

Draft - November 2002

**DRAFT ECONOMIC IMPACT ANALYSIS
OF PROPOSED CRITICAL HABITAT
FOR THE BLACKBURN'S SPHINX MOTH**

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PREFACE

The U.S. Fish and Wildlife Service has added this preface to all economic analyses of critical habitat designations:

"The standard best practice in economic analysis is applying an approach that measures costs, benefits, and other impacts arising from a regulatory action against a baseline scenario of the world without the regulation. Guidelines on economic analysis, developed in accordance with the recommendations set forth in Executive Order 12866 ("Regulatory Planning and Review"), for both the Office of Management and Budget and the Department of the Interior, note the appropriateness of the approach:

'The baseline is the state of the world that would exist without the proposed action. All costs and benefits that are included in the analysis should be incremental with respect to this baseline.'

"When viewed in this way the economic impacts of critical habitat designation involve evaluating the 'without critical habitat' baseline versus the 'with critical habitat' scenario. Impacts of a designation equal the difference, or the increment, between these two scenarios. Measured differences between the baseline and the scenario in which critical habitat is designated may include (but are not limited to) changes in land use, environmental quality, property values, or time and effort expended on consultations and other activities by Federal landowners, Federal action agencies, and in some instances, State and local governments and/or private third parties. Incremental changes may be either positive (benefits) or negative (costs).

"In *New Mexico Cattle Growers Ass'n v. U.S.F.W.S.*, 248 F.3d 1277 (10th Cir. 2001), however, the 10th Circuit recently held that the baseline approach to economic analysis of critical habitat designations that was used by the Service for the southwestern willow flycatcher designation was 'not in accord with the language or intent of the ESA.' In particular, the court was concerned that the Service had failed to analyze any economic impact that would result from the designation, because it took the position in the economic analysis that there was no economic impact from critical habitat that was incremental to, rather than merely co-extensive with, the economic impact of listing the species. The Service had therefore assigned all of the possible impacts of designation to the listing of the species, without acknowledging any uncertainty in this conclusion or considering such potential impacts as transaction costs, reinitiations, or indirect costs. The court rejected the baseline approach incorporated in that designation, concluding that, by obviating the need to perform any analysis of economic impacts, such an approach rendered the economic analysis requirement meaningless: 'The statutory language is plain in requiring some kind of consideration of economic impact in the CHD phase.'

"In this analysis, the Service addresses the 10th Circuit's concern that we give meaning to the ESA's requirement of considering the economic impacts of designation by acknowledging the uncertainty of assigning certain post-designation economic impacts (particularly section 7 consultations) as having resulted from either the listing or the designation. The Service believes that for many species the designation of critical habitat has a relatively small economic impact, particularly in areas where consultations have been ongoing with respect to the species. This is because the majority of the consultations and associated project modifications, if any, already

consider habitat impacts and as a result, the process is not likely to change due to the designation of critical habitat. Nevertheless, we recognize that the nationwide history of consultations on critical habitat is not broad, and, in any particular case, there may be considerable uncertainty whether an impact is due to the critical habitat designation or the listing alone. We also understand that the public wants to know more about the kinds of costs consultations impose and frequently believe that designation could require additional project modifications.

"Therefore, this analysis analyzes the impacts of critical habitat designation that may be 'attributable co-extensively' to the listing of the species. Because of the potential uncertainty about the benefits and economic costs resulting from critical habitat designations, we believe it is reasonable to estimate the effects of the designation utilizing this approach to avoid understating potential economic effects. It is important to note that the inclusion of impacts attributable co-extensively to the listing does not convert the economic analysis into a tool to be considered in the context of a listing decision. As the court reaffirmed in the southwestern willow flycatcher decision, 'the ESA clearly bars economic considerations from having a seat at the table when the listing determination is being made.'

DATED: October 22, 2002

FOREWORD

1. CONTENT AND PURPOSE

This report assesses the economic impacts that may result from the designation of critical habitat for the Blackburn's sphinx moth on the islands of Maui, Moloka'i, Kaho'olawe, and Hawai'i 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 plant species.

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 Moth and Proposed Critical Habitat

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

— Chapter II: Physical and Socioeconomic Profile of Hawai'i and Maui Counties

To provide the context for evaluating the economic impacts of the proposed critical habitat designation, this chapter presents a physical description of the islands of Maui, Moloka'i, Kaho'olawe, and Hawai'i, and the socioeconomic profile of Hawai'i and Maui Counties.

— 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 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 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 and estimates section 7 economic costs and benefits. This chapter also identifies the effects which can be attributable solely to the critical-habitat provisions of section 7.

After learning about the proposed critical habitat (Chapter I), readers who are already familiar with Hawai‘i and Maui Counties (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 economic analysis (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. ECONOMIC CONSULTANTS

The analysis was performed by Anden Consulting and Research Solutions, LLC, both based in Honolulu, Hawai‘i, under subcontract to Industrial Economics, Inc (IEc), an economic consulting firm in Cambridge, Massachusetts (IEc). In conducting the analysis, Anden Consulting and Research Solutions worked in Hawai‘i with the Service and with Hawai‘i government agencies, companies, and organizations listed in the References. Decision Analysts Hawai‘i, Inc. (DAHI)—a Hawai‘i based economic consulting firm under subcontract to IEc—conducted similar analyses for other species in Hawai‘i and provided advice and assistance to Anden Consulting and Research Solutions on this report.

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 Blackburn's sphinx moth on Maui, Moloka'i, Kaho'olawe, and Hawai'i (the Big Island). 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 impact, of specifying any particular area as critical habitat. The Service may exclude areas from critical habitat designation when the benefits of exclusion outweigh the benefits of including the areas 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 protection that is provided under section 7, the Act does not provide other forms of regulatory protection to lands designated as critical habitat. Because consultation under section 7 only applies to activities that involve Federal permits, funding or involvement, the designation of critical habitat 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 three critical habitat units on Maui (Units 1, 2 and 3), one unit on Kaho'olawe (Unit 4), two units on the Big Island (Units 5 and 6), and one unit on Moloka'i (Unit 7). One of the units on the Big Island is divided into two subunits (Units 5A and 5B). Thus, the total number of units and subunits in the State of Hawai'i is eight. Combined, these units cover approximately 99,434 acres.¹

3. ECONOMIC IMPACTS

For the most part, implementation of the section 7 listing and critical habitat provisions of the Act on the areas proposed for critical habitat would have modest economic impacts for the following reasons:

- With the exception of the units on the Big Island, relatively few new developments, commercial projects, land uses, and activities are expected in

¹ This acreage estimate overstates the actual critical habitat acreage because it includes "unmapped holes," including a residential area in Unit 3 (Maui), a golf course in Unit 6 (Big Island), and the existing manmade features and structures discussed in Chapter I, Section 2.b.

the proposed critical habitat over the next 10 years. This situation reflects the fact that (1) much of the land is largely unsuitable for development or other economic activities due to the rugged terrain, lack of access, limited infrastructure, and remote location; and (2) existing land-use controls that limit development and most other activities in parts of the proposed designation.

- Some existing and continuing activities involve the operation and maintenance of existing man-made features and structures. These are not expected to be affected by the critical habitat provisions of section 7 because they do not contain the *primary constituent elements* for the moth, 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 units have no *Federal involvement* that would require section 7 consultation with the Service, so they are not restricted by the requirements of the Act. In particular, some large residential development and some industrial development planned on the Big Island are not anticipated to be affected by the proposed designation because they lack a Federal nexus.
- For the anticipated projects and activities that will have *Federal involvement*, many are conservation efforts that will not negatively impact the moth or its habitat, so they will be subject to the minimal level of informal section 7 consultation.

For various economic activities in the proposed critical habitat, Table ES-1 presents estimates of (1) the total direct and indirect costs and benefits attributable to the section 7 provisions of the Act that are associated with listing the moth as an endangered species *and* with designating critical habitat for the moth, and (2) that portion of the total costs and benefits which is solely attributable to the critical habitat designation.

Over a 10-year time period, the total estimated direct section 7-related costs associated with the moth species listing are \$1,211,100 to \$1,914,400. The costs associated with consultation alone are \$226,100 to \$644,600, of which \$120,400 to \$391,600 are costs to the Service and other Federal agencies. The vast majority of the total costs are attributable to anticipated project modifications for one project, the proposed Ane Keohokaolole Highway in Unit 5A (Big Island) (\$985,000 to \$1,230,000). The total costs represent, in the worst case, about 0.03 percent of the total personal income of Maui and Hawai'i Counties in 2000.

The potential indirect costs could be substantially larger than the direct section 7-related costs. While the probability of occurrence for most of the indirect effects is unknown, the costs associated with these effects could be large. Most of the potential indirect costs are associated with Units 5A, 5B, and 6 on the Big Island because portions of these units are planned for development. However, while estimates are presented in the text for indirect effects were they to occur, it is unclear what the probability of occurrence is for most potential effects. Thus, the expected value of these effects is unknown and is qualitatively presented in the text.

Designation of the proposed critical habitat and related actions taken to control threats to the moth (e.g., revegetation, fencing, ungulate control) may also generate economic benefits. These

benefits may be related directly or indirectly to designation and manifest in increased regional economic activity or social welfare. For the former, to the extent that critical habitat designation leads to additional conservation management activities funded by out-of-state sources, a local increase in revenues and employment may result. For the latter, species preservation and recovery and other complementary ecological improvements may generate social welfare benefits for residents and non-residents alike. However, the development of quantitative estimates associated with the benefits of the proposed designation is impeded by the scarcity of available studies and information relating to the size and value of beneficial changes that are likely to occur as a result of listing a species or designating critical habitat. In particular, the following information is not currently available: 1) quantified data on the value of the moth; and 2) quantified data on the change in the quality of the ecosystem and the species as a result of the designation (for example, how many fewer ungulates will roam into the critical habitat, how many fewer invasive plants will be introduced as a result, and therefore how many more of the adult or larval host plants will be present in the area and how many more moths these additional plants will support). As a result, it is not possible, given the information that is currently available, to estimate the value associated with ecosystem preservation that could be ascribed to critical habitat designation. Thus, categories of benefits are discussed in qualitative terms. It 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. In short, 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.

Table ES-1. Section 7 Costs & Benefits Attributable to the Moth Listing & Critical Habitat
(10-year estimates)

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

Item	Total		Explanation
	Low	High	
DIRECT SECTION 7 COSTS			
Management of Game Hunting			
State-Managed Lands, Consultations	\$ 7,500	\$ 7,500	Consultation due to Pittman-Robertson funding
State-Managed Lands, PMs	None	None	No additional PMs anticipated due to moth CH
Residential Development			
Kula Residence Lots, Consultation	\$ -	\$ 44,500	Consultation due to Fed funding
Kula Residence Lots, PMs	Minor	Minor	PMs minor due to small footprint
Kahikinui Kuleana Homesteads, Consultation	\$ -	\$ 51,100	Consultation due to Fed funding
Kahikinui Kuleana Homesteads, PMs	Minor	Minor	PMs minor due to small footprint
Villages at La'i'opua	None	None	No Federal involvement
Other Residential Development, Urban District	None	None	No activity in CH planned in next 10 years
Other Residential Development, Agricultural District	None	None	No Fed involvement
Industrial and Commercial Development			
Kaloko Industrial Park	None	None	No Fed involvement
Farming and Ranching Operations			
Farm Service Loans, Consultations	\$ -	\$ 9,100	Consultations due to Fed funding
Farm Service Loans, PMs	Minor	Minor	Major PMs not anticipated
Conservation Projects			
Conservation Projects Funded by the Service, Consultations	\$ 8,000	\$ 24,000	Consultation due to Fed funding
Conservation Projects Funded by the Service, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
USDA Conservation Programs, Consultations	\$ -	\$ 76,000	Consultation due to Federal funding
USDA Conservation Programs, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Other Conservation Projects, Kahikinui, Consultations	\$ 3,800	\$ 11,400	Consultation due to possible Federal funding
Other Conservation Projects, Kahikinui, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Other Conservation Projects, EMWP, Consultations	\$ 3,800	\$ 3,800	Consultation due to possible Federal funding
Other Conservation Projects, EMWP, Consultations	Minor	Minor	PMs minor due to beneficial nature of activities
Other Conservation Projects, Consultations	\$ 3,800	\$ 34,500	Consultation due to possible Federal funding
Other Conservation Projects, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Kaho'olawe			
Kaho'olawe, Consultations	\$ 10,400	\$ 78,500	Consultations due to possible Federal funding
Kaho'olawe, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Military Activities			
Hawai'i Army National Guard, Consultations	\$ 5,200	\$ 5,200	Consultation due to Fed funding
Hawai'i Army National Guard, PMs	Minor	Minor	Minor PMs due to already established NRMP with input from the Service
Kahului Airport	None	None	No identified Fed involvement

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(10-year estimates)

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

Item	Total		Explanation
	Low	High	
DIRECT SECTION 7 COSTS (cont'd)			
Roads			
Existing Roads	None	None	O&M not subject to section 7
New Roads, Consultations	\$ 32,600	\$ 32,600	Consultation due to Fed funding
New Roads, PMs	\$ 985,000	\$ 1,230,000	purchase
Water Systems			
Water systems, Big Island, Consultations	\$ 20,600	\$ 30,600	Consultation due to possible Fed funding
Water systems, Big Island, PMs	\$ -	\$ 6,200	PMs likely to be minor due to overall beneficial nature of activity
Water systems, Maui, Consultations	\$ -	\$ 30,600	Consultation due to possible Fed funding
Water systems, Maui, PMs	Minor	Minor	PMs minor due to existing vision for Kahikinui
Water systems, Moloka'i	None	None	O&M not subject to section 7
Fire Management			
Consultations	\$ 50,200	\$ 50,200	Consultation due to Fed funding
PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Communications Facilities			
New Facilities, Consultations	\$ 36,400	\$ 72,800	Consultation due to FCC and/or FAA permits
New Facilities, PMs	\$ -	\$ 33,600	PMs could include outplanting
Golf Courses			
Existing Golf Courses	None	None	O&M not subject to section 7
Planned Golf Courses, Consultations	\$ 9,700	\$ 9,700	Consultation on wastewater facility upgrade
Planned Golf Courses, PMs	None	None	PMs not anticipated
State Trail and Access System			
Consultations	\$ 5,200	\$ 5,200	Consultation due to Fed funding
PMs	None	None	PMs not anticipated
Parks			
National Parks	None	None	New National Parks unlikely in next 10 years
State Parks, Consultations	\$ 5,200	\$ 5,200	Consultation due to possible Fed funding
State Parks, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
County Parks	None	None	No Fed involvement
Community Economic Development			
Moloka'i Enterprise Community	None	None	No activity in CH planned in next 10 years
Kahikinui, Consultations	\$ 15,700	\$ 47,100	Consultation due to possible Fed funding
Kahikinui, PMs	Minor	Minor	PMs minor due to existing vision for Kahikinui
Natural Disasters			
FEMA Recovery Projects, Consultations	\$ 4,000	\$ 7,500	Consultation due to FEMA funding
FEMA Recovery Projects, PMs	Minor	Minor	Few adverse impacts anticipated
USDA Disaster Assistance, Consultations	\$ 4,000	\$ 7,500	Consultation due to USDA funding
USDA Disaster Assistance, PMs	Minor	Minor	Few adverse impacts anticipated
Ecotourism			
	None	None	No Fed involvement
TOTAL DIRECT COSTS			
Direct	\$ 1,211,100	\$ 1,914,400	included
Discounted Present Value	\$ 850,626	\$ 1,344,594	
Annualized	\$ 121,110	\$ 191,440	

Table ES-1. Section 7 Costs & Benefits Attributable to the Moth Listing & Critical Habitat
(10-year estimates)

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

Item	Explanation
INDIRECT COSTS *	
Management of Game Mammals and Loss of Hunting Lands	Low probability of State-initiated change in game management policy; undetermined probability of successful third-party lawsuit to change game management policy
Conservation Management	Low to moderate probability of court mandated conservation management, but costs likely to be attributable to section 9 rather than CH
Subsistence and Native Hawaiian Traditional and Cultural Practices	Slight probability of a moderate impact
Redistricting of Land by the State	Small probability of redistricting of entire area; higher yet undetermined probability of redistricting of individual parcels
State and County Development Approvals	Incremental cost to prepare an EIS rather than an EA for five projects; current information insufficient to determine whether factors beside CH would require preparation of EIS
Reduced Property Values	Possibility of loss of property values due to uncertainty about long-term impact of CH. Current information insufficient to determine amount of loss.
Condemnation of Property	
Investigate Implications of CH	75 private landowners may investigate the implications of CH on their lands; cost may range from \$200,000 to \$713,000
Loss of Conservation Projects	Moderate probability of reduced participation in conservation projects to avoid Federal nexus

* Although the analysis does provide general estimates of some of the potential indirect costs, these estimates are not totaled because of the speculative nature of many of these costs. Instead, this table reports qualitatively on their likelihood and their potential magnitude. For additional information on any of these indirect impacts, the reader should refer to the economic cost and benefit chapter of the analysis (Chapter 6).

Table ES-1. Section 7 Costs & Benefits Attributable to the Moth Listing & Critical Habitat
(10-year estimates)

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

Item	Explanation
DIRECT BENEFITS	
Regional Economic Activity Generated by Conservation Management	Much of the benefit likely accrued elsewhere if financed with off-island sources
Regional Economic Activity Associated with Ecotourism	The Service prefers that guides do not feature visits to endangered species
Regional Economic Activity Associated with Avoided Cost to Developers	Helps developers site projects
Regional Economic Activity Associated with Medical/Pharmaceutical Benefits	No way to determine statistical probability or economic value of future ethnobotanical use of host plants, or contribution of CH to conservation of host plant
Social Welfare Benefits of Habitat Designation	The designation may result in preservation of open lands
INDIRECT BENEFITS	
Social Welfare Benefits of Endangered Species Preservation	Difficult to estimate preservation benefits and their value
Social Welfare Benefits of Broader Ecological Improvements	

THE MOTH AND PROPOSED CRITICAL HABITAT²

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 the Blackburn's sphinx moth on the islands of Maui, Moloka'i, Kaho'olawe, and Hawai'i (the Big Island) in the State of Hawai'i. This chapter provides information on the moth and the proposed critical habitat units, most of which comes from the document "Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Blackburn's Sphinx Moth" (the proposed rule), published in the *Federal Register* on June 13, 2002 (67 FR 40633). In addition, the Service provided valuable information for this chapter in the form of overlay resource maps and detailed acreage data.

1. THE LISTED SPECIES

The Service proposes critical habitat for the Blackburn's sphinx moth on Maui, Moloka'i, Kaho'olawe and the Big Island. The proposed rule contains a detailed discussion of the species, including a physical description of the moth, moth biology, moth habitat and range, and threats to the conservation of the species.

2. PROPOSED CRITICAL HABITAT UNITS

The Service is proposing three critical habitat units on Maui (Units 1, 2, and 3), one unit on Kaho'olawe (Unit 4), two units on the Big Island (Units 5 and 6), and one unit on Moloka'i (Unit 7). One of the units on the Big Island is divided into 2 subunits (Unit 5A and Unit 5B). Thus, the total number of units and subunits (referred to throughout this report as "units") in the State of Hawai'i is eight. 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 moth, 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.

² Note to Reader: After learning about the proposed critical habitat in this chapter, readers who are already familiar with Hawai'i and Maui Counties (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).

2.a. 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 moth. The Service defines *primary constituent elements* on the basis of the habitat features of the areas that support the plant species essential for the primary biological needs of the moth. The *primary constituent elements* required by the sphinx moth larvae are four host plant species within the *Nothocestrum* genus and the dry and mesic habitats that support them (i.e., areas between sea level and 1,525 meters (5,000 feet) receiving between 25 and 250 cm of annual precipitation). The *primary constituent elements* required for sphinx moth adults are identified native nectar-supplying plants and the dry to mesic habitats that support them (i.e., areas between sea level and 1,525 meters (5,000 feet) receiving between 25 and 250 cm of annual precipitation).

2.b Excluded Features and Structures

As indicated in the proposed rule, existing manmade features and structures do not contain, and are not likely to develop, *primary constituent elements*. The proposed rule states:

Critical habitat does not include man-made features and structures within the boundaries of the mapped units, such as houses, offices, warehouses, stores, or any other buildings, roads, aqueducts, antennas, towers, water tanks, agricultural fields, paved areas, residential lawns, gardens, parking lots, cemeteries, and any other urban landscaped areas or man-made structures. (67 FR at 40652).

As a result, the Service considers these features and structures to be excluded from the proposed critical habitat as “unmapped holes.” In addition to such man-made features and structures listed in the proposed rule, the Service has identified additional ones that do not contain *primary constituent elements*. Below is a comprehensive list of man-made features and structures likely to be excluded:

- Agricultural fields
- Antennas and towers
- Borrow pits
- Cemeteries
- Gardens
- Houses, offices, warehouses, stores, or any other buildings
- Landing strips
- Parking lots
- Paved areas
- Residential lawns
- Roads and hiking trails
- Water infrastructure, including aqueducts, wells, tanks, tunnels, pipelines, irrigation ditches, siphons, reservoirs, intakes, pumping stations, and gaging stations
- Any other urban landscaped areas or man-made structures

The Service indicates that the final rule for the critical habitat likely will feature remapped boundaries that exclude the larger areas that lack *primary constituent elements* (Memorandum to the Service, Washington Office, from the Service, Honolulu Field Office. August 30, 2002).

Specifically, the following areas lack *primary constituent elements* and therefore would likely be excluded.

- Existing Residences (Unit 3). The eastern side of Unit 3 (Maui) contains approximately 18 privately-owned small lots (predominantly one acre or less) with existing housing structures.
- Makalei Hawai'i Country Club Golf Course (Unit 6). An existing golf course overlaps with the southwestern portion of Unit 6 (Big Island) on land owned by the Makalei Hawai'i Corporation.

Because these man-made features and structures would be excluded, they are also excluded from this economic analysis. Henceforth, references to the proposed critical habitat already exclude all features and structures discussed above unless indicated otherwise by footnotes.

At the bottom of Table I-1, the section entitled "Improvements/Activities" indicates which of these features are associated with each unit.

2.c Acreage³

As shown in Table I-1, the total acreage proposed for critical habitat designation on Maui, Moloka'i, Kaho'olawe and the Big Island is 99,434 acres. The acreage encompassed within the boundaries of the three proposed critical habitat units on Maui totals approximately 44,952 acres, which is about 10 percent of the island. The acreage for the unit on Moloka'i totals approximately 4,521 acres, which is about three percent of the island. The acreage for the unit on Kaho'olawe totals approximately 4,641 acres, which is about 16 percent of the island. The acreage for the three units on the Big Island totals approximately 45,320 acres, which is about two percent of the island.

2.d Location and Terrain

Some of the acreage proposed for designation is in uninhabited or sparsely inhabited remote areas:

- Unit 4 (Kaho'olawe) covers the central elevation of Kaho'olawe, an uninhabited island with limited access.
- Unit 7 (Moloka'i) is located almost entirely within the Moloka'i Forest Reserve and is a mountainous area with steep gulches and valleys.

Two units are in fairly remote areas, in relation to population centers, but portions of the units are considered inhabited:

- Unit 2 (Maui) is located on the lower western slope of Haleakala between Kula and Kihei and is characterized by gentle slopes and rugged terrain. Portions of the Unit have been and are currently used for grazing. Most of

³These acreage estimates overstate the actual critical habitat acreage because they include "unmapped holes," including the residential area in Unit 3, the golf course in Unit 6, and the existing manmade features and structures discussed in Chapter I, Section 2.b.

the Unit is uninhabited, but the eastern portion of the Unit overlaps with a residential development under construction by the Department of Hawaiian Home Lands.

- Unit 1 (Maui) is located on the lower southern flank of Haleakala, extending from about 5,000 feet in elevation to the coastline. The southwestern portion of the Unit is south of the resort area of South Maui (Wailea) and contains some single-family homes. The Department of Hawaiian Home Lands Kahikinui Kuleana Homestead pilot program is located in the eastern half of this Unit. The remainder of the Unit is largely uninhabited but used for grazing. The area is characterized by little water, strong winds, and rugged terrain and contains evidence of former lava flows.
- Unit 6 (Big Island) is located on the lower northwest flank of the Hualalai volcano, extending from about 6,000 feet to about 1,500 feet in elevation. The southwestern and eastern portion of the Unit contains some single-family homes and ranches. The Unit also contains the Pu‘u Wa‘awa‘a cinder cone and large stands of native, dry forest.

Some of the acreage proposed for designation is close to population centers and human activity:

- Unit 3 (Maui) is located along the northern shoreline, approximately 3 miles from the urban center of Kahului. Much of the Unit is within the Kahului Airport boundaries, though the Unit does not include the Airport structures or runway. The Unit also includes the Kanaha Wildlife Pond Sanctuary.
- Unit 5A (Big Island) is located *mauka*⁴ of the Kaloko Light Industrial Park and the Queen Kaahumanu Highway, approximately 2.5 miles north of the urban center of Kailua-Kona. This Unit contains dry native and introduced plant communities, rugged lava flows, and portions of the Hina Lani Street.
- Unit 5B (Big Island) is located approximately 1.5 miles north of the urban center of Kailua-Kona, *mauka* of the Queen Kaahumanu Highway and adjacent to the Kealakehe Transfer Station and Police Station. Similar to Unit 5A, this Unit contains dry native and introduced plant communities and rugged lava flows

Detailed maps appear in the proposed rule.

2.e Occupied and Unoccupied Units

The Service considers about 94,913 acres (95 percent) of the proposed critical habitat to be *occupied* by the moth and 4,521 acres (five percent) to be *unoccupied*. The units on Maui, Kaho‘olawe, and the Big Island are considered to be 100 percent *occupied*; while the unit on Moloka‘i is considered to be 100 percent *unoccupied*. The *unoccupied* areas were included in the

⁴*Mauka* means “towards the mountains.”

proposed designation because the Service believes that they are necessary to provide for the long-term survival and conservation of the species.⁵

2.f Land Ownership

Approximately two acres (0 percent) proposed as critical habitat are owned by the Federal government. The State owns about 70,111 acres (71 percent). The remaining 29,143 acres (29 percent) are owned by private landowners.

On Maui, approximately two acres proposed as critical habitat are owned by the Federal government (0 percent). The State owns about 32,227 acres (72 percent of Maui's designation). The remaining 12,683 acres are owned by private landowners (28 percent of Maui's designation).

On Moloka'i, the State owns about 1,363 acres of the designated area (30 percent of Moloka'i's designation). The remaining 3,158 acres are owned by private landowners (70 percent of Moloka'i's designation).

On Kaho'olawe, the State owns the entire acreage proposed for designation (4,641 acres).

On the Big Island, the State owns about 31,881 acres of the area (70 percent of the Big Island's designation). The remaining 13,302 acres are owned by private landowners (29 percent of the Big Island's designation).

2.g Existing Land Management

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

Table I-1 at the end of this chapter identifies, by critical habitat unit, the amount of 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.

As indicated in the table, none of the acreage in the proposed critical habitat is controlled or managed by the Federal government. At the State level, about 33 percent of the proposed critical habitat is in the State Conservation District. The Conservation District is subject to State control or management, and development and commercial activity is generally limited within the Conservation District with varying levels of restrictions based on the applicable Subzone (see Chapter IV for full discussion).

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: approximately 3,388 acres (three percent of the

⁵ These acreage estimates overstate the actual critical habitat acreage because they include "unmapped holes," including the residential area in Unit 3, the golf course in Unit 6, and the existing manmade features and structures discussed in Chapter I, Section 2.b.

proposed designation) are in State Forest Reserves; 4,641 acres (five percent) are in the Kaho‘olawe Island Reserve; 2,235 acres (two percent) are in State Natural Area Reserves (NARs); and 2,697 acres (three percent) are in a State Wildlife Sanctuary. Approximately 23,950 acres (24 percent of the proposed designation) are in State Hunting Units, large areas managed for public hunting. (See Chapter IV for full discussion of State Forest Reserves, Kaho‘olawe Island Reserve, NARS, State Parks and State Hunting Units).

While the State manages land in the Conservation District, the counties (Maui County and Hawai‘i County) have primary responsibility for land in the other districts--namely, the Agricultural, Urban and Rural Districts. These three Districts are subject to county land-use and development controls, including county community plans, zoning, and building code regulations affecting farm, residential, commercial, and industrial development and use. Of the proposed critical habitat designation, approximately 66,554 acres (67 percent of the proposed designation) are in the Agricultural District, with 34,424 acres on Maui, 546 acres on Moloka‘i, and 31,584 acres on the Big Island. 497 acres are in the Urban District, with 226 acres on Maui and 271 acres on the Big Island. One acre on Maui is in the Rural District. In Special Management Areas (SMAs) located along the shoreline, the county has an additional layer of regulation that provides special control on development, even for land already subject to Conservation District restrictions (see Chapter IV for full discussion).

Approximately 718 acres proposed for critical habitat (one percent), all on Moloka‘i, are privately managed under cooperative agreements as part of the East Molokai Watershed Partnership or by the Nature Conservancy under the Natural Area Partnership program (Kamakou Preserve) (see Chapter IV for full discussion).

Table I-1. Critical Habitat Units, Sphinx Moth: Acreage, Location, Ownership, Land Management, Improvements and Activities

Item	Units	All Units		Maui	Maui	Maui	Kaho'olawe	Big Island	Big Island	Big Island	Molokai'
		Total	Share	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5A	Unit 5B	Unit 6	Unit 7
Total Area*	Acres	99,434		37,599	6,794	559	4,641	309	258	44,753	4,521
Area Occupied by Moth	Acres	94,913	95%	37,599	6,794	559	4,641	309	258	44,753	-
Land Ownership											
Federal	Acres	2	0%	2	-	-	-	-	-	-	-
State	Acres	49,276	50%	10,864	-	527	4,641	-	253	31,628	1,363
State DHHL	Acres	20,835	21%	16,410	4,425	-	-	-	-	-	-
Private, Major Owner	Acres	28,177	28%	9,715	2,369	8	-	261	-	12,666	3,158
Private, Small Owners	Acres	966	1%	568	-	23	-	34	-	341	-
Roads	Acres	178	0%	41	-	0	-	14	5	118	-
Federally Controlled or Managed											
National Parks or Refuges	Acres	-	0%	-	-	-	-	-	-	-	-
FWS, plant populations	Count	258	0%	30	4	-	n/a	1	2	183	38
State-Controlled or Managed											
Conservation District	Acres	32,361	33%	9,997	-	317	4,641	1	0	13,431	3,975
Protective	Acres	6,710	7%	1,308	-	178	4,641	-	-	45	539
Limited	Acres	1,666	2%	-	-	139	-	-	-	1,527	-
Resource	Acres	15,892	16%	4,609	-	-	-	-	-	7,846	3,437
General	Acres	8,027	8%	4,079	-	-	-	1	0	3,947	-
Special	Acres	66	0%	-	-	-	-	-	-	66	-
Forest Reserves	Acres	3,388	3%	236	-	-	-	-	-	66	3,086
Hunting Area	Acres	23,946	24%	-	-	-	-	-	-	20,860	3,086
Natural Area Reserves (NARs)	Acres	2,235	2%	2,235	-	-	-	-	-	-	-
Wildlife Sanctuary	Acres	2,697	3%	-	-	142	-	-	-	2,555	-
County-Controlled or Managed											
Agricultural District	Acres	66,554	67%	27,605	6,794	25	-	262	-	31,322	546
Urban	Acres	530	1%	-	-	226	-	46	258	-	-
Rural	Acres	1	0%	1	-	-	-	-	-	-	-
Private-Controlled or Managed											
Private managed lands	Acres	68	0%	-	-	-	-	-	-	-	68
Private preserve	Acres	650	1%	-	-	-	-	-	-	-	650
Improvements/Activities											
Paved Roads	Count	10		2	-	2	-	1	1	4	-
Unpaved Rds or 4-wd Trails	Count	128		22	5	1	5	1	1	82	11
Hiking Trails	Count	19		4	-	-	n/a	-	-	4	11
Park Improvements	Count	1		-	-	yes	-	-	-	-	-
Beach Recreation	Count	2		yes	-	yes	-	-	-	-	-
Communication Complexes	Count	4		1	-	-	-	-	-	3	-
Landing Strips	Count	2		1	-	-	-	-	-	1	-
Water Improvements	Count	95		11	1	-	1	-	1	78	3
Borrow and Cinder Pits	Count	5		2	-	-	-	1	-	2	-
Cemeteries	Count	1		-	-	-	-	-	-	1	-
Structures	Count	89		2	-	2	n/a	-	-	85	-
Golf Courses	Count	3		1	-	-	-	-	-	2	-
Military Grounds	Count	1		1	-	-	-	-	-	-	-
Hunting, State-Managed Lands	Count	2		-	-	-	-	-	-	yes	yes
Grazing	Count	4		yes	yes	-	-	-	-	yes	yes

Note: Entries may not sum to totals due to rounding, slight acreage discrepancies, and overlapping land-management areas.

*This acreage estimate overstates the actual critical habitat acreage because it includes "unmapped holes," including the existing residences in Unit 3 (Maui) and the Makalei Hawai'i Country Club Golf Course in Unit 6 (Big Island), and the existing manmade features and structures discussed in Chapter 1, Section 2.b.

**PHYSICAL AND SOCIOECONOMIC
PROFILE OF HAWAI‘I AND MAUI COUNTIES⁶**

CHAPTER II

To provide context for evaluating the economic impacts of the proposed critical habitat designation, this chapter presents (1) physical descriptions of the island of Hawai‘i and of the main islands of Maui County (excluding Lana‘i); and (2) socioeconomic profiles of Hawai‘i County and Maui County and of each of the main islands of Maui County (excluding Lana‘i). A summary of the socioeconomic data is presented in Tables II-1 and II-2.

1. PHYSICAL DESCRIPTION OF THE ISLAND OF HAWAI‘I

The County of Hawai‘i, commonly referred to as the Big Island, is composed of the island of Hawai‘i. The island of Hawai‘i is by far the largest of the eight major islands with an area of 4,039 square miles. The island is more than five times the size of Maui, the second largest island, and nearly twice the size of all the other islands put together.

The southernmost and youngest of the Hawaiian Islands, Hawai‘i was formed by the activity of five volcanoes: Hualalai, Kohala, Mauna Loa, Mauna Kea and Kilauea. Except for the windward slope of Kohala, the island is little eroded, and the mountains are far taller than the greatest elevations on the other islands. Mauna Loa and Mauna Kea dominate the landscape, comprising 51 percent and 23 percent of the land area respectively, and rising over 13,500 feet in elevation.

Both Mauna Loa and Kilauea are active volcanoes. Since 1983, Kilauea has been erupting almost continuously, constantly changing the landscape of the southeastern part of the island. Mauna Loa last erupted in 1984, and is expected to continue to erupt at intervals throughout the foreseeable future. Moving northward, the remaining volcanoes are dormant or extinct. Last erupting in 1801, Hualalai is the most symmetrical and steepest of the island’s volcanic peaks and contains both cinder cones and a number of craters. Mauna Kea is a dormant volcano in its postshield stage and is thought to have last erupted 4,500 years ago. Ash from past eruptions still cover both Mauna Kea and Kohala. The most northerly volcano, Kohala, is also considered extinct, but its cinder cones, now covered with grass, remain recognizable features of the landscape.

⁶ **Note to Reader:** Readers who are already familiar with Hawai‘i and Maui Counties 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).

With its wide range of elevations and large size, the island exhibits all climate types characteristic of the Hawaiian Islands. The cold climate of the summits of Mauna Loa and Mauna Kea regularly produce winter snows.

There is significant variability in rainfall on the island. While the windward side of the island receives an average of 200 to 300 inches per year, the leeward side averages less than 50 inches per year, with some locations receiving less than 10 inches a year. The greatest amount of rain does not fall on the summits of Mauna Kea or Mauna Loa, but at elevations of 2,000 to 4,000 feet, due to the presence of the trade-wind inversion layer.

