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# **Waihou Spring State Forest Reserve**

## Management Plan

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September 2010

Prepared by:

State of Hawai‘i  
Department of Land and Natural Resources  
Division of Forestry and Wildlife  
Forest Management Section

## EXECUTIVE SUMMARY

This management plan for Waihou Spring Forest Reserve is one in a series of site-specific plans to be prepared by the Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) for individual forest reserves in the State of Hawai'i. These plans present a brief history of the specific forest reserve, a complete record of land transactions and boundary changes over time, a description of cultural and natural resources, as well as an account of infrastructure and intended use(s) of the area. Plans will serve to: (1) assist in preparation of regulatory compliance documents required to implement management actions outlined in the plan; (2) support DOFAW efforts to secure funding for plan objectives; (3) prioritize implementation of management objectives; and (4) solicit requests for proposals or bids to implement plan objectives.

Waihou Spring Forest Reserve was established by Governor's Proclamation in 1909 for the purpose of protecting the sources of Waihou Spring, one of the few perennial springs on the west slope of Haleakalā. At approximately 186 acres, Waihou Spring Forest Reserve is relatively small but is a popular day-use area. It is close to residential neighborhoods and has a well-used hiking trail. Most of the Reserve has been planted with an assortment of timber species over the years, reforesting an area that was previously weedy grazing land.

DOFAW's current management objectives for Waihou Spring Forest Reserve include preserving the watershed, controlling target weed species, maintaining trails, and removing fallen trees to manage fire fuel loads. Management priorities were divided into eight categories and ranked on a qualitative basis. Summaries of management priorities and State funds budgeted for planned management projects in Waihou Spring Forest Reserve are as follows:

1. Watershed Values – Staff and management costs only;
2. Additional Public Activity – \$31,000 annual costs plus staff and management costs;
3. Resource Protection - \$5000 annual costs plus staff and management costs;
4. Invasive Species Control - \$20,000 annual costs plus staff and management costs;
5. Commercial Activity – Staff and management costs only;
6. Native Ecosystems - \$10,000 annual costs;
7. T&E Species Management – Staff and management costs only;
8. Game Animal Management – Variable annual costs depending on number of special hunts conducted plus staff and management costs.

Details of these priorities and costs can be found in Table 4 on page 21 of the plan.

This plan is intended to describe short-term resource management planning and implementation strategies, as well to serve as a basis for future updates to accommodate evolving or additional objectives such as additional fencing projects and developing improved access and facilities for the Forest Reserve.

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WAIHOU SPRING STATE FOREST RESERVE  
MANAGEMENT PLAN SIGNATURE PAGE

Maui District certification: This plan was prepared by a team of Division of Forestry and Wildlife (DOFAW) staff to provide a management framework for Waihou Spring Forest Reserve.

  
\_\_\_\_\_  
John S. Cumming – DOFAW Maui Branch Manager

8/17/2010  
Date

DOFAW Administrator’s approval: I have reviewed the enclosed Forest Reserve Management Plan and concur with the recommendations herein. I agree that this Management Plan will serve as a guiding document for the resource management of Waihou Spring Forest Reserve.

  
\_\_\_\_\_  
for Paul J. Conry – DOFAW Administrator

9/22/10  
Date

Department of Land and Natural Resources Board approval: This plan meet the criteria established for State Forest Reserve Management Plans as mandated by Chapter 183, Section 16-4, Hawai’i Revised Statues.

  
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Laura H. Thielen – BLNR Chairperson

Approved by the Board  
of Land and Natural  
Resources at its meeting  
held 9/22, 2010

## DEVELOPMENT PROCESS TIMELINE

Waihou Spring Forest Reserve, Maui

<b>Stage of Development</b>	<b>Date Achieved</b>	<b>Comments</b>
Branch review	November 2009	Incorporated
DOFAW review	January 2010	Incorporated
Partner agency consultation	February 2010	Two responses received from partners and other government agencies
Public consultation	July 2010	No comments received
DOFAW approval	September 2010	None
BLNR approval	September 2010	None

## **I. INTRODUCTION**

The Division of Forestry and Wildlife (DOFAW) conducts on-going planning efforts to develop and update management plans for all forest reserves across the State. These efforts, to be consistent across the State, serve to organize field management, assist in budgeting and funding concerns, and aim to make the process transparent for partner organizations and the public. These plans also help to fulfill certain recommendations made in the Hawaii Tropical Forest Recovery Action Plan, which came about as a result of the 1992 Federal Hawaii Tropical Forest Recovery Act.

