3.6 percent from 1990. Oahu's 2000 unemployment rate was 3.8 percent.

As employment increased somewhat on O'ahu during the 1990s, the number of jobs increased by 16.1 percent to 509,400 jobs. Because some workers work two or more part-time jobs, the number of jobs exceeds the number of people employed. These jobs and the growth in jobs were concentrated in three categories: services (hotel, tourism, and health), government; and self-employed. Services increased 13.4 percent; government jobs increased 4.6 percent; and self-employed jobs increased 247 percent. This marked increase in the self-employed reflects the increased number of workers who take advantage of advanced telecommunications to work for themselves; the trend toward services; the replacement of corporate farming (plantation agriculture) with small farming (diversified agriculture); and an apparent change in how the self-employed are estimated**.** The number of jobs declined in all the remaining categories: construction and mining; manufacturing; transportation, communications and utilities; trade (retail and wholesale); finance, insurance and real estate; and agriculture.

### 2.d. Personal Income

In 2000, the O'ahu total personal income and per-capita income were $26.2 billion and $29,960, respectively—amounts that increased from 1990 levels by about 31.7 percent and 26 percent, respectively. However, per-capita income failed to keep pace with inflation as measured by the Consumer Price Index, which increased 27.7 percent over this same period.

## 3. OUTLOOK FOR ECONOMIC GROWTH AND URBAN DEVELOPMENT

O'ahu's economy is expected to grow slowly over the coming decade, with no major changes in its economic structure. Most urban development is being directed to 'Ewa in the southwest corner of the island, to the southern half of Central O'ahu, and to urban in-fill.

No urban development is planned in the Wai'anae and Ko'olau mountain ranges. This reflects the topography of the island, the importance of the watershed for both the potable- and irrigation-water supplies**,** county plans for the location of future development, and State land-use restrictions on development in the mountains and watershed areas.

## Table II-1. Socioeconomic Profile of Oah'u

| Item | 1990 | 2000 | Growth since '90 |
|---|---|---|---|
| **Resident Population** | 836,231 | 876,156 | 4.8% |
| **Visitors** | | | |
| Annual Visitors | 5,350,940 | 4,719,244 | -11.8% |
| Average Visitor Census | 87,400 | 84,910 | -2.8% |
| U.S. Visitors | no data | 51,186 | |
| Foreign Visitors | no data | 33,724 | |
| **Income from Primary Economic Activities** ($ million) | | | |
| Government, Service, Commercial and Transportation Center | no data | no data | |
| Tourism | $ 5,441.1 | $ 5,783.3 e | 6.3% |
| Military (mostly Oah'u) | $ 3,336.0 | $ 4,386.3 | 31.5% |
| Agriculture | $ 180.8 | $ 184.5 | 2.1% |
| High-Technology Activities | no data | no data | |
| **Labor** | | | |
| Civilian Labor Force | 402,300 | 423,500 | 5.3% |
| Employed | 393,300 | 407,600 | 3.6% |
| Unemployment Rate | 2.2% | 3.8% | |
| **Jobs** | 438,850 | 509,400 | 16.1% |
| Construction, mining | 24,000 | 17,200 | -28.3% |
| Manufacturing | 15,800 | 13,350 | -15.5% |
| Transportation, communication, utilities | 34,200 | 33,300 | -2.6% |
| Trade | 102,550 | 99,000 | -3.5% |
| Finance, insurance, real estate | 29,600 | 26,800 | -9.5% |
| Services and miscellaneous | 115,450 | 130,950 | 13.4% |
| Government | 87,600 | 91,650 | 4.6% |
| Agriculture | 2,300 | 2,250 | -2.2% |
| Self-employed | 27,350 | 94,900 e | 247.0% |
| **Personal Income** | | | |
| Total ($ million) | $ 19,921.7 | $ 26,234.8 | 31.7% |
| Per capita | $ 23,772 | $ 29,960 | 26.0% |
| **Consumer Price Index—All Urban Consumers, Honolulu** | 138.1 | 176.3 | 27.7% |

e: estimated

**Source:** Department of Business, Economic Development & Tourism. *The State of Hawai'i Data Book.* Annual.

# THE ENDANGERED SPECIES ACT * CHAPTER III

This chapter provides relevant information from the 1973 Endangered Species Act, as amended (the Act), including the role of critical habitat designation in protecting threatened and endangered species, requirements for consulting with the Service to insure that certain Federal actions do not endanger listed species or their habitats, and prohibited activities that apply to listed species.

## 1. ROLE OF SPECIES LISTING AND CRITICAL HABITAT DESIGNATION IN PROTECTING THREATENED AND ENDANGERED SPECIES

For species listed as threatened and endangered, the Act requires the Service to designate critical habitat to the maximum extent prudent and determinable. The Act defines critical habitat as the specific areas containing features essential to the conservation of a threatened or endangered species and that may require special management considerations or protection.

For listed species, section 7(a)(2) of the Act requires Federal agencies to consult with the Service in order to ensure that activities they fund, authorize, permit, or carry out are not likely to *jeopardize* the continued existence of the species. The implementing regulations define *jeopardy* as any action that would appreciably reduce the likelihood of both the survival and recovery of the species.

For the critical habitat of listed species, section 7(a)(2) further requires Federal agencies to consult with the Service to ensure that activities they fund, authorize, permit, or carry out do not result in destruction or *adverse modification* of critical habitat. *Adverse modification* of critical habitat is defined as any direct or indirect alteration that

* **Note to Reader:** Readers who are already familiar with the Act may wish to skip this chapter and proceed to the next background-information chapters (Chapters IV and V), or to the economic analysis (Chapter VI).

appreciably diminishes the value of critical habitat for the survival and recovery of the species.

As stated in the proposed rule, "... critical habitat also provides non-regulatory benefits to the species by informing the public [as well as land-managing agencies] of areas that are important for species recovery and where conservation actions would be most effective." "Critical habitat also identifies areas that may require special management considerations … and may help provide protection to areas where significant threats to the species have been identified or help to avoid accidental damage to such areas."

## 2. CONSULTATION UNDER SECTION 7 OF THE ACT

As indicated above, section 7 of the Act requires Federal agencies to consult with the Service whenever activities they fund, authorize, or carry out may affect listed species or designated critical habitat. Section 7 consultation with the Service is designed to ensure that current or future Federal actions do not appreciably diminish the value of critical habitat for the survival and recovery of a listed species.

The Service has authority under section 7 to consult on activities on land owned by individuals, organizations, states, or local and tribal governments only if the activities on the land have a *Federal nexus*. A *Federal nexus* occurs when the activities require a Federal permit, license, or other authorization, or involve Federal funding. The Service does not have jurisdiction under section 7 to consult on activities occurring on non-Federal lands when the activities are not Federally funded, authorized, or carried out. In addition, consultation is not required for activities that do not affect listed species or their critical habitat.

When consultations concern activities on Federal lands, the relevant Federal Action agency initiates consultation with the Service. When an activity proposed by a state or local government or private entity requires a Federal permit or is Federally funded or carried out, the Federal agency with the *nexus* to the activity initiates consultation with the Service. For example, the Army Corps of Engineers is the agency that issues section 404 permits under the Clean Water Act, so it is the Action agency.

The consultation begins after the Federal Action agency determines that its action may affect one or more listed species or their designated critical habitat, even if the effects are expected to be beneficial since projects with overall beneficial effects could include some adverse impacts. Consultations are frequently conducted for multiple species if more than one species is affected by the action.

The consultation between the Federal Action agency and the Service may involve informal consultation, formal consultation in the case of adverse impacts, or both.

Informal consultation may be initiated via a telephone call or letter from the Action agency, or a meeting between the Action agency and the Service. In preparing for an informal consultation, the Action agency compiles all the biological, technical, and legal information necessary to analyze the scope of the activity and discusses strategies to eliminate adverse effects on listed species or critical habitat. Through informal discussions, the Service assists the Action agency and the Applicant, if any, in identifying and resolving potential conflicts at an early stage in the planning process, and may make recommendations, if appropriate, on ways to avoid adverse effects.

If during informal consultation the Federal Action agency determines that its action (as originally proposed or revised and taking into account direct and indirect effects) "is not likely to adversely affect" listed species or critical habitat (e.g., the effects are beneficial, insignificant or discountable), and the Service agrees with that determination, then the Service provides concurrence in writing and no further consultation is required.

But if the proposed action, as revised during informal consultation, is still likely to adversely affect listed species or critical habitat, the Action agency must request in writing initiation of formal consultation with the Service and submit a complete initiation package. Formal consultations, which are subject to specific timeframes, are conducted to determine whether a proposed action is likely to *jeopardize* the continued existence of a listed species or destroy or *adversely modify* designated critical habitat. This determination depends on the extent to which a project may affect the species. Many variables, including the project's size, location and duration, may influence the extent of the impact and, in turn, the determination of a "may effect" opinion.

If the Service finds, in its biological opinion, that a proposed action is <u>not</u> likely to *jeopardize* the continued existence of a listed species, or destroy or *adversely modify* the critical habitat—even though the action may adversely affect listed species or critical habitat—then the action likely can be carried out without violating section 7(a)(2) of the Act.

On the other hand, if the Service finds that a proposed action is likely to *jeopardize* the continued existence of a listed species and/or destroy or *adversely modify* the critical habitat, then the Service provides the Action agency with reasonable and prudent alternatives that will keep the action below the thresholds of *jeopardy* and/or *adverse modification*, if any can be identified.

The Service works with Action agencies and Applicants in developing reasonable and prudent alternatives. A reasonable and prudent alternative is one that (1) can be implemented in a manner consistent with the intended purpose of the action; (2) can be implemented consistent with the scope of the Action agency's legal authority and jurisdiction; and (3) is economically and technologically feasible. The Service will, in most cases, defer to the Action agency's expertise and judgment as to the feasibility of

an alternative. Reasonable and prudent alternatives can vary from slight project modifications to extensive redesign or relocation of a project. Costs associated with implementing reasonable and prudent alternatives vary accordingly.

## 3. *TAKING* AND OTHER RESTRICTIONS OF THE ACT

### 3.a. Wildlife Species

Regardless of any *Federal involvement* and critical habitat designation, once a species has been formally listed as threatened or endangered, it is entitled to certain regulatory protections under the Act. First and foremost, section 9 of the Act specifically prohibits the *taking* of any endangered species of fish or wildlife (the prohibition does not extend to plants). The term *take* is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." The regulations at 50 CFR section 17.3 define “harm” to mean an act that actually kills or injures wildlife. This may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. In addition, endangered species, their parts or any products made from them may not be imported, exported, possessed or sold. Section 4(d) of the Act gives the Service regulatory discretion to extend the protections of section 9 to threatened species.

However, the Act allows the Service to permit *take* by private applicants that would otherwise be prohibited, provided such *taking* is "incidental to, and not [for] the purpose of, the carrying out of an otherwise lawful activity." Section 10(a)(1)(B) of the Act allows non-Federal parties planning activities that have no *Federal nexus*, but which could result in the incidental *taking* of listed animals, to apply for an incidental *take* permit. The application must include a habitat conservation plan laying out the proposed actions, determining the effects of those actions on affected fish and wildlife species and their habitats (often including proposed or candidate species), and defining measures to minimize and mitigate adverse effects. The Service may elect to issue an incidental *take* permit if the incidental *take* is to be minimized by reasonable and prudent measures and implementing terms and conditions that are stipulated in the permit.

### 3.b. Plant Species

Section 9(a)(2) of the Act states that it is unlawful to remove and possess any endangered plant species from areas under Federal jurisdiction; maliciously damage or destroy any such species on any such area; or remove, cut, dig up, damage, or destroy any such species on any other area in knowing violation of any state law. In addition,

endangered species, their parts or any products made from them may not be delivered, received, transported, shipped or sold in interstate or foreign commerce. As above, section 4(d) of the Act gives the Service regulatory discretion to extend the protections of section 9(a)(2) to threatened plant species.

However, the Service may give permission to remove a listed plant from areas under Federal jurisdiction, and may also give permission for actions that are otherwise prohibited by section 9 of the Act for "scientific purposes or to enhance the propagation or survival of the affected species including, but not limited to, acts necessary for the establishment and maintenance of experimental populations."

# EXISTING PROTECTIONS * CHAPTER IV

In addition to the Act, other existing regulations and land-management programs protect Hawai'i's threatened and endangered species and their habitats. This chapter provides an overview of these protections, including: other Federal programs, State protections for listed species, State land-use controls affecting public and private lands, county land-use controls, and land management by various public and private organizations. Land use management that applies specifically to the proposed critical habitat is summarized in Table I-1. As appropriate, this information is used in Chapter VI to estimate the section 7 economic impacts that occur over and above impacts attributable to existing protections.

## 1. FEDERAL SPECIES PROTECTIONS AND LAND MANAGEMENT

### 1.a. O'ahu 'Elepaio Critical Habitat

As discussed in Chapter III, under the Act, the Service is charged with designating critical habitat for threatened and endangered species. The goal is to restore healthy populations of listed species within their native habitats so that they can be removed from the list of threatened and endangered species.

The first critical habitat to be designated on O'ahu (on December 10, 2001) was for the O'ahu 'elepaio (*Chasiempis sandwichensis ibidis*), a small forest-dwelling bird and member of the monarch flycatcher family Monarchidae. Its critical habitat covers most of the northern Wai'anae Mountains, the southern Wai'anae Mountains, the central Ko'olau Mountains, and the southern Ko'olau Mountains (see Figure ES-3). Consulta-

* **Note to Reader:** Readers already familiar with existing protections in Hawai'i of threatened and endangered species and their habitats may wish to skip this chapter and proceed to the approach to the analysis (Chapter V), or to the economic analysis (Chapter VI).

tion with the Service will be required for projects and activities that are within this critical habitat and which have Federal involvement.

## 1.b. Integrated Natural Resources Management Plans

The Sikes Act Improvements Act (SAIA) of 1997 required every military installation containing land and water suitable for the conservation and management of natural resources to complete, by November 17, 2001, an Integrated Natural Resources Management Plan (INRMP). The purpose of the INRMP is to integrate the mission of the military installations with stewardship of the natural resources found there. Each military installation that has listed species or critical habitat consulted with the Service on its INRMP.

In addition the main military bases, safety buffers for firing ranges and munitions storage extend into the Waianae Mountains, and training areas encompass the northern third of the Ko'olau Mountains.

## 1.c. Conservation Partnerships Program, Pacific Islands Ecoregion

The Service's Conservation Partnerships Program is a collection of voluntary habitat restoration programs having the goal of restoring native Pacific Island ecosystems through collaborative projects with private landowners, community groups, conservation organizations, and other government agencies. The Program can provide cost-share funds, as well as information on habitat restoration techniques, native species, Safe Harbor Agreements, additional funding sources, required permits, and potential vendors of restoration services (fence contractors, nurseries, etc.). The Program is divided into five sections, discussed below.

### 1.c.(1) Partners for Fish and Wildlife Program

The Partners for Fish and Wildlife (PFW) Program is the Service's habitat restoration program for long-term conservation on private land. The PFW Program was established to offer technical and financial assistance to landowners who wish to restore wildlife habitat on their property. PFW Programs can include constructing fences to exclude feral ungulates; controlling feral ungulates, weeds, rodents, and alien insects; restoring native ecosystem elements such as hydrology and micro-habitat conditions; and reintroducing native species.

The Service provides assistance ranging from informal advice on the location and design of potential restoration projects to cost-shared funding under a formal cooperative agreement with the landowner. If warranted, the Service also provides participating

landowners with technical assistance to develop Safe Harbor Agreements that cover habitat managed for endangered or threatened species. The Agreements provide assurances to landowners that additional land, water, and/or restrictions on uses of natural resources will not be imposed as a result of their voluntary conservation actions.

Since funding is limited, projects given the highest priority are ones that manage or reestablish natural biological communities and provide long-term benefits to declining migratory bird and fish species, and species that are endangered, threatened, or proposed for listing; and projects on private lands that satisfy the needs of wildlife populations on National Wildlife Refuges.

### 1.c.(2) The Hawai'i Biodiversity Joint Venture

The Hawai'i Biodiversity Joint Venture (HBJV) is a public-private effort to protect, maintain, improve, and restore the native biological diversity of the Hawaiian Islands. The mission is to work with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats.

The HBJV was initiated with the following goals:

— Maintain natural communities and habitats for native species

— Support efforts to cooperatively manage significant native ecosystems on public and private land

— Develop natural resource management techniques to address widespread threats (such as feral ungulates, weeds, rats, and alien insects) to Hawai'i's native ecosystems

— Restore former wetlands, native forests and other natural communities on public and private lands

— Protect native Hawaiian ecosystems and natural communities through land and water acquisition and management.

Since funding is limited, priority is given to projects that: (1) implement management or research actions that directly contribute to protecting or restoring habitats for multiple endangered, threatened, candidate, or rare species; (2) address key threats to native ecosystems or habitats; and (3) benefit rare or unique ecosystems or habitats.

### 1.c.(3) Pacific Islands Coastal Program

The Pacific Islands Coastal Program identifies and conserves important coastal natural resources. The goals of the program are to:

— Identify and prioritize coastal natural resources and threats

— Implement on-the-ground projects in partnership with others

— Promote public stewardship of coastal fish, wildlife, plants and their habitats.

The objectives of the program include:

— Protecting and restoring coastal wetlands and uplands, anchialine pools, estuaries, coral reefs and streams

— Preventing and eradicating invasive alien species in coastal areas

— Protecting and restoring watersheds for native species' habitat needs

— Building public support through partnerships, education and community involvement

— Inventory and map coastal resources.

### 1.c.(4) Endangered Species Grant Programs

The Service offers a variety of grant programs to address high-priority habitat restoration needs of endangered, threatened, and candidate species. These programs include the Cooperative Endangered Species Conservation Fund (section 6 of the Act), the Private Stewardship Grants Program, and the Landowner Incentive Program. Additionally, the Service offers regulatory relief incentives such as Safe Harbor Agreements and Candidate Conservation Agreements with Assurances to encourage the conservation of imperiled species.

### 1.c.(5) Other Habitat Restoration Programs

Other Habitat Restoration Programs include the National Coastal Wetlands Conservation Grant Program and the North American Wetlands Conservation Grant Program. In addition, the Conservation Partnerships Program seeks to provide a connection between habitat restoration projects and non-Service funding sources.

## 1.d. Wildlife Habitat Incentives Program

Under the Wildlife Habitat Incentives Program (WHIP), the Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture (USDA) provides assistance to landowners and lessees (leases must be for 5 years or more) to protect and

restore Hawai'i's native habitats as well as habitats of threatened and endangered species. In Hawai'i, the focus is on the following habitats:

— Threatened/endangered plant species habitat

— Native forests/riparian areas adjacent or connected to a native forest reserve, wildlife refuge, or other preserved forest/riparian area

— Montane wetlands and bogs

— Coastal dunes that support rare plants, seabirds, monk seals or turtles

— Anchialine pools

— Endangered waterbird and migratory bird habitat

— Caves and rare species

The NRCS works with private landowners and lessees to help them develop a Wildlife Habitat Development Plan for their land that benefits native wildlife and meets other goals and objectives of WHIP. If the Plan is selected for funding, a 5- to 10-year contract is entered into whereby the landowner or lessee agrees to undertake wildlife habitat development practices such as noxious weed control, fencing, planting of native trees, and wetland restoration. In turn, NRCS reimburses the landowner or lessee 75 percent of the cost of carrying out these practices at specified rates. However, the funds cannot be used for mitigation of any kind, or on any land designated as converted wetland.

### 1.e. O'ahu Forest National Wildlife Refuge

The O'ahu Forest National Wildlife Refuge (O'ahu Forest NWR), established in December 2000, covers about 7 square miles in the northern Ko'olau Mountains. Purchased by the Service from a major landowner in Hawai'i, the O'ahu Forest NWR provides habitat for many native plants (17 of which are endangered species), native-Hawaiian forest birds, and four species of endangered O'ahu tree snails. Other native wildlife include at least two species of Hawaiian honeycreeper and a diverse array of native plants, insects, snails and stream fish. At least nine native natural communities have been identified in the O'ahu Forest NWR.

## 2. STATE LAND MANAGEMENT

### 2.a. State Districting

All lands in Hawai'i are allocated by the State into one of four districts: Conservation, Agricultural, Urban and Rural. The State, through its Department of Land and

Natural Resources (DLNR) and its Board of Land and Natural Resources (the Board) has primary land-management responsibility for activities and development in the Conservation District, while the counties have primary responsibility in the Urban, Rural and Agricultural Districts.

## 2.b. The Conservation District

The purpose of the Conservation District is to conserve, protect and preserve the State's important natural resources through appropriate management in order to promote the long-term sustainability of these natural resources, and to promote public health, safety and welfare (Hawai'i Revised Statutes (HRS) §183C). To this end, limited development and commercial activity is allowed in the Conservation District. "Important natural resources" include the watersheds that supply potable water and water for agriculture; natural ecosystems and sanctuaries of native flora and fauna, particularly those which are endangered; forest areas; scenic areas; significant historical, cultural, archaeological, geological, mineral and volcanological features and sites; and other designated unique areas.

Permission is required to use land, construct facilities, or conduct many of the activities in the Conservation District (see below). Permits for routine uses or activities are issued by DLNR, while more complex activities or uses (such as certain construction projects and commercial operations) require formal approval of a Conservation District Use Application (CDUA) by the Board, and often require an approved management plan.

## 2.c. Conservation District Subzones

All land in the Conservation District has been assigned to one of five subzones that reflect a hierarchy of uses from the most restrictive to the most permissive. These subzones are the Protective Subzone (the most restrictive), Limited, Resource, General and Special (Hawai'i Administrative Rules, Title 13, §5). Except for the Special Subzone, all uses and activities allowed in a more restrictive subzone in the hierarchy are allowed in the less restrictive subzones. The five subzones are described below.

### 2.c.(1) Protective Subzone

The Protective Subzone, the most restrictive of the five subzones, was established to "… protect valuable resources in designated areas such as restricted watersheds … plant and wildlife sanctuaries … and other designated natural and unique areas." Correspondingly, lands and waters generally included in this subzone are needed to

protect watersheds, water sources, and water supplies; and to preserve the natural ecosystems of native plants and wildlife, particularly endangered species.

No structures, homes, or farm activities are allowed in the Protective Subzone, with two exceptions. First, the land can be used by State and county governments and by non-government entities that serve the public (e.g., the local utility companies) "for public purpose"—i.e., to fulfill mandated government functions for the public benefit such as transportation systems, water systems, and communications systems or recreational facilities. Second, Native Hawaiians owning *kuleana* land (land that was granted to Native-Hawaiian tenants in the mid-1800s) may use it for agriculture or single-family residences if their land was used "historically and customarily" for these purposes.

Allowed uses (by permit or Board approval) in the Protective Subzone include: replacing or reconstructing an existing structure and some types of accessory structures, habitat improvements for plant and wildlife sanctuaries, Natural Area Reserves, wilderness areas and scenic areas, limited removal of certain trees, and removal of noxious plants from small areas provided that the ground is not disturbed significantly. Limited landscaping is allowed, but is restricted to plants that are endemic or indigenous; alien subspecies are specifically prohibited.

### 2.c.(2) Limited Subzone

The Limited Subzone encompasses areas that are potentially dangerous to the public due to possible flooding, soil erosion, *tsunami* (tidal waves), volcanic activity or landslides. Lands having a general slope of 40 percent or more are also included in this subzone. The purpose of the Limited Subzone is to limit uses where natural conditions suggest that human activity should be constrained.

In addition to what is permitted in the Protective Subzone, the following activities and uses are allowed in the Limited Subzone by permit or Board approval: accessory structures near existing structures; single-family homes (one per lot) if State and county regulations are followed; agricultural activities; facilities or devices used to control erosion, floods and other hazards; botanical gardens and private parks; landscaping; and removal of noxious plants in areas larger than 10,000 square feet that result in significant ground disturbance.

### 2.c.(3) Resource Subzone

The Resource Subzone encompasses lands that are suitable for growing and harvesting commercial timber or other forest products, park land, and land for outdoor recreation (hunting, fishing, hiking, camping and picnicking, etc.). The purpose of the

Resource Subzone is to develop properly managed areas to ensure the sustained use of Hawai'i's natural resources.

In addition to what is permitted in the Protective and Limited Subzones, the following activities and uses are allowed in the Resource Subzone by permit or Board approval: commercial forestry under an approved management plan, and mining and extraction of any material or natural resource.

### 2.c.(4) General Subzone

The General Subzone is used to designate open space where special conservation uses may not yet be defined, but where urban uses may be premature. This subzone encompasses lands that may not be adaptable to or needed currently for urban, rural or agricultural use. The General Subzone also includes lands that are suitable for farming, flower gardening, nursery operations, orchards and grazing. Golf courses are not allowed.

In addition to what is permitted in the Protective, Limited and Resource Subzones, facilities necessary for the above-mentioned uses are allowed by permit when these facilities are compatible with the natural physical environment, and the use promotes natural open space and scenic value.

### 2.c.(5) Special Subzone

Special Subzones are designated for educational, recreational and research purposes. These subzones set aside lands possessing unique developmental qualities that complement the natural resources of an area.

## 2.d. Additional Management in the Conservation District

In addition to the five subzones in the Conservation District, the State has established further controls by defining other areas it manages within the Conservation District. These include Forest Reserves, Natural Area Reserves, State parks and State trails, and State Hunting Units. These are discussed below.

### 2.d.(1) Forest Reserves

State Forest Reserves were first established in Hawai'i over a century ago to protect the supply of high-quality water that was being threatened due to the destruction of Hawai'i's rainforests. The stated purpose of a Forest Reserve is to protect native ecosystems and important watersheds (HRS §§183-2 and 183-17). Most of Hawai'i's

Forest Reserves are in the Resource Subzone. Limited collecting for personal use (e.g., *ti* leaves and bamboo) is allowed by permit, as is limited (no more than $3,000 value per year) commercial harvesting of timber, seedlings, greenery and tree ferns. Commercial forestry operations are allowed only with approval from the Board. Permission is required to reside in a Forest Reserve, hunt (see below), camp and fish. Land vehicles, mountain bikes, horses, mules and leashed dogs are allowed on designated roads and trails.

Collecting endangered or threatened plants or wildlife is not allowed and, except in the situations described above or with Board approval, no forms of plant or animal life may be removed, injured or killed.

**2.d.(2) Natural Area Reserves**

A Natural Area Reserve (NAR) is based on the concept of protecting ecosystems rather than just single species, with the goal of preserving and protecting representative samples of Hawaiian biological ecosystems and geological formations (HRS §195-5). Although most NARs are located in the State Conservation District, they can include land in other Districts.

Management activities in a NAR include restoring and enhancing existing populations of native plants, removing non-native weeds, and working with local hunters to keep non-native animal populations low in sensitive areas.

Permitted activities in a NAR include hiking, nature study and bedroll camping. Game hunting and research or educational activities are allowed by permit. Prohibited activities in a NAR include: improvements or construction; tent camping; vehicles, except on designated roads; and removing, injuring, killing or introducing plants or wildlife.

O'ahu has three NARs:

— Ka'ala NAR (1,100 acres)

The Ka'ala NAR includes Ka'ala, the highest point on the island of O'ahu (4,020 feet) in the northern Wai'anae Mountains. This fog-shrouded Reserve features steep, wet slopes that descend from a montane bog to semi-wet foothills.

— Kaena Point NAR (34 acres)

The Kaena Point NAR, on the dry, windswept western-most tip of O'ahu is the last relatively intact coastal dune ecosystem on the island. Situated at the base of sea cliffs of the Wai'anae Mountains, the NAR protects

shrublands and rare coastal plants. It is also a nesting area for the Laysan albatross and is visited occasionally by Hawaiian monk seals.

— Pahole NAR (658 acres)

The Pahole NAR covers a complex valley system in the northern Wai'anae Mountains. The area is known for its natural diversity and extends from the summit ridge down to the dry lowlands. The Reserve contains a rare dry forest and a rare mesic forest and is a home to endangered Hawaiian tree snails. Other lowland mesic forests and dry shrub lands, as well as a Hawaiian intermittent stream community are represented.

**2.d.(3) State Parks**

The State Parks System was established to govern the use and protection of all lands and historical and natural resources in Hawai'i's State parks (HRS §§184-3 and 184-5). Within State parks, approvals are required from the Board to erect communications equipment (such as aerials, antennas and transmitters), vacation cabins, and concession facilities. Activities requiring permits include limited camping, lodging (e.g., private and State cabins), fresh-water fishing, and hiking on certain trails. Uses allowed without a permit from DLNR include limited collecting of renewable products (fruits, berries, flowers, seeds, and pine cones) for personal use; hiking on most trails; picnicking; and mountain biking (unless posted signs indicate otherwise).

State-administered parks on O'ahu include:

— Kaena Point State Park (779 acres)

Kaena Point State Park is located on the leeward shore and westernmost point of O'ahu at Kaena Point. A 5-mile trail leads along the coastline from Yokohama Bay to Kaena Point. Facilities include restrooms and showers, and the primary activities in the main portion of the Park are fishing and hiking.

— Kahana Valley State Park (5,000 acres)

Located on the eastern shore of O'ahu, Kahana Valley State Park encompasses the beach at Kahana Bay and the lush interior valley and forest lands up to the ridge of the Ko'olau Mountains. Park facilities include an orientation center, cultural resources, picnic tables, hiking trails, a beach area, and campsites. Over 100 people live within the Park boundaries.

The back of the valley is mountainous and has no park facilities and only secondary hiking trails. Park activities are limited to game hunting

and hiking for the more adventurous. Waiahole Ditch and water diversions are found along the valley walls below the ridgeline.

— Keaiwa Heiau State Recreation Area (385 acres)

Lying in the mountains northwest of Pearl Harbor, the Keaiwa Heiau State Recreation Area protects a variety of cultural and natural resources including the Keaiwa Heiau (a 15th-century healing temple), a eucalyptus forest, guava trees, and native Hawaiian trees. Park facilities include campsites, picnic tables, trails, showers and restrooms; activities include hiking, sightseeing, picnicking and exploring.

### 2.d.(4) Hunting Units

A total of 47 Hunting Units, administered by DLNR, have been established across the State to control game hunting (Hawaii Administrative Rules, Title 13, §§122 and 123). On O'ahu, game animals and birds hunted include feral pigs and goats, pheasant (3 species), Chukar partridge, Japanese quail, Francolin (3 species), and dove (3 species).

Hunting is a licensed activity and is restricted within the Hunting Units. Restrictions address: bag limits, hunting seasons, days allowed, hours of the day, and hunting method (rifle, muzzleloader, handgun, bow and arrows). Game hunting restrictions on private land are set by the landowner. DLNR's intent is to manage the hunting areas, game-mammal populations, and the level of hunting activity to achieve a reasonable balance between (1) recreational benefits for hunters and (2) protection to native ecosystems and threatened and endangered plants.

### 2.d.(5) State Trail and Access Program

The purpose of the State Trail and Access Program is to preserve and perpetuate the integrity, condition, naturalness and beauty of State trails and surrounding areas, and to protect … environmental resources (HRS §198D-11 and 198D-6).

Activities allowed under this program by permit from DLNR include camping, hunting and fishing. Some trails are designated for commercial activity (e.g., commercial hikes on designated trails), but no commercial activity is permitted on a trail if it will compromise the quality and nature of the experience or cause any damage to the integrity or condition of the trail or the surrounding environment. Prohibited uses include collecting, removing, injuring or killing a plant or animal; and introducing plants or wildlife.

### 2.d.(6) Natural Area Partnership (NAP) Program

Under the Natural Area Partnership (NAP) program, the State provides two-thirds of the management costs for private landowners who agree to permanently protect intact native ecosystems, essential habitat for threatened and endangered species, or areas with other significant biological resources. The NAP program can support a full range of management activities to protect, restore, or enhance significant native resources or geological features.

To qualify, the applicant must be a landowner or manager of private lands of high natural area quality. Other requirements include: (1) permanent dedication of the private lands through a transfer of fee title or a conservation easement to the State or a "cooperating entity" such as The Nature Conservancy of Hawai'i, and (2) management of the lands according to a detailed management plan approved by the Board of Land and Natural Resources. A "cooperating entity" is a private non-profit landholding organization or any other body deemed by DLNR to be able to assist in the management of natural areas.

### 2.d.(7) Hawai'i Endangered Bird Conservation Program

The Hawai'i Endangered Bird Conservation Program is a partnership composed of non-profit conservation organizations, private landowners, and government agencies including DLNR and the Service.

The mission of the Program is to recover native Hawaiian ecosystems at the landscape level and to establish self-sustaining bird populations in the wild, using management programs that include captive propagation and reintroduction. Their efforts employ an integrated conservation strategy of research, habitat management, and public education, with a focus on ecosystem health and protection as a prerequisite to reintroduction.

## 3. STATE SPECIES PROTECTIONS

### 3.a. Protection of Threatened and Endangered Wildlife and Ecosystems

The State has established various laws and administrative rules to protect threatened and endangered wildlife and their ecosystems. The Administrative Rule "Indigenous Wildlife, Endangered and Threatened Wildlife, and Introduced Wild Birds," implements a State act that was specifically designed to conserve, manage, protect and enhance indigenous wildlife, endangered and threatened wildlife, and introduced wild birds (Hawai'i Administrative Rules §13-124). The State list of threatened and endangered species includes by reference species on the Federal list.

With regard to threatened and endangered wildlife species, prohibited activities include *taking*, possessing, processing, selling, offering for sale, or transporting these species. Nor can their nests be removed, damaged or disturbed, or their young, eggs, dead body or skin be removed from the State of Hawai'i. Nor does DLNR issue permits to destroy or otherwise control threatened or endangered species of wildlife or introduced wildlife. However, these rules do not apply to authorized employees of DLNR, the State Department of Agriculture, and the Service if the employees are acting in the course of their official duties. Also, "incidental *takes*" are allowed subject to approved habitat conservation plans and safe harbor agreements (HRS §195D).