The only perennial streams are found on the northeastern slopes of Mauna Kea and Kohala. The high permeability of the rock forming the younger mountains inhibits the development of streams elsewhere. As a result, large areas on these mountains are devoid of vegetation. The southwestern side of Kilauea is a desert, due to the limited rainfall and the acidity from volcanic gases.

Natural vegetation communities include rain forest, dry forest, arid scrub, upland scrub and alpine stone desert. Much of the windward side of the island is rain forest, characterized by closed canopy forest often dominated by *ohi'a lehua* and an understory of ferns. Dry forest communities make up much of the northwestern quarter of the island, the southern tip, and the southern flank of Kilauea. These dry forests display considerable diversity, tend to be more open than the rain forest, and contain an understory of shrubs, vines, and herbs that show adaptation to drought. However, over the past century, much of this natural dry forest has been the site of cattle grazing and to a limited extent, development. Arid scrub communities can be found in the lowlands along the northwestern coast and the southern coast. These habitats contain communities of drought-resistant stunted trees and shrubs, such as *wiliwili* and *'ohe*. Upland scrub communities are found encircling the summits of Mauna Kea and Mauna Loa above 5,000 to 6,000 feet, where the influence of trade winds is slight. These communities contain shrubs and low trees that diminish in height and density with elevation, including the rare Hawaiian silversword. Finally, alpine stone desert communities are found only on the peaks of Mauna Loa and Mauna Kea above 10,000 feet. Composed of recent lavas and cinders, these areas are mostly unvegetated, except for the occasional growth of mosses, lichens and drought and cold-resistant herbs.

2. PHYSICAL DESCRIPTIONS OF THE ISLANDS OF MAUI COUNTY

The four main islands and smaller islets of Maui County are situated in the middle of the main portion of the Hawaiian chain. O'ahu lies to the northwest and the Big Island of Hawai'i lies to the southeast. Less than a million years ago, the four islands of Maui County were physically connected—that once-single island is sometimes referred to today as “Maui Nui.”

2.a. Island of Maui

Maui, the second largest of the eight major islands, is 48 miles long, 26 miles wide, and 728 square miles in area. It was formed from the remnants of two large shield volcanoes connected by an isthmus that drops to an elevation of less than 130 feet in the middle of the saddle.

The older West Maui Mountains (at 1.3 million years) are heavily eroded by streams that have cut deep valleys and ridges into the original volcano and have limited access to many of the interior regions. The highest point on West Maui is Pu'u Kukui at 5,788 feet, where the average

rainfall is 400 inches per year. This is the second wettest spot in Hawai‘i. Typical of older and eroded areas, West Maui hosts highly diverse regional flora.

Dominating East Maui is the 10,023-foot massive volcano Haleakala (“House of the Sun”). Haleakala retains its classic shield shape due to its comparative geological youth (750,000 years). It is considered to be an active volcano, although the last summit eruption occurred 800 to 1,500 years ago, and the last flank eruption occurred in about 1790. Average annual rainfall on Haleakala exceeds 300 inches a year on the windward (northeast) side of the mountain at about the 2,000- to 3,000-foot elevation; about 35 inches at the summit; and less than 30 inches on the dry leeward (south) side. Summit rainfall is low because the trade wind inversion (at about the 7,000-foot elevation) impedes the moisture-laden trade winds from reaching higher elevations. The sizable summit crater (7.5 miles long and 2.5 miles wide) is a dry cinder desert. Haleakala does not exhibit the diverse vegetation of the older West Maui Mountains.

2.b. Island of Moloka‘i

Moloka‘i is the fifth largest of the main Hawaiian islands at 38 miles long, up to 17 miles wide, and 266 square miles in area. It was formed from the coalescence of two large shield volcanoes and one much smaller volcano.

West Moloka‘i, the older of the two large volcanoes (at 1.9 million years), is very flat, rising to only 1,381 feet with an east-west extent of about 12 miles. This elevation is insufficient to check the blustery trade winds or induce orographic rainfall. As a result, windy and dry (15 to 40 inches rainfall per year) conditions prevail, and coastal and inland sand dunes extend almost completely across the northwestern corner of West Moloka‘i. In this area, cattle and goats were introduced beginning in the 1800s. Subsequently, these ungulates overgrazed a former forest, resulting in severe erosion.

East Moloka‘i is a slightly younger volcano (1.8 million years) and much larger. It measures 27 miles east to west and eight miles north to south. The eroded East Moloka‘i Mountains comprise about two-thirds of the east-west extent of the island. They are dominated on the north coast by precipitous sea cliffs rising more than 3,600 feet—the tallest sea cliffs in the world. Also, three amphitheater-headed valleys open to the windward (north) coast, their ridges converging on the island’s summit at Kamakou (4,970 feet). Rainfall on the windward side varies from 75 inches to more than 160 inches per year. The gulch-scored leeward slopes of East Moloka‘i descend to a narrow coastal plain on the south side of the island. Certain areas in the East Moloka‘i Mountains are accessible via four-wheel-drive vehicle. Foot trails provide access to portions of the mountainous interior, but many areas have difficult access.

Between these two volcanoes lies the Moloka‘i isthmus, commonly referred to as the Ho‘olehua Plain. This area was formed when lava flowing from the East Moloka‘i volcano overlapped the West Moloka‘i shield.

The third distinctive volcano forms the four-square-mile Kalaupapa Peninsula on the north central coast. Windward cliffs 1,600 feet high and negotiable only on foot or by mule separate Kalaupapa from the rest of the island. Kalaupapa Peninsula receives 40 to 50 inches of rain a year.

2.c. Island of Kaho‘olawe

Kaho‘olawe lies 6.7 miles off the south coast of Maui. It is the smallest of the eight main islands, measuring 10.9 miles long, 6.4 miles wide, 45 square miles in area, and 1,477 feet at its highest point. Formed from the summit of a single volcanic dome, it is one of the older islands in the Hawaiian group. Also, it is arid, having the lowest rainfall of all the main islands. This is due to the combination of its low relief and its position in the lee of towering Haleakala. Annual rainfall averages about 25 inches on its eastern slopes, while the southwestern side of the island receives considerably less rain. By the early 1900s and continuing into the 1990s, overgrazing by goats reduced vegetation, and strong trade winds blew away vast quantities of soil. The landscape suffered further degradation during the approximately 50 years that the military used the island as a target for naval and aerial bombardment training, discussed below.

3. SOCIOECONOMIC PROFILE OF THE COUNTY OF HAWAI‘I

Table II-1 summarizes economic and demographic information for the County of Hawai‘i. Estimates and figures presented in this section are taken from the *State of Hawai‘i Data Book* (DBEDT, annual), the *County of Hawai‘i Data Book* (Department of Research and Development, annual), the *Annual Visitor Research Report* (DBEDT, annual) and *Statistics of Hawai‘i Agriculture* (Hawai‘i Agricultural Statistics Service, annual).

3.a Population and Distribution

In the year 2000, the County of Hawai‘i had a population of 148,677 residents, up 23.6 percent since the 1990 U.S. census. The total Hawai‘i County population amounted to 12.3 percent of the State population, the second largest of the four counties (after O‘ahu).

The population is geographically dispersed around the island. Hilo is the largest town, with a population of 40,759 (approximately 27 percent of the island’s population). The next largest town, Kailua-Kona, contains fewer than 10,000 people. In terms of County Districts, the population in 2000 was distributed as follows (clockwise):

- Hamakua District (4 percent)

The Hamakua District extends inland from the northern coast to include the summit of Mauna Kea and part of Mauna Loa. Most of the population resides in the coastal area. Until the closure of the Hamakua Sugar Company, sugar production dominated the economy of this district.

- North Hilo District (1 percent)

The North Hilo District extends from the coastline inland along the flank of Mauna Kea toward the peak of Mauna Loa and hosts a few small communities. Until the closure of the Hilo Coast Processing Company, sugar production dominated the economy of this district.

- South Hilo District (32 percent)

The South Hilo District is located on the windward (eastern) side of the island. The District contains Hilo, the largest city on the island and the seat of

County government, one of the island's two international airports, and the primary port.

— Puna District (21 percent)

The Puna District is located on the southeastern corner of the island and contains part of the East Rift Zone of Kilauea. The Puna District is the fastest growing on the island, tripling in population between 1980 and 2000. The economy of this district recently lost the Puna Sugar Company.

— Ka'u District (4 percent)

The Ka'u District covers most of the southern part of the island, including the Hawai'i Volcanoes National Park. Despite the closure of the Ka'u Agribusiness sugar mill, the population of this district continues to increase.

— South Kona District (6 percent)

The South Kona District is located on the southwestern coast of the island. It contains several small population centers, as well as Pu'uhoonua O Honaunau National Historical Park.

— North Kona District (19 percent)

The North Kona District, located on the western coast of the island and extending upland to include the volcano Hualalai, contains the area of Kailua-Kona. The population of this District has more than doubled since 1980, supported by the growing tourism industry that provides the local population with access to jobs.

— South Kohala District (9 percent)

The South Kohala District, located on the northwestern corner of the island, contains the harbor of Kawaihae. Originally developed to serve the sugar industry, the port now services the growing population on the west side of the island. The district also contains Waimea, the third largest city on the island.

— North Kohala District (4 percent)

The North Kohala District covers the northwestern tip of the island and hosts very little economic activity since the closure of a sugar plantation in the 1970s.

3.b Primary Economic Activities

The principal economic activities in Hawai'i County are tourism, agriculture, and research.

3.b.(1) Tourism and Resort-Residential Development

The County hosted over 1.2 million visitors in the year 2000, resulting in an average of 21,831 visitors present on the island (the average visitor census). From 1990 to 2000, the average

visitor census increased 28.6 percent, primarily due to an increase in the average length of stay. Total visitor arrivals declined between 1990 and 1995 and increased between 1996 and 2000 to approximately the 1990 levels.

The number of international visitors steadily increased through the 1990s. By 2000, approximately 73 percent of visitors were Americans, while 27 percent were foreign residents, mainly from Japan.

Visitor expenditures totaled approximately \$1.2 billion in 2000, an approximately 30.7 percent increase since 1990. This increase was slightly above the 27.7-percent increase in inflation as measured by the Consumer Price Index (CPI).

Hotels alone employ over 6,000 residents and have an annual payroll of over \$163 million. Scenic and sightseeing transportation operators employ another 600 employees, with a payroll over \$12.5 million.

Tourism on the Big Island is centered on the western coast of the island surrounding Kona, though the Hawai'i Volcanoes National Park on the southeastern quarter of the island is a major tourist attraction. The climate of the Kona coast, typically dry and sunny, and the beauty and diversity of marine life off the coast have combined to support a growing tourism industry in the South Kohala District, while the ongoing volcanic activity at Kilauea, about 30 miles from Hilo, attracts visitors to the windward side of the island.

Resort/residential development includes single-family and multi-family units that are associated with a resort. Many resort-type amenities are offered, including golf, tennis, swimming, spa, etc. Some units are placed in rental pools and used by visitors; some are time-share units; some are second homes owned by non-Hawai'i residents; and some are homes of wealthy retirees from outside Hawai'i. Occupants of resort/residential units tend to spend more money than the average Hawai'i resident and have a lower demand on social services. Also, their income originates from outside Hawai'i. Thus, their economic impact is very similar to that of a tourist. This type of development is centered on the western coast of the island, in North Kona and South Kohala Districts.

The Big Island's visitor industry appears to have recovered from any short-term impacts from the terrorist attack of September 11, 2001. Contributing factors include the current volcanic activity at Hawai'i Volcanoes National Park and the accessibility of active lava flows and the increase in cruise-ship visitors to Hilo since 1998.

3.b.(2) Agriculture

Agriculture, while the second-largest industry in the County, is much smaller than tourism. Specifically, in 2000, agricultural sales in the County totaled approximately \$154 million, or only 13 percent of visitor expenditures. During the 1990s, agricultural sales declined 22 percent, due primarily to the closure of sugar plantations.

In 1990, sugarcane was still the dominant crop on the island, covering 57,900 acres. Despite the fact that the number of sugarcane plantations was halved between 1986 and 1990, the value of sugar sales (approximately \$55 million) represented nearly half of the total value of crop sales on the Big Island in 1990. By 1995, however, only one sugarcane plantation remained and it harvested its last crop in 1996. The closure of the sugar plantations has increased the importance of diversified

agriculture to the County's economy, with forestry as the most promising alternative. However, much former sugar land remains fallow.

Hawai'i County had 3,300 farms in the year 2000, employing approximately 4,500 people. This represents a 25 percent increase in the number of farms since 1990, but total farm acreage has dropped 13 percent since 1990 to 870,000 acres. These trends reflect the transition from larger sugar plantations to smaller farms focusing on diversified agriculture products.

Existing mature agricultural industries include macadamia nuts, papayas, coffee, and flowers and nursery products. The macadamia nut industry faces increased competition from areas such as Australia, and the papaya ringspot virus has impacted the papaya industry. Coffee sales remain strong, but Kona coffee remains primarily a gourmet crop. Flower and nursery products, including anthuriums and orchids, continue to expand, both in terms of acreage and sales. While these agricultural industries are mature, there is still growth potential for flowers and nursery products, coffee, and papaya.

Livestock operations also comprise a significant portion of the agriculture industry in Hawai'i County. 70 percent of the state's inventory of cattle and calves is raised on ranches on the Big Island; however, the overall number of cattle and calves has dropped 21 percent since 1990 to 114,400. The value of cattle sales in 2000 was just over \$14 million, down 39 percent since 1990.

Finally, aquaculture of algae, shellfish, and finfish is an emerging sector of the agriculture economy. Nearly half the State's aquaculture operations were based in Hawai'i County, and Hawai'i County is responsible for 72 percent of the total Statewide sales from aquaculture. In 2000, the value of aquaculture enterprises on the Big Island was estimated at nearly \$16 million, up 219 percent from 1990.

3.b.(3) Scientific Research

Scientific and academic research is another significant component of the economy of Hawai'i County.⁷

Mauna Kea Observatory, at nearly 14,800 feet altitude, is the largest ground-based astronomical observing site in the world. Among the physical characteristics that set Mauna Kea apart from lesser sites are: its freedom from cloud cover, the darkness and dryness of its skies, the transparency of the atmosphere above it to infrared radiation, and the unusual stability of the atmosphere. Also, because the Hawaiian Islands are near the equator, astronomers can observe the entire northern sky and nearly 80 percent of the southern sky. The remoteness of Mauna Kea from major urban development and the strong County outdoor lighting ordinance preserve the darkness of its skies. In the late 1960s, the University of Hawai'i (UH) initiated a program to attract others to construct and operate telescopes on Mauna Kea in scientific collaboration with UH. First the Federal government, and then other countries joined Mauna Kea Observatory, including telescopes funded and operated by major U.S. mainland universities, Canada, France, the United Kingdom, Japan, Taiwan and others. In 1999, operating costs for the 13 major telescopes on Mauna Kea contributed approximately \$48.5 million to the County of Hawai'i's economy and provided jobs for 351 County residents.

⁷ Consolidated data on the size of this industry are not available.

The Natural Energy Laboratory of Hawai'i supports a growing number of research projects. Located on 870 acres at Keahole Point, this development park provides the resources, facilities and support for energy and ocean-related research, educational and commercial activities in areas such as OTEC (ocean thermal energy conversion), aquaculture, cold seawater air conditioning, and infrasound monitoring. Today, the Natural Energy Laboratory hosts 26 projects, contributing over \$30 million to the economy.

The University of Hawai'i at Hilo (UH-Hilo) is also a major contributor to the island's economy. In addition to new research and planned construction, including a \$60 million China-U.S. center, a \$30 million astronomy education center, and a \$18 million agricultural research center, UH-Hilo attracts a large number of foreign students, who were expected to contribute \$13.5 million to the local economy in 2002.

The Hawai'i Volcanoes National Park is another significant natural resource that supports a variety of different research projects, from the study of seismology and volcanology to botany and the ability of native ecosystems to recover after volcanic eruptions. The amount of funding for research varies from year to year, and the specific contribution that this research makes to the County's economy is not available.

3.c Labor Force and Employment

In 2000, the County's civilian labor force numbered about 70,000 workers, up 13.7 percent since 1990. Employment reached 65,350 workers in 2000, up 10.4 percent since 1990 and the number of wage and salary jobs for Hawai'i County increased 14.3 percent between 1990 and 2000. The unemployment rate rose from four percent in 1990 to 6.7 percent in 2000.

As suggested by the discussion of primary economic activities above, most of the County's wage and salary jobs are concentrated in non-farming and non-manufacturing sectors. The County's top two employers are the State and County government, and 15 of the top 30 employers are in the tourism industry. By industry, the primary employers are: (1) services (hotel, tourism, and health); (2) trade (primarily retail); (3) government; and (4) transportation, communication, and utilities. The number of wage and salary jobs rose in all these categories from 1990 to 2000. On the other hand, wage and salary jobs declined in the following sectors: (1) construction and mining; (2) manufacturing; and (3) agriculture. Wage and salary jobs remained the same in the finance, insurance and real estate sector.

3.d Personal Income

The County's total personal income and per-capita income was just over \$2 billion and \$16,603, respectively, in 1990, and by 2000 had risen to just over \$3 billion and \$20,399, respectively. This represents a significant increase in overall income of 50.8 percent, and a more modest increase in per-capita income of 22.9 percent. While beneficial, this modest increase in per-capita income failed to keep pace with inflation as measured by the 27.7-percent increase in the CPI during the same 1990-to-2000 period.

3.e Outlook for Growth and Socioeconomic Change

The primary driving forces for the economy of the island of Hawai'i will continue to be tourism and, to a lesser extent, research and high-technology activities, diversified agriculture, and forestry.

Most of the growth on Hawai‘i will continue to be on the western side of the island, with continued development of resort-residential units, and in the Puna and Ka‘u districts, due to the availability of low cost land. Due to a variety of factors, including volcanic eruptions, difficult access, local community preferences regarding development, and others, little or no growth is anticipated in the following areas: (1) along the southeastern shoreline; (2) on the higher elevations of Mauna Kea and Mauna Loa; and (3) along the northeastern shoreline.

Hawai‘i’s visitor industry should expand over the next decade, as indicated by recovering occupancy and room rates since September 11, 2001. Contributing factors include: (1) a variety of natural and developed attractions, including the ongoing eruptions at Hawai‘i Volcanoes National Park; and (2) economic growth in California and other western states.

Table II-1. Socioeconomic Profile of the County of Hawai'i

Item	1990	2000	Growth since '90
Resident Population, County			
County of Hawai'i	120,317	148,677	23.6%
South Hilo District	44,639	47,386	6.2%
Puna District	20,781	31,335	50.8%
North Kona District	22,284	28,543	28.1%
South Kohala District	9,140	13,131	43.7%
South Kona District	7,658	8,589	12.2%
Hamakua District	5,545	6,108	10.2%
North Kohala District	4,291	6,038	40.7%
Ka'u District	4,438	5,827	31.3%
North Hilo District	1,541	1,720	11.6%
Visitors			
Annual Visitors, County	1,170,830	1,267,966	8.3%
By Origin			
U.S. Visitors	982,900	925,357	-5.9%
Foreign Visitors	187,930	342,609	82.3%
Average Visitor Census, County	16,970	21,831	28.6%
Income from Major Industries			
(\$ million)			
Visitor Expenditures, County	\$ 925.7	\$ 1,210.0	30.7%
Agricultural Sales, County	\$ 198.0	\$ 154.5	-22.0%
Labor			
County of Hawai'i			
Civilian Labor Force	61,550	70,000	13.7%
Employed	59,200	65,350	10.4%
Unemployed	2,350	4,650	n/a
Unemployment Rate	3.8%	6.7%	n/a
County Jobs, Wage and Salary Only¹			
Construction, mining	3,250	2,800	-13.8%
Manufacturing	2,250	1,650	-26.7%
Trans., communication, utilities	2,500	2,800	12.0%
Trade	12,600	13,600	7.9%
Finance, insurance, real estate	2,350	2,350	0.0%
Services and miscellaneous	14,250	19,100	34.0%
Government	8,450	10,950	29.6%
Agriculture	3,550	2,650	-25.4%
Personal Income, County			
Total (\$ million)	\$ 2,018	\$ 3,044	50.8%
Per capita	\$ 16,603	\$ 20,399	22.9%
Consumer Price Index—All			
	138.10	176.30	27.7%

1. 2000 job counts are preliminary for specific industry.

Source: Department of Business, Economic Development & Tourism. *State Data Book*. Annual.
Hawai'i Agricultural Statistics Service. *Statistics of Hawaii Agriculture*. Annual.

Note: Entries may not sum to totals due to rounding.

4. SOCIOECONOMIC PROFILE OF MAUI COUNTY

Table II-2 summarizes economic and demographic information about the County of Maui, including the islands of Maui (four districts), Moloka'i (two districts), Lana'i and Kaho'olawe (one district each). For statistical purposes, Kalawao County (the former colony on Moloka'i for quarantined Hansen's disease patients) is treated as a district of Maui County.

Many of the descriptive economic statistics for Maui County are available only at the aggregated County level; that is, they are not available for each individual island. Nonetheless, wherever possible, data for individual islands are used. Reflecting the data availability, the discussion below first presents information for Maui County, with an emphasis on describing quantitative indicators. Discussions of the individual islands that make up the County follow, with quantitative information provided as available. Estimates and figures presented in this section are taken from the State Data Book as well as the Maui County Data Book 2001, as are the estimates in Table II-1.

4.a. Maui County

4.a.(1) Population and Distribution

In the year 2000, the County of Maui had a population of 128,241 residents, up 27.6 percent since the 1990 U.S. census. The total Maui County population amounted to 10.6 percent of the State population, the third largest of the four counties (after O'ahu).

Based on year 2000 estimates, the island of Maui hosts the greatest population by far of the four County islands, supporting about 91.7 percent of Maui County residents. A much smaller fraction of the County's population lives on Moloka'i (5.8 percent) and Lana'i (2.5 percent). Kaho'olawe has no permanent residents.

4.a.(2) Primary Economic Activities

The economy of Maui County is dominated by a large visitor industry located mostly on the island of Maui. It also features a large but shrinking agriculture industry and a budding high-technology industry, also on the island of Maui.

Tourism

Tourism overwhelmingly dominates the economy of the County (personal communication with Maui Chamber of Commerce, April 2002). The County hosted over 2.3 million visitors in the year 2000, resulting in an average of 43,854 visitors present on the islands (the average visitor census).

From 1990 to 2000, the average visitor census increased 11 percent. While the annual number of visitors to Maui County actually declined 3.6 percent during that time, the visitor census nonetheless rose due to an increase in the average length of stay. Of the visitors present, approximately 95.4 percent were on the island of Maui, 2.1 percent on Moloka'i, and 2.6 percent on Lana'i. Also, approximately 86 percent were Americans and most of the remainder were Japanese and Canadians.

From 1990 to 2000, visitor expenditures increased significantly, by approximately 39.5 percent. This increase was greater than the 27.7-percent increase in inflation as measured by the Consumer Price Index (CPI).

Further detail on the visitor industry on each island is provided in the island-specific discussions, below.

Agriculture

Agriculture, while the second-largest industry in the County, is much smaller than tourism. Specifically, in 2000, agricultural sales in the County totaled approximately \$118 million, or only four percent of visitor expenditures.

In addition, Maui County's agriculture industry is becoming smaller in size. During the 1990s, agricultural sales declined 22.1 percent, due largely to contraction in plantation agriculture and increased competition from farmers on O'ahu.

Agricultural activities include sugar and pineapple plantations on the island of Maui, and diversified crops and ranching located mostly on the islands of Maui and Moloka'i. Further details on island-specific agriculture are discussed in the subsection for each island.

High-Technology Activities

As mentioned above, the island of Maui has a budding high-tech industry, although income figures for the industry have not been aggregated. Information on the specific activities is discussed in the subsection on Maui Island.

4.a.(3) Labor Force and Employment

In 2000, the County's civilian labor force numbered about 72,400 workers, up 28.1 percent since 1990. Employment reached 69,350 workers, up 28.9 percent since 1990 and resulting in a relatively low unemployment rate of 4.2 percent. The number of wage and salary jobs for Maui County increased 22.6 percent (versus 28.9 percent for all jobs), indicating a large increase in the number of self-employed workers and farmers.

As suggested by the discussion of primary economic activities above, most of the County's wage and salary jobs are concentrated in non-farming and non-manufacturing sectors. The primary employers are: (1) transportation, communications, and utilities; (2) trade (retail and wholesale); (3) services (hotel, tourism, and health); and (4) government. The number of wage and salary jobs rose in all these categories from 1990 to 2000. On the other hand, wage and salary jobs declined in the following sectors: (1) construction and mining; (2) manufacturing; (3) finance, insurance and real estate; and (4) agriculture (the declines would be less dramatic if self-employed workers and farmers were counted).

Employment estimates vary considerably from island to island within the County; more information is provided in the island-specific discussions below.

4.a.(4) Personal Income

Reflecting the growth in the tourism sector, the County's total personal income and per-capita income started out the decade in 1990 at \$2 billion and \$19,759 respectively, and by 2000, these numbers had risen to \$3.1 billion and \$24,211, respectively. This represents a significant increase in overall income of 55.3 percent, and a more modest increase in per-capita income of 22.5 percent. While beneficial, this modest increase in per-capita income failed to keep pace with inflation as measured by the 27.7-percent increase in the CPI during the same 1990-to-2000 period.

4.b. Island of Maui

4.b.(1) Population and Distribution

In the year 2000, the island of Maui had 117,644 residents. The population increased 28.2 percent since the 1990 U.S. census, a significantly greater increase than Moloka'i and marginally less than Lana'i. As noted above, the island hosts approximately 91.7 percent of the total County population. In 2000, Maui Island's population was geographically distributed as follows (presented in order of most- to least-populated):

- Wailuku District (Central Maui): 52.1 percent

Wailuku and Kahului, which abut one another at the northern end of the isthmus, serve as the commercial and industrial center of Maui Island. They also contain the County seat, the main airport, and Maui's main harbor. Most Wailuku District residents live in towns along the northern end of the isthmus and, to a lesser extent, along the southern end of the isthmus. The Wailuku District also hosts a large number of visitors, particularly in resorts along the south shore of the isthmus.

- Makawao District: 31 percent

Most Makawao District residents live in towns located "Upcountry" on the western slopes of Haleakala between the 1,000- and 4,000-foot elevations. To a lesser extent, they live in a few small towns near the shoreline at the northern and southern ends of the district. This district also hosts a large number of visitors, particularly in resorts along the south shore.

- Lahaina District (West Maui): 15.3 percent

Most residents of the Lahaina District live in towns located along the shoreline at the western end of the island. This district also hosts a large number of visitors in the West Maui resorts.

- Hana District: 1.6 percent

Most residents of the Hana District live in the town of Hana and in small communities scattered along the northern and eastern ends of Haleakala.

There are no large communities in the mountainous interior of West Maui, or along portions of the north and south shores of West Maui. Also, there are no large communities along the north, east and south flanks of Haleakala, or along the north and south shores of Haleakala. A variety of

factors contribute to the lack of development in these areas, including steep slopes, difficult access, the need for watershed protection, local community preferences regarding development, and others.

4.b.(2) Primary Economic Activities

The island of Maui has a strong economy that is driven by a large and growing visitor industry, a large but shrinking agriculture industry, and a budding high-technology industry.

Tourism

Tourism is Maui Island's primary business (personal communication with Maui Chamber of Commerce, April 2002). Maui Island hosted over 2.2 million visitors in the year 2000, resulting in an average of 41,819 visitors present on the island. Reflecting trends at the County level, from 1990 to 2000 the annual number of visitors to Maui Island declined 4.2 percent, but the average visitor census increased 9.6 percent due to longer stays.

Most of the resorts are located at the western end of the island, along the south shore of Central Maui, and along the southwestern shore of Haleakala.

Maui Island's visitor industry is healthy, as exhibited by strong occupancy and room rates. Contributing factors include: (1) the robust economic growth in California and other western states; (2) a new generation of commercial aircraft that can depart from the short runway on Maui with sufficient fuel to fly to the U.S. mainland; and (3) a variety of natural and developed attractions. Like tourism across all the Hawaiian islands, Maui Island's tourism level declined following the terrorist attacks of September 11, 2001, but has since begun to recover.

Agriculture

The economic significance of agriculture on Maui Island is small compared to tourism (personal communication with Maui Chamber of Commerce, April 2002). This represents a significant contrast to most of the 1900s, however, when sugar and pineapple were the economic mainstays of Maui Island, with plantations located in Central Maui and West Maui. Currently, only two plantations remain: a large sugarcane plantation which is the dominant user of land in Central Maui, and a large pineapple plantation whose fields are split between Central Maui and West Maui. In 1999, a small sugarcane plantation in West Maui closed, thereby freeing land for other uses.

As plantation agriculture has declined, other types of agricultural activities have, to some extent, replaced it. Some of the fields in Central Maui and West Maui have been replanted in diversified crops (i.e., all crops other than sugarcane or pineapple). Also, some Upcountry Maui farmers take advantage of the cooler temperatures to grow specialized crops. Diversified crops on Maui Island include: macadamia nuts, coffee, papaya and other fruits, seed corn, flowers and nursery products, and vegetables. Finally, most of the agricultural land that is unsuitable for growing crops is used for grazing.

While the economic significance of agriculture on Maui is now small compared to tourism, it remains the island's dominant user of land and water.

High-Technology Activities

Maui has a growing high-technology industry that was forged largely on two separate complexes.⁸ One is a grouping of five observatories near the summit of Haleakala. The observatories specialize in studies of the sun, galactic and quasar research, lunar and satellite ranging, and space surveillance.

The second high-technology complex is comprised of companies and operations at the Maui Research & Technology Park. The most prominent tenant is the Maui High Performance Computing Center, a national supercomputing center. Many of the companies in the Research & Technology Park take advantage of the Center's supercomputer, including some that support observatory operations.

4.b.(3) Outlook for Growth and Socioeconomic Change

The primary driving forces for Maui Island's economy will continue to be tourism and, to a much lesser extent, high-technology activities and diversified agriculture. However, limiting factors will be traffic congestion and possibly limited water in some parts of the island.

Most of the growth on Maui Island will continue to be on the west end of the island, on the southern shore of the isthmus, in the towns of Wailuku and Kahului, and in Upcountry Maui. Due to a variety of factors, including steep slopes, difficult access, the need for watershed protection, local community preferences regarding development, and others, little or no growth is anticipated in the following areas: (1) in the mountainous interior of West Maui; (2) along portions of the north and south shores of West Maui; (3) along the north, east and south flanks of Haleakala; and (4) along the north and south shores of Haleakala.

4.c. Island of Moloka'i

4.c.(1) Population and Distribution

In the year 2000, the island of Moloka'i had 7,404 residents, approximately 5.8 percent of the County's total population. The island's population has grown 10.2 percent since the 1990 U.S. census, a significantly smaller growth rate than those for Lana'i and Maui Island for the same period.

In the most recent census, only two towns had populations greater than 1,000 residents: Kaunakakai on the south coast (2,726); and Kualapu'u in central Moloka'i on Hawaiian Homestead Lands near the airport (1,936). The third largest community and a former plantation town, Maunaloa Town in West Moloka'i, had a population of 230. On the north side of the island, Kalaupapa had 147 residents. The remainder of Moloka'i's population lives in scattered communities along the narrow coastal plain on the south side of East Moloka'i, and in a small community near the now-closed Kaluakoi Hotel and Golf Club at the west end of the island.

There are no communities in the mountainous interior of East Moloka'i or on its flanks; no communities on the mountain that forms West Moloka'i or its flanks, with the exception of Maunaloa; no communities on the north shore other than Kalaupapa and a small community at the

⁸ Specific data on the size of this industry are not available.

east end of the island; no communities along the west shore except for the former resort area; and no communities along the south shore of West Moloka‘i.

4.c.(2) Primary Economic Activities

Moloka‘i has a small rural economy that is based largely on tourism, agriculture, ranching, and limited aquaculture.

Tourism

Moloka‘i hosted 64,560 visitors in the year 2000, resulting in an average visitor census of 904 visitors. Attractions include excursions to Kalaupapa, golf and ecotourism. However, even with the robust economic growth in California and other western states during the 1990s, Moloka‘i’s tourism industry has not expanded, primarily because it has not competed well with the other Hawaiian islands which have more attractions and offer direct mainland flights. Unlike Maui Island and Lana‘i, both Moloka‘i’s annual number of visitors and average visitor census declined, down 37.7 percent and 17.8 percent, respectively, from 1990 to 2000. The drop in visitor count was due largely to the fact that some hotels closed during the 1990s, resulting in a 23.3-percent decrease in the number of visitor units from 559 in 1990 to 429 in 2000. In addition, occupancy rates suffered for the remaining units; the average occupancy rate for the 429 visitor units on Moloka‘i was only 42.7 percent in the year 2000. Most recently, in January 2001, the island’s largest hotel—the 138-room Kaluakoi Hotel and Golf Club—closed operations.

Despite the decline in number of visitors to Moloka‘i, tourism remains one of the primary industries in Moloka‘i. The Moloka‘i Visitors Bureau is currently working with the Maui Visitors Bureau to attract more visitors to the island (personal communication with Maui Chamber of Commerce, April 2002).

Agriculture, Ranching and Aquaculture

Agriculture is the other primary industry in Moloka‘i. Similar to Maui Island, agriculture remains a part of Moloka‘i’s economy but has changed in its characteristics over time. For the greater part of a century, pineapple was the island’s chief industry. Plantations were located in West Moloka‘i on the Ho‘olehua Plain and on the western end near Maunaloa. However, the plantations closed by the early 1980s. A portion of the former plantation fields and other suitable agricultural lands have been planted in other crops, including watermelons, seed corn and other seed crops, coffee, bananas, papaya, vegetables, flowers and nursery products, and grass grown for hay. Also, *taro* continues to be grown in Halawa Valley on the east end of the island. Finally, agricultural lands not planted in crops are used mostly for grazing cattle.

However, the future growth of agriculture on Moloka‘i has been adversely affected by new competition from O‘ahu, where the closure of sugar plantations in the mid-1990s resulted in the release of good farm land for diversified crops. Farmers on O‘ahu have a competitive advantage because they are close to the large Honolulu market and, for export, Honolulu Harbor and the Honolulu International Airport. Competing farmers on Moloka‘i must absorb shipping cost to O‘ahu to supply these markets. As a result, agriculture is not expected to grow significantly.

In addition to diversified crops, aquaculture is being pursued on the sunny south shore of West Moloka‘i and in a few of the old Hawaiian fishponds on the south shore of East Moloka‘i. Fish, shrimp and *limu* (seaweed) are harvested for local sale and for export to O‘ahu.

4.c.(3) Outlook for Growth and Socioeconomic Change

In 2000, the unemployment rate was 14 percent, the highest in the major islands of the State. This high unemployment rate reflects the growing labor force combined with contraction in the visitor industry and slow or negative growth in other economic sectors. A number of residents engage in subsistence activity, including farming, hunting and fishing.

However, Moloka‘i has been experiencing some improvement in its economy through the rural Empowerment Zone/Enterprise Communities (EZ/EC) program. This program is administered by USDA’s Office of Community Development. The program promotes self-sustaining, long-term economic and community development in areas of poverty, unemployment and general distress. The program works by helping communities develop and implement comprehensive strategic plans which are supported by partnerships among private, public and non-profit entities.

Moloka‘i was selected as an Enterprise Community in 1999, and began receiving federal funding from USDA. Project leaders work to leverage these federal funds with a broad array of partners, including Federal, State and local government, non-profit organizations, area businesses, public schools, and the University of Hawai‘i. Currently, the Moloka‘i Enterprise Community has attracted a total of 42 partners, with a leveraging ratio of 24:1 (i.e., since January 1999, \$24 has been raised for every dollar from the EZ/EC grant). Partners may also provide technical support, project leadership and/or in-kind services.