Each Branch office of the Division will have one comprehensive management plan that addresses overall Forest Reserve System issues, goals and objectives for that Branch. In addition, management plans will be developed for individual forest reserves, which will in part reflect the Division's management guidelines specific to that area. This document represents the comprehensive management plan for Waihou Spring Forest Reserve, which fits under the overall forest reserve management plan for Maui District. It addresses concerns and strategies only on the public lands in Waihou Spring Forest Reserve.

This management plan for the Waihou Spring Forest Reserve was developed using a variety of methods. Initial development consisted of reviewing and analyzing DOFAW historic and current files (both at the Administrative and Maui Branch office) and documents obtained from the Land Division, Survey Division, Bureau of Conveyances, as well as State Archives. State of Hawai'i Geographic Information Systems (GIS) map layers relating to biological, historical, and environmental resources were referenced to develop this plan. Additional resources utilized included other plans that identified the Forest Reserve or the area. Examples include the U. S. Fish & Wildlife Service (USFWS) Recovery plan for the Hawaiian Hoary Bat, the Hawai'i Biodiversity and Mapping Program, and others. The plan then evolved into its final iteration through discussions with Division staff from all program areas both at the Branch and Administrative offices, other Divisions and State agencies, DOFAW partners, and the public.

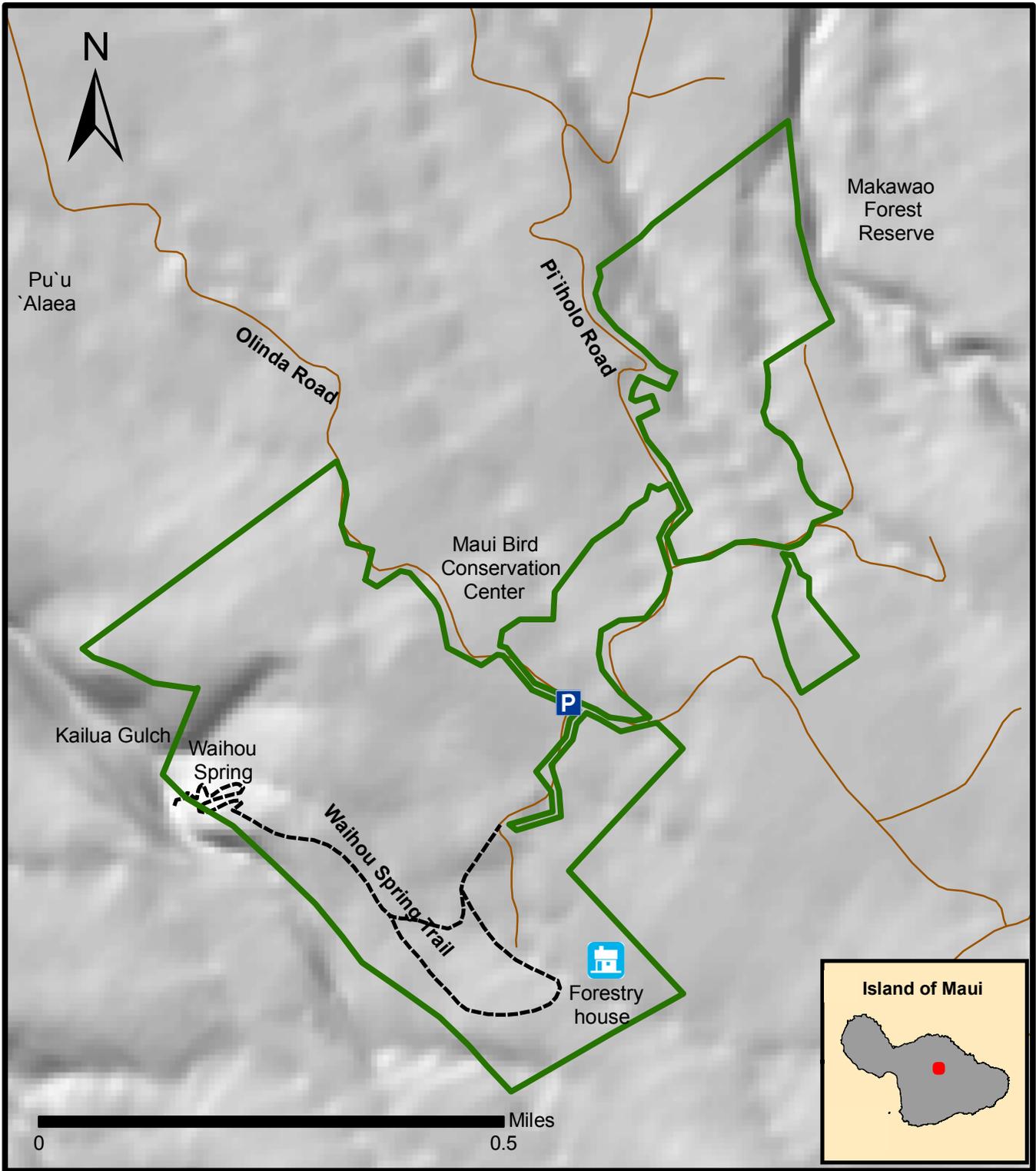
Approval of this Waihou Spring Forest Reserve Management Plan by the Board of Land and Natural Resources may trigger the following actions:

1. Preparation of regulatory compliance documents as required for implementation of management actions as outlined in the plan.
2. DOFAW efforts to secure operational and planning funding for plan objectives.
3. Prioritized implementation of plan objectives by DOFAW.
4. Periodic solicitation of requests for proposals or bids for implementation of plan objectives, including issuance of permits, licenses, or contracts (Hawai'i Administrative Rules §13-104-22), as necessary.

## **II. WAIHOU SPRING FOREST RESERVE DESCRIPTION**

Waihou Spring Forest Reserve currently consists of approximately 186 acres of public land (Table 1, Figure 1); it is one of eight forest reserves on the island of Maui. The Territorial Government initially set aside land for the Forest Reserve on June 5<sup>th</sup>, 1909, the object of which

Figure 1: Waihou Spring Forest Reserve



**Legend**

-  Waihou Spring Forest Reserve
-  Na Alal Hele trails
-  Minor roads

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was to protect the sources of Waihou Spring, cited at the time as “one of the very few permanent springs on the western slope of Mt. Haleakalā” (Hosmer 1909). Once bare pasture land, the area is now well forested with both native and non-native tree species. All public lands within Waihou Spring Forest Reserve are managed directly by DOFAW.

DOFAW’s current principle objectives for the management of Waihou Spring Forest Reserve are to preserve the watershed, control target weed species, maintain trails, and remove fallen trees to manage fire fuel loads and maintain a healthy forest condition..