Similarly, the State has established various laws and Administrative Rules to protect threatened and endangered plants and their ecosystems, which in turn helps protect wildlife. The Administrative Rule "Threatened and Endangered Plants," implements a State act that was specifically designed to conserve, manage, protect and enhance native threatened and endangered plants (HRS §195D). Prohibited activities include the *taking,* selling, delivering, carrying, shipping, transporting, or exporting of any native endangered or threatened plant. However, license holders may sell such plants if the plants are garden-grown. And "incidental *takes*" are allowed subject to approved habitat conservation plans and safe harbor agreements (HRS §195D).

As discussed above, additional protections of threatened and endangered wildlife and ecosystems are embedded in separate laws governing the State Conservation District, State Forest Reserves, State parks, and designated State trails. Also, the State has laws to protect, conserve and preserve ecosystems in NARs, as well as native ecosystems and important watersheds in State Forest Reserves. Under the NAP program, the State shares in the land management costs of private landowners who agree to permanently protect intact native ecosystems, essential habitat for threatened and endangered species, or areas with other significant biological resources. Limited taking of flora is allowed, but only in State parks and State Forest Reserves, and only if the flora is not endangered or threatened. In State parks, collecting or gathering reasonable quantities of natural renewable products—such as fruits, berries, flowers, seeds, and pine cones—is allowed for personal use without a permit. In Forest Reserves, limited collecting for personal use (e.g., *ti* leaves and bamboo) and limited commercial harvesting (e.g., timber, seedlings, greenery and tree ferns) is allowed by permit. Commercial forestry operations are allowed only with approval of the Board.

### 3.b. State Environmental Assessments and Environmental Impact Statements

Hawai'i State law calls for efforts to prevent or eliminate damage to the environment and biosphere and to protect endangered species and indigenous plants and

animals. To meet this and other goals, Hawai'i's Environmental Impact Statement (EIS) law (HRS 343), which is administered by the State Office of Environmental Quality Control (OEQC), requires that an Environmental Assessment (EA) and/or EIS be prepared for many development projects. "The law requires that government give systematic consideration to the environmental, social and economic consequences of proposed development projects before granting permits" for construction (OEQC, 1997). For impacts on biological resources, OEQC guidelines call for biological surveys, an ecosystem impact analysis, and proposed mitigating measures. The requirements and guidelines apply to development projects in the four State Agricultural, Urban, Rural and Conservation Districts.

## 4. COUNTY LAND MANAGEMENT

While the State manages land in the Conservation District, the counties have primary management responsibility for land in the other three State Districts: Agricultural, Urban and Rural. Also, development along the shoreline is subject to county regulation, even for land in the Conservation District.

### 4.a. Agricultural District

The Agricultural District includes "good" farm land and, from an agricultural perspective, land that is commonly referred to as "junk" land because it is unsuitable for farming or ranching. "Junk" land includes gulches, steep hillsides, rocky land and, on Maui and the Big Island, even relatively recent lava flows having little or no topsoil. This districting of "junk" land into the Agricultural District reflects the fact that this district is a catch-all category that includes all lands not otherwise categorized, regardless of the agricultural quality of the land.

Crops, livestock and grazing are permitted in the Agricultural District, as are accessory structures and farmhouses. Although land in the Agricultural District is not meant to be urbanized it is, in practice, sometimes used for large-lot subdivisions. This often involves land unsuitable for farming and some former sugarcane land. On O'ahu, however, agricultural subdivisions are seldom approved.

Listed species are found in some parts of the Agricultural District, particularly in gulches, on hillsides, and on some of the land that is used for low-intensity grazing. In many cases, the fact that the land is in the Agricultural District indirectly protects listed species by limiting urban sprawl.

## 4.b. Rural and Urban Districts

Land-use and development in the State Urban and Rural Districts are subject to county regulations. including the county general plan, district plans, zoning, and building code regulations. On O'ahu, there is no land in the Rural District.

Before developer-initiated changes to the county general plan and district plans are approved, developers are required to address the impacts of their projects on rare, threatened, or endangered species or their habitat, and mitigate any adverse impacts.

## 4.c. Honolulu Board of Water Supply

To preserve watershed, the Honolulu Board of Water Supply manages nearly 4,000 acres in the Ko'olau Mountains.

## 4.d. Special Management Areas

As mandated by Hawai'i Coastal Zone Management (CZM) program, counties have an additional layer of regulation that provides special controls on development in Special Management Areas (SMAs) located along the shoreline, even for land in the Conservation District (HRS §205A and Public Law 92-583). Most development in an SMA requires an SMA Use Permit from the county where the development is proposed.

The intent of the CZM program is to avoid the permanent loss of valuable resources and to ensure adequate access to beaches, recreation areas and natural reserves (HRS §205A). Two of the objectives are: (1) "Protect valuable coastal ecosystems … from disruption and minimize adverse impacts on all coastal ecosystems"; and (2) "Promote the protection, use and development of … coastal resources to assure their sustainability." Related policies are: (1) "Exercise an overall conservation ethic, and practice stewardship in the protection, use and development of … coastal resources"; (2) "Preserve valuable coastal ecosystems … of significant biological or economic importance"; and (3) "Ensure that the use and development of … coastal resources are ecologically and environmentally sound and economically beneficial." Finally, two of the implementing guidelines state that (1) "No development shall be approved unless the authority has first found that the development will not have any substantial adverse environmental or ecological effect, except as such adverse effect is minimized to the extent practicable and clearly outweighed by public health, safety, or compelling public interests"; and (2) "The authority shall seek to minimize, where reasonable, any development which would adversely affect … wildlife habitats."

## 5. OTHER LAND MANAGEMENT

Other land management activities that are not the responsibility of the State or of county governments are discussed below.

### 5.a. Ko'olau Mountains Watershed Partnership

The Ko'olau Mountains Watershed Partnership (KMWP) was formed in October 1999 to protect the watershed areas of the Ko'olau Mountains and to maintain high-quality water for the island of O'ahu. The watershed runs the length of the Ko'olau range, covering about 97,561 acres (over 150 square miles). It encompasses the vegetated portion of the Ko'olau Mountains from the summit area down to the old forest reserve boundary that was established in the early 1900s; this boundary is at a lower elevation than the existing State Forest Reserve boundary. Nearly all of the area is in the Protective and Resource Subzones of the Conservation District while a small portion of it is in the Limited Subzone. A very small portion of the KMWP is in the Urban District.

The watershed includes State Forest Reserves, state-managed Hunting Units, State parks, State trails, a portion of the watershed owned by the county Board of Water Supply, the O'ahu Forest NWR, most of the Kawailoa Training Area, and a large portion of Schofield Barracks East Range.

Members of the KMWP include the Federal government (the Service and the United States Army), the State (DLNR's Division of Forestry and Wildlife and the Department of Hawaiian Homelands), the Honolulu Board of Water Supply, the Waiahole Water System, large private landowners (including Kamehameha Schools, Dole Foods and the Queen Emma Foundation), and small private landowners.

With funds from the State, Kamehameha Schools and the Hawai'i Community Foundation, the KMWP has developed a comprehensive management plan for the watershed; formulating projects to combat threats of fire, weeds, animals, insects, disease and human impacts on the watershed; and seeking cost-shared Federal funding for these projects. Following completion of the plan, a coordinator will be hired to implement the management actions in the plan.

### 5.b. Honouliuli Preserve

The Honouliuli Preserve, which encompasses 3,692 acres on the steep southeastern slope of the Wai'anae Mountains, is home to nearly 70 rare and endangered plants and animals species and is also an area for research and education, community service, cultural preservation, and enjoyment of open space. Since 1990, The Nature Conservancy of Hawai'i (TNCH) has held a long-term lease over the land from the Estate of James Campbell.

A private, non-profit affiliate of a national organization, TNCH works with Federal, state and private partners to protect Hawai'i's natural areas that shelter native species. Its mission is to preserve Hawai'i's native plants, animals, and natural communities by protecting the lands and waters needed for their survival.

In managing the Honouliuli Preserve, TNCH has developed a "2001 - 2005 Honouliuli Preserve Master Plan" with the primary long-term goal being to protect it for future generations. The five key natural resource management strategies set out in the Plan are: (1) control the three most serious threats (wildfires, alien plants and alien animals), (2) restore habitat, (3) protect and recover rare and endangered species, (4) promote research that guides and enhances Preserve management programs, and (5) ensure safe and efficient management of the Preserve. The Plan was developed with the assistance of an advisory group and with additional input from the community. Annual Operational Plans for the 5-year master-plan period are being developed. Key public involvement strategies include community partnerships; community outreach and education; and training professionals, interns and volunteers in conservation techniques and related activities.

### 5.c. 'Ihi'ihilauakea Preserve

The 'Ihi'ihilauakea Preserve encompasses 30 acres in an extinct crater on the southeast end of O'ahu. In 1987, surveys revealed that the crater provided habitat for the largest known population in Hawaii of the fern, *Marsilea villosa*, also known as *'ihi'ihi*. Soon after that, TNCH, the Hawaiian Botanical Society, and the county moved to protect the area, and 'Ihi'ihilauakea Preserve was established.

## 6. SUMMARY OF EXISTING PROTECTIONS

Even without critical habitat designations for listed species, the Ko'olau and Waianae Mountains, the coastal areas in the Conservation District, and offshore islets are already subject to very restrictive land-use management and controls. These controls are designed to protect the watershed; ecosystems; native plants and forests; threatened and endangered plants and wildlife; etc.

Because of the existing controls, very little development and very few commercial activities are allowed in these areas. The exceptions tend to involve small areas, require the uniqueness of a particular area (e.g., a mountain-top for telecommunications antennas), cause little or no adverse impacts, and provide considerable value to the community.

# APPROACH TO THE ECONOMIC IMPACT ANALYSIS * CHAPTER V

This chapter presents the approach used in Chapter VI to estimate the direct and indirect economic impacts of the section 7 listing and critical habitat provisions of the Act on projects, land uses and activities in proposed critical habitat for particular species. First, the scope of the economic analysis is described. This is followed by a discussion of the analytical concepts and steps used to conduct the analysis.

## 1. SCOPE OF THE ANALYSIS

The parameters below define the scope of the economic analysis.

### 1.a. Time Horizon for the Analysis

A 10-year time horizon is used because many landowners and managers do not have specific plans for projects beyond 10 years. In addition, the forecasts in this analysis of future economic activity are based on current socioeconomic trends and the current level of technology, both of which are likely to significantly change over the long term.

### 1.b. Projects, Land Uses and Activities Subject to Analysis

The analysis focuses primarily on the "reasonably foreseeable" projects, land uses, and activities that could affect the physical and biological features of the proposed critical habitat units. In turn, these are the activities that could be affected by the critical habitat designation.

"Reasonably foreseeable" projects, land uses, and activities are defined for the purposes of this report as those which are (1) currently authorized, permitted, or funded;

* **Note to Reader:** Readers who are already familiar with the approach to the analysis may wish to skip this chapter and proceed to the economic analysis in Chapter VI.

(2) proposed in plans currently available to the public; or (3) projected or likely to occur within the next 10 years based on (a) recent economic or land-use trends, development patterns, evolving technologies, competitive advantages, etc., and (b) limits imposed by land-use controls, access, terrain, infrastructure, and other restrictions on development. Current and future activities that could potentially result in section 7 consultations and/or project modifications are considered to be reasonably foreseeable.

## 2. ANALYTICAL CONCEPTS AND STEPS

The approach used to estimate the economic impacts on specific projects, land uses and activities in areas proposed for critical habitat involved, as appropriate, the analytical concepts and steps described below.

### 2.a. Background Information

In order to provide context for the analysis, and to the extent that information was reasonably available, background information was obtained on projects, land uses, and activities that may potentially be affected by the proposed designation. Depending upon the situation, this background information included some or all of the following: (1) the location of a project, land use, or activity; (2) a description of the project, land use, or activity, including its magnitude; (3) the amount of economic activity associated with the project, land use, or activity (e.g., revenues and employment); (4) past section 7 consultations, project modifications and associated costs; and (5) whether the project site is within the geographic area known to be *occupied* by listed species other than those in the current proposal.

### 2.b. *Federal Involvement*

For the current and planned projects, land uses, and activities that may affect the physical and biological features of the proposed critical habitat units, the next step in the analysis was to determine *Federal involvement*. As discussed in Chapter III, Federal agencies must consult with the Service whenever an activity they fund, authorize, or carry out may affect designated critical habitat. When consultations concern an activity on Federal lands, the relevant Federal agency consults with the Service. When consultations involve an activity proposed by a State or local government or by a private entity, the Federal "Action agency" to the activity consults with the Service.

In practice, not every single project, land use, and activity that has a Federal nexus has been subject to section 7 consultation with the Service. Thus, the analysis was further confined to those projects, land uses, and activities which are, in practice, likely

to be subject to consultation. This assessment was based on a review of past consultations, current practices, and the professional judgments of Service and other Federal agency staff.

Activities on State, county, municipal and private lands that do not have a *Federal nexus* (i.e., they do not involve Federal funding, a Federal permit, or other Federal actions) are not directly restricted by critical habitat designation. However, these projects may be indirectly affected by the critical habitat designation, as discussed below. Therefore, these activities are addressed in the analysis.

## 2.c. Exclusion of Man-Made Features and Structures

In practice, the critical habitat provisions of section 7 do not apply to the operation and maintenance (O&M) of existing man-made features and structures because these features and structures normally do not contain, and are not likely to develop, any *primary constituent elements.* Examples of man-made features and structures include buildings, roads, aqueducts, telecommunications equipment, arboreta and gardens, and *heiau* (indigenous places of worship or shrines). As a result, O&M of man-made features and structures were not considered further in the analysis.

An equivalent interpretation is that existing man-made features and structures are "unmapped holes' that are within the boundaries of a critical habitat unit, but are not part of the unit.

## 2.d. Existing Protections

The next step in the analysis involved identifying the impacts on activities that were expected to result in any case from existing protections unrelated to section 7 (e.g., other existing Federal, State, and county land-use controls and environmental protections). If some other existing statute, regulation, or policy limits or prohibits a project, land use, or activity, the economic impacts associated with those limitations or prohibitions are not attributable to section 7 listing provisions and/or critical habitat provisions. For example, State protections include land-use restrictions for activities in the State Conservation District and specific protections of threatened and endangered species and their ecosystems.

## 2.e. Consultations and Project Modifications

For current and planned projects, land uses, and activities that are likely to be subject to consultations under section 7 of the Act, the next step in the analysis was to estimate (1) the quantity and nature of the consultations (e.g., formal or informal); and

(2) changes that are likely to occur in such items as project designs, schedules, land uses, activities and programs.

The estimates reflect the availability of information which, in many cases, was limited (e.g., the outcome of future consultations will not be known until they occur).

## 2.f. Direct Costs

The next step in the analysis was to estimate the costs of consultations and the changes to projects, land uses and activities prompted by implementing section 7 of the Act. The types of economic costs that were considered included, but were not limited to, changes in revenues, costs, and property values. The analysis then determined what proportion of those section 7-related costs were attributable solely to the critical habitat provisions of section 7 (as opposed to the listing provisions).

In some cases, costs were described but were not quantified for one or more of the following reasons: (1) the economic impacts attributable to both the species listing and the critical habitat are expected to be small; (2) the probability that the impacts will occur is small; (3) the impacts are highly speculative; or (4) data needed to quantify impacts are not reasonably available.

## 2.g. Indirect Costs

As mentioned above, certain projects, land uses, and activities that are not subject to section 7 of the Act may still be impacted indirectly by the critical habitat designation. This would occur if State and county officials, courts, landowners, buyers and sellers of land, potential project investors, lenders, environmental groups, and community groups were to treat projects, land uses, and activities in critical habitat differently than they would treat identical projects, land uses, and activities outside of critical habitat. Whenever possible, quantitative assessments of indirect costs were made. However, the magnitude of some impacts and/or the probability of occurrence are unknown. In these cases, the possible impacts were discussed qualitatively.

## 2.h. Costs to Small Entities

All of the entities directly and indirectly affected by the section 7 listing and critical habitat provisions of the Act were evaluated to determine which, if any, are considered small entities by U.S. Small Business Administration (SBA) standards. An analysis was then done to determine if a substantial number of small entities will be significantly impacted, according to SBA guidelines.

## 2.i. Direct Economic Benefits

The next step in the analysis was to estimate the benefits (e.g., species preservation) associated with the section 7 listing and critical habitat provisions. In most cases, a qualitative discussion of benefits is provided because (1) scientific studies are not available on the magnitude of environmental changes due to critical habitat, and (2) market prices or existing economic studies on which to base values are not available (e.g., the economic value of preserving certain species).

## 2.j. Indirect Economic Benefits

The final step in the analysis was to estimate the indirect benefits associated with the section 7 critical habitat provisions. In most cases, a qualitative discussion of benefits is provided because (1) the probability that the indirect effect will occur is unknown, (2) scientific studies are not available on the magnitude of environmental changes due to critical habitat, and (3) market prices or existing economic studies on which to base values are not available.

## 3. SOURCES OF INFORMATION

The approach described above relied primarily on information provided by the Service (GIS map overlays, acreage tables, public testimony, comment letters on prior critical habitat proposals, consultation files, etc.); the State Department of Business, Economic Development & Tourism; county planning and finance departments; other Federal, State and county agencies; public and private landowners and land managers; affected companies; and other interested parties. Public documents used included the proposed rule, *Hawai'i Revised Statutes* and *Hawai'i Administrative Rules* related to land use, *The State of Hawai'i Data Book,* applicable county land-use plans, and property tax data.

# ECONOMIC COSTS AND BENEFITS CHAPTER VI

## 1. INTRODUCTION

As noted in the Preface, the Service may exclude an area from critical habitat designation if it determines that the benefits of excluding the area outweigh the benefits of inclusion. To aid in this determination, this chapter presents an analysis of the section 7-related economic costs and benefits associated with listing the plants as threatened and endangered species, and with designating critical habitat for the plants. However, the Service cannot exclude an area from critical habitat designation if it determines that the exclusion will result in extinction of the species.

As explained in Chapter V, the approach used in this economic analysis involves estimating both (1) the total section 7-related economic costs and benefits (also referred to as economic impacts) of the plants listings and critical habitat designation, and (2) the subset of these costs and benefits that is solely attributable to critical habitat designation. As a result, for each potential impact, the analysis presents two estimates:

— **Total Section 7 Costs and Benefits.** These estimates include the economic impacts likely to occur from implementing both the species listing provision and the critical habitat provision of section 7 of the Act.

— **Costs and Benefits Attributable to Critical Habitat.** These estimates represents those portions of the section 7-related economic impacts that are most likely attributable to the proposed critical habitat designation for the plants, but not to the plants listings.

The discussion and analysis of costs and benefits in this chapter is divided into the following sections: section 7 consultation history and typical costs (Section 2), direct section 7-related costs (Section 3), indirect costs (Section 4), potential impacts on small entities (Section 5), direct section-7 related benefits (Section 6), and indirect benefits (Section 7). A summary of the direct and indirect costs and benefits is given in Section

8. For some land-use activities and projects, the designation of critical habitat may generate both direct and indirect costs, or both costs and benefits, etc. As a result, the analysis of economic impacts for some land-use activities and projects is split among two or more sections, as appropriate.

## 2. SECTION 7 CONSULTATION HISTORY AND TYPICAL COSTS

In order to provide a context for the analysis, this section gives a summary of the consultations and project modifications that concerned one or more of the listed plants

It also presents the costs generally associated with section 7 consultations, biological surveys and associated project modifications. This information is used in Section 3 below to estimate future section 7-related economic impacts.

### 2.a. History of Section 7 Consultations and Project Modifications

Since the 99 plant species were listed (between 1991 and 1996), two formal consultations have been conducted under section 7 of the Act. Both were on behalf of the U.S. Army (Army) for review of the "Biological Assessment for Programmatic Section 7 Consultation Routine Military Training at Makua Military Reservation, and Makua Endangered Species Mitigation Plan." In both consultations, the Service concluded that routine military training at Makua Military Reservation, along with in-depth conservation measures that the Army would carry out in the action area, were not likely to *jeopardize* listed species.

Two informal internal consultations involving Federal Aid in Wildlife Restoration funding (commonly known as Pittman-Robertson funding) for a series of game-management projects Statewide proposed by the State of Hawai'i, Department of Land and Natural Resources (DLNR). One was conducted in March 1995, and the other in March 2001. In both consultations, the Service concurred with DLNR that game-management projects proposed for O'ahu were not likely to affect the listed species. Appendix VI-A presents a more extensive discussion of the outcome of the two consultations.

Of the remaining informal consultations (listed below), the Service concurred with each Federal agency's determination that the projects, as proposed, were not likely to adversely affect listed species. The agencies and projects appear below in the order they are listed in the proposed rule.

— U.S. Army Corps of Engineers: Flood control study.

— U.S. Air Force: Kaena Point Tracking Station.

— U.S. Navy: Lualualei Naval Magazine, "Work Plan for the Implementation of Priority Conservation Measures to Protect Rare and Endangered Biological Resources at Naval Magazine Lualualei, Headquarters, Oahu, Hawai'i," July 11, 1995.

— U.S. Army: November 1995, "Preliminary Draft Endangered Species Management Plan for the Oahu Training Areas" and review of revisions to the plan (two informal consultations).

— Federal Aviation Administration: Relocating and demolishing the FAA's Diamond Head facility (two informal consultations).

— U.S. Department of Transportation: North-South Road Project (two informal consultations).

— U.S. Coast Guard: Lowering antenna spans, Haiku Valley Omega Station.

— U.S. Navy: Cattle removal, upper Lualualei.

— DLNR, Division of State Parks: Review of the Ka Iwi shoreline project categorical exclusion document.

— U.S. Army: Service review of the effects of prescribed burns at Schofield Barracks–West Range (two informal consultations).

— U.S. Army: Insecticidal treatment, upper Wai'anae mountains.

— Hawai'i Army National Guard: Training activities and road improvements, Diamond Head crater.

— U.S. Army: "Makua Propagation and Outplanting Plans for Endangered Plants."

— U.S. Department of Agriculture, Animal & Plant Health Inspection Service: Establishing and monitoring transects to determine feral pig activity, and radio tagging and releasing feral pigs for research in Kuaokala Game Management Area (two informal consultations).

— U.S. Army: Fencing in the upper reaches of Opaeula drainage in the Kawailoa Training Area.

— U.S. Army: Service review of "Redraft Biological Assessment for Routine Military Training at Makua Military Reservation, Oahu, Hawai'i."

— Service: Fencing south Ekahanui Gulch.

— U.S. Army: Reminder to the Army by the Service of contingency placed on the Army in "Biological Opinion for routine military training at Makua Military Reservation, Oahu, Hawai'i" regarding implementing priority stabi-

lization measures for listed species within one year of the Biological Opinion.

— U.S. Army: Service review of "Draft Integrated Natural Resources Management Plan for 2002–2006 at Oahu Army Installations, Hawai'i."

— U.S. Navy: Service reviews of "Naval Computer and Telecommunications Area Master Station Pacific Integrated Natural Resources Management Plan."

— U.S. Department of Energy: Telecommunications radio shack at Mauna Kapu.

Future consultations involving the plants and their proposed critical habitat, some of which would also involve other threatened and endangered species, are expected to include:

— military activities and occasional military projects (e.g., fencing to protect habitat)

— occasional projects to improve access to the O'ahu Forest NWR (e.g., roads, trails, helicopter landing areas)

— occasional new communications facilities that require a Federal operating permit

— Federally funded wildlife restoration and game-hunting projects in state-managed Hunting Units

— Federally funded endangered species programs

## 2.b. Cost of a Typical Section 7 Consultation, Biological Survey and Project Modification

### 2.b.(1) Focus of Consultations

For the plants, the proposed rule indicates that future section 7 consultations are likely to focus on projects and activities that could directly or indirectly adversely affect critical habitat, including:

— Activities that appreciably degrade or destroy the *primary constituent elements* for the plants including the following: overgrazing; maintaining feral ungulate levels; clearing or cutting native live trees and shrubs (e.g., woodcutting, bulldozing, construction, road building, mining, herbicide application); introducing or enabling the spread of non-native species; taking actions that pose a risk of fire, etc.

— Activities that alter watershed characteristics in ways that would appreciably reduce groundwater recharge or alter natural, dynamic wetland, or vegetative communities. Such activities may include new water diversion or impoundment, excess groundwater pumping, and manipulation of vegetation through activities such as the ones mentioned above.

— Rural residential construction that includes concrete pads for foundations and installing septic systems.

— Recreational activities that appreciably degrade vegetation

— Mining sand or other minerals.

— Introducing or encouraging the spread of non-native plant species.

— Importing non-native species for research, agriculture, and aquaculture, and releasing biological control agents.

### 2.b.(2) Cost of Consultations

As discussed in Chapter III, participants in a consultation may include the Service, the Federal Applicant or Federal Action agency, and possibly a non-Federal applicant. Although the Service does not charge fees for its consultations, participants in consultations normally spend time assembling information about the site and their proposed project or activity; preparing for one or more meetings; participating in meetings; arranging for biological surveys and any associated reports; and responding to correspondence and phone calls.

For three levels of complexity ("Low," "Medium" or "High"), Table VI-1 gives the estimated cost to those participating in consultations with the Service. The estimate is based on: (1) a review of consultation records across the country related to other critical habitat rulemakings; (2) the typical amount of time spent by all participants; and (3) the relevant standard hourly rates and overhead allowances for the Service, other Federal agencies, and private applicants in Hawai'i.

As indicated in the table, consultation costs could range from as little as $3,800 to as much as $20,700 if Federal agencies only are involved, and from $5,200 to $28,900 if there is a non-Federal applicant.

### 2.b.(3) Cost of Biological Surveys

The cost of a biological survey for a particular parcel and a technical report on the findings varies according to a number of parameters:

**Table VI-1—Estimated Cost of a Section 7 Consultation**

| Item | Low | Medium | High |
|---|---|---|---|
| Federal Action agency or Federal Applicant | $2,200 | $ 6,400 | $10,700 |
| U.S. Fish & Wildlife Service | $1,600 | $ 5,100 | $10,000 |
| **Total for Federal Agencies** | **$3,800** | **$11,500** | **$20,700** |
| Non-Federal Applicant (if any) | $1,400 | $ 4,200 | $ 8,200 |
| **Total with a Non-Federal Applicant** | **$5,200** | **$15,700** | **$28,900** |

**Sources:** Project consultants and U.S. Office of Personnel and Management, 2002 General Schedule Salary Table.

— Size of the parcel: The consultation history for the plants suggests that projects are of three sizes: small (fewer than 10 acres), medium (11-100 acres), or large (101-500 acres). Large parcels take longer to survey and thus are more costly to survey.

— Ease of access to the parcel: Some parcels can be reached easily while others can be reached only by helicopter. More remote parcels are more costly to survey.

— Type of ecosystem: Forested areas are more difficult to survey than open areas and therefore are more costly to survey.

Based on these parameters, Table VI-2 presents the estimated cost of surveying parcels with different combinations of features, plus the estimated cost of preparing a report on the findings. The estimates assume the following: (1) a three-person team can survey 100 acres in one day if the area is open, and 30 acres if it is forested; (2) sites having "easy" access can be reached in an hour of driving or hiking, "medium" access takes 2 hours, and "difficult" access takes a half-hour by helicopter; (3) biologist and field-assistant services are $50 to $80 per hour; and (4) helicopter time is $700 per hour.

**Table VI-2—Estimated Cost of Biological Surveys for Threatened and Endangered Plants**

| Size and Location | Accessibility: Easy | Medium | Difficult |
|---|---|---|---|
| 10 Acres, Open or Forested Area | $ 2,900 | $ 3,200 | $ 4,300 |
| 100 Acres, Open Area | $ 3,400 | $ 3,800 | $ 4,800 |
| 100 Acres, Forested Area | $ 7,600 | $ 8,800 | $12,300 |
| 500 Acres, Open Area | $12,200 | $14,000 | $19,200 |
| 500 Acres, Forested Area | $33,200 | $39,200 | $56,500 |

**Sources:** Project consultants and discussions with a Hawai'i-based biological consulting firm, 2002.

As Table VI-2 indicates, the cost of a biological survey could range from as little as $2,900 in a 10-acre, easily accessible, open area to as much as $56,500 in 500-acre, remote, forested area. The estimates are based on average projects of each type; specific projects of each type may require more or less survey effort than the average used in the cost estimates, depending on the characteristics.

### 2.c. Cost of Project Modifications

As discussed above and in Appendix VI-A, which addresses hunting, consultations with the Service on listed plant species on O'ahu in most cases have not resulted in significant project modifications. Furthermore, they vary by project. Thus, project modification costs are determined on a project-by-project basis and are not based on standardized costs of typical project modifications.

## 3. DIRECT SECTION 7-RELATED COSTS

The following analysis of direct section7-related costs addresses ongoing land-use activities in the proposed critical habitat, but excludes certain areas and man-made features and structures that are not considered to be part of the proposed critical habitat because they do not contain the *primary constituent elements* of listed plants (see Chapter I). The analysis also addresses foreseeable developments and major land-use changes in the proposed critical habitat.

## 3.a. Management of Game Hunting

Presented below is an analysis of the direct economic impacts of the proposed critical habitat designation on the management of game hunting on State lands. Additional impacts are addressed in Section 4 below, "Indirect Costs," while Appendices VI-A and VI-B provide background information on hunting and game-mammal management.

### 3.a.(1) Affected Hunting Acreage

Four of the 26 proposed critical habitat units on O'ahu overlap State-managed Hunting Units. These overlapping areas total about 17,661 acres, or 67 percent of the total State-managed Hunting Units on O'ahu. A portion of one of the Hunting Units, the Kuaokala Game Management Area (KGMA), is managed by DLNR for maximum harvest of game birds and game mammals.

Private lands on O'ahu are also available for game hunting, although public access to these private lands is limited.

### 3.a.(2) Potential Economic Impact on Game-Management Activities

Potential Projects or Activities, Next 10 Years

DLNR's game-management and hunting-related projects proposed for 2001 to 2005 included:

— O&M of existing buildings, structures and infrastructure in 14 public Hunting Units and the KGMA

— O&M of wildlife feed and watering units in the KGMA

— O&M of feed and watering units for game birds in 14 public hunting areas with fencing or covers to prevent use by game mammals

— Reduction of rat, mongoose, cat and dog populations in the KGMA through baited stations and trapping to enhance game-bird populations

— Improvement of habitat for game-bird populations in the KGMA through fencing (to exclude cattle), mowing, and outplanting of game-bird food plants

— Construction of new game-bird feed and watering units in KGMA with fencing or exclosures to prevent use by game mammals

— Construction of five mail-box hunter check-in stations sited to avoid listed plant populations

— Construction of new storage facilities at Makiki and KGMA in previously cleared areas and sited to avoid listed plant populations

— Surveys to determine game-mammal population status, hunter participation and success, and range conditions within all State Hunting Units

— Surveys to determine game-bird population status and hunter participation and success in game-bird hunting areas.

*Federal Involvement*: Federal Pittman-Robertson funding provided by the Service to DLNR (to restore and rehabilitate wildlife habitat and to support wildlife-management research)

Other Critical Habitat/Other Listed Species: Partially overlaps 'elepaio critical habitat

Other Land Management: Natural Area Reserves (NARs), Ko'olau Mountains Watershed Partnership (KMWP), Forest Reserves, and State parks

Consultations and Cost:

- Total Section 7 Costs: $6,440 to 12,650

Consultations involving DLNR will be required on game-management projects that are partially funded under the Pittman-Robertson Act and which affect listed species or critical habitat. No section 7 consultations are required for game-management projects that (1) do not affect listed species or their habitats; (2) are entirely funded by the State (even if they do affect listed species or their habitats); or (3) are undertaken by private parties on privately-owned land.

Statewide consultations between DLNR and the Service occur every 5 years; the last consultation took place in 2001. Therefore, two programmatic consultations are likely over the next 10 years. The costs associated with the 2001 consultation relating to projects on O'ahu amounted to approximately $4,600 (see Appendix VI-A, Section 8.b.). Without critical habitat designation, information from the Service and DLNR suggests that the next two consultations would each have cost about 50 to 75 percent of the 2001 consultation, or about $2,300 to $3,450. Thus, two consultations over the next 10 years would range from $4,600 to $6,900.

Future consultations will likely address about the same number of game-management projects, involve about the same number of staff, and involve staff who are already familiar with the issues. Nevertheless, critical habitat designation is expected to increase the scope of the section 7 consultation. Given the fact that no plant-related critical habitat consultations have taken place in Hawai'i, no estimates are available for the increase in cost associated with the designation. However, it is anticipated that

future consultations may involve closer review of activities in areas that previously were considered to host no listed plants. The Service estimates that the increase in effort and cost due to critical habitat designation is 20 to 50 percent. The estimate is based on Service experience with recent and ongoing consultations, overlaying proposed critical habitats on action areas, and the additional effort required to address impacts of actions on the *primary constituent elements* for the plants in *unoccupied* portions of critical habitats (Service, November 2002). This raises the potential 10-year consultation cost to $5,520 to $10,350.

Also, the 2001 consultation on Pittman-Robertson funding may be reinitiated due to critical habitat designation. During the reinitiation, the Service is likely to address areas that are not being considered with the species listing. However, since no changes were required in the initial consultation for O'ahu projects, the reinitiation is likely to involve a low level of effort. Similar to the above, the assumed cost is 20 to 50 percent of the initial cost of $4,600, or about $920 to $2,300. Thus, the total projected consultation cost for O'ahu over the next 10 years would range from $6,440 to $12,650.