With the implementation of its 10-year strategic plan, Moloka‘i seeks to achieve economic growth and community development through environmental protection, the promotion of diversified agriculture, encouragement of tourism, and the addition of new community facilities. Results from the Enterprise Community designation are already noticeable. Since its designation, the Moloka‘i EC has contributed to the decline in unemployment rate by creating a total of 88 new full-time jobs, with more than 80 percent of these jobs being sustainable positions (Moloka‘i Enterprise Community Annual Report, 2002).

In summary, although Moloka‘i is still experiencing slow economic and population growth, various efforts, including the EZ/EC program and cooperation between the Moloka‘i Visitors Bureau and the Maui Visitors Bureau, may help revitalize the island’s economy in the future.

4.d. Island of Kaho‘olawe

4.d.(1) Population

Kaho‘olawe has no permanent resident population. In fact, no communities have existed on Kaho‘olawe since before the 1940s.

4.d.(2) Activities on Kaho‘olawe

The U.S. military assumed control of Kaho‘olawe at the beginning of World War II (1941) and, for the next 49 years (through 1990), used the island for amphibious landing exercises; as a

target for naval and aerial bombardment training; and for other training involving the live-firing of weapons. Before 1941, Kaho‘olawe was used for ranching.

In 1994, the island was conveyed to the State and placed under the control of Native Hawaiians via the Kaho‘olawe Island Reserve Commission (see Chapter IV). That same year Congress authorized \$400 million for a 10-year program to clear the island of unexploded surface ordnance, and restore its cultural and natural resources. With funding from the U.S. Navy, a private contractor is clearing the island with the goal of making major portions of it safe for human access. The Navy estimates that 69 percent of the surface but less than 10 percent of the subsurface will be cleared by the end of the 10-year period.

Selected areas will be cleared for specific uses including revegetation with native species, trails and roads, cultural sites, camping areas, and educational facilities. An education and cultural center is planned, and a rock quarry is being developed that will be used to improve the existing eight-mile road from the shoreline base camp at Hanakanaea to the Lua Makika Crater.

While Kaho‘olawe has no permanent residents, about 50 workers live in barracks on the island, and another 325 workers are flown in from Maui Island four times a week for day visits to work in the ordnance-clearing effort. Also, the island is visited regularly by members of a Native Hawaiian organization that has a special arrangement with the Navy.

4.d.(3) Outlook for Growth and Socioeconomic Change

As indicated above, future land uses on Kaho‘olawe are likely to include preservation, education and cultural uses once the island is cleared of unexploded ordnance.

Table II-2. Socioeconomic Profile of the County of Maui
(including Kalawao)

Item	1990	2000	Growth since '90
Resident Population, County	100,504	128,241	27.6%
Maui Island	91,361	117,644	28.8%
Lahaina District	14,574	17,967	23.3%
Wailuku District	45,685	61,346	34.3%
Makawao District	29,207	36,476	24.9%
Hana District	1,895	1,855	-2.1%
Moloka'i Island	6,717	7,404	10.2%
Molokai, excluding Kalawao	6,587	7,257	10.2%
Kalawao County	130	147	13.1%
Lana'i Island	2,426	3,193	31.6%
Kaho'olawe Island	n/a	n/a	n/a
Visitors			
Annual Visitors, County	2,389,970	2,304,666	-3.6%
Maui	2,345,060	2,246,253	-4.2%
Moloka'i	103,630	64,559	-37.7%
Lana'i	45,930	87,662	90.9%
Average Visitor Census, County	39,500	43,854	11.0%
By Island			
Maui	38,150	41,819	9.6%
Moloka'i	1,100	904	-17.8%
Lana'i	250	1,131	352.3%
By Origin			
U.S. Visitors	36,250	37,676	3.9%
Foreign Visitors	3,250	6,178	90.1%
Income from Major Industries			
(\$ million)			
Visitor Expenditures, County	\$ 2,097.2	\$ 2,925.6	39.5%
Agricultural Sales, County	\$ 151.5	\$ 118.0	-22.1%
Labor			
Maui County			
Civilian Labor Force	56,500	72,400	28.1%
Employed	53,800	69,350	28.9%
Unemployed	2,700	3,050	n/a
Unemployment Rate	4.8%	4.2%	n/a

Table II-2. Socioeconomic Profile of the County of Maui (Including Kalawao)
(continued)

Item	1990	2000	Growth since '90
Labor (continued)			
Maui Island			
Civilian Labor Force	52,400	67,550	28.9%
Employed	50,300	65,000	29.2%
Unemployed	2,100	2,550	n/a
Unemployment Rate	4.1%	3.8%	n/a
Lana'i			
Civilian Labor Force	1,400	1,800	28.6%
Employed	1,300	1,700	30.8%
Unemployed	100	50	n/a
Unemployment Rate	5.9%	3.5%	n/a
Moloka'i			
Civilian Labor Force	2,700	3,100	14.8%
Employed	2,200	2,650	20.5%
Unemployed	500	450	n/a
Unemployment Rate	18.1%	14.0%	n/a
County Jobs, Wage and Salary Only¹	50,900	62,400	22.6%
Construction, mining	3,150	2,650	-15.9%
Manufacturing	1,950	1,750	-10.3%
Trans., communication, utilities	3,000	4,500	50.0%
Trade	13,650	16,700	22.3%
Finance, insurance, real estate	3,350	3,000	-10.4%
Services and miscellaneous	17,350	24,000	38.3%
Government	5,850	7,850	34.2%
Agriculture	2,600	1,950	-25.0%
Personal Income, County			
Total (\$ million)	\$ 2,010	\$ 3,120	55.3%
Per capita	\$ 19,759	\$ 24,211	22.5%
Consumer Price Index—All	138.10	176.30	27.7%

1. 2000 job counts are preliminary.

Source: Department of Business, Economic Development & Tourism. The State Data Book. Annual. Hawaii'i Agricultural Statistics Service. *Statistics of Hawaii Agriculture*. Annual.

Note: Entries may not sum to totals due to rounding.

THE ENDANGERED SPECIES ACT⁹

CHAPTER III

This chapter provides relevant information from the 1973 Endangered Species Act (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 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 and private sectors 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 y 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."

⁹**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).

2. CONSULTATION UNDER SECTION 7 OF THE ACT

In accordance with section 7 of the Act, the implementing regulations require 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 that initiates consultation when an activity that requires a permit may affect a listed species or designated critical habitat.

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 affect" opinion.

If the Service finds, in its biological opinion, that a proposed action is not 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/or 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. While clearly prohibiting direct injury to individuals of a listed species, the restrictions on *takings* also apply to actions that destroy or alter the habitat of a listed species if the habitat alteration would result in harm to the 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 IN MAUI
AND HAWAI‘I COUNTIES¹⁰**

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. Only the protections in place on proposed critical habitat for the moth are discussed in this chapter. As appropriate, the information in this chapter and in Table I-1 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. Integrated Natural Resources Management Plans

The Sikes Act Improvements Act (SAIA) of 1997 requires 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 installation with stewardship of the natural resources found there. Each military installation that has listed species or critical habitat on areas it manages consults with the Service on its INRMP.

1.b. 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.

¹⁰**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).

1.b.(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 the population of 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, the projects given the highest priority are those 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 provide expanded habitat for wildlife populations that inhabit National Wildlife Refuges.

1.b.(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. In this program, the Service's mission is to work with others to conserve, protect, and enhance fish, wildlife, and plant populations 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; and
- Protect native Hawaiian ecosystems and natural communities through land and water acquisition and management.

Since funding is limited, the Service gives priority to projects that implement management or research actions that directly contribute to protecting or restoring habitats for multiple

endangered, threatened, candidate, or rare species; address key threats to native ecosystems or habitats; and benefit rare or unique ecosystems or habitats.

1.b.(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; and
- 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; and
- Inventorying and mapping coastal resources.

1.b.(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 ESA), 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.b.(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.c. 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 five 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; and

- Caves and rare species habitat.

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 five- 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.d. Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP) is a voluntary USDA conservation program for farmers and ranchers who wish to address serious threats to soil, water, and related natural resources on their property. Administered through NRCS, EQIP provides technical, financial and education assistance for designated priority areas or significant statewide resource concerns.

Eligible land includes cropland, rangeland, pasture, forestland, and other farm or ranch lands. To evaluate proposed EQIP projects, NRCS first assesses the environmental benefits to be achieved from the planned implementation of conservation practices. Subsequently, applications are then ranked based on the amount of financial assistance requested and the projected environmental benefits.

EQIP offers five- to 10-year contracts for the implementation of conservation practices in each site-specific conservation plan. Each conservation plan, developed with assistance from NRCS or other service provider, must treat the targeted resource concern to a sustainable level. NRCS may pay up to 75 percent of the costs for eligible conservation practices which improve or maintain the health of the natural resources in the area.

The southern portion of proposed critical habitat Unit 7 on Moloka‘i has been designated as an EQIP priority area to address resource concerns about erosion, sedimentation, pest infestation and insufficient water supply. None of the other proposed critical habitat units contain EQIP priority areas.

1.e. Conservation Reserve Program

The Conservation Reserve Program (CRP) is a voluntary program administered through the Farm Service Agency, with technical assistance provided by the NRCS. By offering annual rental and cost-share assistance, NRCS encourages farmers and ranchers to plant long-term vegetative cover to improve soil, water, and wildlife resources.

To be eligible for CRP, land must have been planted in an agricultural commodity two out of the last five years. Some marginal pastureland may also qualify for CRP if suitable for planting. In addition, the land must be considered highly erodible or subject to scour erosion. Finally, the land must be devoted to any of a number of highly beneficial environmental practices, such as filter strips, riparian buffers, grass waterways, shelter belts, wellhead protection areas, and other similar practices.

Annual rental payments are made based on the agricultural rental value of the land. Cost-share assistance will cover up to 50 percent of the cost of establishing the grass or trees on the land. CRP contracts last from 10 to 15 years, depending on the goals of the operator.

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 or 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, Chapter 183C). To this end, only limited development and commercial activity are 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 other 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, Chapter 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.

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 sustainable 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. Within the proposed critical habitat for the moth, these include Forest Reserves and Natural Area Reserves. 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 (Hawai'i Revised Statutes, Sections 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.

The proposed critical habitat for the moth includes portions of the Kahikinui Forest Reserve on Maui, Moloka'i Forest Reserve on Moloka'i, and the Makaula-Ooma Mauka Tract Forest Reserve on the Big Island.

2.d.(2) Natural Area Reserves

A Natural Area Reserve (NAR) is based on the concept of protecting ecosystems rather than individual species, with the goal of preserving and protecting representative samples of Hawaiian biological ecosystems and geological formations (Hawai'i Revised Statutes, Sect. 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 NARs include hiking, nature study and bedroll camping. Game hunting and research or educational activities are allowed by permit. Prohibited activities in NARs include: improvements or construction; tent camping; vehicles, except on designated roads; and removing, injuring, killing or introducing plants or wildlife.

The proposed critical habitat for the moth contains all or part of the following two NARs on Maui:

- 'Ahihi-Kina'u (2,045 acres in size): this reserve was the first reserve created under the Natural Area Reserve System. Sparsely vegetated, the reserve is unique in that it contains an example of the most recent lava flow on the dry south flank of East Maui. The reserve also contains a marine area with high and low salinity anchialine pools that house a diversity of rare Hawaiian shrimps and native Hawaiian cave animals in coastal lava tubes. Coastal dry shrublands, coastal mesic boulder beach communities, and examples of pioneer vegetation can also be found within this NAR serving as habitats for other rare native plants and animals.
- Kanaio (876 acres in size): this reserve is located in rough lava terrain on the southeast slope of Haleakala. The reserve protects a remnant of the native dryland forest that once covered the leeward slope of Haleakala. Kanaio provides visitors with a rich assemblage of native dryland trees and shrubs.

2.e. Wildlife Sanctuaries

Wildlife sanctuaries are established by the State to conserve, manage and protect indigenous wildlife (Hawai'i Revised Statutes, Sections 13-125). Within these sanctuaries, the following activities are prohibited: (1) to remove, disturb, kill, or possess any form of plant or wildlife; and (2) to introduce any form of plant or animal life. Also, human activity is strictly limited: no firearms or hunting equipment are allowed in nearly all sanctuaries; no camping, no fires, and no vehicles are allowed except on designated roads; and, in many cases, no entry is allowed except by permit for scientific, educational, or conservation purposes.

The proposed critical habitat for the moth includes portions of the Kanaha Pond Wildlife Sanctuary located along the northern shoreline of Central Maui and the Pu'u Wa'awa'a Forest Bird Sanctuary on the west side of the Big Island.

2.f. Hunting Units

A total of 47 hunting units, administered by DLNR, have been established across the State to control game hunting (Hawai'i Administrative Rules, Title 13, Chapters 122 and 123). The proposed critical habitat for the moth contains portions of the State managed hunting units on Moloka'i and the Big Island. The hunting units on Moloka'i feature feral pigs, goats, and axis deer; ringneck pheasant; chukar partridge; Francolin (two species); quail (two species); dove (two species); and wild turkey. The hunting units on the Big Island feature feral pigs, goats, and sheep; chestnut bellied sandgrouse; chukar partridge; Francolin (three species); pheasant (three species); quail (three species); dove (three species); and wild turkey

Within the State Hunting Units, hunting is a licensed activity and is restricted. Restrictions vary among the islands and address: bag limits, hunting seasons, days allowed, hours of the day, and hunting method (rifle, muzzleloader, shotgun, handgun, bow and arrows, spear, dogs and knives). 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. Game hunting restrictions on private land are set by the landowner

2.g. Na Ala Hele State Trail and Access Program

The purpose of the Na Ala Hele 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 (Hawai'i Revised Statutes, Sections 198D-11 and 198D-6).

Activities allowed under this program by permit from DLNR include camping, hunting and fishing. Some trails are specified 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. Na Ala Hele trails and access roads exist on Maui, Moloka'i and the Big Island.

2.h. 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.

The proposed critical habitat for the moth contains portions of the Kamakou Preserve on Moloka'i. This area is discussed more in detail later in the chapter under the "Other Land Management" section.

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, Chapter 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 (Hawai'i Revised Statutes, Chapter 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 (Hawai'i Revised Statutes, Sect. 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 (Hawai'i Revised Statutes, Chapter 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 (Hawai‘i Revised Statutes 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. 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 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. On the Big Island, Agricultural land is often used for large-lot subdivisions. These subdivisions can be designed for “residential” development (i.e., housing units targeted at Hawai‘i residents) or high-end “resort/residential” development (i.e., housing units targeted at non-Hawai‘i residents and associated with resorts). Agricultural subdivisions typically occur on lower quality agricultural land.

Listed species are found in some parts of the Agricultural District, particularly in gulches, in craters, 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 Districting

The State Urban and Rural Districts in each county are subject to county land use and development (commercial, industrial, residential, etc.) regulations, including county community plans, zoning, and building code regulations.

4.c. Coastal Zone Management Program and Special Management Areas

As mandated by Hawai'i Coastal Zone Management program, the county has an additional layer of regulation that provides special controls on development in Special Management Areas (SMAs) located along the shoreline. Development in an SMA requires an SMA Use Permit from the county where the development is proposed. The intent is to avoid the permanent loss of valuable resources and to ensure adequate access to beaches, recreation areas and natural reserves (Hawai'i Revised Statutes, Chapter 205A). Although SMAs are defined to include all lands extending not fewer than 100 yards inland from the shoreline, counties can amend their boundaries to achieve certain Coastal Zone Management objectives. Amendments removing areas from an SMA are subject to State review for compliance with the coastal law. The coastal portions of Unit 1 (Maui) and Unit 3 (Maui) overlap with the Special Management Area; the remaining Units are outside the Special Management Area.

4.d. County Boards of Water Supply

Boards of Water Supply in each county own and manage land in their island watersheds in order to protect their county's supply of water. Watersheds generally include mountainous areas.

5. OTHER LAND MANAGEMENT

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

5.a. Preserves Involving The Nature Conservancy of Hawai'i (TNCH)

The Nature Conservancy of Hawai'i (TNCH) is a private, non-profit affiliate of a national organization that works with Federal, State and private partners to protect Hawai'i's natural areas that shelter native species. The mission of TNCH 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 preserves TNCH often takes advantage of Hawai'i's NAP program whereby the State provides two-thirds of the cost of managing private land dedicated to conservation (see discussion of NAP in Section 2.d.).

Management goals for the preserves include some or all of the following: (1) control non-native species; (2) suppress wildfire; (3) restore the integrity of dryland forest ecosystem; (4) reduce damage caused by feral ungulates and small mammals; and (5) prevent extinction of rare species in the preserves. General management actions taken to attain the aforementioned goals include various fencing; monitoring and researching native plant species; hunting to control ungulate population; controlling weeds; and other various programs to prevent wildfire, control non-native plants, etc. Brief descriptions of the preserves in the proposed critical habitat with TNCH involvement are presented below.

The proposed critical habitat for the moth contains portions of the following preserve on Moloka'i:

- Kamakou Preserve (2,274 acres)

Kamakou Preserve is a lush rain forest located in the mountainous interior of East Moloka'i near the summit of the island's highest mountain. The Preserve hosts

numerous rare plant species, native insects, native snails, and native birds, as well as provides important habitat for many of these species. The land is owned by Moloka'i Ranch, Ltd., which, in 1982, granted a conservation easement to TNCH to restore the area and protect it in perpetuity.

5.b. Watershed Partnerships

5.b.(1) Maui Watershed Partnerships

Maui has two Watershed Partnerships—the East Maui Watershed Partnership (EMWP) covering about 100,000 acres of watershed, and the West Maui Mountains Watershed Partnership (WMMWP) of about 50,000 acres. These large areas include all or most of Haleakala National Park, the Protective and Limited Subzones of the Conservation District, State forest reserves, State NARs, the Manawainui Plant Sanctuary, State-managed hunting units, State trails, the portion of the West Maui watershed managed by the county Board of Water Supply, the private Waikamoi and Kapunakea Preserves, the private Pu'u Kukui Watershed Management Area and, for the EMWP, considerable land in the Agricultural District. Members of the EMWP include DLNR, the Federal government (the National Park Service), TNCH and private landowners. The WMMWP has members from the State, TNCH, the Maui County Board of Water Supply, and private landowners.

Participants in the Watershed Partnerships pool their expertise and other resources to implement an active watershed management program with the basic objective being to protect the watershed ecosystems in perpetuity. Watershed management programs include water and watershed resource monitoring, pest animal control, weed control, public education and awareness, and management of infrastructure improvements.

5.b.(2) Moloka'i: East Moloka'i Watershed Partnership

Moloka'i's sole watershed partnership, the East Moloka'i Watershed Partnership (EMWP), was formed in late 1999. It encompasses about 22,000 acres extending from the mountainous interior of East Moloka'i down to both the north and south shorelines. The area includes the Kalaupapa Historical National Park, the island's two NARs, Pelekunu and Kamakou Preserves, and State-managed hunting units. The area encompasses considerable land in the Conservation and Agriculture Districts and a small amount of land in the Urban District.

Membership in the EMWP includes private landowners (Kamehameha Schools, Kapualei Ranch), the State DLNR Division of Forestry and Wildlife, TNCH, Maui County, the Maui Board of Water Supply, Ke Aupuni Lokahi Enterprise Community Governance Board (a grassroots community organization), and Federal agencies (the National Park Service, the Environmental Protection Agency, NRCS, the U.S. Geological Services, and the Service).

The main focus of the partnership is to protect and enhance high-quality native Hawaiian rain forest communities. Using the traditional *ahupua'a* (i.e., Hawaiian land division) approach to dividing land for resource management, watersheds are to be protected from the mountain-top to the sea. Participants in the EMWP share expertise and provide funding and other resources to implement an active watershed management program designed to maintain and increase the watershed capacity and reduce erosion. Upper elevations (above 3,500 feet) are to be kept free of feral animals by installing contour fencing. At mid-elevations (1,000 to 3,500 feet), goat populations are to be reduced to allow recovery of vegetation. Also, a monitoring system will be established to help with long-range planning.

The initial focus of EMWP's efforts will be the Kamalo/Kapualei watershed project on the south side of the island. The goal of this project is to protect and restore 2,000 acres of native rainforest and shrub land by fencing and removing feral goats and pigs from the upper elevations. An existing five-mile long fence may be extended in both east and west directions as neighboring landowners agree to participate.

5.c. Kaho'olawe: Kaho'olawe Island Reserve

Used as a bomb target by the U.S. Department of Defense (DoD) for many years, the management and use of Kaho'olawe has changed significantly in the recent past. In late 1990, DoD stopped using Kaho'olawe for bombing and target practice. In 1993, the Hawai'i State Legislature established the Kaho'olawe Island Reserve to protect the entire island and surrounding coastal waters extending two miles seaward, and established the Kaho'olawe Island Reserve Commission (KIRC) under Native Hawaiian control to manage the island. In 1994, the U.S. Navy signed a deed returning Kaho'olawe to Hawai'i.

By Hawai'i law, the Kaho'olawe Island Reserve is to be used solely and exclusively, in perpetuity, for: (1) the preservation and practice of all rights customarily and traditionally exercised by Native Hawaiians for cultural, spiritual, and subsistence purposes; (2) the preservation and protection of the Reserve's archaeological, historical, and environmental resources; (3) rehabilitation, revegetation, habitat restoration, and preservation; and (4) education. Commercial uses are strictly prohibited in the Reserve.

Congress authorized \$400 million to clean the island and restore its cultural and natural resources. The entire island is being cleared of surface ordnance to be reasonably safe for human access. Selected areas will be cleared for specific uses including revegetation with native species, trails and roads, cultural sites, camping areas, and educational facilities.

APPROACH TO THE ECONOMIC IMPACT ANALYSIS¹¹

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

An 10-year time horizon is used because many landowners and managers do not have specific plans for projects beyond ten 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 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; (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.

¹¹**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. 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 designation of critical habitat, 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.

2.d. Existing Protections

The next step in the analysis involved identifying the impacts on activities that were expected to result 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. County protections include land-use restrictions for activities in the Special Management Area or restrictions based on local plans and zoning ordinances.

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 Economic 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 the section 7 provisions. The types of economic costs that were considered included, but were not limited to, changes in revenues, costs, and property values.

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 designation of critical habitat. 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. 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 or unknown; (3) the impacts are highly speculative; or (4) data needed to quantify impacts are not reasonably available. In these cases, the possible impacts were discussed qualitatively.

2.h. Costs to Small Entities

All of the entities directly and indirectly affected of the section 7 listing and critical habitat provisions of the Act were evaluated to determine which, if any, are considered a small entity by the 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 Foreword, 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 moth as an endangered species and with designating critical habitat for the moth. However, the Service cannot exclude an area if it determines that the exclusion will result in the extinction of the species.

As explained in Chapter V, the approach used in this economic analysis involves estimating the total section 7-related economic costs and benefits (also referred to as economic impacts) of the moth listing and critical habitat designation. As a result, for each potential impact, the analysis presents estimates of economic impacts likely to occur from implementing both the species listing provision and the critical habitat provision of section 7 of the Act.

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), and section 7-related economic benefits (Section 6). A summary of the direct and indirect costs and benefits is given in Section 7. 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 CONSULTATIONS

In order to provide a context for the analysis in Section 3 below, this section gives a summary of the past consultations that concerned the moth. 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

Service records indicate that the Service has conducted five informal section 7 consultations since the moth was listed in February 2000. All five informal consultations involved the United States Department of the Navy and all five addressed unexploded ordnance removal activities,

including controlled burns, at Kaho‘olawe. Because the Navy conducted surveys in advance for the moth’s presence in areas targeted for controlled burns and because of the Navy’s steps to avoid tree tobacco plants through the establishment of firebreaks and controlled burn planning, the Service concurred with the Navy’s opinion that the proposed activity was not likely to adversely affect the listed species. The Service also recommended that tree tobacco plants be monitored before and after burning and that the outplanting of native host plant ‘aiea (*Nothocestrum sp.*) at a ratio of three plants to one be done to replace any plant that died as a result of the burn.

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

2.b.(1) Focus of Consultation

For the moth, 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 remove, thin or destroy moth habitat, whether by burning, mechanical, chemical or other means (e.g. wood cutting, grading, overgrazing, construction, road building, mining, herbicide application, etc.);
- Activities that appreciably decrease habitat value or quality through indirect effects (e.g. introduction or promotion of invasive plant species, forest fragmentation, overgrazing, augmentation of feral ungulate populations, water diversion or impoundment, groundwater pumping or other activities that alter water quality or quantity to an extent that they affect vegetation structure); and
- Activities that increase the risk of fire.

2.b.(2) Cost of Consultation

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 the 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.

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 and 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 (if a Non-Federal Applicant)	\$5,200	\$15,700	\$28,900
Source: Project consultants and U.S. Office of Personnel Management, 2002 General Schedule Salary Table.			

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

2.b.(3) Cost of Biological Survey

As a general matter, the cost of a biological survey to determine if the *primary constituent elements*, specifically the native host plants, exist in an area is assumed to be similar to the cost required to survey an area for listed plant populations because the moth relies on a listed plant and other native plants for survival. Thus, the cost of a biological survey for a particular piece of land and a technical report on the findings varies according to a number of parameters:

- Size of the land area: The consultation history for a variety of listed plants suggests that projects are of three sizes: small (fewer than 10 acres), medium (11-100 acres), or large (101-500 acres). Large land areas take longer to survey and thus are more costly to survey.
- Ease of access to the site: Some sites can be reached easily while others can be reached only by helicopter. More remote sites 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 estimates of the cost to survey land areas with different combinations of features and to prepare the 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; (4) travel costs for the survey team are \$1,000 to \$1,500 for round-trip airfare from O'ahu, car rental, and per diem; and (5) 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	\$3,700	\$3,900	\$5,100
100 Acres, Open Area	\$4,500	\$4,900	\$5,900
100 Acres, Forested Area	\$10,200	\$11,400	\$14,900
500 Acres, Open Area	\$15,900	\$17,700	\$22,900
500 Acres, Forested Area	\$44,600	\$50,600	\$67,900
Source: Project consultants. Based on discussions with a Hawai'i-based biological consulting firm in 2002.			

As Table VI-2 indicates, the costs of a biological survey could range from as little as \$3,700 in a 10-acre, easily accessible, open area to as much as \$67,900 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.b.(4) Costs of Project Modifications

As discussed in Section 2.a. above, no formal consultations regarding the moth have yet occurred, and the five informal consultations were limited to ordinance removal activities. However, the section 7 consultation process may result in certain modifications to a proposed project in order to avoid a finding of adverse modification to the moth critical habitat.

As mentioned in Chapter 1, the moth relies on several host plants during the larval and adult life stages. The larval host plants include two species in the endemic *Nothocestrum* genus (*N. latifolium* and *N. breviflorum*). The plants in the *Nothocestrum* genus are commonly known as 'aiea and are considered uncommon. Though not all *Nothocestrum* species are presently listed as threatened or endangered, *N. breviflorum*, which is found only on the Big Island, is listed as endangered. 'Aiea are straggly soft-wooded trees with small sweet-smelling yellow flowers.

If any larval host plants would be killed for a project, land use, or activity, the Service indicates that a typical project modification would be to collect seeds and plant materials from the host plant, germinate the seeds in a nursery, cultivate the plants until they are large enough to be replanted, and then replant the seedlings in the same general area they were removed from.

The cost of this project modification will depend on a series of variables. Most of the planned projects in critical habitat that require this project modification will have a source of water for irrigation (e.g., residential homes, water line projects, road projects). However, it is assumed the new outplanting site will be up to half a mile away from the water source. Also, it is assumed that available biologists with native Hawaiian plant outplanting experience may have to travel from O'ahu to the project site.

Based on discussions and estimates from several local landscapers and nurseries, the total cost to outplant one *Nothocestrum sp.* is roughly \$120 per plant. This estimate includes seed collection, germination, irrigation system installation, labor, shipping, irrigation water and

maintenance until the plants become established, and airfare from O‘ahu if necessary (Hui Ku Maoli Ola Native Hawaiian Plant Specialists, Akamai Gardens, Aikane Nursery, Big Island Tropical Landscape and Nursery, Lehua Lena Nursery, Pia-Kona Ltd., 2002).

Enclosures may be required to protect the outplantings of larval host plants. In certain areas, there are existing or planned plant enclosures that are maintained to promote the growth of native plants. However, other areas do not have these. Assuming a density of roughly 500 plants per acre, the total cost to build and maintain an enclosure for a period of 10 years is \$160 per plant. This estimate is based on the cost to fence an area to exclude goats and other ungulates, fire control, alien plant control, rodent control, annual monitoring, and administration (Hawaiian Forest Industry Association, 1998; DLNR, PIA-Kona Ltd., 2002). Thus, if an adequate plant enclosure is not located near a project, the total outplanting costs could be \$280 per larval host plant.

The moth also relies on native, nectar producing adult host plants for foraging, sheltering, dispersal, breeding, and egg production. The adult host species include, but are not limited to:

- *Koali ‘awa* or morning glory (*Ipomoea indica* and other species within the genus *Ipomoea*). This common sprawling vine has blue or purple flowers.
- *Maiapilo, pilo, or pua pilo* (*Capparis sandwichiana*). This shrub has three-to 15-foot straggling stems, white flowers, and is a member of the caper family. The Service has listed the plant as a species of concern.
- *Ilie'e, 'ilihe'e, lauhihi* (*Plumbago zeylanica*). This sprawling shrub has white flowers and sticky seeds.

Adult host plants are far more common than larval host plants, are found in many different areas, and are not listed as threatened or endangered. Moreover, in contrast to the larval stage, adult moths are mobile and can fly far distances to find host plants. Thus, the Service indicates that project modifications for activities affecting these plants would not require seed collection, germination, fencing, or three-to-one replacement planting. Instead, the extent of the project modifications would depend upon the number of adult host plants in the vicinity of the project. If there are other adult host plants in the area, no project modifications would be required. On the other hand, if the planned project were to disturb the only existing adult host plant population in an area, project modifications could involve avoidance of existing adult host plant populations where possible and spot planting of replacement adult host plants, likely at less than a one-to-one basis. The approximate cost for outplanting adult host plants is roughly \$20 per plant.

Additional project modification costs are determined on a project-by-project basis in Section 3 below.

3. DIRECT SECTION 7-RELATED COSTS

The following analysis of direct section 7-related costs addresses ongoing land-use activities in the proposed critical habitat, but excludes certain areas and manmade features and structures that are not considered to be part of the proposed critical habitat because they are known not to contain the *primary constituent elements* for the moth (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, "Indirect Costs," while Appendices VI-A and VI-B provide background information on hunting and game-mammal management.

Affected Hunting Acreage

Two of the eight proposed critical habitat units overlap with State-managed hunting lands:

- Unit 6 (Big Island) overlaps with parts of State Hunting Unit J.
- Unit 7 (Moloka'i) overlaps with parts of State Hunting Units D and E.

These overlapping areas represent almost 20,860 acres on the Big Island (three percent of the total State-managed Hunting Units on the Big Island) and 3,090 acres on Moloka'i (16 percent of the total State-managed Hunting Units on Moloka'i).

The proposed critical habitat Unit 6 (Big Island) overlaps with a popular hunting area in the Pu'u Wa'awa'a management area on the Big Island. In 1996, the Service helped the hunting community establish a list of places to safeguard for the future of hunting. Pu'u Wa'awa'a was identified as one of the top priorities on the list. The area is popular due to its relatively easy access, large number of game bird and mammal species, and scenic beauty.

The proposed critical habitat Unit 7 (Moloka'i) overlaps with an easily accessible hunting area in the Moloka'i Forest Reserve. The Moloka'i Forest Reserve Access Road (Maunahui Road) crosses the top half of the proposed unit, and a few spur roads provide access to other hunting opportunities within the unit.

The proposed critical habitat does not overlap with any State Hunting Units on Maui, and there are no State-managed Hunting Units on Kaho'olawe.

Private lands on Maui, Moloka'i, and the Big Island may be available for game hunting, though not managed by DLNR as State Hunting Units. However, public access to private lands is limited and subject to change, based on landowners' actions.

Potential Project or Activity, Next 10 Years: Game management and hunting-related projects.

The draft Pu'u Wa'awa'a Management Plan identifies a series of game management and hunting related projects planned for the next 10 years. These include: utilizing a reservation system to regulate entry into Pu'u Wa'awa'a during periods of high hunter demand, managing highly degraded areas for game mammal hunting as a sustained yield resource, utilizing public hunting to control feral ungulate populations in conservation areas, promoting youth and disabled hunter programs, researching game mammal and game bird populations to guide future hunting program designs, controlling game bird predators such as mongooses and feral cats, providing water to game birds by installing game bird guzzlers, cultivating five acres of grain to increase dove hunting opportunities, expanding game bird hunting opportunities, and developing a bird dog training area.

Based on a Statewide consultation on hunting in 2001 (see Appendix VI-A), game management and hunting-related projects on Moloka'i supported by Federal funding may include

maintenance or construction of a hunter check-in station and game mammal surveys. Fencing or installation of covers on existing game bird watering units has been completed.

Federal Involvement: Federal cost-sharing of many DLNR game-management projects.

The *Federal involvement* is the Federal funding provided by the Service to DLNR to restore and rehabilitate wildlife habitat and to support wildlife management research. The funding is provided as part of the Pittman-Robertson Act (see Appendix VI-A, Section 7).

Other Land Management: All of the State hunting areas in the proposed critical habitat on Moloka'i are also in the Forest Reserve, (See Table I-1), and all of the State hunting areas on the Big Island will be managed by DOFAW as part of the Pu'u Wa'awa'a management area.

Consultation Costs:

C Total Section 7 Costs: \$7,500

No 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.

Because of the presence of listed plants and wildlife throughout most public hunting lands, DLNR consults with the Service once every five years on wildlife management projects that are partially funded under the Pittman-Robertson Act. Historically, these consultations have not taken the moth into consideration because the moth was listed quite recently (February 2000). The critical habitat designation may cause the Service to increase the scope of the section 7 consultation to assess impacts on the moth. This analysis assumes that the increase in scope will involve a Service biologist familiar with the moth to review the proposed projects. The cost estimate is based on five days of time at approximately \$750 per day. Two consultations over 10 years increases the cost to \$7,500 ($5 * \$750 * 2$).

Anticipated Project Modifications and Costs: None

Past section 7 consultations on hunting have required project modifications to protect listed plant species (see Appendix VI-A). In general, these project modifications were made to ensure that Federal funds were not used to maintain or augment feral ungulate populations. Future consultations for the listed plants will result in similar project modifications. Since project modifications will be designed to protect native plants, they will also help to protect the host plants for the moth. The three hunting units that are included in the critical habitat for the moth contain many populations of listed plants, so new project modifications for the moth are not anticipated to be necessary.

Potential Entities Impacted:

Federal: Service

State: DNLR

3.b. Residential Development

3.b.(1) Kula Residence Lots

Approximately 4,425 acres in Unit 2 (Maui) are managed by the Department of Hawaiian Home Lands (DHHL). The mission of DHHL is to manage the Hawaiian Home Lands trust effectively and to develop and deliver land to Native Hawaiians. To that end, DHHL recently completed infrastructure development for a residential subdivision, the Kula Residence Lots (also known as Wai'ohuli Residential Lots). Existing improvements include access roads, a drainage system, a water system, an electrical distribution system, and related work. Lots are less than two acres in size, and leases for 300 of the 320 lots were awarded to Native Hawaiian beneficiaries in 1985 and 1986. With the completion of the improvements, lessees can finally begin construction of homes on the individual lots. Lessees are responsible for the construction of their own homes; thus, the current pace of construction varies by lot, depending upon the individual lessee and their ability to obtain financing.

The U.S. Department of Housing and Urban Development (HUD) sponsors a loan insurance and a loan guarantee program that assist Native Hawaiians to become homeowners. Under these programs, HUD does not make the loan or provide financing. Rather, HUD insures the lender against loss in the event of a default. Because of these programs, the lender may be more willing to provide financing than it would be without the program. HUD expects the two programs to enable Native Hawaiians to tap a variety of mortgage financing programs that would not otherwise be possible.