All of the consultation costs are conservatively attributed to the plants, even though the consultation may also address the 'elepaio critical habitat and other listed wildlife species.

- Cost Attributable to Critical Habitat: $1,840 to $5,750

Without the critical habitat designation, consultation costs are estimated at $4,600 to $6,900 (see above). Thus, the additional amount would be attributable to critical habitat.

<u>Anticipated Project Modifications and Cost</u>:

- Total Section 7 Costs: $37,400 to $74,800

For the most part, DLNR can avoid costly section 7 project modifications by using Pittman-Robertson funds for game-management projects that do not adversely affect listed species or their habitats and, if needed, use only State funds on projects that the Service believes could have adverse impacts. By doing this, *Federal involvement* is avoided. Thus, section 7 project-modification costs are expected to be modest. However, this use of State funds diverts resources from other potential game-management projects.

For projects covered in DLNR's 2001 consultations with the Service, an estimated $110,000 was spent Statewide to protect listed plants (based on discussions with DLNR). Many of the modifications were to protect game mammals from using game-bird watering stations, thereby forcing ungulates to leave an area to find water. The average cost per modification was about $1,000.

Over the next two consultations, the cost of project modifications is expected to be similar to the 2001 costs, or about $110,000 Statewide for each consultation. Over the 10-year period, the O'ahu share would be about $37,400 (2 x $110,000 x 17 percent). The 17-percent share of the cost for O'ahu is based on its share of Pittman-Robertson funding.

As a high estimate, this analysis conservatively assumes that the total cost could be twice this estimate, or about $74,800. The higher cost would reflect the geographic expansion in scope to include habitat that the Service considers to be *unoccupied.*

- Cost Attributable to Critical Habitat: $0 to $37,400

Without critical habitat designation, project modification costs are expected to remain similar to 2001 costs ($37,400). Thus, any additional amount would be attributable to critical habitat.

Potential Entities Impacted:

*Federal*: Service

*State:* Pittman-Robertson funding

## 3.b. State and County Parks

### 3.b.(1) Existing Parks

The proposed critical habitat overlaps many State and county parks and State way-sides, recreation areas, nature preserves, campgrounds, monuments, etc. They include:

State

— Ka'ena Point State Park (Units A, B, D)

— Peacock Flats Campground (Unit A)

— Kahana Valley State Park (Unit L, O)

— Sacred Falls State Park (Unit L)

— Wa'ahila Ridge State Recreation Area (Unit L)

— Keaiwa Heiau State Recreation Area (Unit L)

— Nu'uanu Pali State Wayside (Unit L)

— Malaekahana State Recreation Area (Unit M)

— Diamond Head State Monument (Units X1, X2)

County

— Haiku Valley Cultural and Nature Park (Unit L)

— Aina Haina Nature Preserve (Unit L)

— Kahuku Golf Course (Unit M)

— Kualoa Regional Park (Chinaman's Hat) (Unit P)

— Koko Head Regional Park and Hanauma Bay Nature Preserve (Unit W)

In general, activities associated with these parks and recreational areas involve O&M of existing facilities, which is not subject to section 7 consultation. Except for the parks and recreation areas discussed below, no park improvements are planned within the proposed critical habitat.

**3.b.(2) Improvements to Diamond Head State Monument** (Units X1 and X2)

Diamond Head crater is a prominent feature of Honolulu; the summit offers a view of the entire south shore of O'ahu. Recognizing the utility of this vantage point, the U.S. government acquired all of Diamond Head and some areas outside the crater and created the Fort Ruger Military Reservation in 1906. In the 1960s, Diamond Head was designated as a historic site and as a National Natural Landmark. Today, Diamond Head is both a State Monument with a hiking trail to the summit lookout (also the site of a former military bunker), and the home of several structures and facilities used by the State.

The objective of the Diamond Head State Monument is to establish a "semi-wild" park inside the crater and a park for picnicking outside the crater. According to the Diamond Head State Monument Master Plan, future recreational development is to be limited to passive, unstructured activities, including limited improvements to the trail system and scenic viewing areas; reforestation and natural landscaping with adequate water supply, picnic areas and meadowlands, and a visitors' interpretive center.

The "2000 Master Plan Update Final Environmental Impact Statement" listed several planned improvements, including:

— construct a permanent visitor/interpretive facility

— construct a caretaker's residence

— remove an FAA building (completed 2002)

— remove State Department of Defense buildings

— improve the wetlands areas

— construct a trail around the wetlands

— construct a picnic area

— protect native plant habitat, including that of the listed species *Schidea adamantis*

— open additional trails and lookouts to public access.

In general, no Federal funding and no Federal permits are anticipated for these improvements. The single exception involves a permit from the U.S. Army Corps of Engineers (ACOE) that may be required for work done in the wetland area (Unit X2).

Potential Projects or Activities, Next 10 Years: Diamond Head State Monument improvements

*Federal Involvement:* ACOE permit

Improvement of the wetlands is the only project with known *Federal involvement.*

Critical Habitat/Other Listed Species: Other than plants, no listed species near the project site

Other Land Management: County Special Management Area

Consultations and Costs

- Total Section 7 Cost: $8,100

The cost-estimate is based on (1) one consultation; (2) the Low cost of a consultation with a non-Federal agency as the applicant (from Table VI-1); and (3) a survey of 10 acres of open area with Easy access (from Table VI-2).

- Cost Attributable to Critical Habitat: $0

Listed plants are known to be near the planned wetlands, and the "Diamond Head Master Plan Update FEIS" (FEIS) indicates that the State intends to involve the Service when making decisions affecting the listed plants and their habitats. Thus, it is likely that consultation would have occurred without critical habitat designation. Therefore, none of the costs associated with the consultation are attributable to the proposed critical habitat designation.

Anticipated Project Modifications and Cost: Minor

No major project modifications are anticipated because: (1) the FEIS recognizes areas having three endangered plant populations, and purposely sites proposed improve-

ments away from these areas; (2) the FEIS contains recommendations for future long-term management actions to both protect and enhance listed plant populations; and (3) the FEIS proposes improvement to the wetlands as a conservation project which would improve habitat for endangered plants and waterbirds.

**3.b.(3) Improvements to Haiku Valley Cultural and Nature Park** (Unit L)

Unit L partially overlaps the Haiku Stairs which lead to a summit on the Ko'olau Mountains ridgeline overlooking Kane'ohe Bay on the windward side of the island. The county, who owns the property, is negotiating with other landowners in Haiku Valley to secure public access to the trailhead. In addition, the county is planning Haiku Valley as a nature preserve.

Future activities are expected to include: installing picnic tables and grills, developing a trail system, removing non-native vegetation and replanting native vegetation. Little new construction is anticipated because existing facilities are adequate. Future development is likely to be funded entirely by the county.

Potential Projects or Activities, Next 10 Years: Improvements and conservation projects in Haiku Valley

*Federal Involvement:* None

Costs of Consultations and Project Modifications: $0

No costs associated with consultations or project modifications are anticipated because planned activities have no known *Federal involvement.*

**3.b.(4) Improvements to Aina Haina Nature Preserve** (Unit L)

In 1999, the county acquired land in the back of Wailupe Valley for a future park. The undeveloped land is being managed by the county Department of Parks and Recreation. A vision team has recommended the creation of a nature preserve or native plants botanical garden but, until funding is secured and the planning is complete, specific future improvements are not known. However, future development is likely to be funded entirely by the county.

Potential Projects or Activities, Next 10 Years: Development of a nature preserve or native plants botanical garden

*Federal Involvement:* None

Costs of Consultations and Project Modifications: $0

No costs associated with consultation or project modification are anticipated because planned activities have no known *Federal involvement.*

## 3.c. Watershed Projects

### 3.c.(1) Ko'olau Mountains Watershed Partnership (KMWP) (Units L and O)

In 1999, State, Federal and private landowners joined to form the KMWP, a voluntary partnership that was established to preserve and protect the 97,561-acre watershed in the Ko'olau Mountains. Over 80 percent of this acreage is covered by a Memorandum of Understanding among the cooperating landowners. They have agreed to participate in management of the watershed; to formulate watershed projects that eliminate or reduce the threat of damage to the watershed from weeds, insects, disease, feral ungulates and, in some instances, human impacts; and to seek funds to support these projects.

A KMWP Management Plan (Management Plan), completed in January 2002, includes the following management goals:

— Prevent the establishment of alien species and control established invasive species

— Protect forested areas from feral pig damage

— Reduce the impact of rats and other small mammals

— Minimize the effect of unauthorized and destructive human activities

— Monitor the level of pollutants and mitigate impacts of erosion

— Prevent forest fires

— Monitor and improve the quality of groundwater, surface water, and aquatic environments

— Identify and protect rare species

— Identify and protect cultural resources

— Build public understanding and support for watershed protection

— Support fire prevention activities

The Management Plan calls for hiring a watershed coordinator to supervise the implementation of the Management Plan, to raise and manage funding, and to assist watershed partners. The coordinator was hired in 2002.

Potential Projects or Activities, Next 10 Years: Conservation projects such as fencing, removal of invasive species, control of ungulates and other mammals, and reforestation

*Federal Involvement:* Federal funding from the Service and/or NRCS

Critical Habitat/Other Listed Species: Partially overlaps 'elepaio critical habitat

Consultations and Costs

- Total Section 7 Cost: $15,700 to $47,100

The cost-estimate is based on (1) one to three consultations; (2) Medium cost (from Table VI-1) of a consultation with a non-Federal agency as the applicant; and (3) no biological survey, since the Service is likely to rely on maps and on other information compiled by the Hawai'i Natural Heritage Program and on the KMWP's knowledge of the resources in the watershed. All of the consultation costs are conservatively attributed to the listed plants, even though the consultation may also address the partial overlap with the 'elepaio critical habitat.

The number of consultations will depend upon the number of projects receiving Federal funding and the schedule for initiating them. The expected cost range assumes that projects occurring concurrently will be reviewed during one consultation.

- Cost Attributable to Critical Habitat: $10,500 to $31,500

Various listed species are known to occur in the watershed. Thus, without the plants critical habitat, it is estimated that consultations would involve the Low cost from Table VI-1 ($5,200 to $15,600). The incremental cost between the Low cost and the Medium cost is attributable to critical habitat.

Anticipated Project Modifications and Cost: Minor

Since the nature of the conservation projects is beneficial to the ecosystem, project modifications, if any, are likely to be very minor.

Potential Entities Affected:

*Federal*: Service and NRCS

*Non-Profit*: KMWP

**3.c.(2) Board of Water Supply, West Honolulu Watershed** (Unit L)

The county Board of Water Supply (BWS), owns several scattered properties throughout the southern Ko'olau Mountains that were acquired and preserved because they are valuable water resources. In partnership with the ACOE, the BWS is preparing a West Honolulu Watershed Study, which encompasses a portion of Unit L. The study is intended to identify projects to improve the quality of the watershed and environmental quality in the Moanalua, Kalihi and Nu'uanu watersheds. Following completion of the study, the BWS intends to seek Federal funding, probably from the Service and NRCS, to assist in implementing watershed protection projects. Projects may include ungulate removal, erosion control, and inventorying and monitoring land uses surrounding BWS wells.

Potential Projects or Activities, Next 10 Years: Watershed protection projects

*Federal Involvement:* possible Federal funding for watershed projects from the Service and/or NRCS.

Critical Habitat/ Other Listed Species: Partially overlaps 'elepaio critical habitat

Other Land Management: KMWP

Consultations and Cost:

- Total Section 7 Cost: $24,500

The cost-estimate is based on (1) one consultation; (2) Medium cost from Table VI-1 of a consultation with a non-Federal agency as the applicant; and (3) a biological survey of 100 acres of forested area with Medium access (from Table VI-2).

- Cost Attributable to Critical Habitat: $10,500

Without critical habitat, it is estimated that the potential future consultations would involve the Low cost from Table VI-1 ($14,000 with the biological). The difference in cost is attributable to the proposed critical habitat designation.

Anticipated Project Modifications and Cost: Minor

- Total Section 7 Cost: Minor

Since the nature of the conservation projects in the watershed benefits the ecosystem, project modifications, if any, are likely to be very minor.

Potential Entities Impacted

*Federal:* Service, NRCS

*County:* BWS

**3.c.(3) Ala Wai Watershed Association** (Units L and X1)

The Ala Wai Watershed Association (AWWA) is a community-based non-profit organization dedicated to caring for the Ala Wai Watershed, improving water quality, and fostering awareness of *ahupua'a* concepts. (An *ahupua'a* is a Hawaiian land division that extends from the uplands to the sea). The Ala Wai Watershed includes seven sub-watersheds in the Ko'olau mountain range that extend from the top of Tantalus to the ocean and from Kaka'ako and Makiki to Diamond Head and Palolo. The water flows down to the Ala Wai Canal— which skirts the *mauka* (mountain) side of Waikiki—and flows out to the ocean.

The watershed overlaps with two proposed critical habitat units: Unit L (Ko'olau mountain ridges and slopes) and Unit X1 (Diamond Head slopes).

The AWWA received initial funding from the EPA, and intends to place the majority of this funding into community-based projects to improve the water quality in the watershed. While most of the watershed is outside the proposed critical habitat, projects may take place within it due to the importance of these areas to the overall health of the watershed. While there are no specific plans for AWWA activities within the proposed critical habitat, possible future projects in Units L and X1 could include erosion control and revegetation. The number of such future projects will depend on the types of community proposals submitted for funding, and also on the availability of funding. The AWWA is exploring new Federal funding sources to augment the initial EPA grant.

Potential Projects or Activities, Next 10 Years: Conservation projects

*Federal Involvement:* Federal funding from the EPA, Service, or other Federal agencies

Critical Habitat/Other Listed Species: Large overlap with 'elepaio critical habitat (Unit L)

Consultations and Costs

- Total Section 7 Cost: $0 to $31,400

The cost-estimate is based on (1) zero to two consultations; (2) Medium cost (from Table VI-1) of a consultation with a non-Federal agency as the applicant; and (3) no

biological survey, since the Service is likely to rely on maps and on other information compiled by the Hawai'i Natural Heritage Program and the AWWA's knowledge of the resources in the watershed. The number of anticipated consultations is presented as a range to reflect the uncertainty about whether future projects will occur within the proposed critical habitat.

- Cost Attributable to Critical Habitat: $0 to $21,000

Various listed species are known to occur in the portions of the watershed that overlap with critical habitat. Without the plants critical habitat, it is estimated that the potential future consultations would involve the Low cost from Table VI-1 ($0 to $10,400). The difference in cost is attributable to the proposed critical habitat designation.

Anticipated Project Modifications and Cost: Minor

Since the nature of the conservation projects in the watershed is beneficial, project modifications, if any, are likely to be very minor.

Potential Entities Affected:

*Federal*: Service, NRCS, EPA, other Federal agencies

*Non-profit*: Ala Wai Watershed Association (AWWA)

## 3.d. Conservation Projects

### 3.d.(1) O'ahu Forest National Wildlife Refuge (Unit L)

The O'ahu Forest National Wildlife Refuge (NWR) covers about 4,480 acres in the northern Ko'olau Mountains and provides habitat for native birds, plants, and wildlife. Comprehensive baseline surveys are being conducted to determine the status of plant, bird, bat, snail, and other wildlife populations and the quality of the surrounding ecosystem. The results of these surveys will be used to identify and prioritize areas requiring management attention. It is anticipated that a number of conservation projects will be developed based on the findings, but at this time, the number and specific types of conservation activities are not determined.

Potential Projects or Activities, Next 10 Years: Conservation projects

*Federal Involvement:* Service management of Federal lands and Service funding of projects

Critical Habitat/Other Listed Species: Completely overlaps 'elepaio critical habitat.

Consultations and Costs

- Total Section 7 Cost: $5,100 to $10,000

The cost-estimate is based on (1) one consultation; (2) Medium to High cost (from Table VI-1) of a consultation with the Service as the applicant; and (3) no biological survey, since the Service is likely to rely on maps and on other information compiled by the Hawai'i Natural Heritage Program, baseline surveys, and the NWR Manager's knowledge of the resources. The Medium to High cost reflects the fact that the consultation may cover a wide range of potential projects.

- Cost Attributable to Critical Habitat: $0

The Service routinely conducts internal consultations for activities planned in the National Wildlife Refuge system to ensure that proposed activities do not adversely affect listed plant populations or critical habitat. Thus, no consultation costs are attributable to critical habitat.

Anticipated Project Modifications and Cost: Minor

Since the nature of the planned conservation projects in the O'ahu Forest NWR are intended to be beneficial, project modifications (if any) are likely to be very minor.

Potential Entities Affected:

*Federal*: Service

**3.d.(2) James Campbell National Wildlife Refuge/Flood Control** (Unit M)

The Service is acquiring approximately 760 acres from Campbell Estate to complete the creation of the James Campbell National Wildlife Refuge (James Campbell NWR) on the northeast shore of O'ahu. The James Campbell NWR is currently comprised of two separate parcels. The pending acquisition would join them, creating a 915-acre refuge and the largest managed freshwater wetland on the island. The James Campbell NWR is an essential habitat for four endangered and migratory waterbirds, and encompasses one of the most significant coastal resources in northeast O'ahu. The land acquisition would provide wetland development, endangered species conservation, and public-use opportunities.

Part of the obligation of the Service in acquiring the land is that it will work with the ACOE to address a major flood-control problem in the Kahuku area.

Potential Projects or Activities, Next 10 Years: Land acquisition, conservation projects, flood-control projects

*Federal Involvement:* Service land acquisition and land management; ACOE permit for drainage

Critical Habitat/Other Listed Species: Listed wildlife

Other Land Management: County Special Management Area

Consultations and Costs

- Total Section 7 Cost: $8,000 to $11,900

The cost-estimate is based on (1) one consultation; (2) Low to Medium cost (from Table VI-1) of a consultation with the Service as the applicant; (3) a biological survey of 500 acres of open area with easy access (from Table VI-2), and (4) half of the costs attributable to plants and the remainder to wildlife.

- Cost Attributable to Critical Habitat: $8,000 to $11,900

Since there are no listed plants in the area, all of the consultation costs are attributable to critical habitat.

Anticipated Project Modifications and Cost: Minor

Since the land-use management plan is to conserve native species and their habitat, project modifications (if any) are likely to be very minor.

Potential Entities Affected:

*Federal*: Service, ACOE

**3.d.(3) Honouliuli Preserve**

The Nature Conservancy of Hawai'i (TNCH) is expected to seek Federal funding to implement conservation projects in the Honouliuli Preserve, including: fencing to control ungulates, alien species control, revegetation of native plants, etc.

Potential Projects or Activities, Next 10 Years: Conservation projects

*Federal Involvement:* Service, NRCS and possibly other agencies

Critical Habitat/Other Listed Species: Within the 'elepaio critical habitat

Consultations and Costs

- Total Section 7 Cost: $0 to $49,000

The cost-estimate is based on (1) zero to two consultations; (2) Medium cost (from Table VI-1) of a consultation with a non-Federal agency; (3) a biological survey of 100 acres of forested area with Medium access (from Table VI-2).

- Cost Attributable to Critical Habitat: $0 to $21,000

Without critical habitat, it is estimated that the potential future consultations would involve the Low cost from Table VI-1 ($0 to $28,000). The difference in cost is attributable to the proposed critical habitat designation.

Anticipated Project Modifications and Cost: Minor

Since the nature of the conservation projects is beneficial, project modifications, if any, are likely to be very minor.

Potential Entities Affected:

*Federal*: Service, NRCS

*Non-profit*: TNCH

### 3.d.(4) Other Conservation Activities

Other conservation activities can be expected to occur within the proposed critical habitat over the next 10 years. As discussed in Chapter IV, NRCS provides technical assistance and funding for landowners seeking to protect native habitat through the Wildlife Habitat Incentives Program (WHIP), and the Service provides funding for conservation activities through a variety of programs, including the Partners for Fish and Wildlife (PFW) program and the Pacific Islands Coastal (PIC) program.

Though no projects on O'ahu were funded by the PFW program in 2002, four projects intended to protect and enhance the 'elepaio critical habitat were funded in 2001. Because the proposed O'ahu plants critical habitat overlaps the the 'elepaio critical habitat, future projects targeted towards the 'elepaio may occur in plant habitat and are likely to indirectly benefit listed plant populations. Also in 2001, the PIC program provided emergency funds to DLNR for soil stabilization on two offshore islets designated as State Seabird Sanctuaries—a project that includes planned weed control and outplanting of native species. While the primary intent of the PIC program is to stop erosion that has degraded seabird nesting habitat, the project will also benefit listed plants and proposed critical habitat. Continued restoration efforts are likely to occur in the future. Other Federal agencies, such as the EPA and the U.S. Forest Service, may also fund future conservation activities in the proposed critical habitat.

Finally, other conservation activities sponsored by county or private organizations, such as the BWS, the Sierra Club, or TNCH are likely to occur within the proposed critical habitat. These activities may involve removal of invasive species and revegetation of native plants. In general, these activities by county and private organizations have no *Federal involvement.*

Potential Projects or Activities, Next 10 Years: Conservation activities

*Federal Involvement:* Service, NRCS and possibly other agencies

Critical Habitat/Other Listed Species: Depending on location, possibly within 'elepaio critical habitat and possibly near other listed wildlife species

Consultations and Costs

- Total Section 7 Cost: $47,100 to $157,000

The cost-estimate is based on (1) three to ten consultations; (2) Medium cost (from Table VI-1) of a consultation with a non-Federal agency; and (3) no biological survey because the Service is likely to rely on maps and on other information compiled by the Hawai'i Natural Heritage Program and the applicants' knowledge of resources in the conservation project area.

The estimate of the number of consultations reflects the uncertainty about potential future projects, but takes into account the number of past-funded projects and the the fact that the proposed critical habitat overlaps 72,000 acres of the KMWP. (Consultation costs associated with conservation activities in KMWP are addressed above.)

- Cost Attributable to Critical Habitat: $31,500 to $105,000

Without critical habitat, it is estimated that the potential future consultations would involve the Low cost from Table VI-1 ($15,600 to $52,000). The difference in cost is attributable to the proposed critical habitat designation.

Anticipated Project Modifications and Cost: Minor

Since the nature of the conservation projects is beneficial, project modifications, if any, are likely to be very minor.

Potential Entities Affected:

*Federal*: Service, NRCS

*State*: may include DLNR

*Non-profit, Private*: possible

## 3.e. Communications Facilities

### 3.e.(1) Palehua (Unit I)

At the southern end of Unit I, the 1.5-mile stretch of Palehua ridgeline houses the largest complex of communications towers on O'ahu. Existing users include the Army; the Navy's Pacific Missile Range Facility (PMRF) on Kaua'i; the Coast Guard; the FAA; the National Weather Service; DLNR; Oceanic Cablevision; Verizon; the four primary television broadcasters in Hawai'i; about half of O'ahu's FM-radio broadcasters; and other companies that provide cellular, mobile radio, and paging services.

Palehua is the premier site on O'ahu for providing full and limited telecommunications coverage. This is due to a unique combination of attributes at Palehua, including: (1) a favorable location that provides good coverage to most urban areas on O'ahu, major U.S. military bases, airspace surrounding Honolulu International Airport, and surface water to the south and west of O'ahu's major harbors out to a range of 65+ nautical miles; (2) a favorable location that allows microwave signals to be beamed to many relay stations on O'ahu and Kaua'i; (3) sufficient acreage of moderate slopes to site a large number of towers far enough apart to avoid signal interference; (4) low visual impact because of its remoteness; (5) good road access; (6) access to the island's electrical power grid; and (7) safety (i.e., no nearby apartment buildings and office buildings are affected by strong electromagnetic signals).

From north to south along the ridge, 40 users have 14 telecommunications sites and 20 towers, including: a dense site with two 165-foot towers, three buildings, a rack tower 30+ feet high, and a collection of about nine telephone-pole towers; a microwave relay link used by Oceanic Cablevision to provide back-up service to downtown Honolulu and Kaua'i; a microwave relay link used by Verizon to provide back-up service to Kaua'i; a 400-square-foot building under the control of the FAA; a commercial tower used by one of the television broadcasters, Hawai'i Public Radio, and Ram Paging; an FAA building and a tower over 100 feet high housing a large collection of antennae; an 80-foot tower with a complex of antennae used by PMRF for electronic warfare; and three commercial towers used by the remaining three television broadcasters and half of O'ahu's FM stations.

In 1990, when The Estate of James Campbell (Campbell Estate) provided land to TNCH for the Honouliuli Preserve (Chapter IV, Section 5), Campbell Estate purposely omitted the ridgeline from Honouliuli Preserve because of the (1) significance of the site for existing and planned communications towers; and (2) absence of known threatened and endangered species, which was based on discussions with DLNR. The native vegetation had been disturbed starting in 1934 when the military built a road to the ridge, and by other developments and activities in subsequent years.

The O&M of existing man-made facilities will not be affected by the critical habitat designation. However, additions to existing communications towers and appurtenant structures, major modifications, or the development of new facilities would be subject to section 7 consultation.

It is estimated that ten to twelve additional towers will be constructed at Palehua over the next 10 years, including: (1) six to seven sites for high-definition digital television (DTV) (major television networks are required by the FCC to provide DTV service to the general public by 2006); (2) additional cellular sites; and (3) sites for next-generation service using the frequency now used for analog television broadcasts. In order to provide adequate coverage, all future towers must be sited on or near the ridgeline.

Potential Projects or Activities, Next 10 Years: Construction of ten to twelve communications towers and related facilities

*Federal Involvement*: FCC permit (to operate) and FAA permit (to insure no interference with aircraft)

Critical Habitat/Other Listed Species: Partial overlap with the 'elepaio critical habitat

Consultation Costs:

- Total Section 7 Costs: $81,000 to $97,000

The cost-estimate is based on (1) ten to twelve consultations in the next 10 years, (2) the Low cost of a consultation with a Federal agency as the applicant and the involvement of a non-Federal applicant (from Table VI-1), and (3) a biological survey, of 10 acres of open area with Easy access (Table VI-2).

- Costs Attributable to Critical Habitat: $81,000 to $97,000

Even though there have been consultations on communications facilities in Hawai'i since the plants were listed, there has been no history on consultations for plants. Thus, all of the costs for consultation are attributable to critical habitat.

Anticipated Project Modification and Costs:

- Total Section 7 Costs: $0 to $120,000

It is possible that the construction of a new facility will not adversely affect listed plant species or *adversely modify* critical habitat because: (1) the footprint of a communications tower, related structures, and access is modest; (2) existing infrastructure is present; (3) the towers would be near existing facilities; (4) there are no listed plant populations near the sites; and (5) the area may lack the *primary constituent elements* for the plants. Thus, major project modifications are not anticipated. However,

depending upon the circumstances, such as the precise nature of the construction, it is possible that project modifications may be required to reduce the impact on the critical habitat.

Possible project modifications could include the establishment of inspection programs during construction to prevent non-native plant introduction, erosion control, fire control, and other measures to preserve and improve the existing habitat. The cost of these activities would depend upon the circumstances, but could cost up to $10,000 (based upon information from NRCS, 2002).

- Cost Attributable to Critical Habitat: $0 to $120,000

Because all consultation costs are attributed to critical habitat, the costs associated with any project modifications arising from these consultations are also attributed to critical habitat.

Potential Entities Impacted:

*Federal*: Service, FCC, FAA

*State*: State Dept. of Defense, Civil Defense

*Private*: Four major television networks and other unspecified companies.

**3.e.(2) Koko Head** (Unit W)

Koko Head—a 640-foot-high prominence on the southeastern coast of O'ahu—is uniquely situated for telecommunications and navigational relay stations. It is in line-of-site with Diamond Head to the west and, to the east, Makapu'u Point and the islands of Moloka'i and Maui. In addition, the summit area of Koko Head is level enough for construction purposes and can be reached easily via an existing access road. The land at the summit is owned by the county.

Existing communications facilities on Koko Head include the following: an FAA VORTAC station (which is a long-distance aviation navigational system consisting of two components (VOR and TACAN) that transmit signals to aircraft which allows them to determine their bearings relative to the VOR station on Koko Head); a radio relay station operated by the county (the Honolulu Police Department); a radio station operated by Hawaiian Telephone Company; and several privately-owned antennae for cellular, paging and wireless services.

The State Department of Accounting and General Services (DAGS) is seeking permission from the county to construct a new communications tower and support building

at the site. The facility would support the existing Statewide microwave communications network that serves public-safety responders, including the U.S. Coast Guard, ambulance and police services, State Civil Defense, and others. It would be adjacent to the existing county facility.

The proposal for this new facility is still in the planning stages and final agreements have not been completed. However, the likelihood that it will be constructed within the next 10 years is high due to the importance of the facility to public safety and the limited number of feasible alternatives for communications and navigational relay stations.

Potential Projects or Activities, Next 10 Years: Construction of new communications tower and related infrastructure

*Federal Involvement*: FCC permit (to operate) and FAA permit (to insure no interference with aircraft)

Since VORTAC began operations, the FAA lease has required that all subsequent facilities atop Koko Head first receive approval from the FAA to ensure that they will not interfere with FAA operations.

Other Land Management: County Special Management Area

Consultation Costs:

- Total Section 7 Costs: $8,100

The cost-estimate is based on (1) one consultation, (2) the Low cost of a consultation with a Federal agency as the applicant and the involvement of a non-Federal applicant (from Table VI-1); and (3) the cost of a biological survey, based on a 10-acre open site with Easy access (from Table VI-2). Communications facilities generally have small footprints, and the existing infrastructure on Koko Head further reduces the need for extensive construction.

- Cost Attributable to Critical Habitat: $8,100

Even though there have been consultations on communications facilities in Hawai'i since the plants were listed, there has been no history of consultations for listed plants. Thus, all of the costs for consultation are attributable to critical habitat.

Anticipated Project Modification and Costs

- Total Section 7 Costs: Minor

It is unlikely that construction of a new facility will adversely affect listed plant species or *adversely modify* critical habitat, because (1) the footprint of communications

facilities is small; (2) existing infrastructure is present; (2) the tower would be adjacent to an existing facility; and (4) there are no listed plant populations near the site. Thus, major project modifications are not anticipated.

Potential Entities Impacted:

*Federal:* Service, FAA, FCC

*State*: DAGS

**3.e.(3) Diamond Head** (Unit X1)

The State Department of Defense and State Civil Defense operate several sites in Unit X1 as communications facilities for emergency and public-safety response. The State's sites are on or near the east rim of Diamond Head crater. Since the FAA recently relocated its communications equipment from Diamond Head to Hickam Air Force Base, the State plans to acquire the former FAA building and consolidate three of its antennae there. Major renovations to the building are not anticipated, and planned construction will be limited to installing new antennae poles around the perimeter of the building to accommodate the relocated antennae.

Potential Projects or Activities, Next 10 Years: Relocation of antennae

*Federal Involvement*: FCC permit (to operate) and FAA permit (to insure no interference with aircraft)

Other Land Management: County Special Management Area

Consultation Costs:

- Total Section 7 Costs: $5,200

The cost-estimate is based on (1) one consultation; (2) the Low cost of a consultation with a non-Federal agency as the applicant and the involvement of a non-Federal applicant (from Table VI-1); and (3) a biological survey of 10 acres of open area with Easy access (from Table VI-2). Communications facilities generally have small footprints, and the existing communications infrastructure at Diamond Head near the area planned for the relocated antennae poles reduces the need for extensive construction.

- Cost Attributable to Critical Habitat: $5,200

Even though there have been consultations on communications facilities in Hawai'i since the plants were listed, there has been no history of consultations for listed plants.

Thus, all of the costs for consultation are attributable to critical habitat.

Anticipated Project Modification and Costs

- Total Section 7 Costs: Minor

It is unlikely that the proposed activity will adversely affect listed plant species or *adversely modify* critical habitat because (1) antennae pole sites have small footprints; (2) the poles will be relocated to an already disturbed area adjacent to an existing building; and (3) there are no listed plant populations near the sites. Thus, minor project modifications are anticipated.

Potential Entities Impacted:

Federal*:* Service, FAA, FCC

State: Department of Defense, Civil Defense

**3.e.(4) Other Communications Facilities** (Unit I)

In 2001, the FCC completed a series of informal consultations on proposed communications antennae sites across the Hawaiian Islands. On O'ahu, the proposed sites are in Honolulu, Waipahu, Kane'ohe, Wahiawa, Kailua, Wai'anae, Pearl City, Mililani, Pearl Harbor, Schofield Barracks, Waikiki, Aina Haina, Luana Hills, and Honouliuli. All of the consultations concerned listed birds; no listed plants were affected (Service, FCC).

A review of pending applications to the FCC indicates that one new private antenna is planned on Wiliwilinui Ridge in Unit L. Existing structures at the intersection of Wiliwilinui Ridge and the Ko'olau ridgeline include: communications towers that support a microwave relay link; two FM radio antennae; and antennae for cellular, paging, and wireless services. Access to the site is by helicopter.

It is likely that additional applications for new facilities within the proposed critical habitat will be filed in the next 10 years. In general, new communications facilities are likely to be sited close to existing ones because they can share existing infrastructure and because it is desirable to limit the visual impact of the towers.

It is conservatively estimated that between three and ten communications facilities will be sited in the proposed habitat over the next 10 years. This broad range is given to allow for the uncertainty involved in trying to forecast activity that is not yet planned.

Potential Projects or Activities, Next 10 Years: Installation of three to ten communications facilities

*Federal Involvement*: FCC permit (to operate) and FAA permit (to insure no interference with aircraft)

Critical Habitat/Other Listed Species: Probable overlap with 'elepaio critical habitat

Other Land Management: KMWP (assuming Unit L)

Consultation Costs:

- Total Section 7 Costs: $24,300 to $186,000

The cost-estimate is based on (1) three to ten consultations in the next 10 years; (2) the Low to Medium cost of a consultation with a Federal agency as the applicant and the involvement of a non-Federal applicant (from Table VI-1); and (3) a biological survey of 10 acres of open area with Easy to Medium access (from Table VI-2).