Based on a review of available maps, it appears that approximately 10 lots of the 320-lot subdivision are within the proposed critical habitat, in the northeastern portion of Unit 2 (Maui). The current status of these lots varies widely: some lots do not appear disturbed, while other lots have been graded, and the foundation of a home has been constructed on at least one lot. It is unknown how many of the lessees in the area overlapping with critical habitat will participate in HUD loan guarantee programs.

Potential Project or Activity, Next 10 Years: Residential construction

Federal Involvement: Loan Insurance or Guarantee by HUD

Consultation Costs:

C Total Section 7 Costs: \$0 to \$44,500

Estimate is based on the following: (1) zero to five consultations, (2) Low cost from Table VI-1 of a consultation with a Federal agency as the Applicant and the involvement of a non-Federal entity, and (3) the cost of a biological survey, based on a 10-acre site with easy access. The estimated number of consultations reflects the uncertainty on the amount of lessee participation in HUD loan guarantee programs and on the number of lessees that have already obtained financing. While HUD deals directly with lending institutions and not with individuals, a consultation may involve the lending institution and/or the lessee to provide information about planned construction on the site.

Anticipated Project Modifications and Costs:

C Total Section 7 Costs: Minor

Residential construction involves grading and clearance. Due to the location of the development on the edge of the proposed critical habitat, it is likely that the construction of homes on the area that overlaps with the proposed critical habitat - approximately 10 lots and fewer than 20 acres in total - will not adversely modify the critical habitat unit.

According to the Proposed Rule, there are no known larval host plant populations within Unit 2 (Maui). On the other hand, adult host plant populations are found within Unit 2 (Maui). Because of the limited lot size and terrain considerations, it may not be feasible to avoid adult host plants and still construct the planned home. Where the plants cannot be avoided, the Service may request use of adult host plants in landscaping. Assuming the Service required each house lot to plant two adult host plants, the total cost could be \$200 (5 lots * 2 plants * \$20), based on the outplanting cost given in Section 2. Whether or not this recommendation is required depends upon whether the planned project will destroy the only stand of adult host plants in the area or not. However, even under the most conservative assumptions, the potential project modification costs can be considered minor. If no host plants exist on the lots, then no project modification costs would be anticipated.

Potential Entities Impacted:

Federal: Service, HUD

Private: Lending institutions, Native Hawaiian lessees (individuals)

3.b.(2) Kahikinui Kuleana Homesteads

Approximately 16,410 acres in Unit 1 (Maui) are managed by DHHL. As noted earlier, the mission of DHHL is to manage the Hawaiian Home Lands trust effectively and to develop and deliver land to Native Hawaiians. Approximately 1,000 acres of the 16,410 acres owned by DHHL in Unit 1 (Maui) have been subdivided and leased to approximately 74 individual lessees as part of the DHHL Kahikinui Kuleana Homestead pilot program. Beneficiaries are granted raw land; the only improvement to be provided by DHHL is a bladed roadway network to provide access to individual parcels. Infrastructure, including housing units, water, sewage, solid waste disposal, communications, and energy, are the responsibility of the lessees. This unique program provides a homesteading alternative while giving beneficiaries immediate access to the land and the opportunity to participate in the creation of a community.

At present, very few homes have been constructed and as of March 2001, Kahikinui had an official population of 12 people. As noted earlier, beneficiaries are responsible for the construction of their own homes and for the necessary infrastructure. There are no plans to extend electrical service to the area; instead, energy is to be provided by generators and solar collectors. There are no plans for the development of wastewater infrastructure; instead, beneficiaries are required to dispose of wastewater through portable wastewater systems. There are no plans at the present time to extend water service to the area; instead, residents have to transport water. The development of a catchment system is also possible in the future.

‘Ka ‘Ohana O Kahikinui, a beneficiary community-based organization, actively assisted DHHL in the creation of the Kahikinui Kuleana Homestead program and remains important in the resettlement of Kahikinui, as many of those receiving leases are members of the ‘Ohana. Ka ‘Ohana

O Kahikinui plans to seek financing assistance for community improvements where possible. At the same time, the vision for Kahikinui is to create a self-governing and self-sufficient community that enables residents to reestablish ties with the land, their environment and their Hawaiian heritage. While there is no identified *Federal nexus* for activities associated with the development at Kahikinui, individual lessees may participate in the HUD loan guarantee programs available to Native Hawaiians.

Potential Project or Activity, Next 10 Years: Residential construction

Federal Involvement: Loan guarantee by HUD

Consultation Costs:

C Total Section 7 Costs: \$0 to \$51,100

Estimate is based on the following: (1) one programmatic consultation, (2) Medium cost from Table VI-1 of a consultation with a Federal agency as the Applicant and the involvement of a non-Federal entity, and (3) the cost of a biological survey, based on a 1,000-acre open site with medium access. Given the potentially large number of individual consultations, this analysis assumes that HUD would conduct a programmatic consultation that covers all of the Kahikinui Kuleana Homestead land. In addition, while HUD deals directly with lending institutions and not with individuals, the programmatic consultation may involve lending institutions, individual lessees, or Ka 'Ohana O Kahikinui.

Anticipated Project Modifications and Costs:

C Total Section 7 Costs: Minor

Surveys covering the entire Homestead area conducted during preparation of the State Environmental Assessment in 1995 found no larval host plants within the 2,000 acre area proposed for homestead development. Two adult host plants, *Plumbago zeylanica* and *Ipomoea indica*, were observed, with *Ipomoea* considered common and an important part of the vegetation in the area. While residential construction involves grading and clearance, due the small footprint of the planned homes and the widespread distribution of adult host plants throughout the area, it is unlikely that construction of homes will adversely modify the critical habitat. Thus, no major project modifications are anticipated.

Potential Entities Impacted:

Federal: Service, HUD

Private: Lending Institutions, Native Hawaiian Lessees (individuals)

3.b.(3) Villages at La'i'opua

All of the land (258 acres) in Unit 5B (Big Island) is in the Urban District. The entire unit is contained within the Housing and Community Development Corporation of Hawai'i's (HCDCH) Villages at La'i'opua (VOLA), a 1,000 acre master-planned residential community. VOLA is divided up into 14 separate villages, a municipal golf course (discussed in the Golf Courses section below), a commercial area, and several planned preserves for endangered plants.

The proposed critical habitat Unit 5B (Big Island) contains the following components of the VOLA project:

- 13 acres (56 percent) of Village 5
- 36 acres (100 percent) of Village 9
- 22 acres (100 percent) of Village 10
- Four acres (16 percent) of Village 11
- 149 acres (77 percent) of the planned golf course
- 27 acres (100 percent) of the endangered Aupaka (*Isodendron pyriform*) plant preserve
- Three acres (100 percent) of a smaller Aupaka preserve
- Four acres of existing roads

The backbone infrastructure (roadways, drainage system, water system, and utility lines) has been completed for most of the area in the proposed critical habitat. HCDCH is currently seeking third-party developers to install the remaining infrastructure for each Village and develop the lots or homes for sale. HCDCH has not yet found developers for the four Villages in critical habitat, but most of them are likely to be developed in the next 10 years. The development of Village 5 also involves expenditures to manage the adjacent 27-acre Aupaka preserve, and so it may not be developed, and the preserve may not be managed, within the next 10 years.

Potential Project or Activity, Next 10 Years: VOLA planned development

Federal Involvement: None

The VOLA project did have *Federal involvement* in 1990 because EPA funds were used to build an off-site wastewater treatment plant. However, once the plant was completed, the *Federal involvement* for the project ended.

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because there is no *Federal involvement*.

Potential Entities Impacted: None

3.b.(4) Other Residential Development – Urban District

Residential development commonly occurs on land in the State Urban District. Nearly 200 acres in Unit 3 (Maui), owned by the State of Hawai‘i, are within the Urban District. Much of this land is under the control of the State Department of Transportation – Airports Division, and given the use of this land for purposes related to the management of Kahului Airport, it is assumed that there will be no residential development of this land by the State within the next 10 years.

Proposed critical habitat Unit 5A (Big Island) contains 13 acres in the Urban District. The landowner indicates that there are currently no plans for development in the proposed critical habitat.

However, if any residential projects were proposed in the future, they would not be subject to section 7 consultation as long as there is no *Federal involvement*.

Potential Project or Activity, Next 10 Years: Residential development – none anticipated

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because there are no known plans for residential development on land in the Urban District.

Potential Entities Impacted: None

3.b.(5) Other Residential Development – Agricultural District

Land in the Agricultural District is generally used for crops, livestock, and grazing as well as for accessory structures and farmhouses. Land in the Agricultural District is not meant to be urbanized, although, in practice, it is sometimes used for large-lot subdivisions. In addition, the probability of the State redistricting land for urban uses is higher for land in the Agricultural District than land in the Conservation District.

Approximately 66,554 acres of the proposed critical habitat designation are within the State Agricultural District, in Units 1, 2, 3, 5A, 6 and 7. Specifically, approximately 27,605 acres are in Unit 1 (Maui), 6,794 are in Unit 2 (Maui), 25 are in Unit 3 (Maui), 262 are in Unit 5A (Big Island), 31,322 are in Unit 6 (Big Island), and 546 are in Unit 7 (Moloka'i).

- Unit 1 (Maui): Of the 27,605 acres in the Agricultural District, approximately 9,100 acres are privately owned. Approximately 85 percent of the privately owned land is owned by one landowner, Ulupalakua Ranch, 10 percent is owned by Haleakala Ranch, and the remaining acreage (five percent) is owned by approximately 40 different non-contiguous landowners. Most of the privately-owned land is in active use for grazing or farming and there are no known plans for large-lot residential development. There are also no known plans for development on the State-owned land in the Agricultural District (except the Kahikinui Kuleana Homestead lots discussed above in Section 3.b.(2)). Based on the location of existing infrastructure and on limited access to water, it is not anticipated that this land will be developed within the next 10 years.
- Unit 2 (Maui): All 6,794 acres of land in the unit are within the State Agricultural District. Of this, approximately 2,369 acres are owned by Haleakala Ranch and Kaonoulu Ranch. There are no known plans for development by either landowner; in fact, Haleakala Ranch has publicly stated its intent not to develop these lands (Tanji, 2001). The remaining 4,425 acres are under the control of DHHL. DHHL is planning an agricultural subdivision (Keokea Farm Lots) immediately adjacent to, but outside of, Unit 2. Aside from the Kula Residence Lots discussed earlier in Section 3.b.(1), there are no other currently planned developments; however, DHHL has expressed its intent to develop the remaining property some time in the future. Based on the limited access to water, it is unlikely that the remaining property will be developed within the next 10 years.
- Unit 3 (Maui): There are no known plans to utilize the 25 State-owned acres in the Agricultural District for residential development, and given the

proximity of this land to Kahului Airport, any residential development in the next 10 years would be very unlikely.

- Unit 5A (Big Island): All 262 acres in the Agricultural District are owned by one private landowner. The landowner indicates that there are currently no plans for development on this land.
- Unit 6 (Big Island): The 31,322 acres in the Agricultural District are owned by the State and other private landowners. No development is expected in the next 10 years on about 80 percent (25,122 acres) of this land. Specifically, 19,197 acres are in the Pu‘u Wa‘awa‘a management area, where there are no plans for residential development. Kamehameha Schools owns 4,491 acres and does not plan any residential subdivision. The State owns 1,359 acres that are dedicated to agricultural uses. Approximately 63 acres are covered by existing roads, and 12 acres are small lots that contain existing improvements (radio towers, substations) or are too small for a residential subdivision. However, the remaining 20 percent (6,200 acres) does have the potential for development in the next 10 years. In particular:
 - C 4,262 acres are privately owned and are planned for large lot residential subdivisions (1 unit per 5 acres);
 - C 1,329 acres are privately owned and contain an existing golf course (which is excluded from critical habitat as mentioned in Chapter I) and areas planned for smaller lot residential subdivisions (1 unit per 1-3 acres);
 - C 404 acres are owned by the State and are planned for future homestead lots. Based on the lack of access to water, roads, and utilities, it is unlikely that the property will be developed within the next 10 years; and
 - C 205 acres are privately owned and are dedicated to agricultural uses, but may be developed as large lot residential subdivisions in the next 10 years.
- Unit 7 (Moloka‘i): The 546 acres within the Agricultural District are privately owned by five landowners. Publicly available real estate information indicates that the 329 acres owned by Kawela Plantation Homeowner’s Association are part of a 5,500-acre recreational preserve maintained for the common benefit of the Association. One landowner, Kamehameha Schools, has agreed to implement specific watershed protection management practices through participation in the East Moloka‘i Watershed Partnership on its land (68 acres). There are no known plans for development on the remaining 149 acres.

However, if any residential projects were proposed in the future, they would not be subject to section 7 consultation as long as there is no *Federal involvement*.

Potential Project or Activity, Next 10 Years: Residential development in Unit 6 (Big Island)

Federal Involvement: None

Unit 6 (Big Island) is very dry and there are no natural streams or drainages that require an U.S. Army Corps of Engineers (ACOE) section 404 permit for development. Also, the subdividers and developers indicate they have no plans to obtain Federal permits or Federal funding.

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because there is no *Federal involvement*.

Potential Entities Impacted: None

3.c. Industrial and Commercial Development

There is no existing industrial or commercial development in the proposed critical habitat. There is a light industrial and commercial park called the Kaloko Industrial Park directly to the east of the proposed Unit 5A (Big Island). The existing development contains 85 lots within 103 acres, and is the first two phases of the planned development. The third and fourth phases will add 82 additional lots on a 102-acre parcel. Approximately 32 acres (31 percent) of this expansion parcel is in the critical habitat for the moth.

The developer, TSA International, Ltd. (TSA), has completed a final Environmental Impact Statement (EIS) for the Kaloko Industrial Park expansion. The site was recently redistricted from the Conservation District to the Urban District by the State Land Use Commission (LUC). The only major development approval currently pending is a zoning permit from the County. Since the area is designated for industrial use in the 2001 *County of General Plan Revision*, TSA is likely to receive a zoning permit. There is no known *Federal involvement* at this time.

Development on the site will involve grading all 102 acres, constructing roads, installing utilities, and selling the vacant lots for light industrial and commercial uses.

Potential Project or Activity, next 10 years: Kaloko Industrial Park expansion

Federal Involvement: None

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because there is no *Federal involvement*.

Potential Entities Impacted: None

3.d. Farming and Ranching Operations

As noted above, the proposed critical habitat includes approximately 66,554 acres in the Agricultural District, in Units 1, 2, 3, 5A, 6 and 7 (see Table I-1). Most of the agricultural land is used for grazing, but some of the land is in diversified agriculture.

Activities associated with farming and ranching that could affect the moth typically include plowing, planting, fertilizing, harvesting, applying pesticides and other chemicals, and maintaining irrigation systems and fences. The majority of these farming and ranching operations do not have *Federal involvement* and will not be directly impacted by the proposed critical habitat designation for the moth.

Nevertheless, some farmers and ranchers may participate in farm loan, disaster relief, or conservation programs sponsored by the USDA NRCS and the Farm Services Agency (FSA). USDA farm loan programs are discussed in this section. USDA disaster relief programs are discussed later in the section on Natural Disasters (Section 3.q.), and USDA conservation programs are discussed later in the section on Conservation Activities (Section 3.e.(2)).

FSA Farm Loan Programs

The FSA offers direct and guaranteed loans to farmers and ranchers who are temporarily unable to obtain private, commercial credit. Under the guaranteed loan program, FSA guarantees loans made by conventional agricultural lenders for up to 95 percent of the principal loan amount. The FSA also offers a direct loan program.

The two main types of loans available under both the guaranteed-loan and direct-loan programs are Farm Ownership loans and Farm Operating loans:

- **Farm Ownership Loans** may be used to purchase farmland, construct or repair buildings and other fixtures, develop farmland to promote soil and water conservation, or refinance debt. In order to qualify for this loan or loan guarantee, the farmer or rancher must own the farmland.
- **Farm Operating Loans** may be used to purchase livestock, farm equipment, feed, seed, fuel, farm chemicals, insurance, and other operating expenses; fund minor improvements to buildings; fund water development and family subsistence; and refinance debts. The farmer or rancher need not own the land.

Of the 66,554 acres in the Agricultural District, a total of 16,604 acres is privately owned and actively used for agricultural activities other than grazing for weed control. By unit, it involves approximately:

- 9,100 acres in Unit 1 (Maui);
- 2,400 acres in Unit 2 (Maui);
- 262 acres in Unit 5A (Big Island);
- 4,440 acres in Unit 6 (Big Island); and
- 402 acres in Unit 7 (Moloka'i).

Historically, FSA has provided farm loans and loan guarantees to an average of six borrowers per year on Maui and eight borrowers per year on the Big Island (FSA, 2002). FSA projects that it will provide financing to at most two borrowers per year on Moloka'i in the future (FSA, 2002). If this continues, than approximately 80 additional borrowers on the Big Island (8*10) and 80 additional borrowers in Maui County ((6+2)*10) will receive FSA loans or loan guarantees over the next 10 years.

There are approximately 3,300 farms and 610 ranches on the Big Island, and approximately 800 farms and 242 ranches in Maui County. (Hawai'i Data Book, 1999). Thus, a farmer or rancher on the Big Island has an approximately 0.2 percent chance of receiving financing from FSA each year over the next 10 years ($8/(3,300+610)$), and a farmer or rancher in Maui County has an approximately 0.8 percent chance of receiving financing from FSA each year over the next 10 years ($8/(800+242)$). While ranch size does not directly affect the likelihood of receiving a loan, the FSA targets its loans to farmers who are unable to obtain private commercial credit (typically beginning farmers with insufficient financial resources and established farmers who have suffered financial setbacks from natural disasters).

There are only two ranches in the moth critical habitat on the Big Island. Thus, the probability that either rancher will receive financing through FSA over the next 10 years is extremely low.

In Maui County, three large ranches own the majority of property within the critical habitat on Maui (95 percent of Unit 1 and 100 percent of Unit 2). However, there are numerous (approximately 35) small landowners conducting small-scale grazing and diversified agriculture farming activities within moth critical habitat in Maui County. While the three ranches are not likely to apply for FSA loans because they are large businesses with access to several credit sources and FSA targets its loans to farmers who are unable to obtain private, commercial credit, the smaller landowners may seek FSA assistance. However, again, the probability that any of these landowners will receive financing through FSA over the next 10 years is low.

The only two landowners in the moth critical habitat in the Agricultural District with land in active agricultural use on Moloka'i, Kamehameha Schools and Kawela Plantation Homeowner's Association, are not likely to seek financing because farming activities are not their primary business operations. Thus, the probability that either will receive funding from FSA over the next 10 years is almost zero.

Because the possibility exists, however remote, that a farmer or rancher in moth critical habitat could receive financing from FSA over the next 10 years, the costs of consultation are conservatively included in this analysis as calculated below.

Potential Project or Activity, next 10 years: FSA Farm Operating loans and loan guarantees

Federal Involvement: FSA funding or oversight

Consultations Costs:

FSA indicates that for direct loans, individual farmers and ranchers will be included in the section 7 consultation process and, for loan guarantees, the lending agency will be included in the consultation.

C Total Section 7 Costs: \$0 to \$9,100

Estimate is based on the following: (1) zero to one FSA Farm Operating loans or loan guarantees over the next 10 year; (2) Low cost (from Table VI-1) of a consultation with a Federal agency as the Applicant and the involvement of a non-Federal entity; and (3) one biological survey of 10 acres with easy to medium access.

Anticipated Project Modifications and Costs:

C Total Section 7 Costs: Minor

FSA Farm Operating loans and loan guarantees in critical habitat will be used by either farmers or ranchers. In general, based on the occurrence of the moth and of native host plants in grazed areas, ranching activities will not adversely affect the moth or its critical habitat (Service, 2002). So, if all future loans and loan guarantees in critical habitat are used to support ranching, no project modifications are anticipated.

On the other hand, potential project modifications for farmers include avoiding existing stands of adult or larval host plants or transplanting any larval host plants that might be damaged or destroyed by farm activities such as plowing. However, most of the land in agricultural use within the proposed critical habitat is used for grazing rather than farming purposes, so there are few potential farmers to be impacted. Given the limited number of farmers involved in diversified agriculture (6) and the area involved (less than 50 acres), the project modifications costs related to farming activities, should a farmer receive financing from FSA, would be minimal.

Potential Entities Impacted:

Federal: Service, FSA

Private: Individual farmers and ranchers

3.e. Conservation Activities

3.e.(1) Conservation Projects Funded by the Service

The Service funds a variety of conservation and habitat restoration projects through collaboration with private landowners, community groups, conservation organizations, and other government agencies through the Conservation Protection programs as well as other programs. There are currently several conservation projects located within the proposed moth critical habitat:

- Kanaio (Unit 1 (Maui)): This project on private property (Ulupalakua Ranch) involves fencing near the eastern border of the Kanaio Natural Area Reserve and provides a buffer for the NAR.
- Kanaio NAR (Unit 1 (Maui)): This DLNR project involves installing an enclosure fence to exclude ungulates from approximately 600 acres in the Kanaio Natural Area Reserve.
- Kahikinui (Unit 1 (Maui)): This project on DHHL land involves construction of a fenced enclosure (12 mile perimeter) and outplanting of native species.
- Pu‘u Makua (Unit 1 (Maui)): The Pu‘u Makua project on private property (Ulupalakua Ranch) entails restoration of approximately 100 acres of the subalpine shrubland and montane mesic forest ecosystem through fencing and outplanting of native species.
- Ahihi-Kinau (Unit 1 (Maui)): This project on State land involves replacing and repairing signage for the Ahihi-Kinau Natural Area Reserve.

- Auwahi (Unit 1 (Maui)): This project on private property (Ulupalakua Ranch) involves fencing, weed management, and outplanting, focused on restoration of moth habitat.
- Pu‘u o Kali (Unit 2 (Maui)): This project on DHHL land involves fencing of approximately 200 acres to keep deer out of an endangered dryland forest.
- Kanaha Pond (Unit 3 (Maui)): This DLNR project involves fence repair at the Kanaha Pond Wildlife Sanctuary, an important breeding area for threatened and endangered birds as well as habitat for the moth. The project will repair one-half mile of fencing to prevent dogs and deer from entering the Sanctuary and disturbing habitat.
- Pu‘u Wa‘awa‘a (Unit 6 (Big Island)): The Service is funding a number of projects in Pu‘u Wa‘awa‘a to address and perhaps mitigate the longstanding conflict between game mammal management and endangered species conservation. These projects, selected to benefit both game animals and endangered species, include fencing, a water reservoir repair project, a water system boundary survey, and fire control.
- Ka‘upulehu (Unit 6 (Big Island)): This project on land owned by Kamehameha Schools under long term lease to PIA Kona Limited Partnership involves fencing, outplanting 900 endangered plants, and fire and rodent control.

Additional projects are likely in the proposed critical habitat over the next 10 years. This may involve the continuation or extension of existing projects at Auwahi, Pu‘u o Kali, Kanaio or Pu‘u Wa‘awa‘a; the extension of past projects, such as fencing by the East Moloka‘i Watershed Partnership; or new projects within the proposed critical habitat. The number of projects that occur in the proposed critical habitat will depend upon available resources, landowner participation and the potential benefits of a project. Based on these factors and on the number of past projects, it is estimated that between five and 15 projects will be funded in the proposed critical habitat over the next 10 years.

Potential Activity, Next 10 Years: Conservation projects, including fencing and outplanting

Federal Involvement: Federal funding from the Service

Consultations Costs:

C Total Section 7 Cost: \$8,000 to \$24,000

The cost estimate is based on (1) 5 to fifteen consultations; (2) Low to Medium cost from Table VI-1 for an internal consultation; and (3) no biological survey. As a general matter, internal consultations typically do not involve the applicant. No additional surveys are anticipated because of the initial information presented in the request for Service funding, technical assistance provided by the Service during the funding process, and the beneficial nature of the project.

Anticipated Project Modifications and Costs:

C Total Section 7 Costs: Minor

In general, conservation projects funded by the Service are designed to improve wildlife habitat by preventing ungulates from entering areas where sensitive plants are found, reducing fire potential, controlling weeds and invasive species, etc. These kinds of projects benefit the moth since they encourage the growth of the native host plants. While the Service may recommend minor changes, such as avoiding native host plant populations or having a biologist on-site when finalizing details such as fencing route, a review of completed conservation projects across the State indicates that this type of monitoring is standard practice in biologically sensitive areas. Thus, no major project modifications are anticipated.

Potential Entities Impacted:

Federal: Service

3.e.(2) USDA Conservation Programs

Some farmers and ranchers may seek Federal funding for soil and water conservation projects from NRCS and the FSA. Programs that are applicable to the agricultural land in the proposed critical habitat are described briefly below.

- **Environmental Quality Incentives Program (EQIP):** The intent of this program is to address problems with soil, water, and related natural resources. Projects are most likely to be funded if they address significant statewide concerns such as animal waste management, sediment in runoff, and noxious weed control. Examples include planting a cover crop to reduce erosion, building a firebreak, and converting from a trench to a pipe fed sprinkler irrigation system.
- **Wildlife Habitat Incentives Program (WHIP):** The intent of this program is to restore and enhance wildlife habitat, particularly for native species. Projects are more likely to be funded if they are within critical habitat. Examples include planting native species, protecting caves, and protecting near-shore environments.
- **Wetland Restoration Program (WRP):** The intent of this program is to restore, enhance, and/or develop wetlands on agricultural lands.
- **Conservation Reserve Program (CRP):** This program allows landowners and producers who have highly erodible cropland or marginal pasture land to return the land to conservational use. Projects are most likely to be funded if they reduce erosion, improve water quality, and improve wildlife habitat. Projects typically include planting trees or grass on cropland.

The proposed critical habitat covers approximately nine percent of the acreage in the Agricultural District in Maui County and three percent of the acreage in the Agricultural District on

the Big Island. Thus, most of the funding will likely go to projects located outside the proposed critical habitat simply because most of the agricultural land is outside the designation.

Over the past five years, approximately 31 farmers or ranchers received conservation funding in Maui County, and approximately 77 farmers or ranchers received conservation funding on the Big Island. Assuming that the number of awards is evenly distributed across the agricultural land, approximately three landowners would receive funding in Maui County ($31 * .09$) and two on the Big Island ($77 * .03$) over the next five years. Thus, a total of 10 financed projects could be expected over the next 10 years ($(3 + 2) * 2$).

The annual number of recipients may increase, however, due to increased funding and more inclusive criteria outlined in the 2002 Farm Bill (NRCS, 2002). At the same time, however, some of the landowners with land inside the proposed critical habitat who would be eligible to participate in these programs have indicated an intention to avoid participation in federally funded conservation activities to avoid a *Federal nexus* (see Section 4.k. for full discussion). Thus, to account for both scenarios, this analysis estimates that between zero and 20 projects located in the proposed critical habitat will receive funding over the next 10 years.

These projects are not expected to adversely affect the moth or its critical habitat because they are designed to reduce pollution and runoff, manage non-native weed growth, enhance wildlife habitats, and conserve soil and water resources. Nevertheless, NRCS intends to initiate informal section 7 consultation for each project to confirm that the Service concurs with this view.

Potential Project or Activity, next 10 years: NRCS and FSA conservation projects

Federal Involvement: Partial USDA funding

Consultations Costs:

C Total Section 7 Costs: \$0 to \$76,000

Estimate is based on (1) zero to 20 conservation projects, (2) Low cost (from Table VI-1) of a consultation with a Federal agency as the Applicant, and (3) no biological survey. All past biological assessments in Hawai'i have been done by NRCS staff. Individual farmers and ranchers are notified about the consultations but are generally not directly involved in the consultation process for conservation projects (NRCS, FSA, 2002).

Anticipated Project Modifications and Costs:

C Total Section 7 Costs: Minor

In general, NRCS and FSA conservation projects are designed to reduce soil erosion, conserve water, and enhance wildlife habitat. These kinds of projects benefit the moth since they improve the general ecosystem, indirectly encouraging the growth of the native host plants. While the Service may recommend minor changes, such as avoiding native host plant populations or having a biologist on-site when finalizing details such as fencing routes, a review of completed conservation projects across the State indicates that this type of monitoring is standard practice in biologically sensitive areas. Thus, no major project modifications are anticipated.

Potential Entities Impacted:

Federal: Service, NRCS, FSA

3.e.(3) Other Conservation Projects

Kahikinui

The *ahupua'a*¹² of Kahikinui, much of which is contained in proposed critical habitat Unit 1 (Maui), has been largely uninhabited since the mid-1800s. Remotely located on the southeastern flank of Haleakala, Kahikinui was designated as Hawaiian Home Lands in 1920, and DHHL leased out the land for cattle ranching until 1992. While the area was once home to about 1,500 Native Hawaiians and provided habitat to native plants and animals, the area is currently dry and windy with rugged terrain.

As discussed previously in Section 3.a.(2), the Kahikinui Kuleana Homesteads, located in Unit 1 (Maui), is under development by Native Hawaiian beneficiaries. Based on prior plans and actions, it is assumed that the community at Kahikinui will also participate in the management and care for DHHL land within Unit 1 (Maui) outside the immediate homestead area. Through a community-based planning process on Maui, a plan to protect and restore the native forest and watershed on the *mauka* slopes was completed. In addition, a Community Based Economic Development and Makai Management Plan was developed in collaboration with the University of Hawai'i Department of Urban & Regional Planning. These plans incorporate the vision for Kahikinui of a self-governing and self-sufficient intentional community that enables residents to reestablish ties with the land, the environment, and their Hawaiian heritage and includes a strong sense of stewardship towards the land of Kahikinui.

Through these plans, the community identified certain planned management actions, including:

- Fencing *makai* of Pi'ilani Highway
- Fencing *mauka* in the Kahikinui Forest Reserve
- Exclosure fencing of areas with rare or endangered plants
- Removal of ungulates (both *makai* and within the Forest Reserve)
- Restoration of native plant vegetation (*makai*)
- Reforestation
- Removal of alien vegetation, including gorse

DHHL has leased approximately 7,050 acres in the Kahikinui Forest to Living Indigenous Forest Ecosystems, Inc. (LIFE), a beneficiary community-based non-profit organization for stewardship purposes that works closely with Ka 'Ohana O Kahikinui. Approximately 236 of these acres overlap with Unit 1 (Maui); most of the Kahikinui Forest Reserve lies outside the proposed critical habitat. A second beneficiary community-based organization, Ka 'Ohana O Kahikinui, includes many of the lessees at Kahikinui and continues to actively participate in the development and management of the land at Kahikinui as the community itself slowly grows.

¹² An *ahupua'a* is a traditional Hawaiian land division usually extending from the uplands to the sea. Pukui and Elbert, 1986, Hawaiian Dictionary.

It is likely the community will seek Federal funding from any available source to support stewardship and conservation activities. While no specific agency has yet been targeted, it is assumed that funding will be requested for one to three projects in the next 10 years based on the community's plans and the existing community resources to implement any proposed conservation project.

Potential Project or Activity, Next 10 Years: Conservation activities such as fencing, replanting, and removal of alien vegetation

Federal Involvement: Federal funding

Consultation Costs:

C Total Section 7 Costs: \$3,800 to \$11,400

Estimate based on (1) one to three consultations in the next 10 years, (2) Low cost from Table VI-1 of a consultation with a Federal agency, and (3) no biological survey.

The small size of the community currently at Kahikinui makes it difficult to estimate the number of conservation activities likely to occur with Federal funding within the next 10 years. Because beneficiaries will simultaneously be responsible for the development of their own homes, they may lack the time to participate in conservation projects. The estimate of one to three consultations takes into account these circumstances and the number of past conservation activities in the area and provides a range that reasonably reflects the amount of expected activity in the next 10 years.

No biological surveys are anticipated because of the amount of existing information regarding Kahikinui and the existence of earlier surveys conducted as part of the environmental review process for the creation of the Kuleana Homestead program.

Anticipated Project Modifications and Costs:

C Total Section 7 Costs: Minor

Conservation projects such as fencing, replanting of native species and removal of alien vegetation benefit the moth since they encourage the growth of the native host plants. While the Service may recommend minor changes, such as avoiding native host plant populations or having a biologist on-site when finalizing details such as fencing routes, a review of completed conservation projects across the State indicates that this type of monitoring is standard practice in biologically sensitive areas. Thus, no major project modifications are anticipated.

Potential Entities Impacted:

Federal: Conservation-targeted Federal agency(ies)

East Moloka'i Watershed Partnership

The East Moloka'i Watershed Partnership (EMWP) was established in November 1999 to implement a watershed management program to maintain and increase the watershed capacity and to decrease erosion. Approximately 720 acres managed as part of EMWP fall within proposed

critical habitat Unit 7 (Moloka'i). EMWP has already constructed a 5.5-mile contour fence within the Watershed to the east of the moth's proposed critical habitat to keep ungulates out of the upper forest. Additional watershed management activities, including extension of fencing, are possible in the next 10 years.

Initial EMWP funding came from a variety of sources, including the Service, U.S. Department of Agriculture (USDA) (Enterprise Community funding), Environmental Protection Agency (EPA), State Department of Health, Maui County, Maui Board of Water Supply, Natural Resources and Conservation Service (NRCS), and the Nature Conservancy. It is assumed that future funding will also be sought from a variety of sources, and this analysis assumes that one consultation will be required as a result of funding from a Federal agency besides the Service.

Potential Project or Activity, next 10 Years: Conservation activities

Federal Involvement: Partial and/or entire Federal funding

Consultation Costs:

C Total Section 7 Costs: \$3,800

For any new watershed partnership projects, the estimate is based on (1) one consultation in the next 10 years; (2) Low cost from Table VI-1 of a consultation with a Federal agency; and (3) no biological survey. The Federal agency involved in the consultations will depend on the source of funding and may include the EPA or USDA. All of the consultation costs are conservatively assigned to the moth, even though the consultation may also address critical habitat for listed plant species. No biological survey is anticipated due to existing information about the location of adult and larval host plant populations necessary to support the moth.

One consultation is anticipated because while the EMWP would like to provide support for management activities on all the land within the watershed subject to erosion, the number of projects undertaken in the next 10 years is dependent on landowner willingness to participate in conservation projects. It is possible that the success of the existing management agreement may encourage the participation of more landowners. Based on the limited amount of overlap between the watershed and the moth proposed critical habitat, this analysis estimates that at most one new consultation will occur in the next 10 years due to funding from a Federal agency other than the Service.

Anticipated Project Modifications and Costs:

C Total Section 7 Costs: Minor

Conservation projects that may occur as part of watershed management, such as fencing, replanting of native species, and removal of alien vegetation benefit the moth since they encourage the growth of the native host plants. While the Service may recommend minor changes, such as avoiding native host plant populations or having a biologist on-site when finalizing details such as fencing routes, a review of completed conservation projects across the State indicates that this type of monitoring is standard practice in biologically sensitive areas. Thus, no major project modifications are anticipated.

Potential Entities Impacted:

Federal: Service, USDA, NRCS, EPA, other Federal agency

Unidentified Future Conservation Projects

There are a variety of federally sponsored programs, through NRCS, EPA, etc. that may be used to fund conservation activities by the State or by private landowners in the proposed habitat over the next 10 years. Participation in these programs depends upon the individual landowners, the types of projects proposed, and the availability of funds.

Potential Project or Activity, next 10 Years: Conservation activities

Federal Involvement: Partial and/or entire funding by Federal agencies

Consultation Costs:

C Total Section 7 Costs: \$3,800 to \$34,500

Estimate based on (1) one to three consultations in the next 10 years, (2) Low to Medium cost from Table VI-1 of a consultation with a Federal agency, and (3) no biological survey. No biological survey is anticipated because previous conservation projects have not required biological surveys due to the beneficial nature of the project and the technical assistance provided by the Service and/or other Federal agencies during project development. All of the consultation costs are conservatively assigned to the plants, even though the consultation may also address listed wildlife species that may be present.