- Cost Attributable to Critical Habitat: $24,300 to $186,000

Even though there have been consultations on communications facilities in Hawai'i since the plants were listed, there has been no history of consultations for listed plants. Thus, all of the costs for consultation are attributable to critical habitat.

Anticipated Project Modification and Costs:

- Total Section 7 Costs: $0 to $100,000

It is likely that the construction of a new facility will not adversely affect listed plant species or *adversely modify* critical habitat because (1) the footprint of communications towers is relatively small; (2) existing infrastructure is present; (3) the towers would be adjacent to or near existing facilities; and (4) there may be no listed plant populations near the site. Thus, major project modifications are not anticipated. However, depending upon the circumstances, such as the presence of a listed plant population, the precise nature of the construction, and the quality of the *primary constituent elements* in the area, it is possible that project modifications may be required to reduce impact to listed species or critical habitat.

Possible project modifications could include inspection programs during construction to prevent non-native plant introduction, relocation of listed plants, replacement of any harmed listed plants, erosion control, fire control, and other measures to preserve and improve the existing habitat. The cost of these activities would depend upon the circumstances, but could cost up to $10,000 (based upon information from NRCS, 2002).

- Cost Attributable to Critical Habitat: $0 to $100,000

Because all consultation costs are attributed to critical habitat, the costs associated with any project modifications arising from these consultations are also attributed to critical habitat.

Potential Entities Impacted:

*Federal*: Service, FAA, FCC

*Private*: Private communications companies

## 3.f. Power Transmission Lines

### 3.f.(1) Existing Power Transmission Lines

Four high-voltage (13-Kv) power transmission lines transverse portions of proposed plant critical habitat units. Three pass through Unit L, and one passes through the southern portion of Unit I. Portions of all four of the power lines pass through *occupied* areas. In addition, lower voltage (46-Kv) lines pass through other portions of the proposed critical habitat.

Since the power transmission lines are existing structures and O&M is the main activity associated with them, they are not subject to section 7 consultation. Furthermore, no *Federal involvement* is anticipated with O&M of power transmission lines.

### 3.f.(2) New Power Transmission Lines

No plans have been announced to install new power lines across the Wai'anae Mountains or the Ko'olau Mountains in the proposed critical habitat. If, at some time in the future, such projects are proposed, they would be financed by Hawaiian Electric Company and would not require Federal permits.

Potential Projects or Activities, Next 10 Years: Possible power lines

*Federal Involvement:* None

Consultations and Cost: $0

No consultation required because of no *Federal involvement*

### 3.g. Farming

Unit I contains land in the State Agricultural District that is being actively farmed in pineapple by Del Monte Fresh Produce (Hawai'i), Inc. (Del Monte). The total acreage, including pineapple fields in crop, plantation roads and fields that are temporarily fallowed exceeds 400 acres. This land has been in cultivation for over 50 years. In addition, Del Monte may plant pineapple on some former sugarcane lands that were in cultivation for the better part of a century.

As discussed in Chapter I, Section 4, the Service intends to exclude these areas from the final critical habitat because they do not contain the *primary constituent elements* required for the conservation of listed plants. Thus, the proposed critical habitat is expected to have little or no economic impact related to farming.

### 3.h. Ranching

Approximately 10,000 acres in the proposed critical habitat are used by about a half-dozen ranchers for grazing cattle and other livestock (Units A and I). Most of this land is in the Wai'anae foothills within the State Agricultural District.

A ranching operation can have *Federal involvement* if the rancher receives: a small grant from NRCS to adopt voluntarily environmentally friendly practices, a loan from the Federal Farm Service Agency (FSA) or other USDA programs, or emergency funding from the FSA. The 2002 Farm Bill increased funding for these programs.

Potential Projects or Activities, Next 10 Years: Possible environmentally friendly land-use projects, farm loan for operations or small projects, and/or disaster recovery projects

*Federal Involvement:* Possible NRCS and/or FSA funding through the USDA

Consultations and Cost:

- Total Section 7 Cost: $0 to $86,100

Estimate based on (1) zero to five consultations in the next 10 years; (2) the Low to Medium cost (from Table VI-1) of a consultation with a Federal agency as the applicant; and (3) if needed, two biological surveys of a 100-acre open site with Easy to Medium access.

All of the consultation costs are conservatively assigned to the plants, even though the consultation may also address listed wildlife species.

- Cost Attributable to Critical Habitat: $0 to $86,100

Since no listed plants are in the area, the entire cost is attributable to critical habitat.

Anticipated Project Modifications and Cost: Minor

Because projects sponsored by NRCS are generally beneficial to the environment, project modifications, if any, are likely to be minor. Regarding FSA projects, Service guidelines state that project modifications must be economically and technically feasible. Since the profit margins for grazing operations are typically small, the total economic impact is likely to be modest. Furthermore, the rancher may choose to use FSA funds on projects that do not have adverse impacts on listed plants or their habitats.

Potential Entities Impacted:

*Federal:* Service, NRCS

*Private*: Up to two ranches

## 3.i. Aquaculture

Three aquaculture operations have received Federal and State approvals and permits to pump aquaculture-pond water through a pipeline that crosses Unit M and discharges into the ocean. Since this involves O&M of an existing pipeline facility, the aquaculture operations are not subject to section 7 consultation.

Thus, the proposed critical habitat is expected to have little or no economic impact related to aquaculture.

## 3.j. Irrigation-Ditch Systems

### 3.j.(1) Existing Irrigation-Ditch Systems

Unit L overlaps portions of two major irrigation-ditch systems, both of which were built in the early 1900s to deliver large volumes of water to irrigate sugarcane fields. The Waiahole Ditch delivers surface water from the windward side of the Ko'olaus to irrigate fields in Central O'ahu. The other ditch system is comprised of four collection systems (the Wahiawa, Helemao, Opaeula and Kamananui systems). This system delivers surface water from the leeward side of the Ko'olaus to fields on the north shore. For convenience, this system is referred to here as the Waialua Irrigation System since it was built to irrigate the the fields of Waialua Sugar Co.

Since the late 1990s, the Waiahole Ditch has been owned and operated by the State Agribusiness Development Corporation, a division of the Hawai'i State Department of Agriculture. The Waialua Irrigation System is privately owned and operated by Dole Food Company Hawai'i.

Components of an irrigation-ditch system include diversion dams, tunnels for collecting water, tunnels for delivering water, open ditches, covered ditches, flumes, siphons, pipelines, pumps, etc. Periodic maintenance is required to clear the system of vegetation and debris, detect and repair leaks, repair pumps, etc.

O&M of existing irrigation-ditch systems would not be subject to section 7 consultation since they are man-made features.

### 3.j.(2) Major Improvements to Existing Irrigation-Ditch Systems

It is highly unlikely that new or expanded ditch systems will be proposed or approved because this would directly or indirectly reduce stream flow, which is a major environmental concern. However, some existing systems within the proposed critical habitat may undergo major improvements within the next 10 years (e.g., improving a diversion dam, or replacing a high-maintenance flume that crosses a stream with a pipe siphon that is anchored on each side of the stream, etc.). Permits could be required under the Clean Water Act for projects that affect streams, and the State may use Federal USDA funds to repair Waiahole Ditch.

Potential Projects or Activities, Next 10 Years: major ditch repairs

*Federal Involvement:* possible USDA funding, possible ACOE permit

Critical Habitat/Other Listed Species: Portions of Waiahole Ditch are in the 'elepaio critical habitat

Other Land Management: KMWP

Consultations and Cost:

- Total Section 7 Cost: $0 to $39,000

Estimate based on (1) zero to two consultations in the next 10 years, (2) the Low to Medium cost (from Table VI-1) of a consultation with a non-Federal agency as the applicant, and (3) two biological surveys of approximately 100 acres along the existing ditch with Medium access (from Table VI-2). All of the consultation costs are conservatively attributed to the plants, even though the consultation may also address listed wildlife species.

- Cost Attributable to Critical Habitat: $0 to $39,000

Since the ditch systems are in areas regarded by the Service as largely *unoccupied* by the listed plants, it is assumed that all of the section 7 costs would be attributable to critical habitat.

Anticipated Project Modifications and Cost: Minor

- Total Section 7 Cost: Minor

Repair and improvement projects are likely to be limited to existing irrigation-ditch systems. As long as the projects are planned so that they avoid damage to forests and streams—which is likely to be the case—the proposed critical habitat designation would have little or no economic impact on these projects.

Potential Entities Impacted:

*Federal:* USDA

*State:* State Agribusiness Development Corporation

*Private:* Dole Food Company Hawaii

## 3.k. Potable-Water Systems

### 3.k.(1) Existing Potable-Water Systems

Potable-water systems within the proposed critical habitat deliver groundwater from mountain sources to urban and rural communities. System components include wells, water tanks, pipelines, etc. Most of the potable-water systems are built and operated by the Board of Water Supply (BWS), a semi-autonomous agency of the county, while some of the systems are privately owned.

O&M of existing potable-water systems would not be subject to section 7 consultation since they are man-made features.

### 3.k.(2) Improvements to Existing Potable-Water Systems

The BWS plans two projects in the proposed critical habitat over the next 10 years:

— Wailupe Well (Unit L): Install a pump, control building, piping, access road, landscaping, irrigation system, acoustical facilities, transmission main, electrical equipment and appurtenances on land owned by the county.

— Diamond Head Reservoirs (Unit X1): Install a new 4-million-gallon (mg) and 2-mg reservoirs, influent-effluent main, landscaping, irrigation system, access road, and appurtenances. (This project may be outside Diamond Head crater and just outside the proposed critical habitat.)

No *Federal involvement* is anticipated for the Wailupe Well or Diamond Head Reservoirs projects. In general, the BWS pays for planned improvements entirely through water rates.

Potential Projects or Activities, Next 10 Years: Install new facilities (wells, water tanks, etc.)

*Federal Involvement:* None

Consultations and Cost: $0

No consultation required because of no *Federal involvement*.

## 3.l. Highways

A portion of Unit A crosses Farrington Highway near the end of the highway at Kaheana Cave, and a portion of Unit W crosses Kalaniana'ole Highway by Koko Crater. Since these highways are man-made features, their O&M would not be subject to section 7 consultation.

However, major improvements within the next 10 years, if any, to one or both of the highways would be subject to section 7 consultation if the improvements are partially funded by the U.S. Department of Transportation (DOT).

Potential Projects or Activities, Next 10 Years: Possible improvements to one or both of the highways

*Federal Involvement*: Possible DOT funding

Consultation Costs:

- Total Section 7 Costs: $0 to $16,200

The cost-estimate is based on (1) zero to two consultations; (2) the Low cost of a consultation with a Federal agency as the applicant (from Table VI-1); and (3) a biological survey of 10 acres of open area with Easy access (from Table VI-2).

- Cost Attributable to Critical Habitat: $0 to $16,200

Since no listed plants are near the potential sites, all costs are attributable to critical habitat

Anticipated Project Modification and Costs:

- Total Section 7 Costs: Minor

Provided that the highway improvements are made within the existing rights-of-way, few if any project modifications are anticipated

Potential Entities Impacted:

*Federal:* Service, DOT

*State:* State DOT

## 3.m. Hiking Trails and Unpaved Access Roads

The proposed critical habitat contains numerous hiking trails and unpaved access roads. Many of the hiking trails (e.g., in Units A, B, C, L, X1) are maintained by DLNR's Na Ala Hele Trails and Access Program. Also, a contour trail within the Honouliuli Preserve (Unit I) is maintained to serve as a firebreak to help protect the native forest. O&M of existing trails and unpaved roads is not subject to section 7 consultation because they are existing man-made features.

New trails and access roads would be subject to section 7 consultation if there is *Federal involvement*. However, over the next 10 years, no plans are known for new trails or access roads that will also have *Federal involvement.*

Potential Projects or Activities, Next 10 Years: new trails and access roads

*Federal Involvement:* None

Consultations and Cost: $0

No consultation required because of no *Federal involvement*.

## 3.n. Ecotourism

About a half-dozen companies on O'ahu offer nature tours that include mountain hikes in their menus of choices. Led by professional naturalist guides, the tours feature Hawai'i's unique ecosystems and endemic plants and wildlife. The half-day tours cost about $35 to $45 per person, and tour groups range in size from about 6 to 12 people. Most of the mountain tours take place in in Unit L.

Also, an unknown number of visitors engage in self-directed mountain hikes (mostly in Units L, I and A), taking advantage of public access to O'ahu's trails and the various guide books on trails, native plants, birds, etc.

Potential Project or Activity, next 10 Years: Commercial hiking tours

*Federal Involvement:* None

Consultations and Cost: $0

No consultation required because of no *Federal involvement*

## 3.o. Residential Use and Development

### 3.o.(1) Existing Residential Use

The southern end of Unit I contains 17 cabins along the ridgeline at Palehua. They are on leased land and are used by their occupants as year-round residences. On the north shore, a home and a monastery are in the foothills above Mokule'ia (Unit A). It is possible that a few other isolated homes exist in other areas proposed for critical habitat designation.

Residential use is regarded as O&M of an existing man-made structure that is not subject to section 7 consultation, even if there is *Federal involvement* (e.g., a Federal mortgage).

### 3.o.(2) New Residential Development

No known plans exist for constructing additional homes in the proposed critical habitat. Furthermore, such plans are unlikely for that portion of the critical habitat that lies within the State Conservation District (see Chapter IV).

However, residential development is possible on about 8.5 acres of privately owned land in the back of Niu Valley and Aina Haina Valley which are zoned for residential development. These lands were not developed when the adjoining land was developed, presumably because of unstable soils. Also, construction of homes on large lots is possible in the State Agricultural District.

Potential Projects or Activities, Next 10 Years: Possibility of some residential development

*Federal Involvement:* Possible ACOE permit for drainage

Consultations and Cost:

- Total Section 7 Cost: $0 to $24,300

The cost-estimate is based on (1) zero to three consultations; (2) the Low cost of a consultation with non-Federal applicant (from Table VI-1); and (3) a biological survey of 10 acres of open area with Easy access (from Table VI-2).

- Cost Attributable to Critical Habitat: $0 to $24,300

Since no listed plants are near the possible project sites, all costs are attributable to critical habitat.

Anticipated Project Modification and Costs:

- Total Section 7 Costs: Minor

Project modifications are expected to be minor since (1) the areas that are subject to possible development do not host listed plants, (2) none of the species are aquatic plants, and (3) the focus of the ACOE will be on drainage.

Potential Entities Impacted:

*Federal:* ACOE

*Private:* Possible involvement of unspecified small developers

## 3.p. Landfill

A private landfill is planned for Unit I in the foothills of the Wai'anae Mountains above Kunia. The project would use approximately 100 acres for processing household, commercial, construction, and possibly municipal waste. An additional 150 acres would be used as a buffer and would be left undisturbed. Operations would entail separation of wastes, a recycling facility, excavating land, land filling, etc.

A number of permits and approvals will be required from the State and the county, but none from the Federal government.

Potential Projects or Activities, Next 10 Years: Development of a new landfill

*Federal Involvement:* None

The U.S. Environmental Protection Agency (EPA) has delegated implementation of the Federal Resource Conservation and Recovery Act (RCRA) to the Hawai'i Department of Health (DOH).

Consultations and Cost: $0

Historically, EPA has not consulted on RCRA requirements delegated to the State DOH.

## 3.q. U.S. Military Activities

The proposed critical habitat overlaps ten separate areas on O'ahu that are under the control of the U.S. military. Before critical habitat for the plants was proposed, much of this overlap was already subject to section 7 consultation due to the presence of listed plants. Also, "Integrated Natural Resources Management Plans" (INRMPs) were developed recently by the Army and Navy covering these military areas. The purpose of the INRMPs is to integrate the mission of each military area with responsible stewardship of the natural resources, including any listed species in these areas (see Chapter IV).

### 3.q.(1) Army, Dillingham Military Reservation (Unit A)

Dillingham Military Reservation contains 550 acres of land in Mokule'ia on the north shore of O'ahu between the cliffs of the Wai'anae Mountains and the ocean. It features a 9,000-foot runway that is leased to the State for civilian use. Air traffic is limited to daytime operations by small aircraft, sail planes, ultra-lights and helicopters.

The Army uses the facility for small unit maneuvers of platoon and squad size. The airport is also used for day and night tactical flight operations.

At the base of the cliff, a sliver of land in Unit A overlaps the Dillingham Military Reservation. No military exercises take place in this overlapping area, and none are anticipated. Also, no significant improvements are located in this area and none are planned.

Current conservation practices include weed control and fire prevention. Plans for fire management include installation of remote automated weather stations and construction of a firebreak and an access road.

Potential Projects or Activities, Next 10 Years: Conservation and land management

*Federal Involvement*: Military activities

Critical Habitat/Other Listed Species: None

Other Land Management: INRMP

Consultations and Cost:

- Total Section 7 Cost: $14,400 to $15,200

The estimate is based on: (1) two consultations; (2) the Low cost of a consultation with a Federal agency as the applicant (from Table VI-1); and (3) a biological survey of 100 acres of open area with Easy to Medium access (from Table VI-2).

- Cost Attributable to Plant Critical Habitat: $2,200 to $3,000

Based on discussions with the Service, about 15 to 20 percent of the total effort and cost will be attributable to plant critical habitat. The estimate is based on Service experience with recent and ongoing consultations, overlaying proposed critical habitats on action areas, and the additional effort required to address impacts of actions on the *primary constituent elements* for the plants in *unoccupied* portions of critical habitats.

Anticipated Project Modifications and Costs: Minor

In view of existing and planned weed and fire control, project modifications based on additional consultations are expected to be modest.

Potential Entities Impacted:

*Federal:* Service, Army

**3.q.(2) Army, Fort Shafter** (Unit L)

A small portion of Unit L overlaps a portion of Fort Shafter. The overlap is located near the head of a narrow mountain valley, and is inland of military improvements, operations, and activities. No military improvements or activities are anticipated for this area of the valley.

Potential Projects or Activities, Next 10 Years: None

Critical Habitat/Other Listed Species: Completely within 'elepaio critical habitat

Other Land Management: INRMP, KMWP

Consultations and Cost: None

Since no projects or activities are anticipated in the proposed critical habitat, no consultations will be required.

**3.q.(3) Army, Kahuku Training Area** (Unit L)

The northern end of Unit L in the Ko'olau Mountains overlaps about half of the Army's Kahuku Training Area (Kahuku). The terrain in the overlap is mostly mountainous and heavily forested. The northern part of Kahuku, which is outside Unit L, has gently rolling terrain and grassy areas that are prone to fire during dry conditions.

At 7,600 acres, Kahuku is the largest contiguous training area on O'ahu, and provides training for company-sized units. The Army as a whole is undertaking a transformation to greater mobility and, as part of this effort, plans to increase the use of old jeep trails and to use more off-road vehicles (primarily the Stryker). In addition, live-fire restrictions may change, or maneuver activities may expand. Blank ammunition and limited pyrotechnics outside the boundaries of Unit L during training exercises may represent a potential fire hazard to the proposed critical habitat.

To facilitate travel between Helemano and Kahuku, Drum Road is likely to be converted from a jeep trail to an all-weather road. The conversion will require covering the current jeep trail with gravel and, in some cases, concrete. The road shoulder may also be expanded.

Conservation and land-management activities at Kahuku include fencing to control ungulates, fire management, weed control, fruit and seed collection, and outplanting. Plans for fire prevention and control include: installation of remote automated weather stations, construction of fire access and perimeter roads, construction of a dip pond, and purchase of two brush fire vehicles.

An area of Kahuku not in the proposed critical habitat is used for week-end motorcross racing managed by the State. The Army helps monitor the motorcross riders to ensure that they do not enter areas with listed species; the Army is also promoting educational programs.

Potential Projects or Activities, Next 10 Years: Maneuver training, conversion of Drum Road into an all-weather road, conservation and land-management activities

*Federal Involvement*: Military activities

Critical Habitat/Other Listed Species: Wildlife

Other Land Management: INRMP, KMWP

Consultations and Cost:

- Total Section 7 Cost: $105,000 to $153,300

The estimate is based on: (1) three to four consultations (two programmatic consultations, one for Drum Road, and possibly one related to transformation); (2) the Medium to High cost of a consultation with a Federal agency as the applicant (from Table VI-1); and (3) two biological surveys of 500 acres, one involving an open area with Medium access and one involving a forested area with Difficult access (from Table VI-2). A full biological survey is required in the INRMP.

- Cost Attributable to Plant Critical Habitat: $15,800 to $30,700

Based on discussions with the Service, about 15 to 20 percent of the total effort and cost will be attributable to plant critical habitat. The estimate is based on Service experience with recent and ongoing consultations, overlaying proposed critical habitats on action areas, and the additional effort required to address impacts of actions on the *primary constituent elements* for the plants in *unoccupied* portions of critical habitats.

Anticipated Project Modifications and Costs:

- Total Section 7 Cost: $100,000 to $200,000

Based on discussions with the Service, better weed control, better fire control and other project modifications are expected to cost about $10,000 to $20,000 per year.

- Cost Attributable to Critical Habitat: $15,000 to $40,000

Based on discussions with the Service, about 15 to 20 percent of the total cost will be attributable to plant critical habitat.

Potential Entities Impacted:

*Federal:* Service, Army

**3.q.(4) Army, Kawailoa Training Area** (Unit L)

The Kawailoa Training Area (Kawailoa) covers 23,348 acres of rough mountainous terrain in the northern part of the Ko'olau Mountains. It abuts and is south of the Kahuku Training area. Nearly all of Kawailoa is within Unit L.

The Army uses Kawailoa as its principal helicopter training area, including "map-of-the-earth" training. It is the only area on O'ahu where night training noise levels will not disturb residents. Kawailoa is also used for light infantry training and evaluation; due to steep terrain, these activities are limited to short distances from Drum Road. Only blank ammunition is permitted; live-fire, tracer ammunition, incendiaries, explosive, and pyrotechnics are prohibited. The area is also open to hunters on weekends.

Drum Road skirts the western side of Kawailoa. As mentioned previously, this jeep trail is likely to be converted to an all-weather road.

Conservation and land-management activities at Kawailoa include game hunting and fencing to control ungulates, fire management, weed control, fruit and seed collection, and outplanting. Plans for fire prevention and control include: installation of remote automated weather stations, maintenance of a fire access road, and construction of a dip pond.

Potential Projects or Activities, Next 10 Years: Helicopter training, light-infantry training, conversion of Drum Road to an all-weather road, conservation and land-management activities

*Federal Involvement*: Military activities

Critical Habitat/Other Listed Species*:* Wildlife

Other Land Management: INRMP, KMWP

Consultations and Cost:

- Total Section 7 Cost: $23,000 to $41,400

The estimate is based on: (1) two consultations; and (2) the Medium to High cost of a consultation with a Federal agency as the applicant (from Table VI-1). No biological surveys are assumed, since Kawailoa has been surveyed by the Army.

- Cost Attributable to Plant Critical Habitat: $3,500 to $8,300

Based on discussions with the Service, about 15 to 20 percent of the total effort and cost will be attributable to plant critical habitat. The estimate is based on Service experience with recent and ongoing consultations, overlaying proposed critical habitats on action areas, and the additional effort required to address impacts of actions on the *primary constituent elements* for the plants in *unoccupied* portions of critical habitats.

Anticipated Project Modification and Cost:

- Total section 7 Cost: $100,000 to $150,000

Based on discussions with the Service, better weed control and other project modifications are expected to cost about $10,000 to $15,000 per year.

- Cost Attributable to Critical Habitat: $15,000 to $30,000

Based on discussions with the Service, about 15 to 20 percent of the total cost will be attributable to plant critical habitat.

Potential Entities Impacted:

*Federal:* Service, Army

**3.q.(5) Army, Makua Military Reservation** (Unit A)

Makua Military Reservation (Makua) covers 4,190 acres in a large valley on the western end of the island near Kaena Point. Unit A overlaps Makua, encompassing most of the valley rim where slopes are steep and access difficult.

Makua is the largest training area on O'ahu that will support both maneuver and live-fire training, and is the primary company-level combined-arms assault course on O'ahu. The valley will also support limited attack helicopter live-fire training, and the nearby beach is used by the Marine Corps for amphibious assault operations.

However, training was suspended in September 1998 due to community opposition following several wildfires that were ignited by military personnel using live ammunition and following a letter from Malama Makua (a community organization represented by Earthjustice Legal Defense Fund) concerning its intent to sue the Army to require a comprehensive Environmental Impact Statement (EIS) before resuming live-fire training.

In preparing to resume training, the Army worked with the Service to study the impact of the fires on rare flora and fauna, and prepared an Environmental Assessment (EA) costing nearly $350,000. This effort included a formal programmatic consultation that addressed training and all other program activities in Makua Valley and all listed species in the area, including the 'elepaio and other vertebrates, invertebrates, and plants.

A second lawsuit was filed in December 2000 to require an EIS instead of an EA. But following the terrorist attacks of September 11, 2001, the Army and Malama Makua reached an out-of-court settlement on October 4, 2001 to allow live-fire training in the valley on a limited basis.

The out-of-court settlement creates several land-management and environmental requirements that the Army must follow in order to be able to use Makua for live-fire training. The settlement requires the Army to prepare a comprehensive EIS within 3 years, addressing (1) biological resources (the valley contains at least 44 endangered species, including two birds, a bat, a snail, and 40 plants); (2) cultural resources (41 historic and cultural sites and more than 150 historic features); and (3) soil, air, groundwater, and surface-water contamination associated with live-fire training. The Army estimates that the EIS could cost as much as $3 million. In addition, the Army must establish a technical assistance fund of $50,000 to enable the community to hire independent experts to evaluate studies conducted for the EIS. Further, the Army will be required to undertake long-term air and groundwater monitoring. Finally, the community will have limited access to visit cultural sites in the valley, and to observe military training exercises there.

Live-fire operations will take place on 456 acres (11%) of the 4,190 acres controlled by the Army, and concertina wire will be used to keep soldiers out of sensitive areas. Under the settlement, 37 company maneuver Combined Arms Live-Fire Exercises (CALFEXs) will be allowed over the next 3 years; unexploded ordnance will be cleared from an area extending 3,000 feet from the highway into the valley; ordnance will be delivered by air when weather permits and helicopters are available; and when

ammunition is transported by land, the Army will avoid peak traffic hours and hours when children are traveling to and from school.

A maximum of 150 soldiers will be allowed to fire weapons at any one time, compared to the 600 soldiers who often used the valley in the past. To better control fires in this dry valley, less incendiary ammunition will be used, and training will not be allowed when dry, windy conditions present a fire hazard. Also, two 300,000-gallon water tanks, a helicopter with a dump bucket, and a 20-person fire-fighting force will be in place. These fire-control measures will be in addition to the firebreaks and control of vegetation growth along them.

After the EIS is completed, and depending upon the findings in the EIS, training and fire-fighting operations could be subject to more changes.

Independent of the settlement requirements, the Army is implementing a number of land-management measures including: 14+ miles of fence to control movement of ungulates; enclosure fencing to protect endangered plants from ungulates; goat and pig eradication, control of rodents, cats and mongooses during bird nesting season; slug control; firebreaks to contain fires emanating from training areas; grass cutting and use of herbicides to control vegetation along the firebreak roads; and two dip-ponds to provide a source of water to extinguish fires. The firebreaks are located outside the proposed critical habitat. The Army is also attempting to collect seeds and fruit from listed species for the purposes of outplanting to increase plant populations (INRMP).

The Army's INRMP also calls for additional fencing in Makua Valley to protect listed plants from ungulates, weed control and eradication to protect listed plants and reduce the risk of fire, further fruit and seed collection, and outplanting.

Potential Projects or Activities, Next 10 Years: Maneuver and live-fire training, conservation and land-management activities

*Federal Involvement*: Military activities

Critical Habitat/Other Listed Species: Partially overlaps 'elepaio critical habitat

Other Land Management: INRMP

Consultations and Cost:

- Total Section 7 Cost: $16,100 to $43,400

The estimate is based on: (1) three consultations; (2) the Medium to High cost of a consultation with a Federal Agency as the applicant (from Table VI-1); (3) two biological surveys of 100 acres of forested area with Medium to Difficult access (from Table

VI-2), and (4) half the cost allocated to plants and half to the 'elepaio critical habitat. Although Makua was surveyed recently for a section 7 consultation, the Army may conduct biological surveys of certain areas to evaluate the effects of specific activities on the plants and the 'elepaio critical habitat.

- Cost Attributable to Plant Critical Habitat: $3,900 to $21,700

Based on discussions with the Service, about 15 to 20 percent of the total effort and cost will be attributable to plant critical habitat. The estimate is based on Service experience with recent and ongoing consultations, overlaying proposed critical habitats on action areas, and the additional effort required to address impacts of actions on the *primary constituent elements* for the plants in *unoccupied* portions of critical habitats.

Anticipated Project Modification and Cost: Minor

As indicated above, extensive measures are being implemented at Makua to protect listed plants as well as the 'elepaio critical habitat. Project modifications based on additional consultations are expected to be modest.

**3.q.(6) Army, Schofield Barracks–West and South Ranges** (Units A, G and I)

In terms of personnel, Schofield Barracks (Schofield) is the largest Army post in Hawai'i. The base is located in Central O'ahu on 18,000 acres of land. Within the base, Schofield Training Area covers 4,695 acres on the western slopes of the Wai'anae Mountains, of which 2,800 acres are used for firing ranges and impact areas. The firing ranges are used for a variety of live-fire training, including: artillery, antitank, mortar, TOW tracking, grenade, machine gun, M16, pistol, small-unit assault, defense exercises, etc.

The major constraint at Schofield Training Area is its small size. The maximum firing distance is well below the maximum range of most artillery weapons; maneuver space is inadequate; range and firing safety zones overlap to such an extent that many ranges cannot be used simultaneously; and waivers of safety criteria are required to perform certain operations.

The Army's transformation to greater mobility will increase the need for training space. To this end, the Army is negotiating the purchase of land to expand South Range.

Unit A overlaps West Range below Mt. Ka'ala above the firebreak road where slopes are steep and access is difficult. The overlap encompasses most of the safety zone above the live-fire impact zone. No training activities occur in this safety zone, and none are planned. Also, no significant improvements are located in this area and none are scheduled.

A small portion of Unit A crosses the firebreak road and extends into the impact zone. However, the Service has indicated that it plans to remove that portion of Unit A from the proposed critical habitat (see Chapter I, Section 4).

Unit G overlaps with a mountainous portion of Schofield that separates the base from Naval Magazine Pearl Harbor, Lualualei Branch on the other side of the mountain.

Unit I overlaps the southern portion of South Range, much of which is steep and mountainous. This portion of South Range serves as a safety zone that is used as a flyover area for helicopters. No training activities take place in, or are planned for, this area. Also, no significant improvements are located in this area and none are scheduled.

The planned expansion of South Range will include additional land in Unit I. This land will be used to extend the existing safety zone for South Range.

Conservation and land-management activities at Schofield include: fire control, fencing to control ungulates, weed control and eradication, rodent control, and fruit and seed collection. Plans for fire prevention and control include: installation of remote automated weather stations, construction of fire access and perimeter roads, upgrades to the South Range firebreak road, and construction of a dip pond. However, hazards associated with unexploded ordnance restrict ecosystem management.

Potential Projects or Activities, Next 10 Years: Live-fire training, expansion of South Range, conservation and land-management activities

*Federal Involvement*: Military activities

Critical Habitat/Other Listed Species*:* Overlaps 'elepaio critical habitat

Other Land Management: INRMP

Consultations and Cost:

- Total Section 7 Cost: $55,700 to $75,800

The estimate is based on: (1) four consultations (two programmatic consultations, one for the South Range expansion, and one for improvements related to transformation); (2) the Medium to High costs for each of the consultations, with a Federal agency as the applicant (from Table VI-1); (3) two biological surveys, one of 100 acres of forested area with Medium to Difficult access, and one of 500 acres of forested area with Difficult access (from Table VI-2); and (4) half the cost allocated to plants and half to the 'elepaio critical habitat.

The Service indicates that a full biological survey will not be needed because Schofield was surveyed recently for a section 7 consultation. However, the Army may

conduct biological surveys of certain areas at Schofield to evaluate how specific projects and activities affect the plants and the 'elepaio critical habitat.

- Cost Attributable to Plant Critical Habitat: $8,400 to $15,200

Based on discussions with the Service, about 15 to 20 percent of the total effort and cost will be attributable to plant critical habitat. The estimate is based on Service experience with recent and ongoing consultations, overlaying proposed critical habitats on action areas, and the additional effort required to address impacts of actions on the *primary constituent elements* for the plants in *unoccupied* portions of critical habitats.

Anticipated Project Modifications and Costs:

- Total Section 7 Cost: $200,000 to $300,000

For existing portions of Schofield Barracks, better weed control, better fire control and other project modifications are expected to cost about $10,000 to $15,000 per year. Project modifications associated with the expansion of South Range are estimated to cost $20,000 to $30,000 per year (about $40 to $60 per acre per year for proactive land management x about 500 acres in critical habitat). Half of this costs is assumed to be attributable to the plants, and the remainder to the 'elepaio critical habitat and good land stewardship.

- Cost Attributable to Critical Habitat: $30,000 to $60,000

Based on discussions with the Service, about 15 to 20 percent of the total cost will be attributable to plant critical habitat.

Potential Entities Impacted:

*Federal:* Service, Army

**3.q.(7) Army, Schofield Barracks–East Range** (Unit L)

The Schofield Barracks East Range (East Range) covers 5,154 acres in the middle part of the Ko'olau Mountains. The eastern half, which is comprised of rugged mountainous terrain, is in Unit L; the western half is relatively flat.