Anticipated Project Modifications and Costs:

C Total Section 7 Costs: Minor

Unidentified future conservation projects could include fencing, replanting of native species and removal of alien vegetation. These conservation activities would benefit the moth since they encourage the growth of the native host plants. While the Service may recommend minor changes, such as avoiding native host plant populations or having a biologist on-site when finalizing details such as fencing routes, a review of completed conservation projects across the State indicates that this type of monitoring is standard practice in biologically sensitive areas. Thus, no major project modifications are anticipated.

Potential Entities Impacted:

Federal: Service, EPA, NRCS, other Federal agency

3.f. Kaho‘olawe

From 1941 to 1994, Kaho‘olawe and its surrounding waters were used by the U.S. Navy as a live-fire training area. In 1994, the island of Kaho‘olawe was returned to the State of Hawai‘i under the control of the Kaho‘olawe Island Reserve Commission (KIRC). That same year, Congress authorized funding for a 10-year program to clear the island of unexploded ordnance, under the direction of the U.S. Navy.

Under Hawai'i law, Kaho'olawe is to be used solely and exclusively for: (1) the preservation and practices of all rights customarily and traditionally exercised by Native Hawaiians for cultural, spiritual and subsistence purposes; (2) the preservation and protection of the Reserve's archaeological, historical and environmental resources; (3) rehabilitation, revegetation, habitat restoration and preservation; and (4) education.

Initial clean-up goals were to result in surface clearance of the entire island and subsurface clearance of approximately 30 percent of the island to support specific uses, but it is presently estimated that the entire island will not be cleared of unexploded ordnance by 2003. The western third of the island is not expected to receive surface clearance and less than 10 percent of the island will receive subsurface clearance by 2003.

In recognition of the dangers remaining due to unexploded ordnance, the Reserve is divided into six Use Areas based on the level of cleanup referenced in the Navy Cleanup Plan and the KIRC Use Plan. Two Use Areas are in Reserve Waters. The remaining four Areas are on the island. Level 1 and Level 2 areas have received subsurface clearance and are identified as the primary locations for human activity. Level 3 areas have received surface clearance only and have been identified as unspecified restoration areas and open lands. Level 4 areas are uncleared lands where access remains restricted.

One of the eight Level 1 sites and most of the Level 2 sites are within Unit 4 (Kaho'olawe). The remaining acreage in Unit 4 (Kaho'olawe) is either Open land or Uncleared land.

Existing and anticipated activities on Kaho'olawe within the proposed critical habitat include:

- Use of a cultural education center and restoration camp, consisting of sleeping areas, kitchen, central gathering area, fire pit, storage area, garden, water system, composting area, and outhouses, at Luamakika.
- Visitation and preservation of cultural sites.
- Restoration activities, including revegetation and planting of native vegetation; development of nurseries; soil stabilization and terracing; climatological monitoring stations; creation of botanical/wildlife preserves; creation of buffer zones and fire breaks; development of a water collection and storage system.
- Maintenance of roads and trails.
- Past consultations regarding activities on Kaho'olawe have focused on the unexploded ordnance removal activities, including controlled burns. There is no history of consultation for other activities.

November 2003 marks the end of the Navy's congressionally mandated cleanup period by the Navy. After that point, KIRC may seek some form of Federal assistance, from agencies such as Natural Resources Conservation Service (NRCS) and the National Endowment of the Arts, to support continued restoration efforts.

Potential Project or Activity, Next 10 Years: Restoration activities

Federal Involvement: Possible Federal funding

Other Land Management: Kaho‘olawe Island Reserve

Consultation Costs:

C Total Section 7 Costs: \$10,400 to \$78,500

Estimate based on (1) two to five consultations in the next 10 years, (2) Low to Medium cost from Table VI-1 of a consultation with a Federal agency as the applicant and the involvement of a non-Federal agency, and (3) no biological survey. The number of consultations will depend on the amount of Federal funding sought by KIRC and the nature and location of the project activity being federally funded. No new biological surveys are anticipated because of the extensive information gathered during the ongoing ordnance removal.

Anticipated Project Modification and Costs:

C Total Section 7 Costs: Minor

Hawai‘i State law mandates the preservation of existing resources and habitat restoration on Kaho‘olawe, which will directly and indirectly benefit the moth. While the Service may recommend minor actions, such as utilizing moth host plants in revegetation activities, given the context of Kaho‘olawe and the beneficial nature of planned future activities to the overall health of the island, no major project modifications are anticipated.

Potential Entities Impacted:

Federal: NRCS, NEA

State: Kaho‘olawe Island Reserve Commission

3.g. Military Activities

The Hawai‘i Army National Guard manages the Kanaio Training Area, on State land within Proposed Unit 1 (Maui). For the past five years, the Guard’s primary activities in this area involve environmental preservation, including the construction of fencing around botanically sensitive areas. Conservation and preservation activities were designed in close cooperation with the Service. The Guard plans to maintain existing areas, but has no current plans for new conservation projects.

The Guard does, however, intend to begin training exercises within Unit 1 (Maui) and is currently seeking an Executive Order from the Governor to transfer the land from DLNR to the National Guard to allow for this training. These training exercises could include air-mobile (i.e. helicopter) operations, insertion and maneuver training, and land navigation and scouting procedures with company-sized units, but no live-fire training.

The Kanaio Training Area includes a number of sensitive areas, including cultural sites and proposed critical habitat for listed plants, in addition to existing moth populations. The Guard uses these sensitive areas to enhance training by treating them as locations to be avoided. Ultimately, the Guard would like its operations to be a working model of combined preservation and training.

Potential Project or Activity, Next 10 Years: Institution of military training exercises

Federal Involvement: Federal funding

The Hawai'i Army National Guard receives Federal funding to support its activities.

Consultation Costs:

C Total Section 7 Costs: \$5,200

Estimate based on (1) one consultation in the next 10 years, (2) Low cost from Table VI-1 of a consultation with a Federal agency as the applicant and the involvement of a non-Federal agency, and (3) no biological survey. No new biological survey is anticipated due to the existence of previous surveys and prior Service familiarity with the area. While other listed species may be present, the entire cost of the consultation is conservatively assigned to the moth, even though the consultation may also address the other listed species.

Anticipated Project Modification and Costs:

C Total Section 7 Costs: Minor

The Guard has worked closely with the Service on the development of a Natural Resources Management Plan for the area, which includes specific conservation activities to protect listed species and important habitat. Because any new training activities are likely to be planned with the input of the Service and in conformance with the existing Natural Resources Management Plan, no major project modifications are anticipated.

Potential Entities Impacted:

Federal: Service

State: Hawai'i Army National Guard

3.h. Kahului Airport (Maui)

Most of the land within Unit 3 (Maui) is within the Kahului Airport Boundary, managed by the State Department of Transportation, Airports Division (DOTA). Kahului Airport is the principal airport on Maui, serving over 5.7 million air passengers and handling over 47,000 tons of cargo and mail in 2001. The proposed critical habitat covers areas within the Airport Boundary *makai*¹³ of the existing airport structures and runways and includes some safety areas, runway protection zones, and transition areas. Current activities in this area include the clearance and/or cutting back of vegetation. In general, these activities do not have *Federal involvement*.

However, DOTA has expressed extreme concern about designating area within the Airport Boundary as critical habitat, especially areas inside the existing fenceline. DOTA opposes designation of critical habitat in this area due to the possible conflict with safety requirements. DOTA does receive Federal funding for transportation improvements, and while this money is not likely to be used for activities within the proposed critical habitat, the possibility of a *Federal nexus* does exist at some unspecified time in the future. Currently, however, there is no known *Federal nexus* for existing airport activities within the proposed critical habitat.

¹³ On the ocean side.

Potential Project or Activity, next 10 years: Vegetation clearance.

Federal Involvement: None known.

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because there is no *Federal involvement*.

Potential Entities Impacted: None

3.i. Roads

3.i.(1) Existing Roads

As shown in Table I-1, proposed critical habitat contains 10 paved roads and 128 unimproved private roads or four-wheel drive trails (most of which are used to access grazing areas, hunting areas, or other remote areas).

As mentioned in Chapter I, the O&M of existing paved roads, unpaved roads, and four-wheel drive trails are not subject to section 7 consultation because they are existing man-made features.

Potential Project or Activity, next 10 years: O&M of existing roads

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because these areas are not subject to section 7 consultation.

Potential Entities Impacted: None

3.i.(2) New Roads

The County of Hawai'i plans to extend Olowalu Street once the Kaloko Industrial Park extension is complete. However, the only portion of the Olowalu Street that will be in Unit 5A (Big Island) is the portion that is included in the Kaloko Industrial Park extension and will be constructed and paid for by the developer. There is no known *Federal involvement* for this development (see Section 3.c.: Industrial Development).

The *Keahole to Keauhou Development Plan* (1991), the draft *County of Hawai'i General Plan Revision* (2001), and the *Keahole to Keauhou Project Update* (2002) all identify a second road project that will directly affect proposed critical habitat Unit 5A (Big Island): the Ane Keohokalole Highway (Mid-level Road). The highway, a four-lane primary arterial road with a minimum right-of-way of 120 feet, is planned to run *mauka* (inland) of and parallel to the existing Queen Ka'ahumanu Highway with a north-south orientation. Approximately 0.45 miles of the right-of-way will cross through the center Unit 5A (Big Island).

Potential Project or Activity, next 10 years: Planning and constructing the Ane Keohokaolole Highway

Federal Involvement: U.S. Federal Highways Administration (FHWA) funding

Major public road construction and improvement projects in Hawai'i generally receive funding from the FHWA.

Consultation Costs:

C Total Section 7 Costs: \$ 32,600

Estimate is based on (1) one consultation for road construction (2) High cost (from Table VI-1) of a consultation with a non-Federal Agency as the Applicant, and (3) one biological survey of a 10-acre open site with easy access.

Anticipated Project Modification and Costs:

C Total Section 7 Costs: \$985,000 to \$1,230,000

Both larval host plants and adult host plants are found within Unit 5A (Big Island). Because the larval host plant found in Unit 5A (Big Island), *Nothocestrum breviflorum*, is listed as an endangered species, some of the outlined project modifications could be considered as attributable to its listing as an endangered species and not to its status as a *primary constituent element* for the moth critical habitat. However, for purposes of this analysis, all costs are conservatively attributed to the moth.

Based on a review of section 7 consultations for road projects on the Big Island and discussions with the Service, a consultation on constructing the Ane Keohokaloole Highway would involve the following project modifications to avoid adverse modification to the critical habitat for the moth:

Realigning the road to avoid any larval host plants

The cost of realigning the road will depend on a series of factors, including 1) the planned alignment; 2) the extent of the realignment; 3) the surrounding landowners. A recent EIS for the completion of the Kealakehe Parkway (approximately 1 mile from Unit 5A (Big Island)) indicates an alternative alignment preferred by the Service to avoid listed plants will cost \$6 million less than the planned alignment because the alternative alignment will require less fill and excavation (FHWA, 1998). However, the alternate alignment could also have cost \$6 million more depending on the location of the listed plants.

Until the right-of-way is finalized and the area is surveyed, there is a considerable amount of uncertainty regarding the cost of a realignment. Since there are only two larval host plants in Unit 5A (Big Island) that are not located within the currently planned route, the area is all owned by one landowner, and the biological surveys will occur early in the planning process, the cost of realignment, if any, is expected to be minor.

Constructing an additional eight-foot paved shoulder along both sides of the road to trap a burning cigarette or match thrown from a vehicle

Adding an additional eight feet of paved shoulder on each side of the road will increase the construction costs. As planned, the project will cross 0.45 miles of Unit 5A (Big Island). Since a

fire started along the road outside of critical habitat could spread to critical habitat, it is assumed an additional half-mile of the road on each side of Unit 5A (Big Island), or a total of 1.45 miles (.5 + 0.45 + .5), will require the wider paved shoulder as a buffer. An eight-foot shoulder on each side of 1.45 miles of road equals roughly 122,500 square feet of additional pavement (1.45 * 5,280 * 8 * 2). Based on a review of road projects across the State, the construction of a square foot of road costs between \$8 and \$10 (Hawai'i County Department of Planning, 1991; Hawai'i County DPW, Hawai'i Department of Transportation, Wilson Okamoto & Associates, 2002). As such, the road construction costs would increase by \$980,000 to \$1,225,000.

Developing a fire plan

A fire plan typically indicates the responsible agency, point of contact in case of fire, appropriate chain of command, identification of those responsible for extinguishing fires, location of the listed and other biologically important species, and the duration of the plan. The fire plan is distributed to various fire stations throughout the area before construction begins. In addition, road signs are posted to alert drivers of potential fire hazards.

A fire plan for this road project is not expected to take more than a week of time to prepare and distribute. Assuming \$100 per hour for the applicant's or a consultant's time, the total cost to prepare and implement a fire plan would not exceed \$5,000 (10 hours per day * \$100 * five days).

Potential Entities Impacted:

Federal: Service, FHWA

County: DPW

3.j. Water Systems

3.j.(1) Water Systems, Big Island

As indicated in Table I-1, proposed critical habitat Units 5A, 5B and 6 on the Big Island contains 80 separate water system improvements. Most of these improvements are designed to store or transport water in the relatively dry region. The improvements include water tanks, water catchment basins, water lines, and wells.

As mentioned in Chapter I, these existing water features are excluded from the proposed critical habitat as "unmapped holes." As such, the operation and maintenance of these manmade features and structures would not be impacted by critical habitat designation.

The existing water improvements in proposed critical habitat Unit 5A (Big Island) were recently upgraded and there are no plans for future upgrades (DLNR, 2002).

In Unit 6 (Big Island), the draft Pu'u Wa'awa'a management plan proposes to install new water system improvements over the next 10 years. The planned projects include:

- **Installation of seven new water catchment tanks.** These 10,000 gallon galvanized metal tanks will be constructed in close proximity to planned conservation units. The tanks will serve as a dip tank for helicopters and tankers responding to fire incidents, support livestock grazing along

conservation unit fence lines for fine fuel control, supply water for herbicide use during weed control operations, and provide an irrigation source for newly planted seedlings of rare and endangered plants within conservation units.

- **Upgrade existing waterline system.** The upgrade involves replacing 20 miles of existing galvanized waterline with drisco pipe and installing nine additional miles of new drisco waterlines.
- **Install water troughs.** This project involves constructing 12 new water troughs to support livestock grazing and wildlife management objectives.

Additional water system improvements will be built over the next 10 years on private lands to the west of the Pu‘u Wa‘awa‘a management area to provide water for cattle and residential development and to irrigate native plant preserves, golf courses, and residential landscaping.

Potential Project or Activity, Next 10 Years: Construction of new water infrastructure on the Big Island

Federal Involvement: Possible Federal funding from the Service or NRCS for planned projects in the Pu‘u Wa‘awa‘a management area. Water system projects on private land generally do not have *Federal involvement*.

Other Land Management: Pu‘u Wa‘awa‘a management

Consultation Costs:

C Total Section 7 Costs: \$20,600 to \$30,600

Estimate based on (1) one consultation in the next 10 years, (2) Medium cost from Table VI-1 of a consultation with a Federal agency as the applicant and the involvement of a non-Federal agency, and (3) the cost of a biological survey, based on a 100-acre open or forested site with medium to difficult access. While other listed species may be present, the entire cost of the consultation is conservatively assigned to the moth, even though the consultation may also address the other listed species.

Anticipated Project Modification and Costs:

C Total Section 7 Costs: \$0 to \$6,200

The replacement of existing water lines may involve soil and vegetation disturbance. If the Service were to find that the net benefit of the project to the moth critical habitat, created by providing an irrigation sources for seedlings or by supplying water for fire protection, outweighs the loss of a few host plants, then no major project modifications would be anticipated.

If, however, the net benefit does not exceed the loss, such as where the project disturbs larval host plants or where the project disturbs the only stand of adult host plants in an area, the Service could require project modifications such as avoidance of existing plant populations or outplanting.

Based on the number and locations of *Nothocestrum* in Unit 6 (Big Island), there is a low probability that the projects would affect an individual larval host plant. Avoidance of these plant populations is anticipated to involve minimal cost.

The Service indicates that an average acre in Unit 6 (Big Island) may support between one to three *Capparis sandwichiana*, two to five *Plumbago zeylanica* and two to five *Ipomoea sp.*, or a total of five to 13 adult host plants. Assuming a five-foot corridor is disturbed along the 29 miles of water lines to be installed or replaced, and the installation of each of the 12 water tanks will disturb half an acre, the total area disturbed is 23.6 acres ((29 miles * 5,280 * 5) / 43,560 + (0.5 * 12)). Accordingly, the water system projects may permanently disturb 120 to 310 adult host plants (5 * 23.6, 13 * 23.6). As stated above, if there are other adult host plants in the vicinity of the project, the Service is unlikely to require project modifications such as re-siting the waterlines to avoid the adult host plant populations or outplanting. If, however, the project disturbs the only adult host plant population in the area and avoidance of the population is not feasible, the Service may require outplanting of adult host plants, at most on a one-to-one basis. Thus, the costs of outplanting could go as high as \$6,200 (\$310 * \$20), based on the outplanting cost given in Section 2.

Whether or not these project modifications are required depends on the specific characteristics of the planned project and the project site. Thus, project modification costs are presented as a range, to reflect the possibility that no project modifications may be required.

Potential Entities Impacted:

Federal: Service, NRCS
State: DLNR

3.j.(2) Water Systems, Maui

As indicated in Table I-1, components of water systems on Maui are located in proposed critical habitat Units 1 and 2. Most of these improvements are designed to store or transport non-potable water in the relatively dry region. The non-potable improvements include water tanks, water catchment basins, water lines, and wells.

As mentioned in Chapter I, these existing water features are excluded from the proposed critical habitat as “unmapped holes.” As such, the operation and maintenance of these manmade features and structures would not be impacted by critical habitat designation.

Additional non-potable water system improvements are likely to be built over the next 10 years on Maui for cattle and to irrigate native plant preserves and residential landscaping. In addition, the development of a catchment or fog-drip water collection system for the residents of Kahikinui is possible. While most of these improvements are likely to be privately financed with no *Federal involvement*, the residents of Kahikinui may seek Federal funding for a catchment or fog-drip water collection system.

Potential Project or Activity, Next 10 Years: Construction of new water infrastructure on Maui

Federal Involvement: Possible Federal funding

Consultation Costs:

C Total Section 7 Costs: \$0 to \$30,600

Estimate based on (1) zero to one consultation in the next 10 years, (2) Medium cost from Table VI-1 of a consultation with a Federal agency as the applicant and the involvement of a non-Federal agency, and (3) the cost of a biological survey, based on a 100-acre open or forested site with medium to difficult access. The number of consultations is presented as a range to account for the possibility that the project does not occur in the next 10 years or that it occurs without *Federal involvement*.

Anticipated Project Modification and Costs:

C Total Section 7 Costs: Minor

The development of a catchment or fog-drip water collection system could involve soil and vegetation disturbance. Because restoration of the area is an integral part of the vision for Kahikinui, it is assumed that any proposed project within Kahikinui will be planned to protect and enhance the native ecosystem and avoid permanent disturbance of native vegetation, including any adult or larval host plant populations. As such, major project modifications are not anticipated.

Potential Entities Impacted:

Federal: Service

Private: Ka 'Ohana O Kahikinui

3.j.(3) Water Systems, Moloka'i

As indicated in Table I-1, components of water systems on Moloka'i are located in proposed critical habitat Unit 7 (Moloka'i). This unit contains infrastructure belonging to the Moloka'i Irrigation System, including reservoirs, pipelines, tunnels, and aqueducts for collecting surface water and pumping groundwater from Waikolu Valley (outside the critical habitat) and transporting it to the Kualapu'u Reservoir in central Moloka'i (outside the critical habitat). In addition, Unit 7 (Moloka'i) also contains water infrastructure belonging to Moloka'i Ranch, including pipelines and aqueducts.

The Moloka'i Irrigation System is operated and managed by the State Department of Agriculture (DOA). It delivers irrigation water to 239 agricultural customers in central Moloka'i. Water improvements require periodic maintenance to insure that pumps continue to run, leaks are detected and repaired, vegetation is cleared from ditch systems, etc.

A recently completed study (2001) of the Moloka'i Irrigation System, commissioned as a result of a severe drought from 1998 to 2001 that lowered the reservoir depth at Kualapu'u to four feet, reviewed ways to mitigate the water shortage. The study contained 30 recommendations, of which 27 were short-term actions to minimize losses, improve irrigation efficiencies, and better manage the Moloka'i Irrigation System. These actions focus on repair and maintenance or information gathering/improved monitoring to increase efficiencies in the existing system. As stated previously, the O&M of existing man-made water system improvements is not subject to section 7 consultation.

The remaining three recommendations were long-term actions related to the development of new water sources:

- Study the feasibility and effect on the environment of collection of runoff water from other sources, including Manawainui, Kaunakakai and Kawela gulches with intermittent stream flows.
- Investigate the use of non-potable brackish well water for mixing with Waikolu Valley water for irrigation.
- Negotiate an agreement to share or purchase Moloka‘i Ranch water.

New water improvements associated with the collection of runoff water from other sources or with the drilling of a new non-potable brackish well could be subject to section 7 consultation if there is *Federal involvement*. Examples of such *Federal involvement* are funding from the USDA or Federal permits under the Clean Water Act for projects that affect streams (e.g., improving a diversion dam, etc.). However, it is highly unlikely that improvement related to new water sources will be proposed or approved in the next 10 years for the following reasons:

- The entire island of Moloka‘i is designated as a Water Management Area. This designation requires a permit from the State Commission on Water Resource Management before any new withdrawal, diversion, impoundment, or consumptive use of groundwater
- Environmental and cultural issues of the impact of water removal on the ecosystem, other water sources, the Public Trust Doctrine, and Native Hawaiian rights will necessitate comprehensive studies before any new water project can proceed.
- Under the State’s current economic climate and financial constraints, developing new water sources on Moloka‘i has not been given priority by the State Legislature, the primary funding entity.

The privately-owned Moloka‘i Ranch water system provides drinking water to Maunaloa town and Maunaloa Industrial Park, as well as irrigation water for Moloka‘i Ranch. Activities anticipated in the next 10 years include repair and maintenance to the existing system.

Potential Project or Activity, Next 10 Years: O&M of existing water systems, new water systems

Anticipated Costs of Consultations and Project Modifications: None

No costs of consultations or project modifications are anticipated because O&M of existing man-made features is not subject to section 7 consultation and no new projects are anticipated within the next 10 years.

3.j.(4) Water Systems, Kaho‘olawe

Planned improvements on Kaho‘olawe include the development of a water collection and storage system, including water tanks, water catchment basins, reservoirs, and water lines, to support

revegetation and restoration efforts. Costs associated with consultations involving new water infrastructure on Kaho'olawe are included in Section 3.f.

3.k. Fire Management

Wildfires pose a significant threat to natural resources and property in the dry forest areas in Hawai'i. The profusion of fountain grass (*Pennisetum setaceum*) and Kikuyu grass (*Pennisetum clandestinum*) increases fire loads for areas that are not regularly grazed. The danger of wildfire is especially evident in Unit 6 (Big Island), where a wildfire in 1995 burned 1,200 acres of the Pu'u Wa'awa'a Forest Bird Sanctuary and another wildfire in 1999 burned 5,000 acres in the Pu'u Wa'awa'a management area. These fires required \$478,000 in suppression costs and caused an estimated \$22.3 million in damages to natural resources.

Current fire management activities include the maintenance of existing firebreaks through mechanical clearing (weed-whacking), chemical spraying (herbicides), mowing, and grazing.

The North Kona Fuels Management Group (NKFMG) is a regionally-based consortium of wildland fire-fighting agencies, natural resource managers, ranchers, private landowners, and other assorted interests organized to developing a long-term strategy to reduce wildfire occurrence within the North Kona and South Kohala districts of the Big Island. The NKFMG's current strategy calls for establishment and maintenance of over 50 miles of roadside firebreaks the region. Approximately 11 miles of these roadside firebreaks fall in the proposed critical habitat Unit 6 (Big Island) along the Mamalahoa Highway.

The firebreaks on State land are currently maintained by DLNR. The draft Pu'u Wa'awa'a management plan indicates that future fire management activities will include:

- A campaign to increase public awareness about the destructive capabilities of wildfires;
- Installing a remote area weather station that can be monitored by satellite;
- Widening firebreaks along the Mamalahoa Highway to 40 feet;
- Maintaining 12 miles of firebreaks by mechanical and chemical clearing or by promoting grazing;
- Maintaining firebreaks and reduce fuel loads within and immediately outside of fenced conservation units;
- Installing parking lots along public access roads in Pu'u Wa'awa'a that are free of fuels;
- Pursuing research for a biological control for fountain grass;
- Creating a map to educate firefighters about biologically sensitive areas; and
- Suppress any fire that is ignited.

Additional fire management activities are likely to take place on private lands outside of the Pu'u Wa'awa'a management area. However, these activities are less likely to have *Federal involvement* or be subject to section 7 consultation.

Potential Project or Activity, next 10 years: Fire management activities in Pu'u Wa'awa'a.

Federal Involvement: Potential funding from the Service or the U.S. Forest Service

According to the draft Pu‘u Wa‘awa‘a management plan, the only fire management activities that could be supported by Federal funding are the annual firebreak maintenance, the purchase and maintenance of fire fighting equipment, biological control research, and annual fire training courses.

Consultation Costs:

C Total Section 7 Costs: \$50,200

Estimate is based on (1) one consultation in the next 10 years; (2) Low cost (from Table VI-1) of a consultation with a non-Federal Agency as the Applicant, and (3) 10 annual biological surveys of 100 acres of open firebreaks with easy access. The firebreaks will have to be surveyed each year because the adult host plants could spread to the firebreaks within one year.

Anticipated Project Modification and Costs:

C Total Section 7 Costs: Minor

Wildfire is a significant threat to moth eggs, larvae, larval host plants and adult host plants. Any activities that reduce the threat of wildfire will have long-term benefits to the moth by reducing the likelihood of large-scale fires that could destroy larval host plants or the moth itself. This benefit is likely to outweigh any potential harm to critical habitat, especially as firebreaks are near the roads, are regularly cleared or grazed, and are dominated by non-native species. As a result, it is exceedingly unlikely that larval host plants (*Nothocestrum*) would be found in the firebreaks. While adult host plants may be found in the firebreaks, the Service indicates that the overall net benefit of fire prevention activities would outweigh any harm to critical habitat because other adult plants are likely to be found within flying distance of the moth. Thus, no major project modifications are anticipated.

Potential Entities Impacted:

Federal: Service, U.S. Forest Service
State: DLNR

3.1. Communications Facilities

The proposed critical habitat contains communications facilities in Unit 1 (Maui) and in Unit 6 (Big Island). The communication facility on Maui is a private antennae farm owned by Island Airwaves at Keonehunehune on land owned by Ulupalakua Ranch and includes a radio tower. The facilities on the Big Island include: a radio facility and two towers owned by Verizon Hawai‘i, Inc.; a radio facility and tower owned by Kamehameha Schools; and a radio tower owned by Hawaiian Electric Light Company, Inc (HELCO). Operation and maintenance of these existing man-made features and structures are not subject to section 7 consultation. However, planned modifications and additions to the communications facilities in the critical habitat would be subject to consultation.

In 2001, the FCC completed a series of informal consultations on proposed communications antennae sites across the State. In general, these proposed sites were in urban areas. None of the proposed sites are in the proposed critical habitat. All of the consultations concerned listed birds; the moth was not affected.

While the most recent FCC permits have been issued for antennae sites near the urban areas outside the proposed critical habitat, new facilities could be proposed for areas near the existing facilities or elsewhere in the proposed critical habitat. It is conservatively estimated that the number of communication facilities in critical habitat will increase by 50 to 100 percent (four to eight) new communications facilities the next 10 years.

Potential Project or Activity, Next 10 Years: Permitting of four to eight new communications facilities

Federal Involvement: FCC and/or FAA permits

Permits are required from the Federal Aviation Administration (FAA) to ensure that communications facilities will not interfere with aircraft, and from the Federal Communications Commission (FCC) to operate the facility

Other Land Management: Possible, depending on location of facilities

Consultation Costs:

C Total Section 7 Costs: \$36,400 to \$72,800

Estimate based on (1) four to eight consultations in the next 10 years, (2) Low cost from Table VI-1 of a consultation with a non-Federal agency as the applicant, and (3) the cost of a biological survey, based on a 10-acre site with medium access. Currently, the Service consults on all communications towers to review impacts to listed birds. The Low cost was selected from Table VI-I to reflect the cost attributable to the additional level of effort required to review these projects for impact to the moth critical habitat. Thus, while the total cost of a consultation regarding communication towers could be higher, this analysis includes an estimate only of the incremental cost attributable to the moth critical habitat.

Anticipated Project Modification and Costs:

C Total Section 7 Costs: \$0 to \$33,600

Due to the small footprints of communications facilities, it is likely that the facility will not adversely modify the critical habitat. However, if larval host plants are found within the project area, the project may have to be modified.

Project modifications may involve avoiding the larval host plants where possible and may include moving the site far enough away from the plant population so that construction will not affect it. Where native host plants cannot be avoided without incurring high costs, the Service may request that two to three larval host plants be planted for every plant destroyed by construction. For purposes of estimating possible project modification costs, this analysis conservatively assumes that avoidance is not possible on half of the possible future communications sites and that 10 host plants will be destroyed on each of those sites during construction activities. It should be noted that due to the rarity of the larval host plants, this conservative estimate may overstate the likelihood that larval host plants will be found within a planned project area.

For each site, the cost to outplant 20 to 30 plants ($10 * 2$; $10 * 3$) could cost up to \$3,600, based on the outplanting costs mentioned in Section 2. If fencing is required to protect the host

plants, the total costs could amount to \$8,400 for each site, based on the outplanting costs mentioned in Section 2. Thus, the total possible project modification costs if native host plants must be replaced on half the communications facilities sites could amount to \$33,600 ($\$8,400 * 4$). If there are no larval host plants in the areas proposed for future communications facilities, project modifications costs could be zero.

If only adult host plants are found within the project area, project modifications would be considered minor as they would at most involve incorporating a few adult plants in the landscaping surrounding the site. For example, if each site were to be required to replant four adult plants, the total costs could be \$640, based on the outplanting costs mentioned in Section 2. This project modification would only be required, however, if the planned project were to destroy the only stand of adult host plants in the general vicinity of the project.

Thus, the range of possible project modifications costs for future communications facilities is \$0 to \$33,600.

Potential Entities Impacted:

Federal: Service, FCC, FAA

Private: Verizon Hawai'i, Inc., Kamehameha Schools, HELCO, Ulupalakua Ranch

3.m. Golf Courses

3.m.(1) Existing Golf Courses

Proposed critical habitat Unit 6 (Big Island) contains two existing 18-hole golf courses. The Makalei Hawai'i Country Club is located in the southwestern portion of Unit 6 and approximately two thirds of the Links Golf Course is located along the northern edge of Unit 6.

Typical O&M activities for existing golf courses include chemical applications, fertilizer applications, irrigation repairs including some electrical work, mechanical maintenance (e.g., aerating the ground surface, building some masonry, etc.), and mowing, trimming, and edging (Kiahuna Golf Course, 2002).

As mentioned in Chapter I, the Makalei Hawai'i Country Club course and the Links Golf Course will be excluded from critical habitat because they do not contain the *primary constituent elements*.

Potential Project or Activity, next 10 years: O&M of existing golf courses and parks

Federal Involvement: None

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because existing golf courses are excluded from critical habitat because they do not contain the *primary constituent elements* and because there is no *Federal involvement*.

Potential Entities Impacted: None

3.m.(2) Planned Golf Courses

Proposed Unit 6 (Big Island) contains 100 percent of a site planned for a golf course and clubhouse near the existing Links Golf Course. There is no known *Federal involvement* for this golf course construction project.

Proposed Unit 5B (Big Island) contains approximately 150 acres (77 percent) of a 194-acre planned municipal golf course site. The golf course is part of the VOLA master-planned residential project mentioned earlier in Section 3.a.(3). The site for the golf course was conveyed by the State HCDCH to the County of Hawai'i by Executive Order No. 3665 dated July 18, 1995 (HCDCH, 1999).

After the VOLA golf course is built, the County Department of Public Works (DPW) plans to use treated wastewater from the Kealakehe Wastewater Treatment Plant to irrigate the course. This would allow the County of Hawai'i to dispose of treated wastewater and provides a low cost source of irrigation water for the golf course. However, the County must upgrade their wastewater treatment plant before they can use the effluent for irrigation. The County plans to seek EPA funds to upgrade the treatment plant.

Potential Project or Activity, next 10 years: Golf course construction and irrigation

Federal Involvement: EPA funding

The golf course construction projects are not expected to have *Federal involvement*. However, plans to upgrade the existing wastewater treatment plant and to use the water to irrigate the golf course in Unit 5B (Big Island) may use EPA funding.

Consultation Costs:

C Total Section 7 Costs: \$9,700

Estimate is based on (1) one consultation, (2) Low cost (from Table VI-1) of a consultation with a non-Federal Agency as the Applicant, and (3) one biological survey of a 100-acre open site with easy access.

Anticipated Project Modification and Costs: None

The golf course may include host plants for the moth in the rough areas. As long as the treated wastewater does not kill these plants (which is likely to be the case since the treated wastewater would not be proposed if it did kill the plants on the golf course), there are no anticipated project modifications.

Potential Entities Impacted:

Federal: Service, EPA

County: DPW

3.n. State Trails and Access System

The Na Ala Hele Trail and Access System maintains existing trails within the proposed critical habitat:

- Unit 1 (Maui): Hoapili Trail (along the southern coastline of Maui); and
- Unit 7 (Moloka'i): the Moloka'i Forest Reserve Access Road (Maunahui Road).

The State DLNR, Division of Forestry and Wildlife, also manages existing trails within the proposed critical habitat:

- Unit 6 (Big Island): Kiholo-Pu'u Anahulu Trail, Kiholo-Huehue Trail, and Hualalai Trail.

Na Ala Hele receives Federal funding annually from the Federal Highways Administration (FHWA), which it allocates to the different islands by dividing them equally. The funds are used for road and trail restoration and maintenance projects based on need, and may also be used for trails and access roads managed by other divisions of DLNR, such as the Division of Forestry and Wildlife, depending upon maintenance needs. Despite Federal funding, the maintenance of trails and roads would not be subject to section 7 consultation because they are existing man-made features.

Na Ala Hele staff indicate that no new trails or access roads are expected within the proposed critical habitat on Maui, Moloka'i, or the Big Island in the next 10 years. However, DLNR may construct new trails in the next 10 years. The draft Pu'u Wa'awa'a management plan proposes to construct new trail segments that provide access to the Pu'u Wa'awa'a cone, and can accommodate recreational pursuits such as mountain biking and horseback riding. The Pu'u Wa'awa'a cone access trail is likely to be 1.2 miles. Based on the planned budget, there are plans for one more trail segment, but it will be smaller. Thus, it is assumed that there will be 2 miles of new trails constructed in the proposed critical habitat over the next 10 years. DNLR plans to prepare an Environmental Assessment (EA) in accordance with Hawai'i law for these trails.

Potential Project or Activity, Next 10 Years: Construction of two miles of new trails

Activities involved in trail building include removing vegetation, defining the trail corridor and constructing the trail bed.

Federal involvement: Funding from the U.S. Department of Transportation (DOT) Federal Highways Administration (FWHA) Recreational Trails Program

Consultation Costs:

C Total Section 7 Cost: \$5,200

The cost estimate is based on (1) one consultation; (2) the Low cost from Table VI-1 of a consultation with a non-Federal agency as the Applicant; and (3) no survey since the preparation of an EA will include a survey of the planned trail route. All of the consultation costs are conservatively assigned to the moth, even though the consultation may also address listed plants or other wildlife species that may be present.

Anticipated Project Modifications and Cost: None

The Service indicates that project modifications for new trails would include having a biologist on site when the final routes for the trails are determined, so the trail will avoid the host plants for the moth. A review of completed EAs across the State indicates that this type of biological monitoring is standard practice in biologically sensitive areas. Since DOFAW plans to prepare an EA for the new trail segments in the proposed critical habitat, the cost of the project modification will be attributable to the baseline protections (i.e., the EA) and not to the moth's listing or critical habitat.