East Range is used for tactical maneuver training, infantry training and testing, land navigation, equipment and personnel parachute operations, non-commissioned-officer academy training, and all courses of instruction offered by the Light Infantry Training Center. The western portion, which lies outside the critical habitat, is used for bivouac sites and combat unit maneuvering. It is suitable for limited company- and battalion-level infantry Army Training and Evaluation Program missions, and fixed and rotary

wing paratroop operations. The rugged eastern portion, which lies within Unit L, permits only squad-level training.

No transformation activities are planned for East Range. Also, no significant improvements are located in East Range and none are planned. Further only blank ammunition and noise simulators are used.

Conservation and land-management activities include biological surveys for listed plant species, control of ungulates through game hunting, and fire control. A Dip pond is planned to better control fires. Hazards associated with unexploded ordnance restrict management of the ecosystem, however. The ordnance is left over from training activities during and after World War II.

Potential Projects or Activities, Next 10 Years: Squad-level training and limited conservation management

*Federal Involvement*: Military activities

Critical Habitat/Other Listed Species: Overlaps 'elepaio critical habitat; wildlife.

Other Land Management: INRMP, KMWP

Consultations and Cost:

- Total Section 7 Cost: $39,800 to $49,000

The estimate is based on: (1) two programmatic consultations for maneuver training and conservation activities; (2) the Medium to High cost of a consultation with a Federal Agency as the applicant (from Table VI-1); (3) one biological survey of 500 acres of forested area with Difficult access (from Table VI-2), and (4) half the cost allocated to plants and half to the 'elepaio critical habitat. The biological survey reflects the fact that East Range has not been surveyed completely. .

- Cost Attributable to Plant Critical Habitat: $6,000 to $9,800

Based on discussions with the Service, about 15 to 20 percent of the total effort and cost will be attributable to plant critical habitat. The estimate is based on Service experience with recent and ongoing consultations, overlaying proposed critical habitats on action areas, and the additional effort required to address impacts of actions on the *primary constituent elements* for the plants in *unoccupied* portions of critical habitats.

Anticipated Project Modification and Cost:

- Total section 7 Cost: $100,000 to $150,000

Based on discussions with the Service, better weed control, better fire control and other project modifications are expected to cost about $10,000 to $15,000 per year.

- Cost Attributable to Critical Habitat: $15,000 to $30,000

Based on discussions with the Service, about 15 to 20 percent of the total cost will be attributable to plant critical habitat.

Potential Entities Impacted:

*Federal:* Service, Army

**3.q.(8) Hawai'i Army National Guard, Diamond Head Crater** (Units X1 and X2)

Portions of Units X1 and X2 overlap the Hawai'i Army National Guard (National Guard), Diamond Head Crater Lands. The National Guard conducts no military activities in Units X1 and X2, and none are anticipated. Also, no significant improvements are located in this area and none are planned. In 2010, the National Guard plans to turn over its lands to DLNR.

The National Guard's current land-management practices include brush control and fire prevention, weed control, and seed collection.

Potential Projects or Activities, Next 10 Years: Conservation and land management

*Federal Involvement*: Military activities

Critical Habitat/Critical Habitat/Other Listed Species: None

Other Land Management: INRMP

Consultations and Cost:

- Total Section 7 Cost: $10,500

The estimate is based on: (1) two consultations; (2) the Low cost of a consultation with a Federal agency as the applicant (from Table VI-1); and (3) a biological survey of 10 acres of open area with Easy access (from Table VI-2).

- Cost Attributable to Plant Critical Habitat: $1,600 to $2,100

Based on discussions with the Service, about 15 to 20 percent of the total effort and cost will be attributable to plant critical habitat. The estimate is based on Service experience with recent and ongoing consultations, overlaying proposed critical habitats on action areas, and the additional effort required to address impacts of actions on the *primary constituent elements* for the plants in *unoccupied* portions of critical habitats.

Anticipated Project Modifications and Costs: Minor

In view of existing and planned weed and fire control, project modifications based on additional consultations are expected to be modest.

Potential Entities Impacted:

*Federal:* Service, Army

**3.q.(9) Naval Magazine Pearl Harbor, Lualualei Branch (NAVMAG PH LLL)**

(Units F, G, H and I)

NAVMAG PH LLL occupies about 8,000 acres of Lualualei Valley on the Leeward (western) coast of O'ahu. It is the largest ammunition storage and ordnance operation in Hawai'i.

All or portions of Units F, G, H and I overlap NAVMAG PH LLL. Units F, G and H are in the mountainous sections of NAVMAG PH LLL, but most of the overlap occurs with Unit I along the back and south rim of Lualualei Valley where slopes are steep and access difficult. However, a small portion of the land in Unit I has gentle slopes.

The proposed critical habitat is in a safety zone for the magazines stored in the valley. No military activities occur within these units and, with one exception, none are anticipated. Also, no significant improvements are in these units and none are planned. The single exception is the possible outleasing of a portion of the land for cattle grazing.

Conservation activities measures include goat control by the USDA, limited game hunting to control ungulates, fencing, firebreaks, brush control and fire prevention, and operation of a full-service fire station.

Potential Projects or Activities, Next 10 Years: Conservation and land management

*Federal Involvement*: Military activities

Critical Habitat/Other Listed Species: Partially overlaps 'elepaio critical habitat.

Other Land Management: INRMP

Consultations and Cost:

- Total Section 7 Cost: $17,700 to $26,900

The estimate is based on: (1) two programmatic consultations; (2) the Medium to High cost of a consultation with a Federal Agency as the applicant (from Table VI-1);

(3) one biological survey of 100 acres of forested area with Difficult access (from Table VI-2), and (4) half the cost allocated to plants and half to the 'elepaio critical habitat.

- Cost Attributable to Plant Critical Habitat: $2,700 to $5,400

Based on discussions with the Service, about 15 to 20 percent of the total effort and cost will be attributable to plant critical habitat. The estimate is based on Service experience with recent and ongoing consultations, overlaying proposed critical habitats on action areas, and the additional effort required to address impacts of actions on the *primary constituent elements* for the plants in *unoccupied* portions of critical habitats.

Anticipated Project Modifications and Costs: Minor

As indicated above, extensive measures are already in place to prevent and quickly extinguish fires in Lualualei Valley—a situation which reflects the fact that the valley is used to store ammunition and ordnance. Also, measures are in place to control ungulates and weeds. Thus, project modifications based on additional consultations are expected to be modest.

Potential Entities Impacted:

*Federal:* Service, Navy

**3.q.(10) Naval Radio Transmitter Facility Lualualei (RTF Lualualei)** (Units I, J and K)

RTF Lualualei covers about 1,700 acres to the west of and abutting NAVMAG PH LLL. This facility is the transmitter site for Naval Computer and Telecommunication Area Master Station Pacific (NCTAMS PAC), which is the communications center for the Navy in the Pacific and the largest communications station in the world. The mission of NCTAMS PAC is to provide communications for command and control to all naval commands ashore and afloat in the Pacific area and to a wide variety of Army, Marine Corps, Coast Guard and Air Force Commands.

Units J and K (43 acres in total) are located entirely within RTF Lualualei. Because Unit K is adjacent to antennae fields, a portion of the unit is maintained grassland that is mowed regularly for security purposes and to reduce the risk of fire.

Potential Projects or Activities, Next 10 Years: Conservation and land management

*Federal Involvement*: Military activities

Critical Habitat/Other Listed Species: None

Other Land Management: INRMP

Consultations and Cost:

- Total Section 7 Cost: $10,500

The estimate is based on: (1) two consultations; (2) the Low cost of a consultation with a Federal agency as the applicant (from Table VI-1); and (3) a biological survey of 10 acres of open area with Easy access (from Table VI-2).

- Cost Attributable to Plant Critical Habitat: $1,600 to $2,100

Based on discussions with the Service, about 15 to 20 percent of the total effort and cost will be attributable to plant critical habitat. The estimate is based on Service experience with recent and ongoing consultations, overlaying proposed critical habitats on action areas, and the additional effort required to address impacts of actions on the *primary constituent elements* for the plants in *unoccupied* portions of critical habitats.

Anticipated Project Modifications and Costs:

- Total Section 7 Cost: $20,000 to $40,000

Weed control for 43 acres is estimated at $2,000 to $4,000 per year.

- Cost Attributable to Critical Habitat: $3,000 to $8,000

Based on discussions with the Service, about 15 to 20 percent of the total cost will be attributable to plant critical habitat.

Potential Entities Impacted:

*Federal:* Service, Navy

## 3.r. Natural Disasters

The most likely natural disaster to affect mountainous portions of the proposed critical habitat—and the one that would cause the most damage—would be a major hurricane passing over O'ahu. These are rare events. Historically, O'ahu has never been hit by a hurricane, although five have passed sufficiently close to have caused damage. In the mountainous regions proposed for critical habitat, wind and water damage caused by a major hurricane would include downed trees and branches as well as washed out roads, trails, and irrigation-ditch systems. Recovering from a natural disaster would involve clearing away downed trees, branches, and other debris, and rebuilding damaged structures.

Along the coast, the most likely natural disaster would be a *tsunami* generated by a distant earthquake (e.g., from Alaska, Chile, or Japan). The last major *tsunami* to hit Hawai'i occurred in 1960; the largest recorded runup on O'ahu was 36 feet above sea level. In the coastal region proposed for critical habitat, damage caused by a major *tsunami* would include downed trees and plants, salt damage to plants, washed out roads and trails, etc. Recovery would involve clearing the land of debris, rebuilding roads and trails, planting new vegetation, etc.

In the event of a natural disaster, a consultation with the Service would be required if financial assistance is sought from FEMA to help residents, businesses or government recover from the occasional natural disaster in areas where there are listed species and/or critical habitat. In such emergencies, the Service expedites consultations.

Potential Project or Activity, next 10 Years: Possible recovery from a natural disaster

*Federal Involvement:* Financial assistance from the Federal Emergency Management Agency (FEMA)

Critical Habitat/Other Listed Species: Wildlife species in many areas and large overlap with 'elepaio critical habitat.

Other Land Management: May include any or all land-management regimes

Consultation and Cost:

- Total Section 7 Costs: $3,800 to $7,500

Estimate is based on 5 to 10 days of effort by Service biologists to review the proposed projects at approximately $750 per day. All of the consultation costs are conservatively assigned to the plants, even though the consultation may also address the O'ahu 'elepaio and listed wildlife species that may be present.

- Cost Attributable to Critical Habitat: $3,800 to $7,500

FEMA has not consulted with the Service in the past on funding for the recovery of natural disasters in Hawai'i (e.g., Hurricane Iniki, which occurred in September 1992 after a number of plants were listed as threatened and endangered). Therefore it is likely that the costs of any future consultations will be attributable to critical habitat.

Anticipated Project Modifications and Cost: Minor

As long as recovery projects are planned so that they avoid further damage to forests and coast areas—which is likely to be the case—the proposed critical habitat designation would have little or no economic impact on FEMA projects.

Potential Entities Impacted:

*Federal:* Service, FEMA

*State:* Civil Defense

## 4. INDIRECT COSTS

### 4.a. Introduction

Except for the protections described in Chapter III, the Act does not provide other forms of protection for lands designated as critical habitat. And because consultation under section 7 applies only to activities that have *Federal involvement*, critical habitat designation does not afford any additional direct protections for listed species with respect to strictly private activities.

However, critical habitat designation has indirect impacts beyond those associated with the Act. For example, it is expected to provide the impetus for the Hawai'i State and county governments to require additional protections for designated critical habitat that would not otherwise be subject to such protections. In turn, these protections could affect the amount, types, and siting of developments occurring both within and outside critical habitat, as well as property values. These indirect impacts and others are discussed in this section.

### 4.b. Management of Game Mammals and Loss of Hunting Lands

#### 4.b.(1) The Game-Management Issue

One of the major issues surrounding the proposed critical habitat designations concerns the management of game-mammal populations (e.g., feral pigs and goats) and the potential loss of valued hunting lands. This is a highly sensitive issue throughout the State that for decades has been debated among environmental groups, hunters, biologists and government agencies. The concern does not extend to game birds on O'ahu, however, since the Service currently believes that these birds and the hunting of them do not have a significant adverse impact on listed species or their habitats.

As discussed in the proposed rule, the major threat to the survival and conservation of Hawai'i's native plants comes from ungulates, combined with competition from non-native plants. Ungulates feed on the succulent seedlings, stems and roots of various native plants; trample native groundcover and uproot seedlings and other low-growing plants; and create openings and sites where invasive non-native plants can become established and spread. Finally, ungulates carry seeds of non-native weedy and invasive

plants in and on their bodies, thereby distributing invasive plants to new areas, especially along trails, in and around wallows, and in areas that have been rooted up or grazed. Many invasive non-native plants are able to colonize newly disturbed areas more quickly and effectively than can the native plants.

Furthermore, the Service believes conservation goals for endangered Hawaiian plant species cannot be achieved when feral ungulates are present in "essential habitat areas." Ranked in order of importance, the first of 13 recommended management actions needed to assure the survival and conservation of Hawai'i's endangered plants is "feral ungulate control" (proposed rule, 67 FR 37108). Consistent with this finding, the Service opposes land management that allows or enhances the free ranging of large populations of feral ungulates in areas having vulnerable plant species.

Measures to control feral ungulates in protected areas typically include strategic fencing, or barrier fencing, to prevent or limit their migration into designated areas; exclosure fencing to prevent ungulates from entering protected areas; organized hunting to remove them from protected areas; and monitoring ungulate activity so land managers can direct hunters to problem areas. If increased hunting pressure does not reduce feral ungulate activity, land managers may work with hunters to identify and implement alternative methods, which may include trapping in remote areas. All of these activities may reduce the number of game mammals available to hunters and the sizes of hunting areas.

On O'ahu, an estimated 4,250 hunters comprise about 0.5 percent of the population, or about 1.6 percent when family members are included (Appendix VI-A). While many of these hunters accept the need to protect limited portions of the native forest from damage by ungulates, other hunters strongly oppose removing game mammals from large portions of existing hunting areas. Furthermore, many hunters fear that critical habitat designation will lead to a loss of prized hunting areas as was the case with the court-ordered eradication of sheep and goats from the *palila* critical habitat on the Island of Hawai'i 20 years ago (see Appendix VI-A). Instead, many hunters advocate that game-mammal populations continue to be sustained at levels that are sufficient to allow recreational and subsistence hunting in all but possibly a few of the existing State Hunting Units. They also see themselves as important contributors to controlling feral ungulate populations at reasonable levels and at little cost to the taxpayer.

Also, hunters have expressed concern that critical habitat designations could affect wildlife management projects proposed for Pittman-Robertson funding. The concern stems from the perception that the Service, over the objections of DLNR and its subsequent appeal to the Service, withheld Pittman-Robertson funds for game-management projects in areas proposed for critical habitat designation. (This matter is discussed more fully in Appendix VI-A.)

### 4.b.(2) Indirect Impacts on Game Management

Section 7(b)(2) of the Act does not require DLNR to manage State hunting lands to protect critical habitat; assure the survival and conservation of listed species; or participate in projects to recover species for which critical habitat has been established. That is, critical habitat designation does not require (1) creating any reserve, refuge, or wilderness areas; (2) fencing for any reason; (3) removing ungulates; or (4) closing areas to hunters. Furthermore, DLNR can use Federal Pittman-Robertson funds to selectively fund game-management projects that do not affect critical habitat, thereby obviating the need for consultations on game management in these areas.

Nevertheless, critical habitat designation would add weight to the argument that game-mammal populations should be eliminated or reduced substantially in affected areas due to threats to Hawai'i's native plants. In turn, DLNR may elect to change its game-management strategies to reflect this shift in priorities.

### 4.b.(3) Indirect Impacts on Hunting Conditioned on a Change in Game Management

Assuming, for the sake of illustration, that DLNR adopts a policy of reducing game-mammal populations substantially in the State Hunting Units that overlap critical habitat units, then the following impacts related to hunting can be expected.

Hunting Activity

Initially, the number of hunting trips into the more accessible critical habitat units would increase. But after game populations dropped to lower levels, the number of hunting trips into these units would probably drop also because of low success rates.

Some hunters might continue to hunt in the critical habitat for the wilderness experience. And some might switch to hunting game birds. But the most likely outcome is that most of them would switch to State Hunting Units outside the proposed critical habitat, increasing hunting pressures in these areas even more. And some hunters might choose to hunt less or not at all, spending their discretionary time and funds instead on other recreational pursuits.

Economic Activity

To illustrate the magnitude of the impacts, if about half of those who hunt game mammals on the affected lands were to give up hunting, then hunting activity on O'ahu could drop by about 25 percent (half of 50 percent, which is the estimated percentage of the accessible State-managed hunting lands proposed for designation). This translates

into a decrease in economic activity related to hunting on O'ahu of about $650,000 in direct sales (25 percent of $2.6 million); $1.2 million in total direct and indirect sales (25 percent of $4.7 million); 20 jobs (25 percent of 78 jobs); and $375,000 in income (25 percent of $1.5 million). Total economic activity related to hunting on O'ahu is documented in Appendix VI-A.

For the most part, the $650,000 decrease in expenditures by the displaced hunters would probably be spent on other recreational activities, goods and services. This increase in expenditures would create economic activity that would offset the decrease in economic activity related to the reduced expenditures on hunting. Thus, the net economic impact would probably be small. However, there would be distributional impacts, where some providers of goods and services would benefit at the expense of the stores and service-providers that cater to hunters.

Benefits to Hunters

Although a reduction in hunting activity would probably result in a small net change in economic activity, it would result in a loss in value or benefit to hunters (consumers' surplus)—see Appendix VI-A for the total benefits related to hunting on O'ahu. Under the given assumptions, this loss is estimated at $350,000 (25 percent of the current $1.4 million in surplus value). But partially offsetting this loss to hunters would be benefits derived from recreational activities that replace game-mammal hunting.

Pittman-Robertson Funding

In some states, a reduction in the number of licensed hunters could reduce the amount of Federal Pittman-Robertson funding the State receives. The reason for this is that the formula used to calculated the distribution of funds is based in part on the number of licensed hunters. However, Hawai'i currently receives the minimum amount of funding in relation to the number of hunters.

Thus, any drop in the number of hunters would have no effect on the amount of funding Hawai'i receives. Furthermore, if a Pittman-Robertson project is denied by the Service, or DLNR decides not to proceed with a proposed project, the associated Pittman-Robertson funds would not be lost. Instead, DLNR could use the funds to support another wildlife-management project.

State Expenditures

Finally, DLNR would probably have to expend more funds to maintain low game-mammal populations in areas that no longer attract hunters due to low success rates, and

to control the non-native plants and weeds in degraded areas where large populations of game mammals no longer browse (DLNR, 2001). Degraded areas are comprised mostly of exotic plants and weeds and few native plants.

### 4.b.(4) Probability of a Change in Game Management

The above outcome would occur only if the State were to adopt a new policy to reduce game-mammal populations substantially in critical habitat units that overlap with State Hunting Units. While such a change in game management is possible in certain areas, the primary reasons would include better watershed management, better management of NARs, erosion control, etc. For these areas, critical habitat is likely to play a secondary but supporting role. Outside of these areas, a major change in State management of game mammals is not expected.

As mentioned above, the debate about the management of game-mammal populations is a highly divisive and contentious one that has been argued for many decades in Hawai'i—a debate that long preceded the O'ahu plant species listings and the proposed critical habitat designations. Critical habitat designation would not change the nature of the debate significantly, but it would expand the geographic focus to include areas where listed species are not found.

Thus, the probability is small that, based on just the designation of critical habitat, the State would adopt a policy to substantially reduce game-mammal populations in critical habitat units that overlap with State Hunting Units. This judgment reflects discussions with DLNR, others familiar with the subject, and decades of public testimony by hunters: hunters would vigorously oppose a proposed reduction in game populations.

In addition to the political problem, concerns exist within DLNR about the initial cost of fencing and the removal of large numbers of game mammals from 17,660 acres. The most costly item would be removing ungulates from inaccessible areas and the stragglers remaining after hunters lose interest when their success rates drop. DLNR could utilize helicopters at this stage to hunt game, but this is expensive and ineffective in forested areas. Also, snares could be used to trap animals, but DLNR believes that checking them daily is costly; they pose risks to hunting dogs; they are regarded as inhumane; and they evoke complaints from the public.

Once the game-mammal populations are reduced, there are additional concerns within DLNR about the cost of maintaining low populations and of intercepting game mammals that migrate from adjoining non-critical-habitat areas—particularly if hunters are not interested in hunting in an area due to low success rates or difficult access. And if strategic fencing is in place, there are concerns about the periodic cost of repairing or replacing sections that are vandalized.

### 4.b.(5) Net Economic Impact

In summary, the probability of a major change in game management on O'ahu due to critical habitat designation is regarded as small. Thus, the proposed critical habitat designation is expected to have minor economic impacts related to management of game mammals and to hunting.

## 4.c. U.S. Military Activities

The Army, the Navy and the Marine Corps are concerned that the proposed critical habitat designation could compromise military operations important to national defense.

### 4.c.(1) Army Training Areas

In the case of the Army, all or portions of Units A, D, G, I and L overlap all or portions of Schofield Barracks West Range, Schofield Barracks South Range, Schofield Barracks East Range, Kahuku Training Area, Kawailoa Training Area, Makua Military Reservation, and Dillingham Airfield.

These training areas are used by the 25th Infantry Division (Light) (25th ID (L)) and other Army and Marine units for live-fire and maneuver training. The 25th ID (L) is stationed in Hawai'i to provide an operational capability to the Commander-in-Chief, Pacific (CINCPAC). Hawai'i is a strategic location for national defense and rapid deployment of troops.

Even though the Army controls considerable land on O'ahu, only a portion of it is suitable for live-fire and maneuver training. In fact, the Army has a substantial shortfall of suitable land, and is in the process of purchasing additional land on O'ahu and the Big Island in order to reduce the shortfall. Additional land for maneuver training is needed because the Army as a whole is undertaking a transformation to greater mobility.

### 4.c.(2) Naval Magazine Pearl Harbor, Lualualei Branch (NAVMAG PH LLL)

For the Navy, all or portions of Units F, G, H, and I overlap NAVMAG PH LLL. This facility is the largest ammunition storage and ordnance operation in Hawai'i. Its mission is to receive, renovate, maintain, store and issue ammunition, explosives, expandable items and weapons for the Navy, Air Force, Army and other activities and units.

### 4.c.(3) Naval Computer and Telecommunication Area Master Station Pacific (NCTAMS PAC)

Also for the Navy, all of Units J and K are within RTF Lualualei. This facility, which abuts NAVMAG PH LLL, is the transmitter site for the Naval Computer and Telecommunications Area Master Station Pacific (NCTAMS PAC), which is the communications center for the Navy in the Pacific and is the largest communications station in the world. The mission of NCTAMS PAC is to provide communications for command and control to all naval commands ashore and afloat in the Pacific area and to a wide variety of Army, Marine Corps, Coast Guard and Air Force Commands.

NCTAMS PAC needs to reserve adequate land around existing operational facilities at RTF Lualualei to ensure that future expansion of these facilities can be accommodated as necessary.

### 4.c.(4) Potential Impacts

If critical habitat designation compromises any of these operations (which may or may not be a realistic assumption), it could compromise national defense. For example, new constraints on training could risk the loss of lives, expensive equipment, and even military missions in future conflicts. And if the 25th ID (L) or other Army or Marine units were to be stationed elsewhere because of inadequate land for training in Hawai'i, a reduction in readiness would result.

In addition to the impact on national defense, Hawai'i's economy would be adversely affected if units or operations were to relocate outside the State. The economic impact would be very large if the 25th ID (L) and support functions were to relocate.

However, information is not available to estimate the magnitude of the potential impacts, if any.

## 4.d. Communications Facilities and Services

There is concern that critical habitat designation could result in the loss of one or more communications towers—especially since there is limited flexibility in locating most towers, and the impacted area (space for the tower, support building, cleared area around the tower, road, etc.) could require as much as 4 acres. However, a loss of new towers is not anticipated because (1) the new towers are expected to locate in areas removed from existing populations of listed plants, and (2) the Service is obligated to suggest reasonable and prudent alternatives in case of adverse impacts.

But if one or more communications towers is not developed, then the costs could be very high. For example, four major television broadcasters in Hawai'i are required by the Federal government to build new towers to provide digital television (DTV) service to the general public by 2006, or lose their broadcasting licenses. The four stations have combined revenues of about $60 million and provide about 400 jobs. In addition to entertainment, news, and advertising, the stations also provide emergency broadcasting services.

Depending upon the purpose of the facility, the loss of a communications tower could also compromise military and civilian communications, commercial broadcasting services other than DTV, air-traffic control for aircraft converging at and departing from Honolulu International Airport and other nearby airports, etc. However, without a specific project, the potential economic cost is difficult to estimate.

## 4.e. Landfill

As mentioned in Section 4 of this chapter, a private landfill is planned for Unit I in the foothills of the Wai'anae Mountains above Kunia. The project would use approximately 100 acres for processing household, commercial, construction, and possibly municipal waste. An additional 150 acres would be used as a buffer and would be left undisturbed. Operations would entail separation of wastes, a recycling facility, excavating land, land filling, etc.

Depending on approvals received for the landfill, annual revenues could range from $7 million to $25 million, while employment could reach 45 to 50 jobs.

Needed permits, approvals and requirements include a State EIS, a solid-waste management permit from the State Department of Health (DOH), a Conditional Use Permit from the State Land Use Commission (LUC), a Special Use Permit from the county, and county rezoning from the Ag-1 zone to Ag-2. Redistricting by the LUC would not be required since the project site is in the State Agricultural District.

No known populations of listed plant species are within or near the project site, which may reflect the fact that the land has been used for grazing for at least 125 years. Also, the project is expected to have no *Federal involvement* that would require section 7 consultation (see Section 3.p.).

Since a landfill is not compatible with critical habitat, there is a risk that the designation would increase the difficulty of obtaining the necessary approvals and permits, and that critical habitat could even derail the project. Finding a suitable alternative site for a landfill on a small island with a large population would be difficult given environmental concerns and the fact that communities do not want landfills nearby. Fur-

thermore, it is likely that some of the potential alternative sites are also being proposed for plant critical habitat. To date, the developers have invested approximately $1 million and 2 years of effort in the project; they anticipate a similar expenditure if another site must be found. The most likely alternative locations may be on the North Shore, which would require much longer trucking distances on undivided two-lane roads.

## 4.f. Mandated Conservation Management

Some private landowners are concerned that they will be required to alter the management of their lands that fall within critical habitat so as to assure the survival and conservation of listed species—regardless of whether they plan to propose any changes to their use of the land or activities on it. Specifically, they express concern that this new obligation will be expensive, and that they will have to pay most or all of any costs associated with managing the land to assure survival and conservation of the species. Discussed below are the existing and potential obligations under the Act associated with this type of land management; management activities that would enhance the survival and conservation of listed plants; and the costs of such management activities.

### 4.f.(1) Existing Requirements for Conservation Land Management

Existing Federal Requirements

Section 7(b)(2) of the Act does not require landowners to manage their lands to protect critical habitat, assure the survival and conservation of listed species, or participate in projects to recover species for which critical habitat has been established. That is, critical habitat designation, by itself, does not require any landowner to: (1) create any reserve, refuge, or wilderness areas; (2) fence for any reason; (3) remove ungulates, rodents, or weeds; (3) close areas to hunters or hikers; (4) initiate conservation or conservation projects; or (5) prepare special land-management plans.

Instead, designation can help identify areas that would benefit from additional conservation land management.

Existing State Requirements

Under existing State law, a Federal designation of critical habitat would not require landowners to proactively manage their land to conserve listed species. In fact, Hawai'i's endangered species law (HRS §195D), does not mention "critical habitat" although it does mention "habitat."

**4.f.(2) Potential Requirements for Conservation Land Management**

Even though there is no direct requirement under Federal or State law to proactively manage lands to protect listed species and their habitats, some landowners speculate that, pursuant to litigation, a Federal or State court could mandate the cessation of existing activities and the institution of conservation management on privately owned critical habitat. Specifically, landowners fear the success of an argument similar to that used successfully in Federal Court to order the eradication of sheep and goats on Mauna Kea to protect the critical habitat of the endangered *palila* bird (*Palila vs. Hawaii Department of Land and Natural Resources*). The *Palila* case was based upon section 9(a)(1) of the Act and found that habitat degradation could amount to a *take* of the species.

Potential Requirements: Endangered Species Act

Under Federal law, the prohibition on *taking* in the Act applies to fish and wildlife, but not to plants. Thus, according to the Service, it is arguable that the *Palila* decision is not applicable to listed plants because that decision specifically addressed the Service's interpretation of the word *harm*, which is listed as a prohibited activity under the definition of *take.*

Still, an argument could be made that the reasoning underlying the *Palila* decision also applies to section 9(a)(2). Section 9(a)(2) of the Act makes it unlawful to "remove, cut, dig up, or damage or destroy any such (listed plant) species on any [land outside Federal jurisdiction] in knowing violation of any law or regulation of any State or in the course of any violation of a State criminal trespass law." Despite the presence of State law in Hawai'i protecting endangered or threatened plants, the prohibitions in section 9(a)(2) (against removing, cutting, digging up, damaging or destroying listed plants) are arguably narrower than the broader concept of *take* that was at issue in the *Palila* case.

In addition to being limited to the removal, cutting, digging up, damage and destruction of a listed plant, a violation of section 9(a)(2) requires knowledge that the particular action violates State law. While a court could interpret this section broadly to prevent modification to critical habitat or require institution of conservation management activities, it would be difficult to argue that an activity removes, cuts, digs up, damages or destroys a listed species in an area where the species is not present (i.e. an *unoccupied* area). Thus, the likelihood of this result is estimated to be low for purposes of this economic analysis. Also, it should be noted that an attempt to require conservation management in a particular area through litigation based on section 9(a)(2) could be brought with or without the designation of critical habitat. While any conservation management practices required as a result of such litigation would be section 9 costs, rather than section 7 costs, the practical effect of critical habitat

designation could be to expand and define more precisely the geographic extent of habitat that could be the subject of such a court decision.

Potential Requirements: Interplay with State Law

Landowners also fear that conservation management may be imposed based on the interplay between provisions of State law and the designation of critical habitat. Under State law, the *taking* of any native threatened or endangered plant is prohibited. Landowners fear application of the Federal definition of *take*, as applied in the *Palila* case, to the State Act. Moreover, because there is no critical habitat under State law, landowners fear that Federal designation of critical habitat would create the opportunity for this argument to be made under State law. In short, landowners fear that a court could find that an action that degrades Federal critical habitat constitutes an illegal *taking* under State law. For example, allowing ungulates, including cattle, to roam free could be viewed as an activity that degrades a critical habitat and therefore amounts to a *taking* under State law of a listed species.

However, the State law prohibiting the *taking* of endangered or threatened plants is narrower than the Federal *take* provision. Specifically, State law defines *take* as "to cut, collect, uproot, destroy, injure or possess endangered or threatened species of aquatic life or land plants." The word *harm*, upon which the *Palila* case relied, is not included in the State definition of *take* for plants.

Based on the above, while an argument is possible that the interplay between the designation of critical habitat and State law could mandate conservation management, the likelihood of this result is estimated to be low for purposes of this economic analysis.

### 4.f.(3) Conservation Management to Protect Listed Plants

As indicated in the proposed rule, the major threats to native plants come from ungulates, combined with competition from non-native plants. In response to these and other threats, management actions needed to assure the survival and conservation of Hawai'i's listed species include: (1) feral ungulate control (e.g., strategic or barrier fencing to prevent or limit ungulates from migrating into large protected areas, exclosure fencing to prevent them from entering an area, extensive hunting and trapping to remove them from protected areas, one-way gates that allow animals to leave but not to enter an area, and monitoring transects for the presence of ungulates); (2) non-native plant control; (3) rodent control; (4) invertebrate pest control; (5) fire management; (6) maintenance of genetic material of the endangered and threatened plant species; (7) propagation, reintroduction and/or augmentation of existing populations into areas deemed

essential for the conservation of species; (8) ongoing management of the wild, out-planted and augmented populations; and (9) habitat management and restoration in areas deemed essential for the conservation of species.

To varying degrees, much of the land in the proposed critical habitat is already managed, or is scheduled to be managed, to directly or indirectly protect plants. Such areas include: the Natural Area Reserves (NARs), the Honouliuli Preserve, the O'ahu Forest National Wildlife Refuge, the Ko'olau Mountains Watershed Partnership (KMWP), and some military lands (see Table I-1 and Chapter IV). However, other lands may not be managed or may be less-well managed for the preservation of listed plants.

None of the above management actions involve changing existing water diversions or restoring stream flows. This is consistent with the fact that none of the listed plants are aquatic species that would be impacted by water diversions.

### 4.f.(4) Costs of Conservation Management Activities

The cost of implementing the above management actions would depend on the circumstances: the size of the area being managed, its location and access, the terrain, the quality of the native vegetation, ungulate populations, the extent of weeds, the risk of fire, land-management goals, etc.

For large mountainous areas such as watersheds, the greatest costs typically are incurred in the early years, with the most expensive items being fencing and removing ungulates. Depending upon location and terrain, the cost of fencing, including materials and installation, ranges from less than $30,000 per mile for areas that are accessible via a short drive, to as much as $170,000 per mile for remote locations that must be reached by helicopter (based on information from DLNR and the National Park Service).

Depending upon the circumstances, annual conservation-management costs range from an average of less than $30 per acre to more than $80 per acre (based on information from DLNR, the National Park Service, and private organizations). These figures are based on managing large, contiguous areas in the mountains; per-acre costs for managing small, dispersed areas could be significantly higher.

In addition to land-management costs, conservation of endangered plants (i.e., propagation, reintroduction and/or augmentation, monitoring, etc.) can be expensive. For example, a a 5-year effort to plant 25,000 silversword on Mauna Loa and Mauna Kea on the Big Island, which is regarded as being relatively straightforward and does not require weed control, is estimated at $1 million ( DLNR, 2001).