Potential Entities Impacted:

Federal: Service, FWHA
State: DNLR

3.o. Parks

3.o.(1) National Parks

Former U. S. Representative Patsy Mink (D-HI) requested the Department of the Interior to study the feasibility of creating a national park within Unit 1 (Maui), along six miles of coastline from La Perouse Bay to Kanaloa Point. The proposal has the support of the Hawai'i House of Representatives, the Hawai'i Senate, the Maui County Council, the Maui Hotel Association, and the Maui County Cultural Resources Commission.

However, the preliminary study prepared by the Department of the Interior found that the proposed area lacks resources of nationwide significance. Given the findings of the preliminary study and the complexity involved in becoming a National Park, this analysis concludes that it is unlikely that any portion of Unit 1 (Maui) will become part of the national parks system within the next 10 years. Therefore, no consultation costs or project modifications involved in such a proposal have been included in this analysis.

Potential Project or Activity, next 10 Years: Creation of new National Park

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because it is unlikely that any portion of the critical habitat will become a new National Park within the next 10 years.

Potential Entities Impacted: None

3.o.(2) Makena State Park

Makena State Park is a 164-acre beach park located on the eastern edge of Unit 1 (Maui). Currently, DLNR State Parks Division is updating the Master Plan for the Park, which includes conducting an update of the biological and archaeological resources of the Park. Once the Master Plan is complete, DLNR State Parks may propose projects to implement the Plan. DLNR State Parks indicates that it intends to participate in section 7 consultation for any activities that involves Federal permits or Federal funding.

Potential Project or Activity, Next 10 Years: Park improvements

Federal involvement: Federal funding or Federal permit

Consultations Costs:

C Total Section 7 Cost: \$5,200

The cost estimate is based on (1) one consultation; (2) the Low cost from Table VI-1 of a consultation with a non-Federal agency as the Applicant; and (3) no survey since the preparation of the Makena State Park Master Plan will include surveys of the biological and archaeological resources of the park.

Anticipated Project Modifications and Cost:

C Total Section 7 Costs: Minor

The Service indicates that project modifications for new park improvements would include having a biologist on site when siting decisions for items such as trails or new restroom facilities are made, so that the improvements will avoid the host plants for the moth. Since DLNR-State Parks is conducting a master plan that includes a survey of the biological resources of the area and that will then be used in planning future improvements, no major project modifications are expected.

Potential Entities Impacted:

Federal: Service

State: DNLR

3.o.(3) Kanaha Beach County Park

Kanaha Beach County Park is located adjacent to Kahului Airport along the shoreline. The Park is popular with day users for picnicking, windsurfing and kitesurfing and is one of few on Maui which permits overnight camping. The County of Maui is currently preparing a Master Plan for the Beach Park. Future improvements are likely in the next 10 years as necessary to implement the Master Plan, but the County does not anticipate that these improvements will require Federal permits or utilize Federal funding.

Potential Project or Activity, Next 10 Years: Park improvements

Federal Involvement: None

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because there is no *Federal involvement*.

Potential Entities Impacted: None

3.p. Community Economic Development

3.p.(1) Moloka‘i Enterprise Community

The entire island of Moloka‘i was designated a Federal Enterprise Community in 1999. Governed by a volunteer community board, Ke Aupuni Lokahi, the Moloka‘i Enterprise Community’s 10-year strategic plan outlines specific projects to achieve economic growth and community development through environmental protection, the promotion of diversified agriculture, encouragement of tourism, and the addition of new community facilities.

As a result of the Enterprise Community designation, Moloka‘i receives Federal funding from the USDA and leverages these funds to receive additional funding and technical assistance from a broad array of partners, including Federal, State, and local government, non-profit organizations, area businesses, public schools, and the University of Hawai‘i. In 2002, the Moloka‘i Enterprise Community received funds from the following Federal agencies: USDA (EZ/EC grant), Department of Education, Department of Health and Human Services, Department of Housing and Urban Development, Department of Interior, Department of Labor, Economic Development Administration (Department of Commerce), Environmental Protection Agency, USDA NRCS, and USDA Rural Development.

Most of the projects identified in the strategic plan do not involve activities within proposed critical habitat Unit 7 (Moloka‘i), but instead are predominantly centered around Kaunakakai and Ho‘olehua. However, a few activities may involve the proposed critical habitat, including:

- Activities related to watershed protection;
- Activities related to a historic sites inventory; and
- Activities related to the development and implementation of a land trust.

Consultation costs related to watershed protection activities have already been discussed and included in this analysis under Section 3.e. (East Moloka‘i Watershed Partnership). According to the Moloka‘i Enterprise Community Benchmark Summary Report (October 2001), the historic sites inventory focuses on training for cultural, archaeological or ethnographic surveys and compiling the information from existing surveys, thus no consultation costs are expected to arise from activities associated with this project. Finally, while Unit 7 (Moloka‘i) has unique natural resources that may be appropriate for protection through a land trust, the idea of a land trust is still under preliminary discussion, making it impossible to determine the likelihood that any land within Unit 7 (Moloka‘i) will be affected within the next 10 years.

Federal Involvement: Funding from USDA and potential matching funds from other Federal agencies

Anticipated Costs of Consultations and Project Modifications: None

Besides the consultation expected in relation to the watershed protection projects, which was taken into account in Section 3.e. of this analysis, no costs of consultations or project modifications are anticipated from any of the Enterprise Community projects in the next 10 years.

Potential Entities Impacted: None

3.p.(2) Kahikinui

As discussed previously in Section 3.a.(2) and 3.e.(3), the Kahikinui Kuleana Homesteads, located in Unit 1 (Maui), is under development by Native Hawaiian beneficiaries and the surrounding area may be targeted for conservation efforts. In addition, the Kahikinui community seeks to encourage economic development in the area as a means to implement the vision of Kahikinui as a self-governing and self-sufficient community. A Community Based Economic Development and Makai Management Plan was developed in collaboration with the University of Hawai'i Department of Urban & Regional Planning, in which the community specified a variety of possible activities for economic development purposes. These include:

- Forest restoration and sustainable tree farming.
- Development of a recreational access management program: including access control points, a system of visitor permits, the monitoring of total use, and including a small fee to be used for resources protection and management
- Establishment of a hydroponics program to allow farming with less water and fewer pesticides
- Implementation of an eco-cultural tours program
- Organization of an agricultural cooperative and community pasture

Potential Project or Activity, Next 10 Years: Economic development activities

Federal Involvement: Federal funding

Consultation Costs:

C Total Section 7 Costs: \$15,700 to \$47,100

Estimate based on (1) one to three consultations in the next 10 years, (2) Medium cost from Table VI-1 of a consultation with a Federal agency as the applicant and the involvement of a non-Federal applicant, and (3) no biological survey.

The small size of the community currently at Kahikinui makes it difficult to estimate which of the economic development activities are most likely to occur, as well as how many are likely to occur, with Federal funding, within the next 10 years. Because beneficiaries will simultaneously be responsible for the development of their own homes, they may lack the time to participate in the development of communal economic development activities. However, the development of communal economic development activities may take priority if beneficiaries are waiting upon economic opportunities in Kahikinui before joining the community. The estimate of one to three consultations takes into account these circumstances and the number of past activities in the area and provides a range that reasonably reflects the amount of expected activity in the next 10 years.

Because of the uncertainty about what future projects may involve and the particular location of a project, a Medium cost is conservatively attributed to these consultations. No biological surveys are anticipated because of the existing information regarding Kahikinui, including surveys conducted as part of the environmental review process for the creation of the Kuleana Homestead program.

Anticipated Project Modification and Costs:

C Total Section 7 Costs: Minor

Some of the potential economic development activities, such as the development of a recreational access management system or an eco-cultural tours program, would involve very little habitat disturbance. Other economic development activities, such as the organization of a community pasture or the creation of a hydroponics program, would have a greater potential for affecting moth critical habitat. Given the context of Kahikinui and the importance of restoration of the area to the surrounding community, it is assumed that any proposed project within Kahikinui will be planned to protect and enhance the native ecosystem and avoid permanent disturbance of native vegetation, including any adult or larval host plant populations. As such, major project modifications are not anticipated.

Potential Entities Impacted:

Federal: Service, other Federal agency

Private: Ka 'Ohana O Kahikinui

3.q. Natural Disasters

The most likely natural disasters to affect proposed moth critical habitat – and the ones that would cause the most damage - are a major hurricane, wildfires, or a *tsunami*. Wind and water damage caused by a major hurricane could include damaged structures, coastal flooding, surf damage, downed trees and branches, and washed out roads, trails, and irrigation ditch systems. All islands have experienced dangerous wildfires in the past that have caused significant damage to wildlife and watershed areas. Finally, while little *tsunami* activity has occurred in the past 30 years, *tsunamis* have caused more deaths than any other natural disaster in Hawai'i. A *tsunami* hitting the Maui or Hawai'i coast could cause significant damage to the shoreline and to plant life, including moth host plant populations. Recovering from these natural disasters could involve clearing away downed trees, branches, and other debris and rebuilding damaged structures.

3.q.(1) Federal Emergency Management Agency (FEMA)

In the event of a natural disaster, FEMA may provide individual assistance in the form of low-interest loans, cash grants, housing assistance, etc. FEMA also has a Public Assistance Grant Program that provides disaster aid to State and local governments to repair, replace, or supplement parts of a community's infrastructure damaged in a natural disaster.

Potential Project or Activity, next 10 Years: Recovery efforts

Federal Involvement: Financial assistance from the Federal Emergency Management Agency (FEMA)

Consultation Costs:

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.

C Total Section 7 Costs: \$4,000 to \$7,500

Estimate is based on five to 10 days of effort by Service biologists to review the proposed projects at approximately \$750 per day. While other listed species may be present, all costs of the consultation are conservatively assigned to the moth even though the consultation may also address other listed species or their critical habitat.

Anticipated Project Modifications and Costs:

C Total Section 7 Costs: Minor

As long as natural disaster recovery projects are planned so that they avoid further damage to critical habitat—which is likely to be the case—the proposed moth critical habitat designation would have little or no economic impact on FEMA projects following a natural disaster.

Potential Entities Impacted:

Federal: Service, FEMA

3.q.(2) USDA Farm Service Agency Disaster Assistance

Other natural disasters, such as flooding or drought, in the proposed critical habitat could affect agricultural land and infrastructure. The FSA has several programs designed to aid farmers and ranchers affected by natural disasters. These programs are summarized below:

- **Emergency Conservation Program (ECP):** ECP provides emergency funding for farmers and ranchers to rehabilitate farmland damaged by wind erosion, floods, hurricanes, or other natural disasters, and for carrying out emergency water conservation measures during periods of severe drought.
- **Non-insured Crop Disaster Assistance Program (NAP):** NAP provides financial assistance to eligible producers affected by natural disasters. This federally funded program covers non-insurable crop losses and planting prevented by disasters.
- **Emergency Loan Assistance (EM):** EM provides emergency loans to help producers recover from production and physical losses due to drought, flooding, other natural disasters, or quarantine.
- **Emergency Haying and Grazing Assistance:** This program allows haying and grazing of certain Conservation Reserve program acreage in areas suffering from weather-related natural disasters.

If the proposed critical habitat is affected by a natural disaster, some of the farmers and ranchers may elect to participate in one or more of these FSA programs.

Potential Project or Activity, next 10 years: Agricultural disaster recovery projects

Federal Involvement: Financial assistance from the FSA

Consultation Costs:

In the event of a natural disaster, a consultation with the Service would be required if financial assistance is sought from FSA by farmers and ranchers in critical habitat. In such emergencies, the Service expedites consultations.

C Total Section 7 Costs: \$4,000 to \$7,500

Estimate is based on five to 10 days of effort by Service biologists to review the proposed projects at approximately \$750 per day.

Anticipated Project Modifications and Costs:

C Total Section 7 Costs: Minor

As long as natural disaster recovery projects are planned so that they avoid further damage to critical habitat—which is likely to be the case—the proposed moth critical habitat designation would have little or no economic impact on FSA projects following a natural disaster.

Potential Entities Impacted:

Federal: Service, FSA

3.r. Ecotourism

Often, areas proposed for critical habitat designation are areas of significant natural beauty or cultural value, qualities that also make these areas attractive for ecotourism. As shown in Table I-1, Units 1 (Maui), 6 (Big Island) and 7 (Moloka'i) contain multiple hiking trails. Hiking tours, led by professional naturalist guides, are offered on Maui, Hawai'i, and Moloka'i, and may occur within these Units. Organized birdwatching trips to the Kanaha Pond Wildlife Sanctuary may occur in Unit 3 (Maui). Some private landowners owning land within the proposed critical habitat on Maui (Units 1 and 2) have explored the option of offering ecotourism-related activities compatible with ranching, such as horseback riding. Finally, the State is exploring the development of short- and long-term commercial ecotourism activities as part of the Pu'u Wa'awa'a Management Plan. In addition to hiking, these activities could include bird watching, horseback riding, caving, and camping.

Potential Project or Activity, next 10 Years: Commercial hiking, horseback riding, birdwatching, caving, camping

Federal Involvement: None

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because the activity does not have *Federal involvement*.

Potential Entities Impacted: None

4. INDIRECT COSTS

4.a Introduction

Aside from the protection provided by the Act as described in Chapter III, 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 have *Federal involvement*, the designation of critical habitat does not afford any additional protections for listed species with respect to strictly private activities.

However, some private landowners fear that designation of critical habitat may have indirect impacts beyond those associated with the Act. For example, designation may provide the impetus for the State and counties to require additional protections for designated critical habitat that would not otherwise be subject to such protections. These protections may affect both the management of affected lands as well as State and county development approvals. Also, the critical habitat designations may affect property values. While there is uncertainty on whether any or all of these indirect impacts may actually occur and the extent of those impacts if they do occur, possible indirect impacts of the proposed designation are addressed below.

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 (i.e., feral pigs, goats and deer) 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, however, since the Service currently believes that these birds and the hunting of them do not have a significant adverse impact on listed species, including the moth, or their habitats.

As discussed in the proposed rule, one threat to the survival and conservation of the native host plants for the moth comes from the augmentation of ungulate populations, 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.

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 size of the hunting areas and the number of game mammals available to hunters.

The proposed critical habitat designation overlaps with hunting units on Moloka‘i and the Big Island. Approximately 10 percent of Moloka‘i’s resident population are hunters, and six percent of the Big Island’s resident population are hunters. While many hunters accept the need to protect limited portions of the native forest from damage by ungulates, the majority of 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, most 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 is reinforced by the perception that the Service, over the objections of DLNR, withheld Pittman-Robertson funds for game-management projects in areas proposed for critical habitat designation (see Appendix VI-A for more information on hunting in Hawai‘i).

4.b.(2) Indirect Impacts on Game Management

Section 7(a)(2) of the Act by itself 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. Instead, it requires only that, if DLNR seeks to undertake an activity that may affect the designated area using Federal funding or with a Federal permit, the Federal action agency consult with the Service. 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.

However, critical habitat designation would add weight to the argument that game-mammal populations should be eliminated or reduced substantially in affected areas because they threaten the native host plants for the moth. 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 could be expected.

Hunting Activity

Initially, on both Moloka‘i and the Big Island, the number of hunting trips into the more accessible critical habitat units would increase. But after the 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 critical habitat units 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. Finally, some hunters may switch to hunting on privately-managed hunting lands.

Economic Activity

A reduction of hunting activities on Moloka‘i and the Big Island would result in a reduction in economic activity on these islands. To illustrate the magnitude of the impacts on Moloka‘i, if about half of those who hunt game mammals on the affected lands were to give up hunting, then hunting activity could drop by about eight percent (half of 16 percent, which is the estimated percentage of the accessible State-managed hunting lands on Moloka‘i proposed for designation). This translates into an annual decrease in economic activity related to hunting on Moloka‘i of about \$25,000 in direct sales (eight percent of \$315,000); \$45,000 in total direct and indirect sales (eight percent of \$560,000); one job (eight percent of 10 jobs); and \$15,000 in income (eight percent of \$185,000). Total economic activity related to hunting on Moloka‘i is documented in Appendix VI-A.

To illustrate the magnitude of the impacts on the Big Island, if about half of those who hunt game mammals on the affected lands were to give up hunting, then hunting activity could drop by about 12.5 percent (half of 25 percent, which is the estimated percentage of the accessible State-managed hunting lands on the Big Island proposed for designation). While the proposed critical habitat covers only three percent of the total hunting area on the Big Island, the actual hunting activity within the area proposed for designation is much higher than three percent. Based on information provided by DLNR regarding the popularity and the number of hunting trips in the Pu‘u Wa‘awa‘a area, it is assumed the area included in critical habitat supports approximately 25 percent of the hunting activity on the Big Island. A reduction in hunting activity by half in this area would translate into an annual decrease in economic activity related to hunting on the Big Island of about \$425,000 in direct sales (12.5 percent of \$3.4 million); \$750,000 in total direct and indirect sales (12.5 percent of \$6 million); 13 jobs (12.5 percent of 100 jobs); and \$250,000 in income (12.5 percent of \$2 million). Total economic activity related to hunting on the Big Island is documented in Appendix VI-A.

For the most part, the \$450,000 (\$25,000 + \$425,000) decrease in expenditures by the displaced hunters would probably be spent on other activities, goods and services. This 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, with some providers of goods and services benefiting at the expense of the stores and service-providers catering to hunters.

Hunter Benefits

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 Moloka‘i and the Big Island. Under the given assumptions, this annual loss is estimated at \$13,000 (eight percent of the \$165,000 in surplus value) on Moloka‘i and at \$225,000 (12.5 percent of the \$1.8 million in surplus value) on the Big

Island. But partially offsetting this loss to hunters would be benefits derived from 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 calculate the distribution of funds is based in part on the number of licensed hunters. However, Hawai‘i currently receives the minimum amount of funding.

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 because of low success rates, and to control non-native plants and weeds in degraded areas where large populations of game mammals no longer browse.

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. However, without intervention from a third party, a major change in State management of game mammals on Moloka‘i and the Big Island 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 moth listing and proposed critical habitat designation. Critical habitat designation would not change the nature of the debate significantly, but it may expand the geographic focus.

But, even with the added weight of this argument, the probability is slight that the State would adopt a policy to substantially reduce game-mammal populations in critical habitat units that overlap with State Hunting Units. This judgment is based on discussions with DLNR, others familiar with the subject, and decades of public testimony by hunters. Simply put, the scenario is not regarded as politically realistic: hunters would vigorously oppose a proposed reduction in game populations.

In addition to the political problem, there are concerns within DLNR about the cost and feasibility of the removal of large numbers of game mammals from about 24,000 acres. The most costly item would be removing ungulates from less accessible 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—particularly if hunters are not interested in hunting in an area due to low success rates or difficult access. And where strategic fencing is in place, there are concerns about the periodic cost of repairing or replacing sections of fencing that have been vandalized.

4.b.(5) Probability of a Lawsuit to Stop Hunting

While DLNR is not expected to change its policy on game mammal management, some speculate that they could be forced to do so as a result of a third-party lawsuit. *Palila v. Hawaii Department of Land and Natural Resources*, 471 F. Supp. 985 (D. Haw. 1979), aff'd 639 F.2d 495 (9th Cir. 1981).

In the *Palila* case, the court determined that game mammals were destroying or altering *palila* habitat, and thus harming the *palila*. A similar argument could be made for the moth because game mammals are known to destroy native plant seedlings, and the moth relies on certain native plants for foraging, sheltering, maturation, dispersal, breeding, and egg production. If the court determined that the game mammals were harming the moth, DNLR could be forced to change its game mammal policy in order to avoid *take* of the species, as it did in the *palila* case. This decision would be less likely to succeed on Moloka'i because the area is currently *unoccupied* by the moth. However, other Units are considered *occupied* by the moth, and thus could be subject to a court decision that game mammal activity destroying moth habitat constitutes a *taking* of the moth.

As mentioned in the preface, this analysis focuses on section 7 of the Act. The prohibition against *take* is found in section 9 of the Act, so any economic impact related solely to the *take* provision is outside of the scope of this analysis. However, the designation of critical habitat could add weight to the argument that the area is important to the conservation of the moth. This added weight could increase the chances that a third-party lawsuit would be successful.

However, at this point, estimating costs attributable to critical habitat is speculative. The probability that a lawsuit may be filed, the likelihood of its success, and the role of critical habitat in the context of the suit is unknown.

For illustration purposes, if game mammals were removed from critical habitat as a result of a third-part lawsuit, the economic costs would be on the order of the costs mentioned in section 4.b.(3) above, plus legal fees. Again, however, the portion of these costs, if any, that would be attributable to critical habitat is unknown.

4.c. Conservation Management

Private and public landowners have expressed concern that they will be required to alter the management of their lands that fall within the designation so as to assure the survival and conservation of listed species, regardless of whether they plan to propose any changes to land uses or activities in the future. This concern stems in part from language in the proposed rule identifying woodcutting, grading, construction, overgrazing, road building, mining, and herbicide application (activities that remove, thin, or destroy moth habitat) and the introduction of invasive plant species, forest fragmentation, overgrazing, the augmentation of feral ungulate levels, water diversion, and excessive groundwater pumping (activities which decrease habitat quality and value through indirect effects) as activities that may directly or indirectly destroy or adversely modify critical habitat (67 FR 40647).

Specifically, some landowners are concerned that critical habitat designation could interfere with existing and planned activities within proposed critical habitat. Landowners have also expressed concern that, in addition to putting a halt to existing and planned activities, critical habitat designation could result in the imposition of new management obligations, such as the construction of fencing, the removal of feral ungulates, or the removal of noxious weeds. Some landowners have expressed concern that this new obligation will be expensive and they will have to pay most or all of the costs that may be associated with managing the land to assure survival and conservation of the species.

Finally, some landowners have expressed concern over the possible loss of discretion over their land management practices. Specifically, there is concern that beneficial land management practices voluntarily adopted in the past may become mandatory without regard to either the economic impact, the actual benefits associated with the practice, or the role of these management practices in their ongoing operations.

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 the moth, and the estimated costs of such management activities.

4.c.(1) Requirements for Conservation Land Management

Existing Federal Requirements

Section 7 of the Act by itself 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; (4) close areas to hunters or hikers; (5) initiate conservation projects; or (6) prepare special land-management plans.

Instead, it requires only that a Federal agency that provides funding or permits for any activity that may affect the designated area must consult with the Service to insure that the activity is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat of such species.

Existing State Requirements

Under existing State law, a Federal designation of critical habitat does not subject the land to additional State requirements to proactively manage the 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.c.(2) Potential Requirements: Court Ruling on *Taking*

Even though there are no direct requirements under Federal or State law to proactively manage lands to protect critical habitat or conserve listed species, some landowners speculate that, pursuant to litigation, a Federal or State court might mandate conservation management of privately owned land in critical habitat. The legal decision would be based on an interplay among the Act, the State's endangered species law, and various State laws and State Administrative Rules that

protect the ecosystems of threatened and endangered species (see Chapter IV for more detail on these State requirements).

Under Federal and State law, prohibited activities include the *taking* of any wildlife species (see Chapter IV and HRS §124). If a court finds that an action degrades critical habitat to an extent where it significantly impairs essential behavioral patterns of the species, such as breeding, feeding, and sheltering, this action could constitute a *take* of the moth, regardless of whether an individual moth would be harmed directly by the proposed action (i.e., the action could harm a portion of the habitat of the moth, but not the moth itself). Because the point where an activity disturbs habitat sufficiently to constitute a significant impairment of essential behavioral patterns of the species is unclear, landowners fear that their actions could unintentionally amount to an illegal *taking*. All projects and activities could be covered, regardless of *Federal involvement*. For example, clearing land of native host plants in preparation for a housing project could be viewed as an activity that degrades critical habitat and therefore constitutes a *taking* of a listed species. This argument is similar to the one that was 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, discussed earlier in this Section and in Appendix VI-A.

Application to Critical Habitat

As noted above, the precedent set in the *Palila* case exists as a potential requirement for private landowners. For example, in a case brought under the Act, a court might mandate conservation management of privately owned land in existing habitat and/or Federally-designated critical habitat based on arguments similar to those presented in the *Palila* case. As noted previously, the prohibition against *take* is found in section 9 of the Act, so any economic impact related solely to the *take* provision is outside the scope of this analysis. However, the designation of critical habitat could add weight to the argument that an area is important to the conservation of the moth and assist in demonstrating that harm to the area would interfere with the essential behavioral patterns of the species. As such, the effect of the proposed critical habitat designation could be to increase the probability that a lawsuit would be successful or to expand and define more precisely the geographic extent of habitat that could be the subject of a court decision.

In the event that a case is brought under State law, landowners speculate that State agencies or a State court might interpret various State Administrative Rules and State laws that protect "ecosystems" of threatened and endangered species to mean protection of the "critical habitat" of these species—even though "critical habitat" is not mentioned in State laws. As a result, the proposed critical habitat designation could expand and define more precisely the areas that might be affected by State court rulings.

In either case, if conservation management were to be mandated, it is more likely that these costs would be attributable to section 9 of the Act rather than to critical habitat designation.

4.c.(3) Conservation Management to Protect the Moth

As indicated in the proposed rule, major threats to the moth include the loss and degradation of habitat and non-native plants and animals. In response to these and other threats, management actions needed to assure the survival and conservation of the moth 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 moth and the endangered host 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, outplanted and augmented populations; and (9) habitat management and restoration in areas deemed essential for the conservation of species.

4.c.(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. In addition, the costs arising from the halting of any existing and planned activities would depend upon the nature of the activity, the availability of alternative locations to conduct the activity, and the cost of relocation.

Conservation Management Costs Per Acre

The proposed critical habitat on Maui and the Big Island includes rugged dry areas with gentle slopes and evidence of recent lava flows. Management of these areas would include fire, weed, slug, insect, and rodent control; ungulate exclosure fences; monitoring; and outplanting of native host plants. In general, the cost per acre of these conservation management activities are inversely related the number of acres being protected. For example dry forest restoration projects on areas that are less than 100 acres at Ka'upulehu on the Big Island have cost up to \$5,000 per acre per year (Hawai'i Forest Industry Association, 1998). However, the Pu'u Wa'awa'a management plan proposes to fence and manage 7,550 acres at a cost of \$85 to \$100 per acre per year (DLNR, 2002). The proposed critical habitat for the moth covers over 90,000 acres on Maui and the Big Island, so the cost per acre of conservation management may be less than these figures. However, since individual units or portions of units may be fenced at a time, the conservation management costs are likely to fall within the range of \$85 to \$100 per acre per year.

The proposed critical habitat Unit 7 (Moloka'i) is in a mountainous area with steep gulches and valleys. 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 National Park Service).

Depending upon the circumstances, annual conservation-management costs for the mountainous areas on Moloka'i range from an average of less than \$30 per acre to more than \$80 per acre (based on information from DLNR, 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.

Court-ordered conservation management is not anticipated on Kaho'olawe because under existing Hawai'i State law, the island must be managed for, among other things, rehabilitation, revegetation, habitat restoration and preservation (see section 3.f. above).

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.

Total Conservation Management Costs

While there is considerable uncertainty regarding the probability of a court mandating the institution of conservation management practices and the portion of the costs, if any, that would be attributable to critical habitat, for the purposes of illustration of the potential costs involved, this section will assume that conservation management is mandated. This would include roughly 45,000 acres on Maui, 45,300 acres on the Big Island, and 4,500 acres on Moloka‘i.

Under such a circumstance, the critical habitat proposal could cost landowners \$7.7 million to \$9 million per year to manage critical habitat on Maui and the Big Island (based on \$85 to \$100 per acre) and \$135,000 to \$360,000 per year to manage critical habitat on Moloka‘i (based on \$30 to \$80 per acre), for a total of \$7.8 million to \$9.4 million per year.

Based on land ownership of these areas, about \$5.4 million to \$6.5 million per year would be a State obligation (\$7.8 million x 69%; \$9.4 million x 69%), and about \$2.4 million to \$2.9 million per year would be an obligation of private landowners (\$7.8 million x 31%; \$9.4 million x 31%). To varying degrees, some of these lands are already managed as part of the NAR system, the Natural Areas Partnership program, a Wildlife Sanctuary, or a Watershed Partnership (see Table I-1 and Chapter IV) and therefore these estimates likely overstate actual management costs. The related increase in economic activity is discussed in the section on benefits (Section 6).

4.c.(5) Cost to Modify Existing and Planned Projects, Land Uses, and Activities for Conservation Management

Assuming conservation management of the entire critical habitat is mandated, certain existing and planned projects, land uses, and activities may have to change significantly. For example, fencing and game mammal control mandated by court-ordered conservation management could reduce or eliminate the amount of hunting in critical habitat. If the conservation management is focused on fencing certain pristine areas and allowing hunting in the remaining degraded areas in critical habitat, than hunting could continue, albeit at a lesser scale. However, if conservation management requires fencing of the entire critical habitat, hunting in these areas will eventually stop. The economic costs associated with this scenario are presented above in section 4.b.(3).

The remaining current and future projects, land uses, and activities are likely to be consistent with court-ordered conservation management. For example, many areas in critical habitat have been historically used for cattle grazing. These areas still contain the *primary constituent elements* for the moth, so the Service indicates that sustainable grazing in these areas does not adversely affect the moth. Grazing controls weeds and reduces fire hazard, so it also indirectly benefits the species.

As mentioned in the direct costs section, some of the areas in critical habitat are planned to be subdivided for low-density resort/residential development or converted to golf courses. This type of low-density development is not likely to adversely affect the moth because they are relatively strong fliers and can fly from one patch of host plants to another, even if a house, road, or golf green is in between the patches. However, the habitat value would be enhanced if the developers and homeowners include moth host plants in their landscaping. Thus, if conservation management of

the entire critical habitat were to be mandated, the incorporation of moth host plants in landscaping plans could be required.

A local developer who is familiar with the costs of outplanting the host plants for the moth indicates that resort/residential, golf course, industrial, residential, and roadway landscaping could be modified to be consistent with the conservation of the moth. The costs of these modifications are estimated as an additional 10 percent of the planned landscaping expenditures (PIA-Kona Ltd., 2002).

There are approximately 1,000 planned resort/residential lots planned in critical habitat. The lots will be used for low-density high-end homes. Developers typically spend \$10,000 to \$15,000 per lot to landscape common areas, while homeowners typically spend between \$100,000 to \$200,000 per lot to landscape the house lots. Thus, the estimated total amount of money spent on landscaping the resort/residential development ranges from \$110 million to \$215 million ($1,000 * (\$10,000 + \$100,000)$; $1000 * (\$15,000 + \$200,000)$) (PIA-Kona Ltd., Akamai Gardens, No Ka Oi Plants, 2002).

The two planned golf courses in Unit 6 (Big Island) will utilize existing native vegetation so they will only require roughly \$2 million per course for landscaping. The planned golf course in Unit 5B (Big Island) is likely to involve more landscaping, so that total landscaping budget for this course could reach \$5 million. The total landscaping budget for all three golf courses is \$9 million (PIA-Kona Ltd., 2002).

There are 26 industrial lots planned in critical habitat. The people who buy and develop these lots will spend between \$5,000 and \$10,000 on landscaping, so the total estimated landscaping expenditures ranges from \$130,000 to \$260,000 (PIA-Kona Ltd., Akamai Gardens, No Ka Oi Plants, 2002).

The VOLA housing development is anticipated to be at a higher density compared to the other planned housing developments in critical habitat, so the amount of landscaping on each lot will be minimal. The HCDCH indicates that there will be no common landscaped areas in the development. As such, the money spent on landscaping is expected to be small compared to the amounts mentioned above.

The DHHL Kula Residence Lots and Kahikinui Kuleana Homesteads on Maui are likely to retain the existing vegetation around their home sites. Based on similar projects across the State, any expenditures on landscaping will be negligible.

Based on a similar road project in north Kona, the planned Ane Keohokalole Highway in Unit 5B (Big Island) will include 52 square feet of landscaping in the median and on the shoulders for each lineal foot of the right-of-way. Approximately 0.45 miles (2,376 lineal feet) of the right-of-way will cross through the center Unit 5A (Big Island), so there will be 123,550 square feet of landscaping in critical habitat ($2,376 * 52$). The *Keahole to Kailua Development Plan* (1991) indicates the cost of roadway landscaping can reach \$3.33 per square foot. Adjusting for inflation, this figure increases to \$4 per square foot of landscaping. Thus, the total landscaping expenditures for portion of the planned Ane Keohokalole Highway in critical habitat will be \$494,000 ($123,550 * \4).

Based on the information provided above, the total expected landscaping expenditures for all the planned development in critical habitat is roughly \$120 million to \$225 million. If court-

ordered conservation management would result in an increase in these costs of 10 percent, the total additional costs could rise to \$12 to \$22.5 million. The majority, if not all, of these costs, if required by a court as a result of a third-party lawsuit, would be attributable to section 9. And again, the probability of success of such a lawsuit is unknown.

Conservation management for the remaining projects, land uses, and activities in critical habitat (e.g., conservation projects, communications towers, water system projects) is not anticipated because they affect small areas or are beneficial to the moth.

4.c.(6) Conclusion

Private and public landowners have expressed concern that they will be required to alter the management of their lands that fall within the designation so as to assure the survival and conservation of listed species. While the costs associated with mandated conservation management, including the alteration of existing and planned activities, are included in this analysis for purposes of illustrating the potential costs involved, the probability of this consequence is deemed to be moderate to low. In addition, if conservation management were to be mandated, it is more likely that these costs would be attributable to section 9 of the Act rather than to critical habitat designation.

4.d. Subsistence and Native Hawaiian Traditional and Cultural Practices

Another concern expressed is the effect of critical habitat designation on Native Hawaiian traditional and cultural practices, including subsistence activities. Specifically, there is concern that designation of critical habitat may interfere with or restrict the practice of subsistence and other traditional and cultural practices.

4.d.(1) Subsistence and Native Hawaiian Rights

The Hawai'i State Constitution, Chapter 12, Section 7 reads:

"The State reaffirms and shall protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by ahupua'a tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778 subject to right of the State to regulate such rights."

As indicated by this constitutional provision, subsistence and Native Hawaiian rights are closely tied. In early Native Hawaiian life, gathering activities supplemented the cultivated food and medicinal staples of the people, helped people survive in times of famine, and allowed tenants to retrieve large amounts of a product for a communal purpose, such as a tree for a canoe.

While Hawai'i's subsistence economy drastically changed with the changes in the land tenure system, Native Hawaiian traditional rights of access and gathering, for subsistence or other purposes, were not extinguished by the exclusivity traditionally associated with fee simple ownership of the land. (*Kalipi v. Hawaiian Trust Co.*, 66 Haw. 1, 656 P.2d 745 (1982); *Public Access Shoreline Hawai'i (PASH) v. Hawai'i County Planning Commission*, 79 Haw. 425, 450 (1995), cert. denied, 517 U.S. 1163 (1996)). However, access is guaranteed only in connection with undeveloped lands, and while the Hawai'i Supreme Court has ruled that the State Constitution does not prevent development by landowners, the point at which land becomes sufficiently developed to

where it is inconsistent to allow or enforce the practice of traditional Hawaiian gathering rights on such property remains undecided. (*PASH*, 79 Haw. at 450).

Defined narrowly, subsistence consists of the non-commercial and non-recreational harvest of fish, game, marine mammals, plants and other products of the land for personal or communal use. The subsistence lifestyle also includes the processing of these products for food, clothing and other uses as well as sharing or exchanging these products with others in the community. Defined more broadly, subsistence includes a lifestyle choice. For some Native Hawaiians, subsistence is central to their culture and way of life.

4.d.(2) Practice of Subsistence Within Proposed Critical Habitat

Studies of contemporary subsistence in Hawai‘i have documented subsistence practices and formulated conceptual plans for communities on Hawai‘i, Moloka‘i, Maui, and O‘ahu.