Government cost-sharing programs are available to fund conservation projects (see Chapter IV), but current funding is inadequate to support such projects for all the lands in Hawai'i that are being proposed for critical habitat.

### 4.f.(5) Potential Cost of Conservation Land Management Due to Critical Habitat

While the probability that a court would mandate conservation management practices within critical habitat is estimated to be low, the potential cost is estimated for illustration. The illustration is based on the assumption that about 100,000 acres would be subject to a mandate to better manage land so as to protect plants, with about half of the acreage being owned by the government and the remainder being privately owned. The cost of better land management is based on $30 per acre per year, which reflects conservation management of large, contiguous areas in the mountains at a comparatively low level of effort.

With these assumptions, the cost of better conservation land management is estimated at about $3 million per year, split about evenly between government and private landowners (100,000 acres x $30 per acre per year). The related increase in economic activity is discussed in Section 7, below, on Indirect Benefits.

### 4.f.(6) Related Loss of Economic Activity

Although mandated land management for conservation is regarded as unlikely, if it were to occur, it would also involve the loss of some existing economic activities. For example, grazing might have to cease on about 10,000 acres of land, most of which is in the Waianae foothills in the State Agricultural District. The loss in revenues is estimated at about $360,000 per year (based on an estimated carrying capacity of 7 acres per animal unit and $250 per animal unit per year). Companies that supply goods and services to ranches and the employees of these ranches in turn purchase goods and services from other companies, thereby generating even more sales, and so on. When both direct and indirect sales and employment are considered, the total Statewide loss amounts to about $760,000 per year and 22 jobs (based economic multipliers from the Hawai'i Input-Output Model).

Economic losses due to a loss of pineapple fields, plantation roads, and portions of a golf course at Kahuku are not estimated since the Service intends to exclude these areas from the final critical habitat because they do not contain the *primary constituent elements* required for the conservation of listed plants (see Chapter I, Section 4).

If the required conservation management were to include removing ungulates, an additional loss could include the economic activity and benefits related to hunting. As discussed above, this loss would amount to about $1.2 million per year in direct and indirect sales, and $350,000 per year in benefits to hunters. However, any loss in economic activity and benefits would be largely offset by hunters spending on recreational activities and other activities that replace hunting.

### 4.f.(7) Summary

Landowners have expressed concern that they might be required to alter the management of their lands that fall within critical habitat so as to assure the survival and conservation of listed plants. While the cost associated with mandated conservation management is estimated for illustration, the probability of this occurring is deemed to be low.

## 4.g. Redistricting of Land by the State

### 4.g.(1) Concerns about Redistricting

Another concern expressed by private landowners is that once critical habitat is designated on their land, the State may redistrict it from the Agricultural, Rural or Urban District to the Conservation District. In turn, this will result in (1) a substantial reduction in the value of the land; (2) lost current or potential agricultural use of the land; (3) higher property taxes because Conservation land can be assessed at a higher value than Agricultural land; and (4) reduced ability to secure bank financing. These concerns, as they relate to O'ahu are discussed below.

### 4.g.(2) Affected Lands

On O'ahu, about 10,937 acres proposed for critical habitat are in the Agricultural District, of which about 9,000 acres are privately owned. Most of the private land is used for grazing, and most of it is in the foothills of the Wai'anae Mountains above portions of the Wai'anae coast, Makakilo, Kunia and Mokule'ia. This excludes pineapple fields because the Service intends to exclude these lands from the final critical habitat designation (see Chapter I, Section 4).

About 392 acres of the proposed critical habitat are in the Urban District. This includes land owned by the county in Makaha Valley and a portion of a municipal golf course on private land in Kahuku. According to the Service, a small amount of the privately owned Urban land in Makaha Valley is a mapping error in that the proposed boundary clips a number of lots and some actual homes. Much of the remaining Urban land is on hillsides and is unsuitable for development because of steep slopes, unsuitable soils, and/or lack of access; most of this land is zoned by the county as Preservation. Also, Urban land at Turtle Bay Resort is scheduled to be turned over to the county for a park; this land is zoned Preservation.

However, about 8.5 acres of privately owned land in the back of Niu Valley and Aina Haina Valley are zoned for residential development. These lands were not developed when the adjoining land was developed, presumably because of unstable soils.

**4.g.(3) Probability of Redistricting**

The concern about potential redistricting of land designated as critical habitat stems from State statutes for Conservation of Aquatic Life, Wildlife and Land Plants (HRS §195D) and the Land Use Commission (HRS Chapter 205):

— Protection of Hawai'i's Unique Flora and Fauna (HRS §195D-5.1)

> DLNR "… shall initiate amendments to the Conservation District boundaries … in order to include high quality native forest and the habitat of rare native species of flora and fauna within the Conservation District."

— Districting and Classification of Lands (HRS §205-2(e))

> "Conservation Districts shall include areas for conserving indigenous or endemic plants, fish and wildlife, including those which are threatened or endangered."

— Land Use Commission Decision-making Criteria (HRS §205-17)

> "In its review of any petition for reclassification of district boundaries …, the commission shall specifically consider … the impact of the proposed reclassification on … (the) preservation or maintenance of important natural systems or habitats."

DBEDT's Office of Planning is responsible for conducting a periodic review of State District boundaries, referred to as the "boundary review." During the boundary review, the Office of Planning considers whether the existing District boundaries are appropriate, taking into account current land uses, environmental concerns, and other factors. Critical habitat would prompt the Office of Planning to consider redistricting from the Agricultural, Rural or Urban Districts to the Conservation District (DBEDT, Office of Planning).

However, agency-initiated redistricting of privately owned land is likely to occur in only a limited number of cases. This assessment is based on the following:

— Critical habitat designation alone would not prompt the State to propose redistricting. A number of other factors would come into play, such as the quality of the native habitat, the value of the land as watershed, slopes, etc. (DBEDT, Office of Planning).

— Approval of redistricting requires six affirmative votes from the nine commissioners, with the decision being based on a "clear preponderance of the evidence that the proposed boundary is reasonable" (HRS §205-4).

— Private landowners strongly oppose proposals to redistrict their lands if they believe this might result in a decrease in property value and/or a loss in the

economic use of their lands. Furthermore, they may file lawsuits claiming an unconstitutional taking of property.

— In the last State District boundary review, only four privately owned parcels were redistricted to Conservation, even though several hundred parcels were proposed for redistricting.

But in view of State law, there is a significant risk of a successful lawsuit that would force redistricting.

**4.g.(4) Cost of Contesting Redistricting**

Even though the probability may be low that the State will redistrict private land to Conservation, the landowner can spend time and money to contest a proposed redistricting. Based on the last boundary review, some landowners report spending over $50,000. However, in the event of a lawsuit to force redistricting, the costs would be much higher.

**4.g.(5) New Restrictions on Land**

Even if land is not redistricted, the State may seek agreements with landowners to protect the habitats of listed species as an incentive to retain their existing State District designation. Based on the last boundary review, this could involve agreements to reforest lands using native species, or to not subdivide or develop land that is habitat for listed species. Such requirements restrict future land use, thereby lowering property values.

**4.g.(6) Reduction in Land Values Due to Redistricting**

On O'ahu, reductions in land values due to State redistricting from the Agricultural District to Conservation could range from less than $5,000 per acre for remote Agricultural land having steep slopes and difficult access, to more than $30,000 per acre for land suitable for large-lot residential development. For a particular parcel, the per-acre reduction in value resulting from redistricting would depend upon views, location, access, terrain, county plans, available infrastructure, development potential, etc. The average value is estimated at $10,000 per acre (based on a general knowledge of appraised land values and discussions with landowners). However, appraised values may be closer to half the market value. Redistricting the land to the Conservation District could reduce the land values to about $1,000 per acre (based on a general knowledge of appraised land values). Thus, redistricting 9,000 acres of privately owned Agricultural land to the Conservation District would reduce land values by about $81 million (9,000 acres x a $9,000 per-acre reduction in value).

Urban land that is zoned for residential development and that is near existing infrastructure, but which has unstable soils, has a value estimated at about $40,000 per acre (based on a general knowledge of appraised land values). Thus, redistricting 8.5 acres of privately owned Urban land to the Conservation District would reduce land values by about $330,000 (8.5 acres x a $39,000 per-acre reduction in value).

### 4.g.(7) Reduction in Agricultural Use of the Land

If land is redistricted to Conservation, grazing could continue depending upon which subzone is assigned: grazing is not allowed in the Protective Subzone, but is allowed in other subzones with permission of the State Board of Land and Natural Resources.

Even if grazing is not allowed, the per-acre loss in economic activity would be small since grazing is a low-value, marginally profitable activity that typically generates land rents of less than $10 per acre per year (based on information from landowners and ranchers). For 9,000 acres, the loss in rents would be less than $90,000 per year (9,000 acres x $10 per acre per year).

### 4.g.(8) Summary

In view of existing State law, there is a significant risk that designation of critical habitat could result in a redistricting of privately owned Agricultural and Urban land to the State Conservation District. The resulting loss in land value could exceed $81 million. Also, landowners could spend resources fighting redistricting.

## 4.h. State and County Development Approvals

### 4.h.(1) Concerns about Development Approvals

As discussed below, a major concern among a number of private landowners, developers, and other interested parties is that critical habitat designation will significantly affect State and county development approvals, even with no *Federal involvement*. They are concerned that areas designated as critical habitat will be interpreted by government officials as "environmentally sensitive," and that this will result in increased difficulty in securing development approvals. The argument against approvals would be that critical habitat must be protected, and development should be limited or not allowed within critical habitat boundaries.

Related concerns are that critical habitat will result in more expensive environmental studies; delayed projects; costly project modifications; increased risks of projects being denied; and, for projects that are approved, the possibility of high legal fees to fight lawsuits designed to prevent or substantially alter projects.

The primary focus of the concern lies with potentially controversial projects that: (1) are in portions of the critical habitat that were not previously recognized as being environmentally sensitive because they contain no listed species; and (2) require major funding or discretionary approvals by the State or county. Discretionary approvals could include redistricting by the State Land Use Commission, approvals by the Board of Land and Natural Resources for projects in the State's Conservation District, General Plan or Community Plan amendments by county councils, etc.

**4.h.(2) State and County Environmental Review**

Based on discussions with planning consultants and government officials, critical habitat designations are likely to increase the level of environmental analysis. The reason for this is that State and county agencies would require developers to address the impact of projects on critical habitat and related public concerns.

Subject to certain exemptions, a State Environmental Assessment (EA) or Environmental Impact Statement (EIS) is required for projects that: (1) use State or county lands or funds; (2) are in the Conservation District; (3) are in the Shoreline Setback Area (usually 40 feet inland from the certified shoreline); (4) require an amendment to a county plan that would designate land to some category other than agriculture, conservation or preservation; or (5) involve reclassification of State Conservation District lands. If a project "substantially affects a rare, threatened, or endangered species, or its habitat," then a State EIS might be required instead of the simpler and less expensive EA.

It is reasonable to assume that the term "habitat" (which, in Hawai'i, includes areas that support listed threatened and endangered species) may eventually be interpreted by decision-makers to include "critical habitat" (which may include areas that could support listed species but presently do not). Those arguing in favor of this interpretation would include environmental groups, those who may oppose development, and possibly some government agencies. Eventually a developer may elect to, or be required to, submit a State EIS based on the fact that a project is located in a critical habitat. Once the precedent is set, succeeding developers may be required to submit State EISs under similar circumstances. Furthermore, a court may interpret "habitat" to include "critical habitat."

If critical habitat designation results in a requirement for a State EIS instead of an EA then, depending upon the complexity of the project, this could cost $25,000 to

$75,000 more than an EA (based on estimates from Hawai'i planning firms, 2002). Also, preparing and processing a State EIS would take about two months longer than an EA. In addition, biological surveys could be required.

### 4.h.(3) Project Mitigation

If a proposed project requires major State or county approvals and is within critical habitat, developers are likely to be required by State and county agencies to request comments from the Service on the project. If the Service indicates that the project would have a negative impact on the habitat of listed species, then State and county agencies probably would require project mitigation to address Service concerns. This would be expected even with no *Federal involvement*. The cost of the mitigation would depend upon the circumstances.

### 4.h.(4) Affected Projects and Potential Costs

Over the next 10 years, the number of affected projects is expected to be small because most of the proposed critical habitat units are (1) in mountainous areas that are unsuitable for development due to difficult access and terrain, and (2) within the State Conservation District where land-use controls severely limit development.

Depending on how much the proposed critical habitat designation contributes to additional environmental studies, project delays, project modifications, and potential project denials, the cost ranges from insignificant to substantial. However, information is insufficient to meaningfully quantify potential additional costs to developers, landowners and government agencies.

## 4.i. Reduced Property Values

### 4.i.(1) General Factors Underlying Reduced Property Values

An issue often raised by private landowners, and closely related to the above discussions, is that their property may lose value because of critical habitat designation. They are concerned that the designation will make their land less desirable by restricting its potential use or its development potential, or by increasing landowners' land-management or development costs.

The market value of a property reflects the future time-stream of economic and other benefits (e.g., profits) anticipated by potential buyers and sellers of land. Thus, factors which affect the future time-stream of benefits will affect the property values. For example, even partial approval of development can increase anticipated benefits and the

timing of these benefits, thereby increasing property value. On the other hand, restrictions on land use, higher land-management costs, limits on development potential, higher development costs, and delayed development will adversely affect the anticipated time-stream of benefits, thereby reducing the property value.

Reduced property values may be based on facts and an accurate assessment of the implications of critical habitat. But even perceptions of the economic impact of critical habitat designation can result in a loss of property value if landowners or buyers believe that the designation will cause significant changes in the time-stream of benefits. Such a loss in property value will be experienced for as long as the perceptions persist.

Similarly, uncertainty about the impact of a critical habitat designation can cause a temporary reduction in land value that will continue until clear and correct information is distributed. To reduce the uncertainties, landowners may feel it necessary to retain counsel, land surveyors, biologists, and other experts to determine the implications of the designation on their property (see below). This can be particularly important for landowners who plan to sell their property and so must address concerns of potential buyers.

### 4.i.(2) Potentially Affected Properties and Impacts on Property Values

The concern of landowners about reduced property values primarily involves land that is: (1) privately owned; (2) in the State's Urban, Rural or Agricultural District; and (3) suitable for eventual development or commercial use based on access, gentle slopes, proximity to infrastructure and services, etc. It also includes some privately owned land in the Conservation District that has high value because of unique characteristics (e.g., potential communications sites).

However, only a limited number of such properties are proposed for plant critical habitat designation. As indicated previously, most of the land is: (1) owned by government; (2) in the Conservation District; and (3) not suitable for development because it is in mountainous areas that have poor access and difficult terrain.

Lands that would be at risk of a significant loss in land value include those previously mentioned: about 9,000 acres of privately owned Agricultural land and about 8.5 acres of Urban land. It would also include land at Palehua (Section 3.d above) that is suitable for communications sites. As discussed previously, redistricting Agricultural and Urban land to the Conservation District could reduce land values by over $81 million. A loss of potential telecommunications development at Palehua could result in a loss in land value in excess of $10 million (based on $1 million per site x at least 10 potential sites). Thus, the total land-value at risk exceeds $91 million.

Based on just the section 7 consultation requirements, any decrease in property value due to critical habitat designation is expected to be small—at least in theory and assuming fully informed buyers and sellers. The reason for this is that few projects and activities in these areas would be subject to consultations, and project modifications are not expected to be burdensome. However, all of the communications projects at Palehua would be subject to consultations and perceptions could contribute to a more significant reduction in property values.

More burdensome State and county permitting requirements for new facilities at Palehua could also adversely affect land values.

However, the greatest loss in land value would be due to the perceived risk of State redistricting of Agricultural and Urban land to the Conservation District as discussed above. Furthermore, this loss in value will remain until a State court decides whether land designated as critical habitat should be redistricted to Conservation. Because there is little experience in Hawai'i with critical habitat, however, information to accurately estimate the actual loss in value does not exist—there are no comparables in Hawai'i upon which to base a loss in value, and mainland comparables do not apply because of different state environmental and land-use law.

Thus, the actual loss in land value due to critical habitat and the perceived loss in development potential would be some undetermined fraction of the $91 million mentioned above. Based on discussions with landowners and land appraisers, the loss could be significant—at least until more experience is gained with critical habitat or until the issue is resolved in court.

Regarding the small number of existing homes in the proposed critical habitat, they are man-made features and structures that are excluded from the proposed critical habitat (see Chapter I, Section 4). The proposed designation would not restrict residential use of this land, nor affect existing or potential lease rents from residential use. Consequently, the designation is not likely to affect property values or leasehold values.

### 4.j. Condemnation of Property

Some landowners suspect that, following critical habitat designation, the Service eventually will condemn private property at depressed land values. However, the Service is not proposing nor is it contemplating purchasing any land being proposed for critical habitat designation.

On occasion, the Service does purchase land (e.g., land for a National Wildlife Refuge). But this would be a separate action from critical habitat designation. As such, any proposed land purchase should be evaluated at the time it is proposed, and should be

based on what is actually proposed. When the Service does purchase private property, the normal practice is to do so only when (1) the landowner is willing to sell the land, and (2) the price and other terms are acceptable to the landowner.

## 4.k. Costs to Investigate Implications of Critical Habitat

A number of the private landowners may hire attorneys or use their own professional staff to investigate the implications of critical habitat designation on their property. They would do this to learn how the designation may affect (1) the use of their land (either through restrictions or new obligations), and/or (2) the value of their land.

On O'ahu a total of about 125 private landowners are included in the proposed critical habitat designation. However, some of them own extensive acreage in Hawai'i and are familiar with the Act. And for some, critical habitat may be of only limited concern because the portion of their land that overlaps the proposed critical habitat is not suitable for development because of mountainous terrain and Conservation Districting. Thus, only a portion of the landowners are likely to investigate the implications of critical habitat.

The cost to investigate the implications of critical habitat designation is estimated at $80,000 to $400,000. This range is based on the following assumptions: (1) 30 to 60 landowners will investigate the implications of critical habitat; (2) about 15 to 25 hours will be spent on the investigation at rates of $150 to $200 per hour; and (3) Service staff will spend 4 to 10 hours at $100 to $150 per hour responding to inquiries from each landowner.

## 4.l. Loss of Conservation Projects

Some parties have expressed concern that the ongoing activities of the Service to designate critical habitat could cause some landowners to cooperate less with the Service, NRCS, and DLNR on conservation projects. By not cooperating, they hope to avoid having listed species discovered on their lands or having their lands identified as favorable habitat for listed species. More to the point, the landowners hope to avoid having their lands designated as critical habitat in an attempt to shield their existing property rights and property values.

Reduced cooperation from landowners which, in fact, has occurred in Hawai'i on occasion, may include refusal to allow biological surveys of their land, or refusal to participate in watershed and conservation partnership programs sponsored by the Service, NRCS and DLNR. Reduced cooperation could result in lower-quality land management, environmental degradation, and increased risks to native plants and wildlife. If a

value were placed on these environmental losses, it could reflect an economic loss to society.

Any change from the current level of cooperation from landowners will depend on how much land is designated, which land is designated, actual and perceived restrictions on land use and development due to the designations, and perceived risks in the future. The assessment would be based on other landowners' experiences in Hawai'i as well as in other states.

For the listed plants on Oahu, the proposed critical habitat designation is expected to have a modest impact on land use and development over and above existing restrictions. This is especially true for land in the Conservation District which accounts for 90 percent of the proposed critical habitat. Thus, as landowners gain experience with the actual effects of critical habitat, their concerns about cooperating on conservation projects may diminish.

Nevertheless, the proposed critical habitat is large—amounting to 29 percent of the island—and includes some privately owned land in the State's Agricultural and Urban Districts. As a result, a modest but undetermined reduction in cooperation may occur, along with a corresponding but undetermined environmental loss to society.

## 5. COSTS TO SMALL ENTITIES

### 5.a. Regulatory Flexibility Act

Under the Regulatory Flexibility Act (RFA) (as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996), whenever a Federal agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effect of the rule on small entities (i.e., small businesses, small organizations, and small government jurisdictions). However, no regulatory flexibility analysis is required if the head of an agency certifies that the rule will not have a significant economic impact on a substantial number of small entities.

SBREFA amended the RFA to require Federal agencies to provide a statement of the factual basis for certifying that a rule will not have a significant economic impact on a substantial number of small entities.

While SBREFA does not explicitly define either "substantial number" or "significant economic impact," the U.S. Small Business Administration (SBA) and other Federal agencies have interpreted "substantial number" to mean 20 percent or more of the small entities in any industry, and "significant economic impact" to equal 3 percent or more of a business's annual sales.

Federal courts and Congress have indicated that an RFA/SBREFA analysis should be limited to the direct impacts on entities subject to the requirements of the regulation (Service, 2002). As such, entities not directly subject to the proposed critical habitat designation are not considered in this section of the analysis.

## 5.b. Entities Potentially Impacted

The analysis is based on a review of all previously discussed projects, activities, land uses and entities that may be directly regulated as a result of the proposed critical habitat designation. Based on this review, the following entities will be directly regulated due to a *Federal nexus.* The projects, activities, land uses are noted in parentheses.

— **Federal:**

ACOE (Permitting drainage projects)

DOT (Funding highways)

Army (Training, land management)

EPA (Funding conservation programs)

FAA (Approving communications facilities)

FCC (Permitting communications facilities)

FEMA (Funding natural disaster recovery)

FSA (Farm loans, disaster relief)

Hawai'i Army National Guard (Land management)

Navy (Land management)

NRCS (Conservation programs)

Service (All projects, activities, land uses)

— **State:**

Hawai'i Civil Defense (Communications facilities)

Hawai'i DAGS (Communications facilities)

Hawai'i DLNR (Game management, parks)

Hawai'i DOD (Communications facilities)

— **County:**

Board of Water Supply (Conservation projects)

**— Non-Profit:**

Ala Wai Watershed Association (Conservation projects)

The Nature Conservancy of Hawai'i (Conservation projects)

Ko'olau Mountains Watershed Partnership (Conservation projects)

**— Private:**

Dole Food Company Hawai'i (Improvements to irrigation-ditch system)

KGMB, KITV, KHNL, KHON (New communications facilities)

Ranchers (Farm loans and conservation programs)

Unspecified cellular, paging, and wireless services (Communications facilities)

## 5.c. Potential Impacts on Small Entities

The RFA/SBREFA considers "small entities" to include small governments, small organizations, and small businesses (5 U.S.C. §601). The following discussion examines each entity potentially impacted from the list above to determine whether it would be considered "small" under the RFA/SBREFA.

### 5.c.(1) Federal Agencies

For the purposes of the RFA/SBREFA, Federal agencies are not considered small governments. As such, the Federal agencies listed above are not considered further in this portion of the economic analysis.

### 5.c.(2) State Agencies

For the purposes of the RFA/SBREFA, State governments are not considered small government jurisdictions. As such, the State agencies listed above are not considered further in this portion of the economic analysis.

### 5.c.(3) County Agencies

The RFA/SBREFA defines "small governmental jurisdiction" as the government of a city, county, town, school district, or special district with a population of less than 50,000. Oahu has a population greater than 50,000 (see Chapter II). As such, the county agencies listed above are not considered further in this portion of the economic analysis.

**5.c.(4) Non-Profit**

The RFA/SBREFA defines "small organization" as any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

The Ko'olau Mountains Watershed Partnership (KMWP) is not independently owned, but it is a public-private partnership among Federal agencies, State agencies, and private landowners that is to be the forum for setting policy for watershed protection within the Ko'olau Mountains watershed. Based on the above factors, this analysis does not consider KMWP to be a "small organization."

The Ala Wai Watershed Association (AWWA) is a 501(c)(3) non-profit organization formed to improve water quality within the Ala Wai watershed through pilot projects and the promotion of long-term stewardship. However, with an EPA grant of $1.475 million and an EPA-grant budget of $881,467 for the fiscal year starting in April 2002, AWWA is a dominant non-profit organization dedicated to improving water quality on O'ahu. Based on the above factors, this analysis does not consider AWWA to be a "small organization."

The Nature Conservancy of Hawai'i (TNCH) is a 501(c)(3) non-profit organization dedicated to protecting Hawai'i's native forests and wildlife, and is responsible for managing more than ten private preserves Statewide. While the definition of "small organization" leaves room for interpretation, TNCH can be considered dominant in its field on O'ahu and also Statewide. Based on the above factors, this analysis does not consider TNCH to be a "small organization."

**5.c.(5) Private**

The RFA/SBREFA defines "small business" as one that is independently owned and operated, organized for profit, and not dominant in its field. Depending on the industry, eligibility is based on the average number of employees for the preceding 12 months, or on sales volume averaged over a 3-year period.

The Dole Food Company, Inc. (Dole) may be involved in a consultation regarding improvement of an irrigation-ditch system. Dole is listed on the New York Stock Exchange, with 2001 revenues of $4.5 billion (Dole, 2002). The company considers itself the world's largest producer and marketer of high-quality fresh fruit, fresh vegetables, and fresh-cut flowers (Dole, 2002). The SBA defines a farming operation as "small" if its annual sales are less than $750,000. Thus, Dole cannot be considered a small business for purposes of this analysis.

Hawai'i's four major television stations—KGMB (CBS affiliate) and KHON (Fox affiliate), KITV (ABC affiliate), and KHNL (NBC affiliate)—may be involved in consultations regarding communications facilities. The SBA defines a television

broadcaster as "small" if its annual sales are less than $12 million. Both KGMB and KHON are owned by Emmis Communications, which owns 15 stations across the country and had net revenues of over $517 million in the last fiscal year (Emmis, 2002). KITV is owned by the Hearst Corporation, which owns about 27 stations reaching approximately 17.5 percent of U.S. television households and had total revenues of over $641 million during the past fiscal year (Hearst, 2002). KHNL is owned by Raycom Media, which owns about 34 stations reaching about 10.5 percent of U.S. television households (Raycom Media, 2002). Based on this information, it is unlikely that any of Hawai'i's four major television stations would be considered small businesses.

One or more private companies offering paging, cellular, and other wireless communications services may be involved in consultations for communications facilities. The SBA defines these companies as "small" if they have less than 1,500 employees. It is not known which companies will, in the future, be requesting Federal permits to add facilities in the proposed critical habitat. However, it is reasonable to assume that these will be large, nationwide companies as they are now.

About a half-dozen ranchers may be involved in consultations regarding conservation projects and FSA farm loans. The SBA defines a rancher as "small" if annual sales are less than $750,000. Total livestock sales in the county in 2000 were just $556,000 (State Department of Agriculture, 2002); it is therefore assumed that all ranchers are small businesses. Hawai'i has 60 cattle operations (including a few dairies) on O'ahu (State Department of Agriculture, 2002). Thus a half-dozen ranches constitutes just 10 percent of the industry which does not meet the "substantial number" standard (20 percent).

### 5.d. Summary

Based on the above analysis, designating critical habitat for the O'ahu plants under section 7 of the Act could have a negative economic impact on about a half-dozen ranchers. However, the number of ranchers affected does not represent a "substantial number" of ranchers in Hawai'i. Therefore, the proposed critical habitat designation will not have a significant economic impact on a substantial number of small entities in Hawai'i.

## 6. DIRECT SECTION 7-RELATED BENEFITS

### 6.a. Introduction

The primary purpose of critical habitat is to protect areas that are needed to conserve threatened and endangered species. Many economic studies have demonstrated

benefits associated with the conservation and recovery of endangered and threatened species and their ecosystems (e.g., Bishop 1978 and 1980; Brookshire and Eubanks, 1983; Boyle and Bishop, 1986; Hageman, 1985; Samples *et al*., 1986; Stoll and Johnson, 1984).

However, the additional economic benefits of conservation and recovery that would be attributable to the designation of critical habitat is difficult to estimate because of the scarcity of (1) scientific studies on the magnitude of the recovery and ecosystem changes resulting from the critical habitat designation, and (2) economic studies on the per-unit value of many of the changes. For example, scientific studies have not been conducted to estimate—based on critical habitat and related project modifications and changes in land management—the reduction in the number of ungulates that will roam the critical habitat, the reduction in the number of invasive plants that will be introduced, any reduction in erosion and soil runoff, any increase in the number of endangered plants that will be present in the area, any increase in water recharge, etc. And while some economic studies been done on the per-unit value of some of these changes, studies have not been done for most (see Section 7.d.(2) below).

As a result, it is not possible, given the information that is currently available, to estimate the value of many of the benefits that could be ascribed to critical habitat designation. Thus, categories of benefits are discussed below in qualitative terms. The discussion is not intended to provide a comprehensive analysis of the benefits that could result from section 7 of the Act in general, or of critical habitat designation in particular. Instead, the Service believes that the benefits of critical habitat designation are best expressed in biological terms that can be weighed against the expected costs of the rulemaking.

The direct benefits are discussed in this section, followed by a discussion of indirect benefits in the next section.

## 6.b. Benefits of Project Modifications

As indicated in the Section 3 of this chapter, several projects are likely to occur in the proposed critical habitat. Some of them may be modified during the section 7 consultation process in order to reduce impacts on listed species. However, many of the anticipated project modifications will affect relatively small areas and will result in little change to the projects (e.g., communications towers, helicopter pads, etc.). As such, the project modifications are likely to provide localized benefits that help conserve populations of listed plants and their immediate habitat.

However, some project modifications may affect large areas and, as a result, may provide significant benefits to the habitat for listed species. Examples include changes

in game management to reduce the number of ungulates in sensitive areas (as noted previously, ungulates feed on threatened and endangered plants, and introduced weeds); possible changes in conservation projects to better protect sensitive areas from ungulates (e.g., fencing to control the movement of ungulates), improved fire control related to live-fire training by the military, and procedures to reduce the introduction of weeds.

### 6.c. Benefits to Developers

For areas that are regarded as *occupied* by the Service, the main advantage of critical habitat designations to developers is that they have more information on where they can site their projects. By knowing the critical habitat boundaries, and if they have the flexibility, they can site projects outside the boundaries, thereby avoiding certain issues related to threatened and endangered species. But even if there is no flexibility in siting a project, it can still be helpful to developers to know the boundaries of a critical habitat. If a project is located outside the boundaries, then the developer can proceed with project planning with less risk of facing issues related to critical habitat. On the other hand, if a project is located inside a critical habitat boundary and there is *Federal involvement*, then the developer should know that informal consultations with the Service must take place before proceeding with detailed site plans.

## 7. INDIRECT BENEFITS

### 7.a. Species Preservation

Section 3 discussed project modifications that would help protect habitat needed to conserve threatened and endangered species. Conserving species in their natural settings, their own habitat, is key to ensuring their long-term survival. Critical habitat can also help educate the unaware landowner or land manager about the importance of protecting the habitat of listed species on their land.

If endeavors to conserve threatened and endangered species are successful, environmental and other benefits include the survival and conservation of the plant populations, greater biodiversity and healthier ecosystems, aesthetics, enhanced opportunities for scientific experts to study native plants, preservation of genetic material, possible medicinal uses, etc. In addition, many people derive satisfaction simply from knowing that threatened and endangered species are being preserved and that the species will be on earth for future generations to appreciate.

If the proposed critical habitat designation culminates in the successful conservation of threatened and endangered plant species, then related benefits would be: (1) reduced internal costs to the Service and to the other Federal agencies that are involved in con-

sultations on listed species; (2) reduced internal costs for the non-Federal applicant, if any; and (3) reduced costs for biological assessments.

Some landowners have questioned some of these environmental and related benefits, arguing that critical habitat would make little or no contribution to the ultimate conservation of Hawai'i's threatened and endangered plants. They observe that many of these native plants are vulnerable because they are weaker and more fragile than non-native plants, and they grow more slowly. In particular, native plants lack the natural defenses (e.g., thorns, bitter tastes, offensive odors, etc.) to protect them from non-native pests (insects, diseases, rats, nematodes, birds, grazing animals, etc.)—a vulnerability that reflects the fact that native plants evolved in isolation in a benign environment. Finally, many of the native plants cannot compete against aggressive fast-growing exotic plants, particularly when they are stressed, such as during droughts. In the long term, some argue that many listed plants will not be able to survive in the wild, with or without critical habitat designations.

Nevertheless, as long as these designations enhance the probability of the survival and conservation of listed species and contributes to healthier ecosystems, critical habitat has value.

In any case, a monetary value is not estimated for the incremental benefits related to species preservation for the reasons previously mentioned: (1) the scarcity of scientific studies on the net changes in these benefits attributable to the critical habitat designations (i.e., the benefits that would occur over and above what will occur due to the listing of these plants and other existing protections), and (2) the lack of existing economic studies on the per-unit value of the changes.

Few studies have focused on the value of preserving endangered plants and, given the scope of this analysis, no primary economic research was conducted on the value of species preservation. Instead, most research on the value of species preservation has focused on mammals (e.g., the grizzly bear, gray wolf, humpback and gray whales, sea turtle, sea otter, bighorn sheep, etc.), birds (e.g., bald eagle, spotted owl, whooping crane, red-cockaded woodpecker, etc.), and fish (e.g., Pacific and Atlantic salmon, steelhead, cutthroat trout, squawfish, striped shiner, etc.). Depending upon the species, studies indicate that households are willing to pay an average amount ranging from $6 per year for the striped shiner to $70 per year for the spotted owl. Alternatively, they are willing to pay lump-sum amounts of $15 for the cutthroat trout to $216 for the bald eagle (Loomis and White, 1996). Household willingness-to-pay for a single species of endangered plant is likely to be lower than these amounts, particularly if the species is not well-known to the general public.

The value of general conservation, including preservation of native plants, is presented below in the discussion on benefits to the ecosystem.