Subsistence can play an important role in community life, including:

- Providing families with essential resources that compensate for low income.
- Preserving traditional Hawaiian cultural values, customs and practices as cultural knowledge. Place names, fishing *ko‘a* (shrines), methods of fishing and gathering, and the reproductive cycles of marine and land resources have been passed down from one generation to the next through training in subsistence skills.
- Providing a link to the traditions and ways of life of previous generations - to the ways of the *kupuna* (elders) and the previous occupants of the land.
- Providing a basis for sharing and gift-giving within the community and reinforces good relations among members of extended families and neighbors.
- Allowing family members of all ages to contribute to family welfare.
- Fostering conservation because traditional subsistence practitioners are governed by particular codes of conduct intended to ensure the future availability of natural resources.
- Providing a valuable, but relatively inexpensive, form of exercise and stress reduction.
- Increasing the time spent in nature, cultivating a strong sense of environmental kinship.

(Moloka‘i Subsistence Task Force: Final Report 1994).

Preserving the practice of subsistence is of particular importance in Kahikinui (within Unit 1 (Maui)), on Kaho‘olawe (Unit 4), in Pu‘u Wa‘awa‘a (Unit 6 (Big Island)), and in the Moloka‘i Forest Reserve (Unit 7 (Moloka‘i)). The Kahikinui Community Based Economic Development and Makai Management Plan (2000) reflects the importance of subsistence opportunities, noting that the residents predominantly use the natural resources in the *moku*¹⁴ of Kahikinui for subsistence purposes. The plan explicitly provides that “subsistence uses are valued above all other uses of the

¹⁴ *Moku* is a Hawaiian word referring to a large land division encompassing one or more *ahupua‘a* (a division extending from the uplands to the sea). Handy, Handy & Pukui, 1972, Native Planters.

resources.” Similarly, the Kaho‘olawe Use Plan (1995) explicitly values the continued practice of subsistence activities, stating that “in modern Hawai‘i, Kaho‘olawe serves as the foundation for the revitalization of Hawaiian cultural, religious, and subsistence practices.” Likewise, the Draft Management Plan for the Ahupuaa of Pu‘u Wa‘awa‘a and the Makai Lands of Pu‘u Anahulu (2002) specifically recognizes prior gathering activities by Native Hawaiians and lists “establish protocol for sustainable traditional and cultural gathering” as an objective for the future management of the area. Finally, the Moloka‘i Community Plan (2001) reflects the importance of subsistence and of traditional and cultural practices on Moloka‘i, explicitly setting forth “[t]he continued practice of subsistence as a part of the Moloka‘i lifestyle which incorporates and fosters the traditional and cultural values of conservation, *malama ‘aina* and *‘auwana* as a community goal.” Anticipated future subsistence activities within the proposed critical habitat include hunting, forest gathering, stream gathering, fishing and ocean gathering.

4.d.(3) Economic Valuation of Subsistence Activities

As noted earlier in Section 4.c, the possibility exists that a Federal or State court could mandate conservation management of critical habitat based on the interplay between the Act and State requirements, which could involve activities such as fencing or ungulate removal that might reduce the ability of Native Hawaiians to practice subsistence activities in these areas. In addition, the State or private landowners could adopt a policy of restricting access into areas that overlap critical habitat units without a judicial mandate as a conservative measure to protect critical habitat. The resulting economic impact under either scenario is difficult to estimate, as discussed below.¹⁵

The total economic value of subsistence is the total amount that subsistence participants and others would be willing to pay to engage in subsistence activities independent of whether they actually pay that amount. While it is possible to measure this total value for recreational activities like fishing, the discussion below describes why typical methods of estimating economic value do not work when applied to subsistence.

One method for measuring willingness to pay, contingent valuation, is based on asking people how much they would be willing to pay to engage in subsistence, or how much they would need to be compensated to stop engaging in subsistence. To Native Hawaiians who consider subsistence to be a right or way of life, such questions have no meaning. In addition, some Native Hawaiians involved in the subsistence lifestyle have modest incomes and may be considered economically disadvantaged compared to other groups when responding to questions involving relative values based on monetary income.

The other commonly used method, known as travel cost, would estimate the value of subsistence by observing how often people visit sites at different distances with different characteristics. The value of different sites to subsistence participants may be estimated by observing how the number of visits to different sites declined as the distance to the site increased. In theory, this method could determine the net economic value of subsistence activities in specific locations and thus be used to value the use of proposed critical habitat for subsistence activities. The practical difficulties in conducting such a study make it virtually impossible to conduct, and no such studies have ever been done.

¹⁵ This analysis borrows from *Economic Assessment of Bristol Bay Area National Wildlife Refuges: Alaska Peninsula/Becharof/Izembek Togiak Final Draft*, prepared by the Institute of Social and Economic Research and Industrial Economics, Incorporated, for the Service in December 1998.

One way to portray the importance of subsistence activities, a large share of which are for the collection and preparation of food, is by calculating the nutritional value of the products of the harvest. However, while it is known that food derived from subsistence activities makes up a portion of the diet of those practicing subsistence, the number of families practicing subsistence within the proposed critical habitat, the total nutritional value gained through subsistence, and the proportion of food derived from subsistence activities conducted in the proposed critical habitat (as opposed to outside the proposed critical habitat) is unknown.

Another way to portray the importance of subsistence activities is to use replacement cost to estimate its value. Replacement cost is defined as the market prices of the food and other commodities obtained through subsistence. The net value of subsistence would then be calculated by subtracting out the costs of engaging in subsistence. But replacement cost is an inappropriate measure of the total economic value of subsistence because it produces an underestimate of total economic value by not including the value associated with the activity of subsistence itself, independent of its product. For many different reasons, people engaged in subsistence value the experience independent of the harvest. For example, many people who are engaged in subsistence value the experience for the opportunity to share cultural knowledge with younger generations and for the connection with nature.

Because replacement cost underestimates the total economic value of subsistence activities, it is best to avoid its use altogether. Not only is the underestimation likely to be considerable, but its use also validates and perpetuates the idea that the total value of subsistence lies in the market value of its products. In addition, there are practical difficulties in determining the replacement cost of many subsistence products, like *limu* or deer meat, that are not found in the grocery store.

However, the products of subsistence do represent income-in-kind to the residents of these communities. When measuring the economic well-being of residents of Maui, Hawai‘i, or Moloka‘i, it is necessary to include not only money income, but also the monetary value for any goods or services that the residents receive, which is known as income-in-kind. Typical examples of income-in-kind are the rental value of owner occupied housing and the value of products produced and consumed on family farms. Typically a value is placed on these goods and services based on observed prices in markets for these products. Estimation of this income-in-kind shows both the market value of the products harvested and the importance of these products as a source of income to the residents. For this calculation the use of replacement cost could be appropriate. However, without information on the amount of subsistence harvest, it is impossible to provide estimates.

4.d.(4) Potential Impact on Subsistence and Native Hawaiian Traditional and Cultural Activities Due to Critical Habitat

The value of subsistence activities to the residents of Maui, Hawai‘i and Moloka‘i is difficult to quantify because of the lack of information on the amount of the subsistence harvest. Further, the impact of a worst-case scenario that restricts access and prohibits subsistence activities in all areas proposed for critical habitat designation is complicated by the fact that subsistence activities occurs in areas outside the proposed critical habitat. The relative importance of the areas located within critical habitat versus those outside the proposed critical habitat is not documented. Presumably, a restriction in access would result in subsistence practitioners switching to locations outside the proposed critical habitat.

However, such a switch would have an impact. Clearly, subsistence fishing, ocean gathering, hunting, and forest and stream gathering, play an important role in the cultural and social

framework of the community. The cultural aspect of subsistence does place value on the location where the activity is conducted. In addition, the areas within the proposed critical habitat used for subsistence activity may have greater importance than their size may indicate. For example, an area within the proposed critical habitat may be the only location on the island to collect a certain plant used for medicine. As such, there could be a significant, though undetermined, loss associated with restriction of subsistence activities in the proposed critical habitat.

However, the probability of the worst-case scenario, resulting in the restriction of access and prohibition of subsistence activities in all areas proposed for critical habitat designation is undetermined, but is extremely unlikely. More likely to occur are restrictions in small, localized areas of significant biological importance – those areas containing trees in the genus *Nothocestrum* that sustain the larvae of the moth. Because of the strong stewardship and conservation values associated with those practicing subsistence activities within the proposed critical habitat, as well as the traditional recognition of the value of protecting certain areas through the *kapu* system, it is likely that subsistence activities would be consistent with conservation restrictions, particularly in localized areas. Thus, it is anticipated that the impact of critical habitat designation on subsistence activities will be minimal.

4.e. State Redistricting of Land

4.e.(1) Concerns about Redistricting

A concern raised 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 reduction in the value of the land; (2) a potential loss in current or future 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.

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 District designation, as evidenced by past practice. 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. Some of these requirements may involve direct costs to the landowners, such as the cost of revegetation, while others involve indirect costs, as the loss of property value through restrictions on future land use.

4.e.(2) Affected Lands

On Maui, a total of 11,500 acres of privately owned land in the Agricultural District are proposed for critical habitat: approximately 9,100 acres in Unit 1 and 2,400 acres in Unit 2. Approximately one acre of privately owned land in the Rural District is proposed for critical habitat (Unit 1).

On Moloka‘i, approximately 550 acres of privately owned land in the Agricultural District is proposed for critical habitat (Unit 7).

On the Big Island, approximately 10,670 acres of privately owned land in the Agricultural District are proposed for critical habitat; approximately 250 acres in Unit 5A and 10,420 acres in Unit 6. Approximately 45 acres of privately owned land in Unit 5A is in the Urban District. In

addition, 258 acres of State owned land in the Urban District in Unit 5B is planned for development and would be adversely affected by redistricting.

4.e.(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, 205):

- Protection of Hawai'i's Unique Flora and Fauna (HRS 195D-5.1)

DLNR “ÿ shall initiate amendments to the Conservation District boundaries ÿ 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 ÿ, the commission shall specifically consider ÿ the impact of the proposed reclassification on ÿ (the) preservation or maintenance of important natural systems or habitats.”

DBEDT's Office of Planning (OP) is responsible for conducting a periodic review of State District boundaries, referred to as the “boundary review.” During the boundary review, OP considers whether the existing District boundaries are appropriate, taking into account current land uses, environmental concerns, and other factors. Critical habitat would prompt OP to consider redistricting from the Agricultural, Rural or Urban Districts to the Conservation District (DBEDT, Office of Planning).

However, such 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 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.

4.e.(4) Cost of Contesting Redistricting

Even though the probability of redistricting private land to Conservation may be low, contesting a redistricting action can be time-consuming and costly for the landowner. Based on the last boundary review, some landowners report spending over \$50,000.

4.e.(5) Cost of Reduction in Agricultural Use of the Land

If land is redistricted to Conservation, agricultural activities could continue depending upon which subzone is assigned: typical agricultural activities are not allowed in the Protective Subzone, but are allowed in other subzones with permission of the State Board of Land and Natural Resources (BLNR).

Many areas of critical habitat have been grazed for tens or hundreds of years. There are few native forest remnants left in these areas, and those that do remain have adapted to the presence of cattle. Since these areas are highly degraded from their natural state, they are not anticipated to meet the standards of a natural ecosystem required to be put in the Protective Subzone (HAR §13-5-11). Further, cattle can indirectly enhance the ecosystem by reducing fire danger and controlling non-native weeds. It is assumed that areas that have previously been used for ranching will not be placed in the Protective Subzone, and grazing can continue with BLNR approval.

A rancher or landowner will need to get a Conservation District Use Authorization (CDUA) permit to obtain BLNR approval to allow grazing in the Conservation District. The cost of obtaining a CDUA can be between \$25,000 and \$100,000 (based on information from planning consultants, 2002). It is assumed that any large landowner that allows grazing for ranching or weed control purposes on their land will obtain a CDUA permit. There are three large landowners who allow grazing on Maui, two on Moloka'i, and six on the Big Island. Since some smaller landowners or lessees may also obtain CDUA permits, the total number may range from 15 to 30. Based on this information, the total cost to agricultural activities if land in the Agricultural District was redistricted to the Conservation District would be \$375,000 to \$3 million (15 x \$25,000; 30 x \$100,000).

4.e.(6) Cost of Loss of Development Due to Redistricting

Big Island

As noted above, redistricting of privately owned land is likely to occur in only a limited number of cases, if any.

If redistricting were to occur, however, certain planned development projects would not be able to continue as planned, if at all. The primary development projects planned in critical habitat for the moth on the Big Island include the Kaloko Industrial Park expansion in Unit 5A (Big Island), the State VOLA master planned community in Unit 5B (Big Island), and several agricultural subdivisions in Unit 6 (Big Island). These developments are consistent with current land use districting. However, if the state were to redistrict the land to the Conservation District, the developments would not be able to continue.

The economic impact to the developer of the loss of development potential includes the amount of money already invested in the project (sunk costs) plus the expected profits that will not be realized due to redistricting (future profits).

Big Island: Previous Expenditures

The current level of investment by the developers varies by project. The developer of the largest agricultural subdivision in Unit 6 (Big Island) has already invested \$75 million in a golf course, wells, water lines, lease acquisition, and planning. Since the golf course is near completion and may be excluded from critical habitat, it could still operate if all the land in critical habitat is redistricted. However, the primary value of the golf course is not the revenue it generates but in the increase in the selling value of the homes that are planned to be built around the golf course. All of these planned home sites are in critical habitat (PIA-Kona Ltd., 2002)

The State has already invested \$30 million in the VOLA master planned community. This figure includes money spent on building roads, installing utilities, planning, developing an EIS, and a payment to the county to expand the wastewater treatment plant (HCDCH, 2002).

The developer of the Kaloko Industrial Park expansion has completed an EIS and recently was granted a change from the Conservation District to the Urban District. However, roads and other improvements have not been installed on the site. Based on the cost of preparing an EIS and other planning efforts, the total amount of money invested in this project is likely to be on the order of \$500,000 (based on information from Hawai'i planning firms, 2002).

None of the remaining developers or landowners have invested significant amounts of money in roadways or improvements for their planned developments and subdivisions.

Big Island: Future Profits

In addition to the amount of money already invested, the landowners and developers will lose the future profits associated with the developments if the parcels are redistricted. Based on the number of planned resort/residential lots in critical habitat (1,000), and the future profits per lot (\$100,000), the projected loss in profits could reach \$100 million if the entire area was redistricted to conservation (PIA-Kona Ltd., Makalei Hawai'i Corp., PBR Hawai'i, 2002).

Approximately 26 lots of the planned Kaloko Industrial Park expansion are in critical habitat. If these lots are redistricted to the Conservation District, the landowner would lose the profits associated with the sales of the lots. The roads and other improvements are expected to be constructed within the next few years. If the area is redistricted after these improvement are in place, the economic impact will be the full selling value of the lots. Based on the assessed and selling values of lots of the same size in the existing portion of the Kaloko Industrial Park, each of the future lots will sell for roughly \$400,000, so the total economic loss would be \$10.4 million (26 x \$400,000) (Hawai'i County Real Property Tax Office, Hawai'i Information Service, Yamanaka Enterprises, Inc., 2002).

There are 950 homes planned in the villages that are included in critical habitat in the VOLA master planned community. 570 of these homes (60 percent) will be affordable housing units. In most projects with a relatively high percentage of affordable housing units, the profits from the market-priced units typically offset the losses associated with building the affordable housing units. As such, the project is not expected to make significant profits.

However, affordable housing is viewed as a social good and an essential component of a developing community. As part of the permitting process, the Hawai'i County Office of Housing and Community Development (OHCD) requires that each developer include a certain number of affordable housing units in their project plans. If the developer is unable to provide these units, the developer must pay \$4,720 to the county for each unit not built (OHCD, 2002). Using this value as a proxy for the social value of affordable housing, the loss of 570 affordable units in the VOLA development equates to a loss of almost \$2.7 million to the community. This loss could be offset if additional affordable housing units are built elsewhere, however, the State indicates that if it is unable to continue with the VOLA development, a new affordable housing development is not likely to be completed in the next 10 years (HCDCH, 2002).

Maui, Moloka'i, and Kaho'olawe

As mentioned in the direct impacts section above, portions of two DHHL residential developments are in critical habitat. However, the subdivision for these developments are complete, individual beneficiaries have received long-term leases from DHHL, and the homes are planned at a low enough density that they are likely to be consistent with the Conservation District. Moreover, historically, the Department of Hawaiian Home Lands has not applied for Conservation District Use permits for activities on land managed or owed by them within the Conservation District (DLNR, 2002).

There are no other significant residential, resort/residential, hotel, commercial, or industrial developments currently planned in critical habitat on Maui, Moloka'i and Kaho'olawe.

Summary of the Costs of Loss of Planned Development

While the probability of redistricting all of the land in critical habitat to the Conservation District is low, the economic costs associated with the loss of planned development if redistricting did occur are significant. Based on the amount of money already invested by some the developers and landowners, the planned profits, and the cost of obtaining additional permits, the total economic cost could be as high as \$220 million. The economic impact would be higher if more money is invested in the developments before the area is redistricted. However, if some of the development occurs before the area is redistricted, the economic impact would be less. Due to the uncertainty of the timing of the potential redistricting, \$220 million is likely to be a mid-range estimate of the economic impacts associated the loss of planned development due to redistricting, if redistricting of all the land in the critical habitat to the Conservation District did occur.

A loss in development can lead to economic losses due to the "ripple-effect". For example, if a home cannot be built, both the developer and the construction company who would have built the home will have reduced revenues. In addition, the lumber company that supplies lumber to the construction company will have reduced revenues. These "ripples" can travel throughout a regional economy.

However, the ripple-effects associated with the loss of development due to redistricting are not considered in this analysis because it is assumed that the development will still occur in other areas. For example, there are several other sites available for industrial development near the Kaloko Industrial Park that will be developed if there are fewer lots available in critical habitat (Wilson Okamoto and Associates, Inc., 2000). There is also a significant amount of land in the Agricultural District on the Big Island available for resort/residential subdivision. Due to the availability of suitable land, any economic activity that is displaced within critical habitat for the moth due to redistricting would be expected to occur elsewhere on the Big Island.

While most of the landowners in critical habitat do not currently have public plans for development, the property values reflect that these areas could be developed at some point in the future. If the entire area was redistricted to the Conservation District, much of the development potential would be lost. The economic impacts associated with a loss in property values is discussed below.

4.e.(7) Reduction in Property Values Due to Redistricting

Some of the privately-owned Agricultural Land on Maui being proposed for critical habitat is composed of parcels less than 10 acres in size, where existing county plans restrict the type of development that could occur, and where the amount of water is limited. There are currently no publicly available plans for development in this area, but limited development may occur in the future. If redistricting were to occur on these smaller parcels, the reduction in property values would be minor. Since the construction of single-family homes is possible in the Conservation District with CDUA permit, redistricting these parcels to the Conservation District may reduce the value by the cost of this permit. The cost of getting a CDUA permit ranges from \$25,000 to \$100,000.

Many of the smaller parcels already have structures, such as homes, built upon them. Redistricting to the Conservation District may increase the property value of these parcels because it reduces the probability of dense developments on adjacent parcels.

These two effects can be seen by comparing the current property values of small parcels in the Conservation District and in the Agricultural District on Maui. Current property values for Agricultural Land range widely from \$1,000 to over \$2 million per acre, mainly depending on location, with parcels close to the shoreline having the highest value. Property values for Conservation Land within the proposed critical habitat also range widely, from \$120 to \$5.5 million per acre, with parcels along the shoreline having the highest value. This demonstrates that Conservation Land can have higher property values than Agricultural Land, as well as how the property values are based on the unique characteristics of a specific parcel. The net effect of redistricting on the property values of small parcels in the Agricultural District is not anticipated to be significant, and in some cases, the effect could be positive.

Most of the remaining privately owned larger parcels in the Agricultural District on Maui and the Big Island could be subdivided and developed at some point in the future. Based on the market property values provided by the Maui County Real Property Assessment Division and the Hawai'i County Real Property Tax Office, and on the opinions of several landowners and ranchers in critical habitat, the market value of these unplanned large parcels ranges from \$3,000 to \$15,000 per acre, depending on location, water availability, roads, views, etc. There are approximately 11,260 acres of land in large parcels in the Agricultural District on Maui and 10,670 acres on the Big Island, for a total of 21,930 acres. If the property values of these parcels were to drop to \$120 (the low end value for Conservation District land within critical habitat designation) as a result of redistricting, the total economic impact would range from \$63.6 million to \$327 million. However, as mentioned above, if redistricting were to occur, most of this area is likely to be put into the General Subzone of the Conservation District where grazing and other uses of the land are permissible. These allowable uses add to property values, so the total loss would be less than \$63.6 million to \$327 million. For example, if redistricting were to reduce property values by half, the total economic impact would range from \$33 million to \$164 million.

There is a 13-acre portion of a parcel of unplanned land in the Urban District in Unit 5A (Big Island). Based on the market property values provided by the Hawai'i County Real Property Tax

Office, and on the opinions of several landowners and ranchers in critical habitat, the market value of this parcel is \$20,000 to \$30,000 per acre. If the property value of this parcel was to drop to \$120 (the low end value for Conservation District land within critical habitat designation) as a result of redistricting, the total economic impact would range from \$258,000 to \$388,000.

If redistricting were to occur on Moloka'i, reductions in property values are not expected to be significant. First, only 545 acres are privately-owned Agricultural land. Approximately 400 acres is within a privately-owned recreational preserve or is managed as part of the East Moloka'i Watershed Partnership, thus limiting future development in these areas. The current property values of the remaining land range from \$600 to \$4,500 per acre, and totals approximately \$341,000. This land is adjacent to the Moloka'i Forest Reserve, is generally remote from existing population centers, and there are no known plans for development in this area. Thus, possible reductions in property value due to redistricting on Moloka'i would not be expected to exceed \$341,000. Again, as noted previously, redistricting of privately owned land is likely to occur in only a limited number of cases, if any.

Even if a landowner has no plans to sell the land, the loss in property value could reduce potential mortgage financing.

4.e.(8) Changes in Property Taxes, Agricultural Land

Even though property values for most of the land in critical habitat would decrease if Agricultural land were redistricted to Conservation, property taxes could remain the same, or they could increase or decrease. The change in taxes would depend on whether the land was dedicated to agriculture; if so, the land would be assessed at a low agricultural value rather than its higher market value. Because of a State policy to encourage agriculture, property taxes on land dedicated to agriculture are generally lower than they are with similar land in the Conservation District that is not used for agriculture. In other words, non-grazing land or non-farmed land in the Conservation District would not benefit from the State policy of assessing a lower agricultural value instead of market value.

If land is in the Conservation District and actively used for agriculture, then the assessed value and the property taxes would be the same as for Agricultural land. Thus, if Agricultural land actively used for agriculture is redistricted to Conservation and agricultural use is allowed to continue, then property taxes would remain the same. In both cases, the land is assessed at its agricultural value and taxed at the rate of land in the Agricultural District. Most of the privately owned land in the Agricultural District within the proposed critical habitat is used as pasture and is assessed at a low agricultural value. In addition, much of the privately owned land in the Conservation District within the proposed critical habitat is also used as pasture and is assessed at a lower value. This indicates that even if redistricting were to occur, the land would most likely be assigned to a subzone in which typical agricultural activities are allowed.

If Agricultural land is not used for agriculture, then its assessed value is its estimated market value. In that case, redistricting to Conservation would result in a lower assessed value for the land and lower property taxes.

4.e.(9) Potential Redistricting-Related Costs Due to Critical Habitat

An undetermined probability exists that critical habitat designation could result in some privately-owned Agricultural and Urban land being proposed for redistricting to Conservation. If

this were to occur, then the affected landowner could spend more than \$50,000 contesting the redistricting (see section 4.e.(5) above). Since this could involve approximately 45 private landowners on Maui, 13 owners on Hawai'i, and five owners on Moloka'i, total costs would be almost \$3.2 million (63 x \$50,000).

As mentioned above, if all of the Agricultural and Urban land in critical habitat is redistricted to the Conservation District, the costs could be as follows:

- Cost to contest redistricting: \$3.2 million
- Loss of previous expenditures on Big Island development: \$105.5 million
- Loss of future profits on Big Island development: \$113.1 million
- Potential loss in Big Island and Maui Agricultural property values: \$33 million to \$327 million
- Loss in Big Island Urban property value: \$258,000 to \$388,000
- Loss in Moloka'i property value: \$341,000

As such, the economic costs of the loss of development and the loss in property values could range from \$255 million to \$550 million if the entire critical habitat is put in the Conservation District. However, there is a small probability that critical habitat designation could in fact result in Agricultural and Urban land being redistricted to Conservation, and if it did, redistricting of privately owned land is likely to occur in only a limited number of cases, if any. Moreover, these estimates are conservative and therefore are likely overstate the actual loss that would occur if the entire critical habitat was put in the Conservation District. In other words, economic losses on the order of \$550 million are not anticipated.

4.f. State and County Development Approvals

4.f.(1) Concerns about Development Approvals

As discussed below, a major concern among private landowners, developers, and other interested parties is that critical habitat designations will significantly affect State and county development approvals, even when there is 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 for both new projects and for improvements to existing structures. 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 BLNR for projects in the State's Conservation District, General Plan or Community Plan amendments by county councils, use permits from the county councils for activities within the Special Management Areas, etc.

There are no anticipated projects within the proposed critical habitat for the moth that would require major discretionary approvals by the State or county. Thus, there is no discussion in this analysis of what mitigation measures might be required by the State or county as a condition of receiving this discretionary approval.

4.f.(2) State and County Environmental Review

Based on discussions with planning consultants and government officials, critical habitat designations are likely to increase the scope of required 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.

While all of the units proposed for designation, except that on Moloka‘i, are considered *occupied* by the moth, the presumed presence of the species alone may not trigger an EIS due to the mobility of the moth and its wide range over an area. Thus, it is possible for a project to not substantially affect the moth, and at the same time, substantially affect its habitat due to expected impact on the host plants. It is reasonable to assume that, although State law does not include the concept of critical habitat, 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, and hence may “substantially affect,” critical habitat. Once the precedent is set, succeeding developers may be required to submit State EISs under similar circumstances. Alternatively, 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). Also, preparing and processing a State EIS would take about two months longer than an EA. In addition, biological surveys could be required.

4.f.(3) Affected Projects and Increased Costs

Five projects, land uses, and activities in the proposed critical habitat may require an EA because they will use State or county funds. These projects include the Makena State Park; Kanaha Beach Park improvements; KIRC projects; and water tank installation and fire control at Pu‘u Wa‘awa‘a. If all these projects subsequently require EISs, the additional cost to prepare them will be between \$125,000 and \$375,000 (5 x \$25,000 and 5 x \$75,000). Most of these projects will

require a survey as part of a section 7 consultation or other environmental review, so survey costs are not presented here to avoid double-counting.

It is possible that other aspects of these projects may compel the preparation of an EIS rather than an EA in which case the costs would not be attributable to critical habitat. Because it is impossible to state definitively at this point whether an EIS would be required absent critical habitat designation, as a conservative measure, the entire costs are reported as potential costs due to critical habitat.

4.f.(4) Project Modification

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.

The five projects mentioned above affect small areas, will require project modifications for listed species, and/or will require project modifications as part of a section 7 consultation. Thus, additional project modification costs for these projects are expected to be minor.

4.g. Reduced Property Values

4.g.(1) General Factors Underlying Reduced Property Values

Another issue raised by private landowners is that their property may lose value because of critical habitat designation. There is the concern 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.

Reduced property values need not be based in fact. Perceptions of the economic impact of critical habitat designation can result in a temporary loss in property value if landowners or buyers believe that the designation will restrict land uses, require modifications to the property, or cause project delays or other problems. Such a loss in property value can 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 property 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 specialists to determine the implications of the designation on their property. This can be particularly important for landowners who plan to sell their property and so must address concerns of potential buyers.

4.g.(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, pleasing views, etc.

As mentioned in the redistricting section 4.e.(7) above, the total market value of the privately owned large parcels (i.e., greater than 10 acres) in critical habitat ranges from \$66 million to \$329 million. Many of the small parcels contain homes and are already developed at their highest and best use. In this case, the designation of critical habitat is not likely to affect the property value. However, some of the small parcels do not contain existing homes and do have high assessed market values. These parcels are located on the southwest portion of Unit 1 (Maui), near the coastline. The combined market value of these parcels likely ranges from \$12 to \$25 million. Thus, the total market value of the property in critical habitat ranges from \$78 million to \$354 million (\$66 million + \$12 million; \$329 million + \$25 million).

The magnitude of a long-term decrease in property values due to critical habitat will depend on the property market's assessment of the potential costs or reduced opportunities due to critical habitat designation. The costs could result from section 7 consultations, conservation management, preparing EISs, applying for permits, etc. The loss in opportunities could result from project modifications, land redistricting, environmental review, etc. Many of these potential costs and losses in opportunities are discussed in this section and in the direct costs section above. However, the largest impacts to property values are likely to result from fears of redistricting. As mentioned above, the probability that all of critical habitat will be redistricted to the Conservation District is small. However, the simple uncertainty regarding whether a particular parcel will be redistricted can cause a decrease in property values.

For illustration purposes, if all of the potential costs and lost opportunities for land in critical habitat resulted in a drop in property values of 20 percent, the total economic impact would range from \$15.6 million to \$70.8 million (20% x \$78 million; 20% x \$354 million). However, the actual impact to property values could be significantly higher or lower. This uncertainty can only be resolved after a significant number parcels inside critical habitat and comparable parcels outside of critical habitat are sold and the final selling prices can be compared. Since critical habitat designations in areas with active property markets are relatively new in Hawai'i, this type of analysis will have to be performed at some point in the future.

4.h. Condemnation of Property

Some landowners suspect that, following critical habitat designation, the Service eventually will condemn private property at depressed property 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 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.i. Costs to Investigate Implications of Critical Habitat

Many 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 may want to learn how the designation may affect (1) the use of their land (either through restrictions or new obligations), and (2) the value of their land.

A total of 75 private landowners are included in the proposed critical habitat designation (57 on Maui, five on Moloka'i, and 13 on Hawai'i). Many of these landowners control small parcels, less than 10 acres in size, within the proposed critical habitat designation. While a few of these landowners may be familiar with the Act, this analysis assumes that all of them will investigate the potential impacts on their properties.

An estimate of the costs involved with this investigation ranges from roughly \$200,000 to \$713,000. This estimate is based on the following assumptions: (1) 75 landowners will investigate the implications of critical habitat; (2) the landowner and/or his attorneys or professional staff will spend about 15 to 40 hours on the investigation at rates of \$150 to \$200 per hour; and (3) Service staff will spend four to 10 hours at \$100 to \$150 per hour responding to inquiries from each landowner.

4.j. Loss of Conservation Projects

Some parties have expressed concern that the ongoing activities of the Service to designate critical habitat will cause some landowners to decide not to engage in conservation projects with the Service, NRCS, and/or DLNR. Landowners may reduce participation in these projects to avoid *Federal involvement* over their land management practices, out of concern that participation in conservation projects within critical habitat may result in project modifications that expand the project and increase the cost or that shift the focus of the project away from the landowner's initial intent.

The loss of conservation projects which, in fact, has occurred in the State of 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. It may also involve ceasing participation in existing conservation projects. Reduced cooperation could result in lower-quality land management, environmental degradation, and increased risks to native plants and wildlife, including the moth. If the environmental changes were valued, they could reflect an economic loss to society.

In addition, several large private landowners employ staff to oversee their natural resources management and their participation in conservation projects. Reduced cooperation in these projects could result in these positions being eliminated.

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 experiences in Hawai'i as well as in other states.

For the moth, 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 33 percent of the proposed critical habitat. As landowners gain experience with the actual effects of critical habitat, their concerns about whether or not to cooperate on conservation projects may diminish.

Nevertheless, the proposed area is relatively significant — amounting to two percent of Hawai'i, 10 percent of Maui, and three percent of Moloka'i — and includes some privately owned land in the Agricultural District. 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 three percent or more of a business’s annual sales.

Federal courts and Congress have indicated that an RFA/SBREFA analysis should be limited to direct and indirect impacts on entities subject to the requirements of the regulation (Service, 2002). As such, entities indirectly impacted by the moth listing and critical habitat, and therefore, not directly regulated by the listing or 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 impacted by the moth listing and critical habitat designation. Based on this review, the following entities will be directly impacted (projects, activities, and land uses are noted in parentheses):

Federal:

- Service (All projects, activities, land uses)
- HUD (Loan programs for Kula Residence Lots and Kahikinui Kuleana Homesteads)
- FSA (FSA farm loan programs, USDA conservation programs, FSA disaster relief programs)
- NRCS (USDA conservation programs, funding Kaho‘olawe restoration activities, funding water system construction)
- USDA (Funding East Moloka‘i Watershed Partnership projects)
- EPA (Funding East Moloka‘i Watershed Partnership projects, permitting treated wastewater use)
- FHWA (Funding construction of new roads and trails)
- NEA (Funding Kaho‘olawe restoration activities)
- FCC and/or FAA (Permitting communications facilities)
- FEMA (Funding natural disaster recovery)

- U.S. Forest Service (Funding fire management activities)
- Other Federal Agencies, not yet identified (Funding for East Moloka‘i Watershed Partnership projects, economic development activities at Kahikinui)

State:

- DLNR (game management, trail construction, Makena State Park improvements, water system improvements, fire management)
- Hawai‘i Army National Guard (military training exercises)
- KIRC (Kaho‘olawe restoration activities)

County:

- Hawai‘i County DPW (Golf course and road construction)

Non-profit:

- Ka ‘Ohana O Kahikinui (Participation in residential loan programs, construction of a water collection system)
- Kamehameha Schools (Construction of new communications facilities)

Private:

- Lending institutions on Maui (Loans for residential development)
- Native Hawaiian lessees (Participating in residential loan programs)
- One farmer or rancher (Participating in farm loan programs)
- Verizon Hawai‘i, Inc. (Construction of new communications facilities)
- HELCO (Construction of new communications facilities)
- Ulupalakua Ranch, Inc. (Construction of new communications facilities)

5.c. Small Entities Potentially Impacted

The RFA/SBREFEA 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/SBREFEA.

5.c.(1) Federal Agencies

For the purposes of the RFA/SBREFEA, Federal agencies are not considered small governments. As such, the Service, HUD, FSA, NRCS, USDA, EPA, FWHA, NEA, FCC, FAA, FEMA, U.S. Forest Service, and other Federal agencies are not considered further in this portion of the economic analysis.

5.c.(2) State Agencies

For the purposes of the RFA/SBREFEA, State governments are not considered small government jurisdictions. As such, the DLNR, Hawai‘i Army National Guard, and KIRC 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. Maui and Hawai'i counties both have populations greater than 50,000 (see Chapter II). As such, county agencies such as the Hawai'i County DPW 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. Ka 'Ohana O Kahikinui is a beneficiary community-based organization and for the purposes of this analysis, is considered to belong to the field of community-based organizations focused on Native Hawaiian and/or environmental issues. Because Ka 'Ohana O Kahikinui focuses its efforts on activities related to the resettlement and restoration of the *ahupua'a* of Kahikinui, because of the small size of its membership, and because of the number of other organizations on Maui involved in Native Hawaiian and environmental issues, this analysis concludes that according to the RFA/SBREFA definitions, Ka 'Ohana O Kahikinui is likely to be considered a small organization.

Kamehameha Schools is the largest charitable trust in Hawai'i, as well as the State's largest private landowner; it also has a substantial investment in securities and owns real estate in other states. In 2001, Kamehameha Schools had over \$1 billion in revenues, gains, and other support (Kamehameha Schools, 2001). Thus, it is not likely to be considered a small organization.

5.c.(5) Private

Lending institutions may be involved in up to six consultations regarding HUD residential loan programs for homes in the proposed critical habitat on Maui. These lending institutions must be approved by the Federal Housing Administration (FHA) in order to participate in the HUD loan programs. Most of the approved lending institutions doing business in Maui are branches of financial institutions that operate Statewide, nationally, or internationally and are not small businesses. However, it is possible that one or two of the FHA approved lending institutions involved in section 7 consultations will be small according to the SBA definition (i.e., less than \$6 million in annual sales).