## 7.b. Ethnobotanical Benefits

Closely related to the benefits of preserving threatened and endangered plant species is the benefit of preserving a subset of them that has ethnobotanical uses; that is, they are found in historical plant lore and in the agricultural customs of Native Hawaiians. On O'ahu, ten plant genera are found in the proposed critical habitat:

Food: *Cyanea, Diplazium*

Medicinal Use: *Chamaesyce, Cyrtandra, Hibiscus, Mariscus, Melicope, Plantago, Solanum*

Scent for Barkcloth: *Dubautia*

Designating critical habitat where these plant genera occur could contribute to their survival and conservation. However, no monetary value of the incremental economic contribution is estimated because of the difficulty of quantifying this contribution, and the lack of existing economic studies on the benefits of preserving these plants.

## 7.c. Medicinal/Pharmaceutical Benefits

As indicated above, seven of the listed species have medicinal value to Hawaiians. It is possible that other listed plants will be discovered to have medicinal value. However, information is not available on the statistical probability of this occurrence, the economic value of an as-yet undiscovered medicinal uses, or the contribution critical habitat designation will have to the conservation of that as-yet unspecified plant.

## 7.d. Benefits to the Ecosystem

Project modifications for game management, certain conservation projects, and military activities are likely to affect very large portions of the Ko'olau and Wai'anae Mountains and, as a result, provide significant benefits to the ecosystem. As discussed below, many benefits to the ecosystem would derive from ungulate control. To gain insight into the value of these benefits, two studies are summarized below.

### 7.d.(1) Controlling Ungulates

As discussed in the subsection above on conservation management, the survival and conservation of Hawai'i's native plants will require controlling feral ungulates since they constitute the major threat to the listed plants.

Ungulates also cause environmental problems. Their browsing, digging, and trampling contribute to a loss of native habitat which, in turn, contributes to the loss of listed

birds and other native birds, the endangered Hawaiian bat, and snails and insects that are either currently listed or are candidates for listing. Also, mosquitoes hatched in pig wallows frequently carry avian malaria and pox that contribute to the decline of native bird populations. Furthermore, certain ungulates (especially sheep and goats) can remove vegetation to such an extent that erosion becomes a major issue. In turn, the loss of vegetation can degrade watersheds, and the soil run-off can increase silt in streams thereby harming aquatic life; create layers of mud on otherwise sandy beaches; and bury nearshore reefs, thereby harming marine communities. Adverse impacts are more severe for bays and other protected marine environments that are not flushed by strong ocean currents.

If a significant reduction in the ungulate population were to occur—possibly in mountainous areas of the critical habitat that do not overlap with accessible portions of Hunting Units—then the following additional environmental benefits would be expected: (1) fewer mosquitoes, (2) less erosion, (3) enhanced survival of native wildlife, (4) healthier watersheds, (5) cleaner and healthier streams and nearshore marine environments, and (6) cleaner beaches. In turn, these environmental benefits would enhance the experiences of hikers, birdwatchers, beach visitors, etc. However, for critical habitat that overlaps with Hunting Units, it is unlikely that the ungulate population will be reduced substantially (see Section 4.b on the management of game-mammals).

### 7.d.(2) UH Study on the Value of the Ko'olau Mountains

A 1999 study by economists at the University of Hawai'i (UH) found that the present value of the future stream of ecosystem services provided by O'ahu's Ko'olau Mountains to be worth $7.4 billion to $14 billion, an estimate that excludes the ecosystem services provided by the smaller and dryer Wai'anae Mountains. The present-value estimates are based on a 1- to 3-percent social discount rate.

Ranked in order of their contribution to the total value, the estimates include the following:

— Groundwater Quantity (61% of total value)

The estimated value is based on the cost of replacing all of the groundwater recharge with expensive desalinated water.

— Aesthetics (14% to 22% of total value)

The estimated value is based on a survey of O'ahu residents which revealed that, on average, households are willing to spend 0.23 cent per year to save an acre of sugarcane land in open space. This figure was extrapolated to the entire Ko'olau mountain range, resulting in an estimate of $112.50 per household per year for the aesthetic value of the Ko'olaus.

— Ecotourism (13% to 22% of total value)

The estimated value is based on the assumption that 1/15 of visitor expenditures on nature tours was on the assets of the Ko'olaus.

— Species Habitat (7% to 10% of total value)

The estimated value is based on an assumption that households are willing to spend $35.50 per year to preserve endangered birds—a value which reflects willingness to pay to save certain bird species on the mainland.

— Water Quality (1% to 3% of total value)

The estimated value is based on the assumption that all of the water that percolates into the soil will run off into streams instead, and on the estimated cost of periodic dredging of sediment from the Ala Wai Canal (a proxy for the cost of cleaning up water pollution). The water in the man-made Ala Wai Canal comes from three large valleys that drain through partially channelized streams in urban areas. Because the canal was built with inadequate flushing from stream or ocean currents, it functions as an unintentional settling basin. The costs are extrapolated to the entire Ko'olau watershed, but exclude estimated runoff from urban areas.

— In-stream Uses (1% to 2% of total value)

The estimated value is based on the assumption that households are willing to spend $7 per year to preserve a single endangered aquatic species—a value that reflects willingness to pay to save certain fish species on the mainland.

— Hunting (0.8% to 1.4% of total value)

The estimated value is based on a fraction of the hunting expenditures in Hawai'i.

— Climate Control (0.6% to 1.1% of total value)

The estimated value is based on an estimated value of the carbon-storage function of all tropical forests in the world times the percentage-share attributable to the Ko'olaus.

— Subsistence Hunting (0.5% to 0.9% of total value)

The value is based on the estimated harvest of pigs in the Ko'olaus times the market value per pig.

— Biodiversity (0.01% to 0.03% of total value)

The estimated value is based on the cost of listing 11 endangered plants in the Ko'olaus.

— Commercial Harvest (0.01% to 0.02% of total value)

The value is based on selective harvest of *koa* timber, although *koa* is not commercially harvested on O'ahu.

Estimating the total value of the ecosystem services provided by the Ko'olau Mountains is a difficult task, requiring some assumptions that are open to challenge. And, as noted in the UH analysis, not all benefits of the Ko'olaus are addressed. In any case, the value of the ecosystem services provided by the Ko'olaus is very large.

Since the proposed critical habitat covers nearly all of the Ko'olau mountain range, as well as the Wai'anae Mountains, and some project modifications can affect a large portion of the mountains, even a very small-percentage improvement to the ecosystem services can translate into large economic benefits. For illustration, if $10 billion is assumed for the present value of the ecosystem services provided by the Ko'olaus, and project modifications increase ecosystem services by as little as 0.01 percent, then the resulting economic benefit amounts to about $1 million, or $20,000 per year assuming a 2-percent social discount rate. The $10 billion present value and 2-percent discount rate are mid-values from the UH study.

### 7.d.(3) Trust for Public Land Survey on the Value of Open Space and Wildlife Habitat

A survey sponsored by the Trust for Public Land and conducted in April 2000, revealed the approximate amount that Maui County voters were willing to pay to better protect open space, wildlife habitats, recreational areas, and land around rivers and streams. According to the survey, approximately 66 percent of the voters would support a "community lands and open-space preservation fund" to protect land and water in Maui County, funded by a 2.5-percent increase in the property tax. This works out to a total of about $1.38 million per year (based on Maui County estimated property-tax revenues of $83.4 million in FY 2000 x 2.5 percent x 66 percent), or an average of about $11 per resident per year (based on a Maui County resident population 128,100 in 2000). Assuming that the survey is applicable to Oahu the corresponding total is about $9.6 million per year ($11 per resident per year x 876,156 residents).

When voters were asked the same questions from another perspective, 57 percent of them were willing to pay $28 per year to support the fund; another 2 percent were willing to pay $21 per year; another 8 percent were willing to pay $14 per year; and another 4 percent were willing to pay $13 per year. This works out to a total of about $1.67 million per year, or about $13 per resident per year (based on an estimated 93,800 adult taxpayers and a county population of 128,100 in 2000). Assuming that the survey is applicable to O'ahu, the corresponding total is about $11.4 million per year ($13 per resident per year x 876,156 residents).

Of 18 potential projects that could be financed by a conservation fund, six relate to the benefits of preserving native plants and the environmental benefits of reducing ungulates (discussed above). These projects, along with their ranking and support by those surveyed, are as follows:

— Ranking #1: protect native forest areas (85 percent of surveyed voters reported this to be extremely important or very important, and 12 percent reported it to be somewhat important)

— Ranking #2: preserve critical watershed lands (85 percent reported this to be extremely important or very important, and 11 percent reported it to be somewhat important)

— Ranking #3: permanently protect natural lands threatened by development (81 percent reported this to be extremely important or very important, and 12 percent reported it to be somewhat important)

— Ranking #4: protect beaches and coastal areas (80 percent reported this to be extremely important or very important, and 15 percent reported it to be somewhat important)

— Ranking #5: save habitats for whales, seals, turtles, birds, and other fish and wildlife (79 percent reported this to be extremely important or very important, and 15 percent reported it to be somewhat important)

— Ranking #7: purchase land by rivers and streams to protect water quality (78 percent reported this to be extremely important or very important, and 14 percent reported it to be somewhat important)

Assuming that this County of Maui survey reflects preferences and values on O'ahu, the above rankings suggest that a major portion of the $9.6 to $11.4 million per year that voters are willing to pay annually for additional conservation on O'ahu would be in support of: (1) protecting native plants (particularly those in native forests) and (2) the benefits that would result from controlling ungulates to protect native plants (i.e., enhanced survival of native wildlife, healthier watersheds, cleaner and healthier streams and nearshore marine environments, and cleaner beaches). Residents of other islands in Hawai'i, and even residents of other states and countries would add to this dollar amount, although the average per-capita amount they would be willing to pay for conservation on O'ahu surely would be much lower than the amount O'ahu residents would be willing to pay.

### 7.d.(4) Value of Benefits to the Ecosystem

Even though critical habitat designation may result in significant benefits to the ecosystem, information is not available to provide a meaningful estimate of the value of

these benefits. As previously discussed, (1) scientific studies are not available on the magnitude of the changes due to critical habitat, and (2) economic studies are not available on the per-unit value of many of the specific changes.

## 7.e. Ecotourism

As discussed above, commercial hiking tours, led by professional naturalist guides and featuring Hawai'i's unique ecosystems and endemic plants, are offered in some of the mountainous areas proposed for critical habitat. Critical habitat designation could benefit these operations by providing a marketing dimension that would enhance the appeal of hiking tours for visitors. However, the direct benefit is expected to be slight inasmuch as the Service prefers that these commercial operations do not feature visits to view threatened and endangered plants since revealing their locations increases the risk that a species may be collected or damaged or its habitat harmed. Also, many areas are already regarded as being special, including: NARs, the Honouliuli Preserve, the O'ahu National Wildlife Refuge, State Recreational Areas, and State and county parks.

From a broader perspective, however, ecotourism could benefit from project modifications that enhance the quality of the ecosystem and expand the geographic scope of high-quality ecosystems, thereby increasing the appeal of mountain tours to visitors.

## 7.f. Economic Activity Generated by Conservation Management

In FY 2001, the Service spent about $240,000 on conservation management for listed plants on O'ahu, including expenditures on salaries, equipment, supplies and services. In turn, workers and companies that benefited from the Services's expenditures on conservation management purchased additional goods and services, thereby generating additional economic activity. In total, the initial Service expenditure generated approximately $430,000 in direct and indirect sales for the islands, and supported about five direct and indirect jobs (based on multipliers from the Hawai'i Input-Output Model, DBEDT, 2002). The U.S. Army, the USDA, the State and other organizations also spend a considerable amount on conservation management that involves listed plants.

If the proposed critical habitat results in an increase in conservation management on O'ahu, then the increase in expenditures could contribute to an increase in economic activity in Hawai'i. Based on State multipliers, each additional $1 million of new money spent in Hawai'i would generate approximately $1.8 million in direct and indirect sales in Hawai'i, and would support approximately 22 direct and indirect jobs in Hawai'i (based on multipliers from the Hawai'i Input-Output Model, DBEDT, 2002).

If, as estimated in Subsection 4.e.(4), an additional $3 million per year is spent on better conservation land management (which is not expected unless mandated by a court

order), then this expenditure would generate about $5.4 million per year in direct and indirect sales in Hawai'i, and would support about 66 direct and indirect jobs in Hawai'i.

However, the economic activity supported by funds spent on conservation management may or may not represent an expansion of Hawai'i's economy, depending upon how the expenditures are financed. If the increase in conservation management is financed by an influx of new funds from outside the State, then the increase in expenditures will contribute to increased economic activity in Hawai'i. New funding for conservation management could come from the Federal government, grants from non-profit organizations outside Hawai'i, etc. While this is possible, no known projections are available that indicate a significant increase in funding for conservation management emanating from outside Hawai'i as a result of critical habitat designation.

At the national level, however, increased funding of conservation programs in Hawai'i would result in no significant change in economic activity for the U.S. economy as a whole because any funds spent in Hawai'i would be at the expense of expenditures elsewhere in the economy (e.g., funds diverted from some other Federal program). In effect, the increase in economic activity in Hawai'i would represent a transfer of economic activity from elsewhere in the national economy.

A similar situation applies to Hawai'i's economy. Increased funding from the Hawai'i economy on conservation management would result in no significant change in economic activity for Hawai'i's economy because funds spent on conservation management would be at the expense of funds spent elsewhere in Hawai'i's economy (e.g., funds diverted from some other government or private program). In effect, the increase in expenditures on conservation programs in Hawai'i would represent a transfer of economic activity from elsewhere in Hawai'i. If the funds come from outside Hawai'i, but are diverted from some other expenditure that would also have been made in Hawai'i, that too would result in no significant change in Hawai'i's economy as a whole.

## 8. SUMMARY OF ECONOMIC IMPACTS

Discussed below and summarized in Table VI-3 are the direct and indirect costs and benefits that are expected due to the listing of the O'ahu plants and the proposed critical habitat designation.

### 8.a. Direct Section 7-Related Costs

For most of the proposed designation and for most activities, implementation of section 7 of the Act would have minor economic impacts for the following reasons:

— Except for communications facilities, a landfill, and a few other projects, little development is planned for most of the proposed critical habitat. This situation reflects the fact that (1) most of the land is unsuitable for development due to the rugged mountain terrain, lack of access, and remote locations; and (2) existing land-use controls severely limit development and most other economic activities in the mountainous regions of O'ahu.

— Some existing and continuing activities involve the operation and maintenance of existing man-made features and structures. These are not subject to the provisions of section 7 because they do not contain the *primary constituent elements* for the plants, and therefore would not be impacted by the designation.

— Some existing and planned projects, land uses, and activities that could affect the proposed critical habitat have no *Federal involvement* that would require section 7 consultation with the Service, and so are not restricted by the requirements of the Act.

— For the anticipated projects and activities that do have *Federal involvement,* many are conservation efforts that will not negatively impact the plants or their habitat, so they will be subject to a minimal level of informal section 7 consultation.

Nevertheless, as summarized in Table VI-3, a number of projects and activities will be subject to section 7 consultation. For each activity, the table summarizes the total costs involved with consultations and the related project modifications, as well as that portion of the costs which would be attributable to just the critical habitat designation. Because of uncertainty, low and high cost estimates are provided.

As indicated in the table, most of the costs for the consultations and anticipated project modifications will fall on the U.S. military. Most of these project modifications will involve improved fire and weed control to protect the plants and their habitats.

Significant costs are also estimated for game management, watershed projects, conservation projects, communications facilities, and possibly ranching and irrigation-ditch systems. Costs would also be incurred for parks, highways, residential development, and natural disasters.

The bottom of the second page of Table VI-3 shows estimates for the total direct costs for section 7 consultations and project modifications over a 10-year period. As indicated, the total direct cost for both the plant species listings and critical habitat is estimated at $1.1 million to $2.3 million; the amount attributable solely to critical habitat is $308,000 to $1.1 million. The estimated average annual cost and present-value cost are also given in the table.

**8.b. Indirect Costs**

The top portion of the last page of Table VI-3 summarizes the indirect costs of the proposed critical habitat designation. The information consists of a mixture of quantitative estimates and qualitative assessments. The qualitative assessments—which reflect the professional judgments of the economic consultant based on the analyses given in corresponding sections—were used in cases where available information is inadequate for developing meaningful quantitative estimates. As indicated in the table, the indirect costs may very well exceed the direct costs.

Some of the indirect costs could be very high if critical habitat were to seriously compromise or cause the loss of a project or activity. At the same time, the probability of such occurrences could be very low. For example, there is a small probability that critical habitat could result in: (1) a reduction in the amount of land available for public hunting and a loss of benefits to hunters; (2) restrictions on military training that risks national security; (3) the loss of communications facilities that could compromise military communications, civilian communications, or commercial broadcasting; or (4) expensive court-ordered conservation management of lands designated as critical habitat. Also, there is a risk that some future conservation projects could be lost if some landowners cooperate less with the Service because of the designation. Although all of these impacts are possible, none of them are expected.

However, the State and county are likely to incorporate critical habitat into their permitting and approval procedures. Thus, for future unspecified projects, additional costs for environmental reports and some delays are likely, even in the absence of *Federal involvement*. In some cases, critical habitat could result in increased opposition to projects and increased difficulty in obtaining approvals.

This might, in fact, be the case for a 100-acre landfill that is in the planning stages in the proposed critical habitat. If the State or county denies the project because it is deemed to be incompatible with critical habitat, this could could cost approximately $1 million and a 2-year delay to find an alternative landfill site and prepare new environmental reports.

The greatest risk of critical habitat involves the overlap with privately owned urban and agricultural land. The risk comes from a State law that mandates the State to initiate redistricting to the State Conservation District of "habitat of rare native species of flora." Redistricting, either initiated by the State or due to a successful lawsuit, would result in a substantial loss in land value. Because landowners, land-use attorneys, investors, and appraisers perceive mandated redistricting as a substantial risk, critical habitat designation is likely to result in a significant loss in property value. However, because there is little experience in Hawai'i with critical habitat, information to accurately estimate the actual loss in value does not exist—there are no comparables in Hawai'i upon

which to base a loss in value, and mainland comparables do not apply because of different state environmental and land-use law. The loss in land value is expected to last until more experience is gained with critical habitat or until the issue is resolved in court.

Finally, as noted in Table VI-3, it is expected that a number of landowners will incur costs to investigate the implications of critical habitat.

## 8.c. Direct and Indirect Benefits

The bottom portion of the last page of Table VI-3 summarizes the direct and indirect benefits of the proposed critical habitat designation. As indicated, the summary is entirely qualitative and reflects the professional judgments of the economic consultant based on the analyses given in corresponding sections. Qualitative assessments reflect the paucity of (1) scientific studies on the magnitude of species recovery and changes in the ecosystems resulting from critical habitat designation, and (2) economic studies on the per-unit value of many of the changes. As indicated in the table, some of the benefits may prove to be substantial.

For site-specific projects, some project modifications may provide localized benefits that help conserve populations of listed plants and their immediate habitat.

On a larger scale, project modifications for game management, watershed and conservation projects, and military activities are likely to affect major portions of the mountains and, as a result, provide significant benefits to ecosystems. Many of the project modifications would be designed to reduce the risk of fire, reduce damage to the forest by ungulates, and reduce the introduction of weeds into native forests. Many of the modifications may in fact be minor (e.g., to watershed and conservation projects), but may provide significant benefits over large areas.

The resulting benefits to ecosystems would include: heathier native forests, greater biodiversity, fewer mosquitoes due to fewer pig wallows, enhanced survival of birds and other native wildlife (mosquitoes frequently carry avian malaria and pox), healthier watersheds with greater recharge of the aquifer, less erosion, cleaner and healthier streams and nearshore marine environments, cleaner beaches, etc. In turn, these environmental benefits would enhance the experiences of hikers, birdwatchers, beach visitors, etc.; they would also increase the appeal of mountain tours to visitors.

Other potential benefits include species preservation, related ethnbotanical benefits, and related medicinal/pharmaceutical benefits if one or more species are later discovered to have medicinal value.

For developers, the main advantage of critical habitat designations would apply to areas that are regarded as *occupied* by the Service. By knowing the critical habitat

boundaries, and if they have the flexibility, developers can site projects outside the boundaries, thereby avoiding certain issues related to threatened and endangered species. But even if there is no flexibility in siting a project, and assuming *Federal involvement,* developers would know in advance that informal consultations with the Service must take place before proceeding with detailed site plans.

Finally, if critical habitat designation results in increased expenditures for conservation management, and the expenditures are financed from outside Hawai'i—which is likely to be the case for Federally managed lands—then this will contribute to the expansion and diversification of Hawai'i's economy.

## 8.d. Geographic Distribution of Costs and Benefits

Most of the section 7-related direct and indirect benefits of the proposed critical habitat are expected to derive from lands in the Ko'olau and Wai'anae Mountains that are in the State Conservation District. Most of these benefits are expected to derive from project modifications involving military activities, watershed and conservation projects, and game management.

Most of the direct costs will be for consultations and project modifications for these same activities and projects. However, most of the indirect costs—specifically, a loss in property values—will involve privately owned lands in the State Agricultural and Urban Districts.

**Table VI-3. Section 7 Costs and Benefits Attributable to the O'ahu Plants Listing and Critical Habitat**
(10-year estimates)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal ne = not estimated

| Item | Total | | Share to CH | |
|---|---|---|---|---|
| | Low | High | Low | High |
| **DIRECT SECTION 7 COSTS** | | | | |
| **Management of Game Hunting** | | | | |
| Consultations | $ 6,400 | $ 12,700 | $ 1,800 | $ 5,800 |
| PMs | $ 37,400 | $ 74,800 | $ - | $ 37,400 |
| **State and County Parks** | | | | |
| Diamond Head, Consultations | $ 8,100 | $ 8,100 | $ - | $ - |
| Diamond Head, PMs | Minor | Minor | Minor | Minor |
| Haiku Valley | $ - | $ - | $ - | $ - |
| Aina Haina Nature Preserve | $ - | $ - | $ - | $ - |
| **Watershed Projects** | | | | |
| Ko'olau Mountains Watershed Partnership, Consultations | $ 15,700 | $ 47,100 | $ 10,500 | $ 31,500 |
| Ko'olau Mountains Watershed Partnership, PMs | Minor | Minor | Minor | Minor |
| BWS West Honolulu Watershed, Consultations | $ 24,500 | $ 24,500 | $ 10,500 | $ 10,500 |
| BWS West Honolulu Watershed, PMs | Minor | Minor | Minor | Minor |
| Ala Wai Watershed Association, Consultations | $ - | $ 31,400 | $ - | $ 21,000 |
| Ala Wai Watershed Association, PMs | Minor | Minor | Minor | Minor |
| **Conservation Projects** | | | | |
| O'ahu Forest NWR, Consultations | $ 5,100 | $ 10,000 | $ - | $ - |
| O'ahu Forest NWR, PMs | Minor | Minor | Minor | Minor |
| James Campbell NWR/Flood Control, Consultations | $ 8,000 | $ 11,900 | $ 8,000 | $ 11,900 |
| James Campbell NWR/Flood Control, PMs | Minor | Minor | Minor | Minor |
| Honouliuli Preserve, Consultations | $ - | $ 49,000 | $ - | $ 21,000 |
| Honouliuli Preserve, PMs | Minor | Minor | Minor | Minor |
| Other Conservation Activities, Consultations | $ 47,100 | $ 157,000 | $ 31,500 | $ 105,000 |
| Other Conservation Activities, PMs | Minor | Minor | Minor | Minor |
| **Communications Facilities** | | | | |
| Palehua, Consultations | $ 81,000 | $ 97,000 | $ 81,000 | $ 97,000 |
| Palehua, PMs | $ - | $ 120,000 | $ - | $ 120,000 |
| Koko Head, Consultations | $ 8,100 | $ 8,100 | $ 8,100 | $ 8,100 |
| Koko Head, PMs | Minor | Minor | Minor | Minor |
| Diamond Head, Consultations | $ 5,200 | $ 5,200 | $ 5,200 | $ 5,200 |
| Diamond Head, PMs | Minor | Minor | Minor | Minor |
| Other Communications Facilities, Consultations | $ 24,300 | $ 186,000 | $ 24,300 | $ 186,000 |
| Other Communications Facilities, PMs | | | | |
| **Power Transmission Lines** | None | None | None | None |
| **Farming** | None | None | None | None |
| **Ranching** | | | | |
| Consultations | $ - | $ 86,100 | $ - | $ 86,100 |
| PMs | | | | |
| **Aquaculture** | None | None | None | None |
| **Irrigation-Ditch Systems** | | | | |
| Consultations | $ - | $ 39,000 | $ - | $ 39,000 |
| PMs | Minor | Minor | Minor | Minor |
| **Potable-Water Systems** | None | None | None | None |

**Table Vi-3. Section 7 Costs and Benefits Attributable to the O'ahu Plants Listing and Critical Habitat**
(10-year estimates)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal ne = not estimated

| Item | Total | | Share to CH | |
|---|---|---|---|---|
| | Low | High | Low | High |
| **Highways** | | | | |
| Consultations | $ - | $ 16,200 | $ - | $ 16,200 |
| PMs | Minor | Minor | Minor | Minor |
| **Hiking Trails and Unpaved Access Roads** | None | None | None | None |
| **Ecotourism** | None | None | None | None |
| **Residential Use and Development** | | | | |
| Consultations | $ - | $ 24,300 | $ - | $ 24,300 |
| PMs | Minor | Minor | Minor | Minor |
| **Landfill** | None | None | None | None |
| **U.S. Military** | | | | |
| Army, Dillingham Military Reservation, Consultations | $ 14,400 | $ 15,200 | $ 2,200 | $ 3,000 |
| Army, Dillingham Military Reservation, PMs | Minor | Minor | Minor | Minor |
| Army, Fort Shafter, Consultations | None | None | None | None |
| Army, Kahuku Training Area, Consultations | $ 105,000 | $ 153,300 | $ 15,800 | $ 30,700 |
| Army, Kahuku Training Area, PMs | $ 100,000 | $ 200,000 | $ 15,000 | $ 40,000 |
| Army, Kawailoa Training Area, Consultations | $ 23,000 | $ 41,400 | $ 3,500 | $ 8,300 |
| Army, Kawailoa Training Area, PMs | $ 100,000 | $ 150,000 | $ 15,000 | $ 30,000 |
| Army, Makua Military Reservation, Consultations | $ 16,100 | $ 43,400 | $ 3,900 | $ 21,700 |
| Army, Makua Military Reservation, PMs | Minor | Minor | Minor | Minor |
| Army, Schofield Barracks–West and South Ranges, Consultations | $ 55,700 | $ 75,800 | $ 8,400 | $ 15,200 |
| Army, Schofield Barracks–West and South Range, PMs | $ 200,000 | $ 300,000 | $ 30,000 | $ 60,000 |
| Army, Schofield Barracks–East Ranges, Consultations | $ 39,800 | $ 49,000 | $ 6,000 | $ 9,800 |
| Army, Schofield Barracks–East Range, PMs | $ 100,000 | $ 150,000 | $ 15,000 | $ 30,000 |
| Hawai'i Army National Guard, DH Crater, Consultations | $ 10,500 | $ 10,500 | $ 1,600 | $ 2,100 |
| Hawai'i Army National Guard, DH Crater, PMs | Minor | Minor | Minor | Minor |
| Navy, NAVMAP PH LLL, Consultations | $ 17,700 | $ 26,900 | $ 2,700 | $ 5,400 |
| Navy, NAVMAP PH LLL, PMs | Minor | Minor | Minor | Minor |
| Navy, RTF Lualualei, Consultations | $ 10,500 | $ 10,500 | $ 1,600 | $ 2,100 |
| Navy, RTF Lualualei, PMs | $ 20,000 | $ 40,000 | $ 3,000 | $ 8,000 |
| **Natural Disasters** | | | | |
| Consultations | $ 3,800 | $ 7,500 | $ 3,800 | $ 7,500 |
| PMs | Minor | Minor | Minor | Minor |
| **Total Direct Costs** | **$ 1,087,400** | **$ 2,281,900** | **$ 308,400** | **$ 1,099,800** |
| **Average Annual Direct Costs** | **$ 108,740** | **$ 228,190** | **$ 30,840** | **$ 109,980** |
| **Present Value (7% discount rate)** | **$ 763,744** | **$ 1,602,711** | **$ 216,607** | **$ 772,453** |

**Table VI-3. Section 7 Costs and Benefits Attributable to the O'ahu Plants Listing and Critical Habitat**
(10-year estimates)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal ne = not estimated

| Item | Total | | Share to CH | |
|---|---|---|---|---|
| | Low | High | Low | High |
| **INDIRECT COSTS** | | | | |
| **Management of Game Mammals and Loss of Hunting Lands** | | | | |
| Potential Loss of Benefits to Hunters, Annual | n.e. | n.e. | None | $ 350,000 |
| Probability | n.e. | n.e. | - | Small |
| **Military, Risk to National Security** | n.e. | n.e. | none | Undetermined |
| **Communications Facilities and Services** | | | | |
| Potential Loss of Benefits to Hunters | n.e. | n.e. | None | Large |
| Probability | n.e. | n.e. | - | Small |
| **Landfill** | | | | |
| Potential Cost to find Alternative Site | n.e. | n.e. | None | $ 1,000,000 |
| Probability | n.e. | n.e. | - | Significant |
| **Mandated Conservation Management** | | | | |
| Potential Cost for Land Management, Annual | n.e. | n.e. | None | $ 3,000,000 |
| Loss of Economic Activity (Direct + Indirect Sales), Annual | | | None | $ 1,960,000 |
| Probability | n.e. | n.e. | - | Small |
| **Redistring of Urban and Agricultural Land to Conservation** | | | | |
| Potential Loss of Land Value (court-ordered redistricting) | n.e. | n.e. | None | $ 81,000,000 |
| Probability | n.e. | n.e. | - | Undetermined |
| **State and County Approvals** | | | | |
| Increase in Costs, Delays and Denials | n.e. | n.e. | Minor | Significant |
| **Reduced Property Values** (Mostly reflects the perceived risk of a court-ordered redistricting; continues until resolved in court) | n.e. | n.e. | Significant | Undetermined fraction of $ 91,000,000 |
| **Comdemnation of Property** | n.e. | n.e. | None | None |
| **Costs to Investigate Implications of CH** | n.e. | n.e. | $ 80,000 | $ 400,000 |
| **Loss of Conservation Projects** | n.e. | n.e. | None | Some |
| **DIRECT AND INDIRECT BENEFITS** | | | | |
| **Benefits of Project Modifications for:** | | | | |
| Site-specific Projects | n.e. | n.e. | Significant | Significant |
| Land Management Affecting Large Portions of Mountains | n.e. | n.e. | Significant | Large |
| **Benefits to Developers** (For *occupied* areas, information that allows better project siting and planning) | n.e. | n.e. | Minor | Small |
| **Species Preservation** | | | | |
| Potential Benefits | n.e. | n.e. | Large | Large |
| Probability | n.e. | n.e. | Low | Undetermined |
| **Ethnobotanical Benefits** | | | | |
| Potential Benefits | n.e. | n.e. | Significant | Signficant |
| Probability | n.e. | n.e. | Low | Undetermined |
| **Medicinal/Pharmaceutical Benefits** | | | | |
| Potential Benefits | n.e. | n.e. | None | Large |
| Probability | n.e. | n.e. | - | Undetermined |
| **Benefits to Ecosystem** | n.e. | n.e. | Significant | Large |
| **Ecotourism** | n.e. | n.e. | Small | Significant |
| **Economic Activity Generated by Conservation Management** | n.e. | n.e. | Small | Large |

# APPENDIX VI-A

## INFORMATION ON HUNTING AND GAME-MAMMAL MANAGEMENT

### 1. INTRODUCTION

Presented below is background information on hunting on O'ahu and DLNR's game-mammal management. The material is used in Chapter VI in addressing direct and indirect economic impacts of critical habitat on game-mammal management. Subjects addressed include the following: hunting activity on O'ahu, economic activity associated with hunting, the value of hunting to hunters, DLNR game management, the loss of hunting areas due to the *palila* critical habitat, information on the Pittman-Robertson Act, consultation with the Service on Pittman-Robertson projects, and recent changes in hunting fees.

### 2. HUNTING ACTIVITY ON O'AHU

Hunting is an important activity for many O'ahu residents because it provides recreation, a desired lifestyle, and subsistence for some. Also, hunting is largely a local activity with, with few visiting hunters. Game mammals hunted on the island include feral pigs and goats deer. Game birds include pheasant (3 species), Francolin (3 species), chukar partridge, Japanese quail, and dove (4 species).

### 3. ECONOMIC ACTIVITY ASSOCIATED WITH HUNTING

In 2001, 17,000 hunters in Hawai'i, most of whom were local residents, spent an estimated 316,000 days and about $15.076 million on hunting, of which about $2.816 was for food and lodging, $5.028 million was for transportation, $0.258 was for other trip costs, $5.322 million was for hunting equipment, $1.189 million was for auxiliary equipment, and $0.463 million was for other items (2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation). Based on the 1996 survey, approximately 70 percent of their hunting trips were spent hunting game mammals and the remaining trips were for game birds. Based on hunting licenses issued, about 4,250 hunters (about 25 percent of the State total) live on O'ahu (information provided by DLNR 2001).

Companies that supply goods and services to hunters, and the employees of these companies, in turn purchase goods and services from other companies, thereby creating even more sales, and so on. These "indirect" sales are scattered throughout the economy and the State. When both "direct" and "indirect" sales are included, total Statewide sales due to hunting in Hawai'i amounted to about $26.8 million in 2001. In turn, this economic activity supported an estimated 450 jobs and generated an estimated $8.8 million in income (an average of about $19,400 per job). These estimates are based on multipliers from the Hawai'i Input-Output Model (DBEDT, 1998).