Native Hawaiian lessees may also be involved in consultations regarding HUD residential loan programs. However, private individuals are not included in the RFA/SBREFA definition of a small entity. As such, Native Hawaiian lessees are not considered further in this portion of the economic analysis.

One farmer or rancher may be involved in a consultation regarding the FSA farm loan program. Based on location and climate, the farmers in critical habitat are likely to grow fruits (excluding pineapples), vegetables, flowers, or other diversified crops. The SBA defines a diversified farmer or a rancher as small if its annual sales are less than \$750,000. Based on annual sales figures for diversified farmers and ranchers in Maui and Hawai'i counties (see section 5.d.(3) below), it is assumed that the one farmer or rancher will be a small businesses (DBEDT, 2002).

Verizon Hawai'i Inc. is a subsidiary of Verizon Communications Inc. (Verizon), an international communications company. The SBA defines a communications company as small if

it has fewer than 1,500 employees. Verizon currently has 260,000 employees, so it is not a small business (Verizon, 2002).

HELCO is a subsidiary of Hawaiian Electric Industries, Inc. (HEI). HEI is the largest Hawaii-based company, providing electric utility services to 95 percent of Hawaii's residents. HEI also owns the State's third largest bank. The SBA defines an electric utility as small if, including its affiliates, its total electric output for the preceding fiscal year did not exceed 4 million megawatt hours. HEI's affiliates generated 9.4 million megawatt hours in 2001, so it is not a small business (HEI, 2002)

Ulupalakua Ranch, Inc. is a beef cattle ranch. The SBA defines a beef cattle ranch as small if its annual sales are less than \$750,000. Based on average annual sales, Ulupalakua Ranch, Inc. is not a small business (Dun & Bradstreet, 2002).

5.d. Potential Impacts on Small Entities

The small or potentially small entities that may be impacted by the moth listing and critical habitat designation are Ka 'Ohana O Kahikinui on Maui, one to two lending institutions on Maui, and one farmer or rancher on Maui, Moloka'i, or the Big Island.

5.d.(1) Ka 'Ohana O Kahikinui

Ka 'Ohana O Kahikinui may be involved in a programmatic consultation on HUD loan programs for the Kahikinui Kuleana Homesteads and a consultation regarding the construction of a water collection system. Based on the estimates provided in Table VI-1, the cost of participation in each of the consultations will be \$4,200, or a total of \$8,400 for both consultations. Based on the estimates provided in Table VI-2, the cost of conducting biological surveys will be \$35,400 for the programmatic consultation and \$11,400 to \$14,900 for the water collection consultations. Project modifications associated with these consultations are expected to be minor. Ka 'Ohana O Kahikinui may apply for Federal funding to cover these costs, but the application process will take time and effort. Since the organization does not have a steady source of income, these costs are likely to be a significant economic impact.

In fiscal year 2000, the Maui County Office of Economic Development provided grants to 27 separate community based organizations. The primary focus of eight of these organizations was on Native Hawaiian and/or environmental issues. There are likely to be significantly more community based organizations in Maui County that either (1) did not apply for a county grant, or (2) applied but did not receive a grant. As such, Ka 'Ohana O Kahikinui is not likely to represent a substantial number (greater than 20 percent) of the total number of community based organizations focused on Native Hawaiian and/or environmental issues.

5.d.(2) Lending Institutions

Between one and two small lending institutions on Maui may be involved in a section 7 consultation regarding HUD loan programs. Based on the estimates provided in Table VI-1 and Table VI-2, participation in the consultation will cost \$1,400 and conducting the biological survey will cost \$3,700, so the total impact will be \$5,100 per lending institution.

The average annual revenues for the one to two small lending institutions on Maui is unknown. If they each earn less than \$170,000 in annual sales (\$5,100 divided by three percent),

the economic impact attributable to critical habitat would be a significant economic impact to the lending institutions (i.e., greater than three percent of annual sales).

There are currently 37 mortgage lending institutions in Maui County. Of these, 32 meet the SBA definition of a small business (i.e., less than \$6 million in annual sales)(Dun & Bradstreet, 2002). One to two lending institutions out of roughly 32 (three to six percent) will potentially be subject to a significant economic impact. This does not equal a substantial number (i.e., 20 percent) of the small lending institutions in Maui County.

5.d.(3) Farming and Ranching

One farmer or rancher may be involved in a section 7 consultation regarding a FSA farm loan. Based on the estimates provided in Table VI-1 and Table VI-2, participation in the consultation will cost \$4,200 and conducting the biological survey will cost up to \$3,900, so the total economic impact will be \$8,100. Project modifications associated with this consultation are expected to be minor.

The 2000 average annual sales for diversified farmers in Maui and Hawai'i counties are \$54,600 per farmer, and the average annual sales for ranchers is \$27,100 per rancher (DBEDT, 2002). Since \$8,100 is 15 percent of the average annual sales for a diversified farmer and 30 percent of the average annual sales for a rancher, it is assumed that critical habitat will have a significant economic impact (i.e., three percent or more of a business's annual sales) on the farmer or rancher.

However, there are 1,400 diversified farmers and 470 ranchers on the Big Island and 500 diversified farmers and 170 ranchers in Maui County. Based on the annual sales figures mentioned in the preceding paragraph, most of these farmers and ranchers are small businesses (i.e., less than \$750,000 in annual sales). One farmer or rancher is less than one percent of both the number of ranchers and diversified farmers in both Maui and Hawai'i counties. This does not equal a substantial number (i.e., 20 percent) of the small businesses in either the diversified farming or ranching industries.

5.d.(4) Summary

Based on the analysis above, implementation of the Act's section 7 provisions for the moth may have a significant economic impact on one small community based organization, one to two small lending institutions, and one small farmer or rancher. However, these entities do not represent a substantial number of the small entities in their respective fields or industries. Therefore, the moth critical habitat designation will not have a significant economic impact on a substantial number of small entities.

6. SECTION 7-RELATED ECONOMIC BENEFITS

6.a. Introduction

Critical habitat designation is likely to provide economic benefits to the region, as well as to society as a whole. These benefits fall into two categories. Direct benefits are those directly attributable to the activities associated with compliance with the habitat designation, while indirect benefits arise from preservation of threatened and endangered species and other environmental improvements encouraged by critical habitat designation. Direct and indirect economic benefits may be manifested in two ways: changes in regional economic activity and changes in social welfare.

Regional economic and social welfare measures represent alternate ways to view the benefits of critical habitat designation. Regional economic benefits refer to an increase in revenues or employment in a given area. Changes in regional economic activity are an important aspect of policy and project evaluation because the costs of certain actions may be more concentrated among regional residents than are the benefits. From a national perspective, however, increases in activity in the region reflect a redistribution of activity from another geographic area, not a net increase in national economic activity. The exception is inflow from non-domestic sources.

“Social welfare benefits” are measured by individuals' "willingness to pay." The sum of an individual's willingness to pay for something, net of the costs associated with its consumption, is referred to as consumer surplus. Consumer surplus is the standard metric used to evaluate alternate allocations of society's resources, as in cost-benefit analysis of environmental programs. While one might argue that local residents are the primary beneficiaries, welfare benefits associated with critical habitat designation, to the extent that it enhances the nation's stock of natural assets, flow to society at large.

However, the development of quantitative estimates associated with the benefits of the proposed designation is impeded by the scarcity of available studies and information relating to the size and value of beneficial changes that are likely to occur as a result of listing a species or designating critical habitat. In particular, the following information is not currently available: 1) quantified data on the value of the Blackburn's Sphinx Moth; and 2) quantified data on the change in the quality of the ecosystem and the species as a result of the designation (for example, how many fewer ungulates will roam into the critical habitat, how many fewer invasive plants will be introduced as a result, and therefore how many more of the host plants and how many more of the moth species will be present in the area). As a result, it is not possible, given the information that is currently available, to estimate the value associated with ecosystem preservation that could be ascribed to critical habitat designation. Thus, categories of benefits are discussed in qualitative terms. It 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. In short, 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.

6.b. Direct Benefits

6.b.(1) Regional Economic Benefits

Regional Economic Activity Generated by Conservation Management

In FY 2001, the Service spent an estimated \$571,310 on conservation management measures in the proposed critical habitat that directly or indirectly benefit the moth, including expenditures on salaries, equipment, supplies and services. In turn, workers and companies that benefited from the Service's expenditures on conservation management purchased additional goods and services, thereby generating additional economic activity (referred to as the multiplier effect). In total, the initial Service expenditure generated approximately \$1,142,620 in direct and indirect sales for the year in Hawai'i on Maui and other islands, and supported about 22 jobs in Hawai'i (based on multipliers from the Hawai'i Input-Output Model, DBEDT, 2002).¹⁶ The State and other

¹⁶ The Hawai'i Input-Output Model is an economic forecasting tool that can be used to estimate the "ripple effect" of changes in regional expenditures. That is, as dollars are spent in or

organizations also spend a considerable amount on conservation management that directly or indirectly benefit the moth and its proposed critical habitat. (e.g., State expenditures to manage NARs; State matching funds to Service grants; etc.).

If the proposed critical habitat results in an increase in conservation management activities on Maui, Moloka'i, Kaho'olawe, and the Big Island, associated expenditures may increase economic activity in Hawai'i. Based on State multipliers, each additional \$1 million spent in Hawai'i would generate approximately \$2.0 million in direct and indirect sales in Hawai'i, and would support approximately 40 direct and indirect jobs.

If, as discussed in Section 4.c., conservation management were mandated within the proposed critical habitat, the resulting expenditures of about \$7.7 million to \$9 million per year to manage critical habitat on Maui and the Big Island (based on \$85 to \$100 per acre) would generate roughly \$16.2 million to \$18.9 million per year in direct and indirect sales in Hawai'i and would support about 270 to 315 direct and indirect jobs. The resulting expenditures of \$135,000 to \$360,000 on Moloka'i (based on \$30 to \$80 per acre) would generate roughly \$280,000 to \$756,000 per year in direct and indirect sales in Hawai'i and would support about 5 to 13 direct and indirect jobs.

Several types of businesses may experience increase in demand as a result of the presence of the moth and/or its proposed critical habitat. Such businesses may include, but are not limited to, private botanists, nurseries, and fence suppliers and builders. The Service may require surveys or monitoring for the moth and/or the adult and larval host plants during activities in the critical habitat as part of the project modifications, and this may create unknown number of job opportunities for private botanists. In addition, fencing and outplanting of native host plants may also be suggested as project modifications in order to protect the host plant populations during construction or from ungulates. As such, an unknown number of businesses in this sector may experience increased demand. However, it is impossible to forecast the number of such businesses that would experience economic benefit from the moth proposed critical habitat or make quantitative estimate of such benefit.

It is important to note, however, that expansion of Hawai'i's economy through these expenditures is contingent upon how they 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, or other sources. While this is possible, no known projections are available that indicate a significant increase in funding for conservation management from outside Hawai'i due to the proposed critical habitat designation.

withdrawn from a particular sector of the economy, not only is that sector affected directly but also the other sectors that supply goods and services to it are affected indirectly. The magnitude of this "ripple effect" is captured by estimates known as "multipliers". For example, a multiplier of two indicates that \$1 worth of expenditures in a particular sector is responsible for an overall contribution of \$2 to the local economy. It is important to note that "direct" and "indirect" in the context of input-output modeling refer to primary and secondary changes in sales and employment associated with expenditures. They do not, in this context, distinguish direct from indirect costs or benefits, as discussed in the introduction.

If increased expenditures on conservation management are funded from within Hawai‘i, or through funds from outside sources already intended for use in the State, there would be no significant change in economic activity. Similarly, as discussed in the introduction, increased funding of conservation programs in Hawai‘i would result in no significant change in economic activity for the economy as a whole because any funds spent in Hawai‘i would be at the expense of expenditures elsewhere (e.g., funds diverted from some other Federal program).

Regional Economic Activity Associated with Ecotourism

Commercial ecotours, via foot hikes and horseback riding, led by professional naturalist guides are offered in portions of the proposed critical habitat on Maui, Moloka‘i and the Big Island. These may include guided tours on the slopes of Haleakala (Units 1, 2 (Maui)), within the Moloka‘i Forest Reserve (Unit 7 (Moloka‘i)), or within Pu‘u Wa‘awa‘a (Unit 6 (Big Island)). Designation could benefit these operations by providing a marketing dimension that enhances the appeal of the ecotours to visitors. However, this benefit is expected to be slight inasmuch as these areas are already regarded as being special due to their existing natural and cultural resources. In addition, in most if not all cases, the Service prefers that these commercial operations do not feature visits to view threatened and endangered species since revealing their locations increases the risk that a species may be collected or damaged or its habitat harmed.

Regional Economic Activity Associated with Avoided Costs to Developers

The main advantage to developers of critical habitat designations is to provide them with more information regarding project siting. For example, knowledge of critical habitat boundaries can help developers avoid facing issues related to listed species. In the future, this may reduce delays and resultant revenue impacts associated with project modifications.

Regional Economic Activity Associated with Medical/Pharmaceutical Benefits

Many native plants species had ethnobotanical value to the Native Hawaiians. Of the host plants for the moth, the *Nothocestrum* (*‘aiea*) was used in house-building, canoe building, and medicine. The other host plants may also have undiscovered medicinal value, but there is no way to determine the statistical probability of this occurrence or the economic value of a future ethnobotanical use. Moreover, it is impossible to determine what contribution the designation of critical habitat for the moth will have on the conservation of these plants.

6.b.(2) Social Welfare Benefits of Habitat Designation

Critical habitat designation could also generate direct social welfare benefits. For example, economic literature has demonstrated individual's willingness-to-pay for preservation of open space, both in general, as well as specifically in the vicinity of their residence. Similarly, 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, and funded by a 2.5-percent increase in the property tax. This works out to a total of about \$1.38 million per year in Maui County alone (based on 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 county population of 128,100 in 2000). Thus, to the extent that designation results in preservation of open lands that might otherwise be developed, some

welfare benefits may be created. However, much of the proposed critical habitat is already kept as open space and is governed by State and local land use laws and County plans. As such, these benefits provided by critical habitat designation are likely to be insignificant.

6.c. Indirect Benefits

6.c.(1) Social Welfare Benefits of Endangered Species Preservation

The primary purpose of critical habitat is to protect areas that are needed to conserve threatened and endangered species. Many economic studies have demonstrated social welfare benefits associated with the conservation and recovery of endangered and threatened species (e.g., Bishop 1978 and 1980; Brookshire and Eubanks, 1983; Boyle and Bishop, 1986; Hageman, 1985; Samples *et al.*, 1986; Stoll and Johnson, 1984). Most research in this area has focused on mammals, birds, and fish. Depending upon the species, this literature indicates that households are willing to pay between \$6 and \$70 per year for species conservation, or one-time payments up to \$216 (bald eagle, Loomis and White, 1996). These values may be motivated by expectations of future viewing opportunities, or a desire to preserve important natural resources for future generations.

Willingness-to-pay for a single species of endangered moth is likely to be on the low end of these amounts, particularly if the species is not well known to the general public. There are no known studies which have focused on the value of preserving the Blackburn's Sphinx moth, and given the scope of this analysis, no primary economic research was conducted on the value of species preservation. Similarly, no information was found regarding the value of Blackburn's Sphinx Moth to two subsets of the general public: Native Hawaiians and lepidopterists.

The development of quantitative estimates associated with the benefits of the proposed designation is impeded by the scarcity of available studies and information relating to the size and value of beneficial changes that are likely to occur as a result of listing a species or designating critical habitat. In particular, the following information is not currently available: 1) quantified data on the value of the moth or the moth's critical habitat; and 2) quantified data on the change in the quality of the ecosystem and the species as a result of the designation (for example, how many fewer ungulates will roam into the critical habitat, how many fewer invasive plants will be introduced as a result, and therefore how many more of the adult or larval host plants will be present in the area and how many more moths these additional plants will support). As a result, it is not possible, given the information that is currently available, to estimate the value associated with ecosystem preservation that could be ascribed to critical habitat designation. Thus, categories of benefits are discussed in qualitative terms.

Some landowners have argued that critical habitat would make little or no contribution to the ultimate conservation of the moth. They observe that several non-native plants, including tree tobacco, can and do act as host plants for the moth, though they have not been identified as *primary constituent elements* of the moth critical habitat. They also observe that many of the native host plants identified as the *primary constituent elements* for the moth are vulnerable because they are weaker and more fragile than non-native plants, they grow more slowly and they cannot compete against aggressive fast-growing exotic plants. Nevertheless, critical habitat designations are mandated by law. In addition, the Service believes that the host plants identified as the *primary constituent elements* for the moth are more stable and drought-resistant than the tree tobacco plant and thus more likely to support the moth over the long-term. As long as these designations enhance the probability of the survival and conservation of the moth, regardless of how small that probability, critical habitat has value.

6.c.(2) Social Welfare Benefits of Broader Ecological Improvements

As discussed above, the long-term survival and conservation of Hawai'i's Blackburn's Sphinx Moth will require controlling habitat loss and encouraging the growth of larval and adult host plants. One of the threats to larval and adult host plants includes feral ungulates. It is also recognized that ungulates cause additional 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 near-shore 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.

In this manner, if feral ungulate control were undertaken for purposes of moth critical habitat, some complementary environmental improvements may be expected. These improvements may in turn improve ecosystem health and contribute to the welfare of residents and visitors. Similar to the benefits of species preservation discussed above, welfare benefits have also been ascribed to preservation of general biodiversity and ecosystem function (e.g., Pearce and Moran, 1994). However, determining the nature and extent of improvements specifically attributable to critical habitat designations would be difficult, if not impossible. For this reason, coupled with a lack of existing economic research, these potential broader ecological benefits are not quantified.

7. SUMMARY OF ECONOMIC IMPACTS

For economic activities affected by the proposed plant critical habitat in the next 10 years, Table VI-3 summarizes the total section 7-related costs and benefits attributable to the plant listings, as well as those which are attributable solely to the proposed critical habitat designation.

These findings reflect the fact that, with the exception of the units on the Big Island, relatively few new developments, commercial projects, land uses, and activities are expected in the proposed critical habitat. This is due to (1) lands that are largely unsuitable for development and most other activities because of their rugged terrain, lack of access, limited infrastructure, and remote locations; and (2) existing land-use controls that severely limit development and most other activities in parts of the proposed designation. Also, a number of projects and activities in the proposed critical habitat would not be subject to section 7 consultation because there is no *Federal involvement*, or the activities involve O&M of existing man-made features and structures, or the projects or activities would not impact the *primary constituent elements* essential to the survival and conservation of the moth.

Thus, as shown in Table VI-3, over a 10-year time period the total direct section 7-related costs associated with the moth species listings are \$1,211,100 to \$1,914,400. The costs associated with consultation alone are \$226,100 to \$644,600, of which \$120,400 to \$391,600 are costs to the Service and other Federal agencies. The vast majority of the total costs are attributable to anticipated project modifications for one project, the proposed Ane Keohokaloole Highway in Unit 5A (Big Island) (\$985,000 to \$1,230,000). The total costs represent, in the worst case, about 0.03 percent of the total personal income of Maui and Hawai'i Counties in 2000.

The potential indirect costs could be substantially larger than the direct section 7-related costs. While the probability of occurrence for most of the indirect effects are all unknown, the costs associated with these effects could be large. Most of the potential indirect costs are associated with Units 5A, 5B, and 6 on the Big Island because portions of these units are planned for development. However, while estimates are presented in the text (see Section 4 of this Chapter) for indirect effects were they to occur, it is unclear what the probability of occurrence is for most potential effects. Thus, the expected value of these effects is unknown and the impacts are presented qualitatively in the text.

Designation of the proposed critical habitat and related actions taken to control threats to the moth (e.g., revegetation, fencing, ungulate control) may also generate economic benefits. These benefits may be related directly or indirectly to designation and manifest in increased regional economic activity or social welfare. For the former, to the extent that critical habitat designation leads to additional conservation management activities funded by out-of-state sources, a local increase in revenues and employment may result. For the latter, species preservation and recovery and other complementary ecological improvements may generate social welfare benefits for residents and non-residents alike. However, the development of quantitative estimates associated with the benefits of the proposed designation is impeded by the scarcity of available studies and information relating to the size and value of beneficial changes that are likely to occur as a result of listing a species or designating critical habitat. In particular, the following information is not currently available: 1) quantified data on the value of the moth or the moth's critical habitat; and 2) quantified data on the change in the quality of the ecosystem and the species as a result of the designation (for example, how many fewer ungulates will roam into the critical habitat, how many fewer invasive plants will be introduced as a result, and therefore how many more of the adult or larval host plants will be present in the area and how many more moths these additional plants will support). As a result, it is not possible, given the information that is currently available, to estimate the value associated with ecosystem preservation that could be ascribed to critical habitat designation. Thus, categories of benefits are discussed in qualitative terms.

Table VI-3. Section 7 Costs & Benefits Attributable to the Moth Listing & Critical Habitat
(10-year estimates)

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

Item	Total		Explanation
	Low	High	
DIRECT SECTION 7 COSTS			
Management of Game Hunting			
State-Managed Lands, Consultations	\$ 7,500	\$ 7,500	Consultation due to Pittman-Robertson funding
State-Managed Lands, PMs	None	None	No additional PMs anticipated due to moth CH
Residential Development			
Kula Residence Lots, Consultation	\$ -	\$ 44,500	Consultation due to Fed funding
Kula Residence Lots, PMs	Minor	Minor	PMs minor due to small footprint
Kahikinui Kuleana Homesteads, Consultation	\$ -	\$ 51,100	Consultation due to Fed funding
Kahikinui Kuleana Homesteads, PMs	Minor	Minor	PMs minor due to small footprint
Villages at La'i'opua	None	None	No Federal involvement
Other Residential Development, Urban District	None	None	No activity in CH planned in next 10 years
Other Residential Development, Agricultural District	None	None	No Fed involvement
Industrial and Commercial Development			
Kaloko Industrial Park	None	None	No Fed involvement
Farming and Ranching Operations			
Farm Service Loans, Consultations	\$ -	\$ 9,100	Consultations due to Fed funding
Farm Service Loans, PMs	Minor	Minor	Major PMs not anticipated
Conservation Projects			
Conservation Projects Funded by the Service, Consultations	\$ 8,000	\$ 24,000	Consultation due to Fed funding
Conservation Projects Funded by the Service, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
USDA Conservation Programs, Consultations	\$ -	\$ 76,000	Consultation due to Federal funding
USDA Conservation Programs, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Other Conservation Projects, Kahikinui, Consultations	\$ 3,800	\$ 11,400	Consultation due to possible Federal funding
Other Conservation Projects, Kahikinui, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Other Conservation Projects, EMWP, Consultations	\$ 3,800	\$ 3,800	Consultation due to possible Federal funding
Other Conservation Projects, EMWP, Consultations	Minor	Minor	PMs minor due to beneficial nature of activities
Other Conservation Projects, Consultations	\$ 3,800	\$ 34,500	Consultation due to possible Federal funding
Other Conservation Projects, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Kaho'olawe			
Kaho'olawe, Consultations	\$ 10,400	\$ 78,500	Consultations due to possible Federal funding
Kaho'olawe, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Military Activities			
Hawai'i Army National Guard, Consultations	\$ 5,200	\$ 5,200	Consultation due to Fed funding
Hawai'i Army National Guard, PMs	Minor	Minor	Minor PMs due to already established NRMP with input from the Service
Kahului Airport	None	None	No identified Fed involvement

Table VI-3. Section 7 Costs & Benefits Attributable to the Moth Listing & Critical Habitat
(10-year estimates)

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

Item	Total		Explanation
	Low	High	
DIRECT SECTION 7 COSTS (cont'd)			
Roads			
Existing Roads	None	None	O&M not subject to section 7
New Roads, Consultations	\$ 32,600	\$ 32,600	Consultation due to Fed funding
New Roads, PMs	\$ 985,000	\$ 1,230,000	PMs could include realignment, fire break, outplanting, fire management, off-site conservation purchase
Water Systems			
Water systems, Big Island, Consultations	\$ 20,600	\$ 30,600	Consultation due to possible Fed funding
Water systems, Big Island, PMs	\$ -	\$ 6,200	PMs likely to be minor due to overall beneficial nature of activity
Water systems, Maui, Consultations	\$ -	\$ 30,600	Consultation due to possible Fed funding
Water systems, Maui, PMs	Minor	Minor	PMs minor due to existing vision for Kahikinui
Water systems, Moloka'i	None	None	O&M not subject to section 7
Fire Management			
Consultations	\$ 50,200	\$ 50,200	Consultation due to Fed funding
PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Communications Facilities			
New Facilities, Consultations	\$ 36,400	\$ 72,800	Consultation due to FCC and/or FAA permits
New Facilities, PMs	\$ -	\$ 33,600	PMs could include outplanting
Golf Courses			
Existing Golf Courses	None	None	O&M not subject to section 7
Planned Golf Courses, Consultations	\$ 9,700	\$ 9,700	Consultation on wastewater facility upgrade
Planned Golf Courses, PMs	None	None	PMs not anticipated
State Trail and Access System			
Consultations	\$ 5,200	\$ 5,200	Consultation due to Fed funding
PMs	None	None	PMs not anticipated
Parks			
National Parks	None	None	New National Parks unlikely in next 10 years
State Parks, Consultations	\$ 5,200	\$ 5,200	Consultation due to possible Fed funding
State Parks, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
County Parks	None	None	No Fed involvement
Community Economic Development			
Moloka'i Enterprise Community	None	None	No activity in CH planned in next 10 years
Kahikinui, Consultations	\$ 15,700	\$ 47,100	Consultation due to possible Fed funding
Kahikinui, PMs	Minor	Minor	PMs minor due to existing vision for Kahikinui
Natural Disasters			
FEMA Recovery Projects, Consultations	\$ 4,000	\$ 7,500	Consultation due to FEMA funding
FEMA Recovery Projects, PMs	Minor	Minor	Few adverse impacts anticipated
USDA Disaster Assistance, Consultations	\$ 4,000	\$ 7,500	Consultation due to USDA funding
USDA Disaster Assistance, PMs	Minor	Minor	Few adverse impacts anticipated
Ecotourism			
	None	None	No Fed involvement
TOTAL DIRECT COSTS			
Direct	\$ 1,211,100	\$ 1,914,400	included
Discounted Present Value	\$ 850,626	\$ 1,344,594	
Annualized	\$ 121,110	\$ 191,440	

Table VI-3. Section 7 Costs & Benefits Attributable to the Moth Listing & Critical Habitat
(10-year estimates)

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

Item	Explanation
INDIRECT COSTS *	
Management of Game Mammals and Loss of Hunting Lands	Low probability of State-initiated change in game management policy; undetermined probability of successful third-party lawsuit to change game management policy
Conservation Management	Low to moderate probability of court mandated conservation management, but costs likely to be attributable to section 9 rather than CH
Subsistence and Native Hawaiian Traditional and Cultural Practices	Slight probability of a moderate impact
Redistricting of Land by the State	Small probability of redistricting of entire area; higher yet undetermined probability of redistricting of individual parcels
State and County Development Approvals	Incremental cost to prepare an EIS rather than an EA for five projects; current information insufficient to determine whether factors beside CH would require preparation of EIS
Reduced Property Values	Possibility of loss of property values due to uncertainty about long-term impact of CH. Current information insufficient to determine amount of loss.
Condemnation of Property	No condemnation resulting from CH. Also, the Service acquires land by negotiation, not condemnation
Investigate Implications of CH	75 private landowners may investigate the implications of CH on their lands; cost may range from \$200,000 to \$713,000
Loss of Conservation Projects	Moderate probability of reduced participation in conservation projects to avoid Federal nexus

* Although the analysis does provide general estimates of some of the potential indirect costs, these estimates are not totaled because of the speculative nature of many of these costs. Instead, this table reports qualitatively on their likelihood and their potential magnitude. For additional information on any of these indirect impacts, the reader should refer to the economic cost and benefit chapter of the analysis (Chapter 6).

Table VI-3. Section 7 Costs & Benefits Attributable to the Moth Listing & Critical Habitat
(10-year estimates)

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

Item	Explanation
DIRECT BENEFITS	
Regional Economic Activity Generated by Conservation Management	Much of the benefit likely accrued elsewhere if financed with off-island sources
Regional Economic Activity Associated with Ecotourism	The Service prefers that guides do not feature visits to endangered species
Regional Economic Activity Associated with Avoided Cost to Developers	Helps developers site projects
Regional Economic Activity Associated with Medical/Pharmaceutical Benefits	No way to determine statistical probability or economic value of future ethnobotanical use of host plants, or contribution of CH to conservation of host plant
Social Welfare Benefits of Habitat Designation	The designation may result in preservation of open lands
INDIRECT BENEFITS	
Social Welfare Benefits of Endangered Species Preservation	Difficult to estimate preservation benefits and their value
Social Welfare Benefits of Broader Ecological Improvements	Difficult to determine environmental improvements attributable to the implementation of section 7

APPENDIX VI-A

Information on Hunting and Game-Mammal Management

1. INTRODUCTION

The proposed critical habitat designation overlaps with State-managed hunting lands on Moloka'i and the Big Island. Presented below is background information on hunting on Moloka'i and the Big Island 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 Moloka'i and the Big Island, economic activity associated with hunting, the value of hunting to hunters, DLNR game management, the loss of hunting areas 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 MOLOKA'I AND THE BIG ISLAND

Hunting is an important activity for Moloka'i and the Big Island, because it provides recreation, subsistence, and a desired lifestyle. Subsistence hunting is particularly important on Moloka'i because of the rural lifestyle and the high level of unemployment in some areas.

Statewide, hunting is largely a local activity, with approximately five percent of the game-mammal hunters coming from off-island (based on DLNR estimates, 2001). However, the creation of a DLNR website about hunting in Hawai'i has increased phone calls from potential visitors requesting additional information about hunting in Hawai'i.

Game mammals hunted on Moloka'i include feral pigs, goats and axis deer. Game birds include ringneck pheasant; chukar partridge; Francolin (two species); quail (two species); dove (two species); and wild turkey.

Game mammals hunted on the Big Island include feral pigs, goats and sheep. Game birds include chestnut bellied sandgrouse; chukar partridge; Francolin (three species); pheasant (three species); quail (three species); dove (three species); and wild turkey.

3. ECONOMIC ACTIVITY ASSOCIATED WITH HUNTING

In 2001, 17,000 hunters in the State of Hawai'i, most of whom were local residents, spent an estimated 316,000 days and about \$15.1 million on hunting, of which about \$8.1 million was trip-related and about \$7 million was for equipment and other expenses (2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation). 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 three percent of the State's hunters live on Moloka'i and 32 percent live on the Big Island (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, 2002).

In 2001, economic activity supported by just game-mammal hunting on Moloka‘i amounted to about \$315,000 in direct sales, \$560,000 in total direct and indirect sales, 10 jobs, and \$185,000 in income. Economic activity supported by just game-mammal hunting on the Big Island amounted to about \$3.4 million in direct sales, \$6 million in total direct and indirect sales, 100 jobs, and \$2 million in income. These figures are order-of-magnitude estimates based on 70 percent of the hunting trips being spent hunting game mammals, three percent of the State’s hunting activity taking place on Moloka‘i, and 32 percent taking place on the Big Island.

4. VALUE OF HUNTING TO HUNTERS

The net value of hunting opportunities to hunters is based on what they would be willing to pay above and beyond their expenditures for hunting equipment, supplies, and travel to participate. “Consumer surplus” is the standard measure of value used in cost-benefit 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; and (2) they hunted a total of 316,000 days that year. The value of just game hunting amounted to about \$165,000 for Moloka‘i (\$7.9 million x 70 percent x 3 percent), and \$1.8 million for the Big Island (\$7.9 million x 70 percent x 32 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 consistent with estimates of the valuation of hunting from the following economic 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 (Donnell 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.

DLNR achieves what they regard as a reasonable balance between the two mandates by permitting recreational hunting based on site conditions (e.g., animal population and food supply) and habitat quality (nearly pristine, highly degraded, or somewhere in between) (see Appendix VI-B). For example, the most liberal hunting (e.g., year-round pig hunting) is permitted in nearly pristine areas that have 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 species. 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 populations allow hunters 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 two 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 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 endangered species 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 falls off 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 the game-mammal surveys indicate that the 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 enclosures, 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 UNDER THE *PALILA* DECISION

Based on past experience, most hunters in Hawai'i associate critical habitat designation with loss of prized hunting areas. The association is based on the *palila* critical habitat on the Big Island.

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 may associate critical habitat designation with eradicating game animals and loss of prized hunting areas, the eradication of sheep and goats from the *palila* habitat was based on the Federal *taking* provision of the Act and not on *adverse modification* to the critical habitat. However, under Federal law, a situation similar to the *palila* habitat could apply to the moth critical habitat since the Federal *taking* provision applies to all species of listed wildlife.

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 harvesting of wildlife. Hawai‘i’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 County of Maui (which includes Moloka‘i) received about \$170,000 for its game-management program plus another \$50,000 for non-game programs. The Big Island received about \$240,000 for its game-management program plus another \$70,000 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. Projects included game bird and game mammal surveys; construction of game mammal and bird water units; mowing and clearing of vegetation from Game Management Areas; and maintenance of existing structures and features. In order to minimize impacts to listed plant species, DLNR proposed to construct enclosure 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 knowledgeable 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.

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 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 islands, 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 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 Kaua'i, 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.

Most critical habitat designation 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 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 additional 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,’ ‘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.

Draft - November 2002

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."

Hawai'i Department of Land and Natural Resources
Undated

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Additional information was provided in communications with representatives of:

Government

- County of Hawai‘i, Department of Public Works
- County of Hawai‘i, Department of Water Supply
- County of Hawai‘i, Office of Housing and Community Development
- County of Maui, Board of Water Supply
- County of Maui, Department of Finance, Real Property Tax Division
- County of Maui, Parks Department
- County of Maui, Planning Department
- Hawai‘i Army National Guard
- Hawai‘i Department of Agriculture
- Hawai‘i Department of Business, Economic Development, and Tourism
- Hawai‘i Department of Hawaiian Home Lands
- Hawai‘i Department of Land and Natural Resources
- Hawai‘i Department of Transportation, Airports Division
- Hawai‘i Department of Transportation, Highways Division
- Hawai‘i Office of Environmental Quality Control
- Kaho‘olawe Island Reserve Commission
- U.S. Department of Agriculture, Farm Service Agency
- U.S. Department of Agriculture, Natural Resources Conservation Service
- U.S. Department of Housing and Urban Development
- U.S. Department of the Navy
- U.S. Fish and Wildlife Service, Pacific Islands Field Office

Private

- Aikane Nursery
- Akamai Gardens
- Alexander & Baldwin, Inc.
- Big Island Tropical Landscape and Nursery
- Decision Analysts, Hawai‘i, Inc. (DAHI)
- First Hawaiian Bank Trustee
- Haleakala Ranch
- Hana Ranch
- Hawai‘i Cattlemen’s Council
- Hawai‘i Information Service
- Hawai‘i Leeward Planning Conference

- Hui Ku Maoli Ola Native Hawaiian Plant Specialist
- Industrial Economics, Inc.
- Kaupo Ranch
- Kealia Ranch
- Kiahuna Golf Course
- Lanihau Partners
- Lehua Lena Nursery
- Makalei Hawai‘i Corporation
- Maui Electric Company, Inc.
- McCandless Ranch
- No Ka Oi Plants
- PBR Hawaii
- PIA-Kona Limited Partnership
- Ponoholo Ranch, Ltd.
- The Queen Emma Foundation
- Ulupalakua Ranch
- WB Kukio Resorts, LLC
- William L. Moore Planning
- Wilson Okamoto & Associates, Inc.
- Yamanaka Enterprises, Inc.

Non-profit

- Earthjustice Legal Defense Fund
- Hawai‘i Agriculture Research Center
- Kamehameha Schools
- The Trust for Public Land