In 2001, economic activity supported by just game-mammal hunting on O'ahu amounted to about $2.6 million in direct sales, $4.7 million in total direct and indirect sales, 78 jobs, and $1.5 million in income. These figures are order-of-magnitude estimates based on 70 percent of the hunting trips being spent hunting game mammals, and 25 percent of the the State's hunting activity taking place on O'ahu.

In terms of relative importance, the estimated 17,000 hunters in Hawai'i comprised about 1.4 percent of the State's population, and the estimated 450 jobs supported by hunting activity comprised about 0.06 percent of Hawai'i's total jobs (based on figures from the DBEDT Data Book). For O'ahu, hunters comprised about 0.5 percent of the County's population, and supported about 0.02 percent of the jobs. Families with hunters comprise about 4.8 percent of the State population and 1.6 percent of O'ahu's population (based on an average of 3.4 people per family).

## 4. VALUE OF HUNTING TO HUNTERS

The net value of hunting to hunters is based on an estimate of the amount they would be willing to pay that is above and beyond what they actually pay for hunting equipment, supplies, travel, etc.—an amount referred to by economists as "consumers' surplus." It is the extra value consumers derive from consuming an item compared to what they actually spend on the item. Net willingness to pay (consumers' surplus) is the standard measure of value used in benefit-cost analyses.

The Statewide value of all hunting for 2001 is estimated at $7.9 million, based on (1) the assumption that hunters value their experience at $25 per day above and beyond their actual expenditures; and (2) they hunted a total of 316,000 days that year. For O'ahu, the value of just game hunting amounted to about $1.4 million ($7.9 million x 70 percent x 20.5 percent). These figures on the value of game hunting should be interpreted as order-of-magnitude estimates, not precise estimates.

The valuation of hunting at $25 per day is similar in concept to golfers being willing to pay green fees, and is based on resident green fees in Hawai'i. It is also consistent with estimates of the valuation of hunting from the following studies:

— $19.18 or $26.86 per day for hunting deer in Idaho in 1986, with the different amounts being based on methodology, but with the higher amount being deemed more accurate (Donnelly and Nelson, 1986)

— $22.45 or $28.50 per day hunting for jack rabbits and game birds in Idaho in 1986, with the different amounts being based on methodology, but with the higher amount being deemed more accurate (Young, et al., 1986)

— $21.66 or $24.44 per day for hunting pheasant in Idaho in 1986, with the different amounts being based on methodology, but with the higher amount being deemed more accurate (Young, et al., 1986)

— $16.56 per day for hunting pheasant in Idaho in 1971 (Shulstad, 1978)

A valuation of hunting based on the market value of the meat harvested in excess of the hunters' expenditures on hunting (i.e., the subsistence value of hunting) would be lower. In effect, hunting is largely a recreational pursuit for which expenditures on equipment and travel, and the value of the time spent hunting and butchering the animals, are partially offset by the value of the meat harvested.

## 5. DLNR GAME MANAGEMENT

DLNR is the State agency responsible for managing game-mammal populations in State Hunting Units. However, it must carry out this responsibility in the context of two conflicting mandates: provide for sustained-yield recreational hunting in some of the State Hunting Units and protect native ecosystems and plants in other areas.

According to DLNR staff (2001 and 2002), they achieve a reasonable balance between the two mandates by permitting access to hunting areas which varies according to site conditions (e.g., animal population and food supply) and habitat quality (nearly pristine, highly degraded, or somewhere in between) (see Appendix VI-B). The most liberal hunting (e.g., year-round pig hunting) is permitted in nearly pristine areas where the native forest has suffered the least environmental damage. This helps keep game-mammal populations low in these sensitive areas, thereby minimizing harm to native ecosystems and to endangered and threatened plants. However, hunting is not possible in many remote areas that are inaccessible to hunters.

In areas where the native forest is highly degraded and DLNR sees no hope that the native vegetation will return, hunting is restricted in order to sustain larger populations of game mammals (see below for the methods used to restrict hunting). When hunting is restricted, the larger animal populations allow hunters collectively to harvest more

animals each year than would be the case with smaller populations. In addition to the recreational benefits to hunters of having higher game harvests, reasonable numbers of game mammals are available to browse on the non-native plants and weeds, thereby helping control the seed reservoir of noxious non-native plants and their spread into other areas.

Finally, in degraded areas, exclosure fencing of small areas (of less than 1/4 acre to 2 acres) may be used to protect rare native plants and their seeds from foraging animals. These exclosures are small enough to make it practical to weed the overgrowth of aggressive alien plants which would otherwise choke out the native plants or carry a damaging wildfire.

According to DLNR, the combined strategy of using game mammals to help control non-native plants and weeds in degraded areas, and using hunters to help control ungulate populations in pristine areas is accomplished at little cost to the taxpayer while providing recreational benefits to hunters.

However, it should be noted that Service staff and expert biologists question the effectiveness of DLNR's game-management approach in protecting native forests, arguing that so long as large populations of feral ungulates are free to range, they will migrate into areas that are not degraded, possibly because they are fleeing from hunters or searching for better forage than what they can find in degraded game-production areas. In turn, their migration into these areas will contribute to the loss of listed plants and to the spread of noxious plants. Also, the State exclosures are regarded by the Service as too small to sustain viable populations of threatened and endangered plants (Service, *Recovery Plan for the Multi-Island Plants,*1999).

The methods employed by DLNR to manage game-mammal populations take advantage of the fact that the demand for hunting opportunities exceeds the availability of game mammals. Within each State Hunting Unit, DLNR controls the amount of hunting activity by using such restrictions as: bag limits, hunting method (rifle, muzzleloader, bow and arrow, dogs and knives); days allowed (week-ends only), hunting seasons; hours of the day; and for some areas, a limit on the number of daily permits issued (Hawai'i Administrative Rule, Title 13, Chapter 123). However, hunting activity decreases if hunters' success rates are low (which usually occurs when too many hunters are after too few animals) or if certain areas are difficult to access. Also, some of the hunting restrictions are for safety purposes: limiting the number of hunters prevents dangerous overcrowding and risks to both hunters and other recreational users in the area (e.g., hikers and campers).

If game-mammal surveys by DLNR reveal that game-mammal populations have become too high for an area, DLNR responds by allowing more hunting. But if increased hunting does not reduce the population sufficiently—possibly because of

difficult access to a remote area—then DLNR may direct staff to remove the animals where economically feasible.

To provide guidance for adjusting the controls on hunting activity, DLNR monitors the following: (1) hunting activity (including the number of hunting trips, game harvests by type of game, and success rates); (2) game populations (using habitat transects, harvest data, hunter reports, and aerial and ground surveys); and (3) vegetation (including the coverage, composition by type of plant, invasion by non-native plants, trends, comparisons with vegetation inside animal exclosures, and impacts to plants from game mammals). But the management of game-mammal populations is not an exact science. For example, animal population estimates may be inaccurate; populations vary with rainfall and food availability; and animals move from one area to another.

## 6. LOSS OF HUNTING AREA DUE TO THE *PALILA* CRITICAL HABITAT

Based on past experience, most hunters in Hawai'i associate critical habitat designation with loss of prized hunting areas. Although a parallel situation does not exist with the proposed critical habitat on O'ahu, the association hunters make is based on the *palila* critical habitat on the island of Hawai'i.

In 1975, the Service listed the *palila (Psittirostra bailleui),* a Hawaiian honeycreeper (a bird), as an endangered species. The *palila* depends entirely on the *mamane-naio* ecosystem—a broad band of sparse forest encircling Mauna Kea between about 7,000 and 10,000 feet elevation. In 1977, in an effort to further protect the *palila*, the Service designated the *palila* critical habitat, encompassing about 67,000 acres (105 square miles) of hunting land.

The *palila* were at risk because sheep and goats on Mauna Kea browsed on the *mamane* trees in the *mamane-naio* ecosystem, which was very destructive to the *palila's* habitat. Starting in the late 1940s, the population of game mammals was allowed to increase on the mountain to allow sustained harvest by hunters. Even after the *palila* was listed as endangered and its critical habitat was designated, DLNR continued to manage the feral sheep and goat populations at sustainable levels for hunting, causing continued harm to the *palila's* habitat.

This situation led the Sierra Club Legal Defense Fund to file a lawsuit in Federal court, *Palila v. Hawaii Department of Land and Natural Resources,* to require DLNR to remove the feral sheep and goats from Mauna Kea. The case tested the prohibition in the Act on *taking* of any endangered species of fish or wildlife, where *take* is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." At issue was whether modifying a habitat (i.e., in this

case sheep browsing on *mamane* trees) may result in "harm" to a species thereby meeting the definition of "*taking*."

In 1979, a Federal court rendered an opinion in support of the plaintiff. Since studies showed clearly that the sheep and goats were "destroying or altering" the *palila* habitat, the court ordered DLNR to eradicate them from Mauna Kea and this was nearly achieved by 1981. The ruling did not affect the management of pigs on the mountain.

Following this case, the Service regulations defined "harm" to be "an act which actually kills or injures wildlife." The regulations further explain that "[s]uch act may include significant modifications where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering."

Even though Hawai'i hunters associate critical habitat designation with eradicating game animals and loss of prized hunting areas, the eradication of sheep and goats from the *palila* critical habitat was based on the Federal *taking* provision of the Act and not on *adverse modification* to the critical habitat. Furthermore, under Federal law, a situation similar to the *palila* critical habitat would not apply to the critical habitat for plants since the Federal *taking* provision applies only to listed wildlife and not to plants. However, the State's endangered species act does have a *taking* provision for listed plants.

## 7. PITTMAN-ROBERTSON ACT

Game-management funding is provided as part of the Federal Aid in Wildlife Restoration Act, commonly referred to as the Pittman-Robertson Act. This Act was passed by Congress in 1937 to help restore the nation's wildlife following accumulated damage to forests and grasslands and extensive commercial killing of wildlife. Hawaii's local hunters help fund this program, since revenues for it are derived from an 11-percent Federal excise tax on the price of sporting arms, ammunition, and archery equipment, and a 10-percent tax on handguns. Each state's share of these revenues is determined by a formula that considers the total area of the state and the number of licensed hunters in the state, subject to a minimum level of funding. Each state provides matching funds of at least 25 percent of the program costs from a non-Federal source. Also, each state specifies how the funds are to be spent, while the Service serves as an administrative check to insure that the funds are spent in compliance with the Act.

Because of its small area and population, Hawai'i receives the minimum level of Pittman-Robertson funding. For FY2001, total funding amounted to nearly $1.1 million, of which about $817,000 was Federally funded and about $272,000 was State-

funded. The City & County of Honolulu received about $129,500 for its game-management program plus another $52,500 for non-game programs.

## 8. GAME MANAGEMENT CONSULTATION HISTORY

### 8.a. 1995 Pittman-Robertson Consultation

In March 1995, the Service conducted an internal consultation regarding Pittman-Robertson funding for a series of DLNR projects Statewide. The projects included: game-mammal and game-bird surveys; the construction and/or maintenance of hunter check-in stations, watering units, fenced exclosures for endangered plants, and camp-sites; rerouting trails; clearing areas of non-native weedy vegetation; mowing areas of highly degraded game habitat, restoring game-bird populations; and leasing land for hunting. In order to minimize impacts to listed plant species, DLNR proposed to construct exclosure fencing around listed plants; construct new game units in disturbed or previously cleared areas; survey all areas before they were cleared or mowed; and have a knowledgable person supervise other mowing or maintenance activities to ensure that no inadvertent harm came to listed plants. With these precautions, the Service determined that the proposed projects were not likely to affect the listed species.

### 8.b. 2001 Pittman-Robertson Consultation

The 2001 Pittman-Robertson Statewide consultation required approximately one man-month of the Service's time, and 60 man-days of the State's time. Based on current salaries and benefit levels, administrative time, and overhead costs, the time spent in consultation cost the Service about $15,600 and the State about $12,000. Since 17 percent of the 2001 Pittman-Robertson funds went to projects on O'ahu, approximately 17 percent of the Statewide consultation costs are attributable to O'ahu projects. Thus, the O'ahu consultation costs were approximately $2,600 for the Service and $2,000 for the State, or a total of $4,600.

During consultation, the Service approved with some modification 65 of 67 game-management projects proposed by DLNR. The Service determined that the two remaining projects could adversely affect listed species. One concerned the hunter check stations and game-mammal surveys on Kaua'i. In this case, the Service requested assurances from DLNR that information collected from check stations and surveys would not be used to maintain or enhance free-ranging game-mammal populations that could adversely affect Federally listed species. For all island except Kaua'i and Lana'i, DLNR provided the necessary assurances and the Service concluded that these projects were not likely to adversely affect listed species. For Kaua'i, DLNR chose to withdraw the

project from consideration rather than (1) modify it to avoid adverse impacts to listed species, or (2) pursue a formal consultation.

The second exception concerned a portion of a project that involved leasing 30,000 acres on Lana'i for State-managed game hunting, maintenance of hunter check stations, maintenance of game-mammal watering units, and game-mammal population surveys. Because the Service determined that funding the Lana'i portion of this project was likely to adversely affect listed species, the Service was unable to approve it as requested. Again, DLNR opted to withdraw the offending Lana'i portion of the project rather than (1) modify it to avoid adverse impacts to listed species, or (2) pursue a formal consultation. Modification could have involved expensive fencing to prevent game mammals from migrating into areas that support listed species.

For either or both of the two projects discussed above, DLNR could have pursued formal consultation with the Service with the possibility that they have would have received a determination by the Service that the projects were not likely to *jeopardize* the continued existence of listed species and could be funded. But DLNR opted not to do so because: (1) time was too short to assemble needed information and complete the formal consultation; (2) the staff had to make fiscal and budgetary commitments; and (3) the outcome was uncertain.

Instead, DLNR elected to shift funding sources for its wildlife management projects: State monies were used to fund the Kaua'i and Lana'i projects mentioned above, and the remaining Pittman-Robertson funds were used for projects that were originally scheduled to be funded by the State (e.g., game-bird projects). The net effect was no change in the amount of Pittman-Robertson funding provided to DLNR, and modest changes to the wildlife management projects themselves.

On Kauai, DLNR elected to drop a proposed helicopter goat survey project rather than fund it entirely with State monies. The helicopter services would have cost about $4,000. No changes were required for O'ahu projects.

The more significant changes in Maui and Hawai'i Counties involved some new fencing and lids to protect game-bird water stations from being used by game mammals in areas having listed plants. The cost totaled about $110,000 for 29 units on Maui Island, 12 units on Moloka'i, and about 70 units on Hawai'i Island (based on information provided by DLNR, 2002). These projects (1) decreased game-mammal populations in the affected areas or required separate State-funded water stations for game mammals; and (2) diverted Pittman-Robertson and State funds from other projects to pay for the additional fencing, lids, and new game-mammal water stations.

Plant critical habitat designations had no role in the above decisions, however, since critical habitat had not yet been designated. The consultation between DLNR and the

Service on projects proposed for Pittman-Robertson funding, modifications that were made to projects to avoid adverse impacts, and DLNR's decisions to withdraw the Kaua'i and Lana'i projects and to shift funding sources among projects occurred entirely because of the presence of listed species in affected areas.

## 9. HUNTING FEES

In February 2002, the State Board of Land and Natural Resources increased State hunting fees which are expected to increase revenues to the State by about $200,000 per year. The increased fees will give DLNR additional money and flexibility in funding game-management projects.

# APPENDIX VI-B

## RESOURCE MANAGEMENT GUIDELINES

### DEPARTMENT OF LAND AND NATURAL RESOURCES
### DIVISION OF FORESTRY & WILDLIFE

The basis of the Division of Forestry & Wildlife's (DOFAW's) Resource Management Guidelines is the status of the native vegetation in an area. The character of the vegetation is classified as: "Most Pristine Native," "Predominantly Native," "Considerably Disturbed," or "Badly Degraded or Highly Altered." The vegetation status is then considered in conjunction with public safety, public demand for specific resources, and the effect of the proposed use on the vegetation.

Potential game management strategies have been divided into four categories, called Game Animal Management Classifications. These are:

— Game Production. Game is a primary objective. Areas are managed for public hunting on a sustained-yield basis. Habitat may be manipulated for the purpose of increasing or maintaining the game carrying capacity of the habitat. Hunting seasons and bag limits are set to provide sustained public hunting opportunities and benefits. Some of the Game Management Areas are in this class.

— Mixed Game and Other Uses. Production of game is an objective integrated with other uses such as hiking, production of forest products, and protection of native resources. Game populations are managed to acceptable levels using public hunting. Habitat manipulation for game enhancement may be conducted, but only when it is consistent with other uses. Seasons and bag limits are designed to ensure compatibility with other uses. These areas include portions of forest reserves and some Game Management Areas.

— Game Control. Protection of resources is the primary objective, with emphasis on native plant community and watershed protection. Hunting is used to reduce animal impacts to those resources. Bag limits or seasons are liberal. These areas include watershed areas, portions of forest reserves, Natural Area Reserves, and wilderness preserves.

— Staff Control. Areas designated for animal removal by staff or agency designees because of remoteness, environmental sensitivity, or public safety.

> Game mammal control is the objective. Control actions can include but are not limited to staff shooting or animal translocation. These areas include portions of forest reserves, Natural Area Reserves, wilderness reserves, and plant and wildlife sanctuaries.

Under DOFAW's Resource Management Guidelines, maintaining game bird populations is considered compatible with other uses in most areas. Game birds are managed for "Game Production" or "Mixed Game and Other Uses" in most areas.

Because of potential detrimental effects of game mammals on native ecosystems, management strategy for game mammals is more complex. Areas managed for game mammal production; i.e., "Game Production," are located primarily in areas classified as "Badly Degraded or Highly Altered." These areas have a preponderance of weedy species, contain very few native plants, and are managed to produce game animals for recreational hunting. Under this management approach, known individuals or populations of listed plants are fenced or otherwise protected from feral ungulates. Areas classified as "Predominantly Native" and "Considerably Disturbed" are managed as "Mixed Game and Other Uses" for game mammals and have seasons and bag limits designed to ensure compatibility with other uses, including native ecosystem protection. Areas classified as "Most Pristine Native" are managed for "Game Control or Staff Control" and have the most liberal hunting seasons to minimize the pressure of feral animals on native ecosystems.

# REFERENCES

Ala Wai Watershed Association. "Ala Wai Watershed Association EPA Workplan." Honolulu, Hawai'i. October 1, 2001.

Bier, James A. Map of O'ahu . University of Hawai'i Press, Honolulu, Hawai'i. 1997.

Bishop R.C. "Endangered Species and Uncertainty: The Economics of a Safe Minimum Standard." *American Journal of Agricultural Economics* 60: 10-18. 1978.

Bishop R.C. "Endangered Species: An Economics Perspective," *Transactions of the 45th North American Wildlife and Natural Resources Conference.* Wildlife Management Institute, Washington D.C. 1980.

Boyle, K.J. and R.C. Bishop. "The Economic Valuation of Endangered Species in Wildlife." *Transactions of the Fifty-First North American Wildlife and Natural Resources Conference.* Wildlife Management Institute. Washington D.C. 1986.

Brookshire, D.S., L.S. Eubanks, and A. Randall. "Estimating Option Prices and Existence Values for Wildlife Resources." *Land Economics* 59: 1-15. 1983.

City and County of Honolulu Board of Water Supply. "Six-Year Capital Improvement Program: July 1, 2001 to June 30, 2007." (Undated.)

City and County of Honolulu. GIS Parcel Maps and Data for O'ahu.

City and County of Honolulu. *General Plan,* Land Use Ordinance (1999), and District Development Plans (1996 - 2000).

Dashiell, Eugene P. "Ala Wai Canal Watershed Water Quality Improvement Project, management and Implementation Plan." Honolulu, Hawai'i. April 1998.

DeLorme. *Hawai'i Atlas & Gazetteer, Topo Maps of the Entire State, Guide to Outdoor Recreation*. Yarmouth, Maine. 1999.

Donnelly, Dennis M., and Louis J. Nelson. "Net Economic Value of Deer Hunting in Idaho." *USDA Forest Service Resource Bulletin RM-13.* Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. 1986.

Environmental Working Group. *EWG Farm Subsidy Database.* Washington, D.C. 2002.

Fairbank, Maslin, Maullin & Associates, and QMark Research & Polling. "Highlights of Maui County Voter Survey." For The Trust for Public Land. May 30, 2000.

Fausold, C.J. and R.L. Lilieholm. 1999. "The Economic Value of Open Space: A Review and Synthesis." *Environmental Management* 23(3): 307-320.

Hageman, R.K. "Valuing Marine Mammal Populations: Benefit Valuation in a Multi-species Ecosystem." Administrative report No. LJ-85-22. National Marine Fisheries Service. Southwest Fisheries Center. La Jolla, California. 1985.

Hawai'i Agricultural Statistics Service. *Statistics of Hawai'i Agriculture.* Hawai'i Department of Agriculture, Agricultural Development Division and U.S., Department of Agriculture, National Agricultural Statistics Service. Annual.

Fausold, C.J. and R.L. Lilieholm. 1999. "The Economic Value of Open Space: A Review and Synthesis." *Environmental Management* 23(3): 307-320.

Fletcher, Charles H., Eric E. Grossman, Bruce M. Richmond, and Ann E. Gibbs. *Atlas of Natural Hazards in the Hawaiian Coastal Zone*. U.S. Government Printing Office. 2002.

Group 70 International, Inc., "Improvements to Hanauma Bay Nature Preserve, Koko Head Regional Park & Nature Preserve. Final Environmental Impact Statement, East Honolulu, Island of O'ahu." Honolulu, Hawai'i. August 1999.

Group 70 International, Inc., "Koko Head District Park Master Plan and Koko Head Shooting Complex Safety Improvements, East Honolulu, O'ahu, Hawai'i, Final Environmental Impact Statement, East Honolulu, Island of O'ahu*," Hawai'i.* December 2001.

"Hawai'i Fishing News" (hunting articles). Honolulu, Hawai'i. Monthly.

Jaworowski, Susan. Legislative Reference Bureau. "Kahana: What Was, What Is, and What Can Be." Honolulu, Hawai'i. 2001.

Juvik, J.O., and S. P. Juvik. "Mauna Kea and the Myth of Multiple Use Endangered Species and Mountain Management in Hawai'i." *Mountain Research and Development.* Hilo, Hawai'i. 1984.

Hawai'i Tourism Authority. "Ke Kumu. Strategic Directions for Hawaii's Visitor Industry." June 1999.

Kaiser, Brooks, and Nancy Krause, Dee Mecham, Jessica Wooley and James Roumasset. *Environmental Valuation and the Hawaiian Economy* (Draft). Honolulu, Hawai'i. September 1999.

Kido, Michael H. *The Bioeconomics of Stream Management in Hawai'i.* University of Hawai'i Center for Conservation, Research and Training, Hawai'i Stream Research Center. 1996.

Loomis, J.B. and White, D.S. "Economic Benefits of Rare and Endangered Species: Summary and Meta-analysis." *Ecological Economics.* 1996.

Ko'olau Mountains Watershed Partnership. "Ko'olau Mountains Watershed Partnership Management Plan." First Edition. January 2002.

Ko'olau Mountains Watershed Partnership. "Ko'olau Mountains Watershed Partnership Memorandum of Understanding." August 1999.

Loomis, J.B. and White, D.S. "Economic Benefits of Rare and Endangered Species: Summary and Meta-analysis." *Ecological Economics.* 1996.

Map, Hawaiian Islands. Nelles Verlag, Federal Republic of Germany.

Miyabara Associates. "Kualoa Regional Park Master Plan." Honolulu, Hawai'i. March 1995.

Morgan, Joseph R. *Hawai'i, A Unique Geography*. Bess Press, Honolulu, Hawaii. 1996.

PBR Hawai'i. "Diamond Head State Monument Master Plan Update Final Environmental Impact Statement." Honolulu, Hawai'i. October 2000.

Pearce, D. and D. Moran in association with the World Conservation Union. *The Economic Value of Biodiversity.* London: Earthscan. 1994.

Samples, K., J. Dixon, and M. Gowen. "Information Disclosure and Endangered Species Valuation." *Land Economics* 62: 306-312. 1986.

Shulstad, Robert N., and Herbert H. Stoevener. "The Effects of Mercury Contamination in Pheasants on the Value of Pheasant Hunting in Oregon." *Land Economics.* February 1978.

State of Hawai'i, Department of Business, Economic Development & Tourism. *The Hawai'i Input-Output Study: 1992 Benchmark Report.* Honolulu, Hawai'i. December 1998.

State of Hawai'i, Department of Business, Economic Development, and Tourism. *Population and Economic Projections for the State of Hawai'i to 2025.* Honolulu, Hawai'i. February 2000.

State of Hawai'i, Department of Business, Economic Development and Tourism. *The Hawai'i Input-Output Study 1997 Benchmark Report.* Honolulu, Hawai'i. March 2002.

State of Hawai'i, Department of Business, Economic Development & Tourism. *The State of Hawai'i Data Book, A Statistical Abstract.* Honolulu, Hawai'i. 1998 and 2000.

State of Hawai'i, Department of Land and Natural Resources. "Conservation District." Hawai'i Administrative Rules, Title 13, Subtitle 1, Chapter 5. Honolulu, Hawai'i.

State of Hawai'i, Department of Land and Natural Resources. "Indigenous Wildlife, Endangered and Threatened Wildlife, and Introduced Wild Birds." Hawai'i Administrative Rules, Title 13, Subtitle 5, Forestry and Wildlife, Part 2, Wildlife, Chapter 124. Honolulu, Hawai'i.

State of Hawai'i, Department of Land and Natural Resources. "Rules for Hawai'i Statewide Trail and Access Program." Hawai'i Administrative Rules, Title 13, Subtitle 5, Forestry and Wildlife, Part 3, Na Ala Hele, Chapter 130. Honolulu, Hawai'i.

State of Hawai'i, Department of Land and Natural Resources. "Rules Regulating Activities within Forest Reserves." Hawai'i Administrative Rules, Title 13, Subtitle 5, Forestry and Wildlife, Chapter 104. Honolulu, Hawai'i. October 1993.

State of Hawai'i, Department of Land and Natural Resources. "Rules Regulating Game Bird Hunting, Field Trials and Commercial Shooting Preserves." Hawai'i Administrative Rules, Title 13, Chapter 122. Honolulu, Hawai'i. November 1999.

State of Hawai'i, Department of Land and Natural Resources. "Rules Regulating Game Mammal Hunting." Hawai'i Administrative Rules, Title 13, Chapter 123. Honolulu, Hawai'i. November 1999.

State of Hawai'i, Department of Land and Natural Resources. "Rules Regulating Wildlife Sanctuaries." Hawai'i Administrative Rules, Title 13, Chapter 125. Honolulu, Hawai'i. 1981.

State of Hawai'i, Department of Land and Natural Resources. "State Parks." Hawai'i Administrative Rules, Title 13, Subtitle 6,Chapter 146. Honolulu, Hawai'i. June 8, 1999.

State of Hawai'i, Department of Land and Natural Resources. "Threatened and Endangered Plants." Hawai'i Administrative Rules, Title 13, Subtitle 5, Forestry and Wildlife, Part 1, Forestry, Chapter 107. Honolulu, Hawai'i. May 15, 1997.

State of Hawai'i, Office of Environmental Quality Control. "A Guidebook for the Hawai'i State Environmental Review Process." Honolulu, Hawai'i. October 1997.

State of Hawai'i, Office of Environmental Quality Control. "Content Guidelines for Biological Surveys, Ecosystem Impact Analysis." Honolulu, Hawai'i. August 11, 2000.

State of Hawaii, Office of Environmental Quality Control. "The Environmental Notice." Honolulu, Hawai'i. Monthly.

State of Hawai'i, Office of Planning. GIS Maps for O'ahu.

Stearns, Harold T. *Geology of the State of Hawaii.* Pacific Books, Palo Alto, California. 1966.

Stoll, J.R. and L.A. Johnson. Concepts of Value, "Nonmarket Valuation, and the Case of the Whooping Crane." Texas Agricultural Experiment Station Article No. 19360. Natural Resource Workshop. Department of Agricultural Economics. Texas A&M University. 1984.

Supreme Court of the United States, Opinion 94-859. *Bruce Babbitt, Secretary of the Interior, et al., Petitioners v. Sweet Home Chapter of Communities for a Great Oregon, et al.* June 29, 1995.

The Nature Conservancy of Hawai'i. *Honouliuli Preserve Master Plan*. Honolulu, Hawai'i. 2001.

The Research Corporation of the University of Hawai'i. Army Natural Resource Center, Schofield Barracks, Hawai'i. *U.S. Army Garrison Hawai'i O'ahu Training Areas Natural Resource Management, Final Report.* August 2000.

Townscape, Inc. "Final Environmental Assessment. Diamond Head Road Makai Recreation Master Plan. Honolulu, Island of O'ahu, Hawai'i." Honolulu, Hawai'i. November 2001.

U.S. District Court for the District of New Mexico. *Middle Rio Grande Conservancy District v. Bruce Babbit.* No. CIV 99-870, 99-872 and 99-1445M/RLP (consolidated).

U.S. Court of Appeals, Tenth Circuit. *New Mexico Cattle Growers Association, et al v U.S. Fish and Wildlife Service*. No. 00-2050. Filed May 11, 2001.

U.S. Department of Agriculture, Soil Conservation Service in cooperation with The University of Hawai'i Agricultural Experiment Station. *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawai'i.* Washington, D.C. August 1972.

U.S. Department of the Interior, Fish and Wildlife Service. *1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation Hawai'i.* FHW/96-HI. March 1998.

U.S. Department of the Interior, Fish and Wildlife Service. "2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. State Overview. Preliminary Findings." June 2002.

U.S. Department of the Interior, Fish and Wildlife Service. "Biological Opinion of the U.S. Fish and Wildlife Service for the Saddle Road Realignment and Improvement Project." July 27, 1998.

U.S. Department of the Interior, Fish and Wildlife Service, and National Marine Fisheries Service. *Consultation Handbook, Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act.* (Final) March 1998.

U.S. Department of the Interior, Fish and Wildlife Service, Division of Economics. *1996 National and State Economic Impacts of Wildlife Watching, Based on the 1996 National Survey of Fishing, Hunting and Wildlife-Associated Recreation*. Arlington, Virginia. April 1998.

U.S. Department of the Interior, Fish and Wildlife Service. "Endangered and Threatened Wildlife and Plants; Designations of Critical Habitat for Plant Species From the Island of O'ahu, HI; Proposed Rule." 50 CFR Part 17. June 6, 2001.

U.S. Department of the Interior, Fish and Wildlife Service. "Endangered and Threatened Wildlife and Plants; Proposed Determination of Critical Habitat for the O'ahu 'Elepaio," 50 CFR Part 17.

U.S. Department of the Interior, Fish and Wildlife Service. *Environmental Assessment: Proposed O'ahu Forest National Wildlife Refuge, Island of O'ahu, Hawai'i.* March 2000.

U.S. Department of the Interior, Fish and Wildlife Service. *Federal Aid in Wildlife Restoration (Pittman-Robertson)*. August 28, 2000.

U.S. Department of the Interior, Fish and Wildlife Service. Pacific Islands Fish and Wildlife Office. Memorandum to Chief, Branch of Listing, Washington Office. "Areas to be excluded from the Economic Analysis for O'ahu Plant Critical Habitat." September 10, 2002.

U.S. Department of the Interior, Fish and Wildlife Service. Pacific Islands Fish and Wildlife Office. Memorandum to Chief, Branch of Listing, Washington Office. "Areas to be excluded from the Economic Analysis for O'ahu Plant Critical Habitat." December 3, 2002.

U.S. Department of the Interior, Fish and Wildlife Service. *Palila Recovery Plan.* Honolulu, Hawai'i. January 23, 1978.

U.S. Federal Communications Commission. "Universal Licensing System." February 20, 2002.

U.S. Geological Survey. Maps of O'ahu, Hawai'i. U.S. Defense Mapping Agency Hydrographic/Topographic Center, Washington, D.C. 1983.

U.S. Office of Management and Budget, The White House. "Circular No. A-94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs." October 29, 1992.

U.S. Office of Management and Budget, The White House. "Executive Order 12866, Regulatory Planning and Review." September 30, 1993.

Young, John S., Dennis M. Donnelly, Cindy F. Sorg, John B. Loomis, and Louis J. Nelson. "Net Economic Value of Upland Game Hunting in Idaho." *USDA Forest Service Resource Bulletin RM-15*. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. 1986.

Information was provided in communications with representatives of :

<u>Government</u>

- City and County of Honolulu
- Federal Aviation Administration
- Hawai'i Army National Guard
- Hawai'i Department of Accounting and General Services
- Hawai'i Department of Agriculture
- Hawai'i Department of Land and Natural Resources
- Hawai'i Department of Defense, State Civil Defense
- Honolulu Board of Water Supply
- Harold L. Lyon Arboretum, University of Hawai'i
- U.S. Army

— U.S. Department of Agriculture (USDA), Federal Farm Service Agency

— U.S. Fish and Wildlife Service Field Office

— U.S. Navy

— USDA, Natural Resources Conservation Service

Private

— Castle and Cooke Hawai'i

— Del Monte Fresh Produce (Hawai'i), Inc.

— Dole Food Company Hawai'i

— Hawai'i Agriculture Research Center

— Hawaiian Electric Company

— Industrial Economics, Inc.

— KITV 4 ABC

— O'ahu Nature Tours

— The Estate of James Campbell

— Turtle Bay Resort

— URS Corporation

Non-Profit

— Ala Wai Watershed Association

— Earthjustice Legal Defense Fund

— Hawai'i Agriculture Research Center

— Kamehameha Schools

— Ko'olau Mountains Watershed Partnership

— Pacific Legal Foundation

— Pig Hunters' Association

— The Nature Conservancy of Hawai'i