**Table 1.** Government Tax Map Key (TMK) parcels currently comprising public lands of Waihou Spring Forest Reserve.

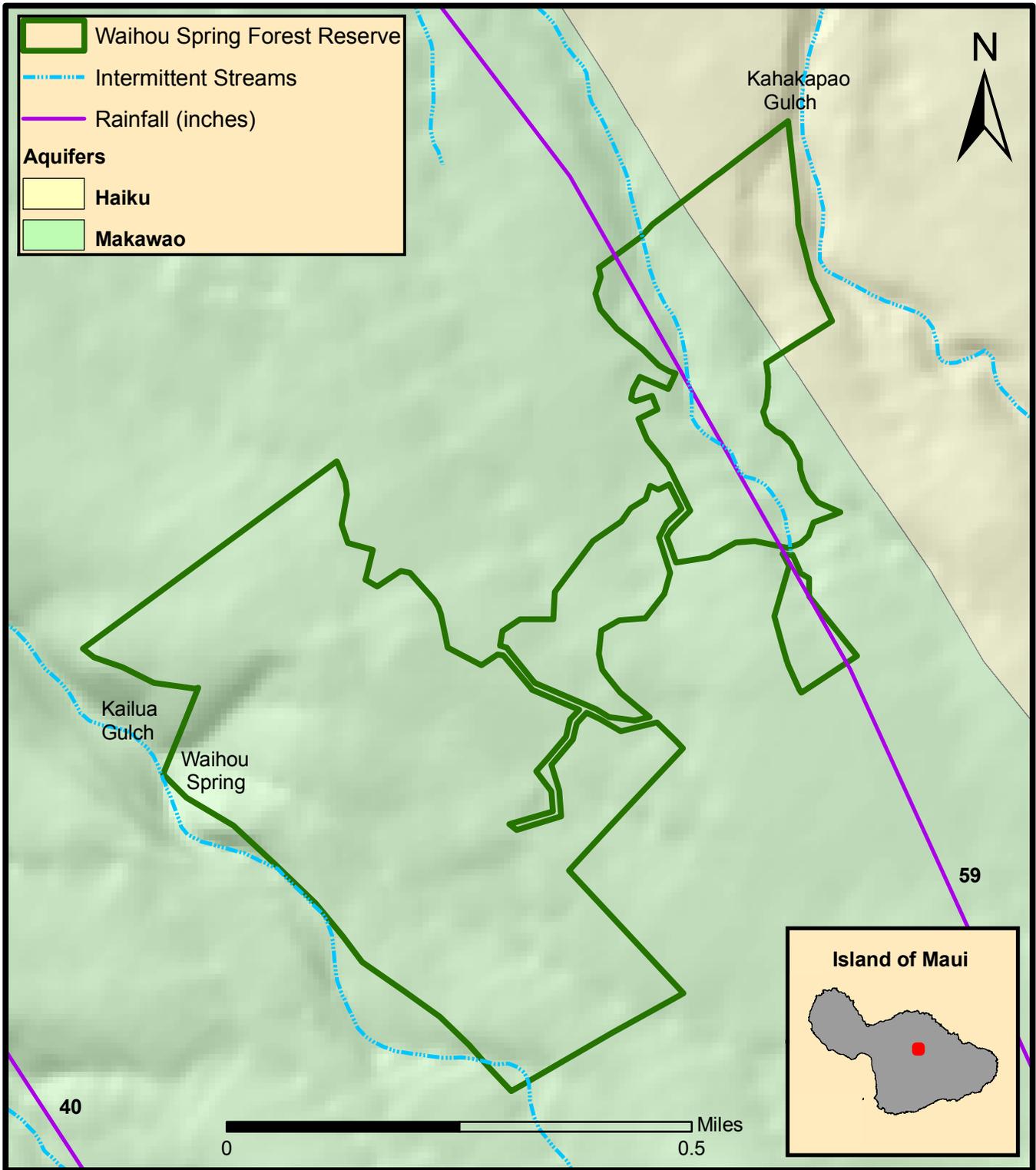
<b>TMK Number</b>	<b>Owner</b>	<b>Tax Acres (entire TMK)</b>	<b>GIS Acres (entire TMK)</b>	<b>GIS Forest Reserve Acres</b>
(2) 2-4-013:054	State of Hawai‘i	28.8	28.4	28.4
(2) 2-3-006:004	State of Hawai‘i	73.6	69.5	69.5
(2) 2-4-013:001	State of Hawai‘i	23.4	24.1	24.1
(2) 2-4-013:002	State of Hawai‘i	5.1	5.3	5.3
(2) 2-4-015:002	State of Hawai‘i	8.5	8.6	8.6
(2) 2-4-015:003	State of Hawai‘i	3.6	2.5	2.5
(2) 2-4-015:004	State of Hawai‘i	16	16.1	16.1
(2) 2-4-015:006	State of Hawai‘i	12.7	13.0	13.0
(2) 2-4-015:012	State of Hawai‘i	14.6	14.5	14.5
(2) 2-4-015:027	State of Hawai‘i	3.9	3.9	3.9
				<b>185.9 acres</b>

**A. Location and Description:** Waihou Spring Forest Reserve is located on the northwest slope of Haleakalā, approximately three miles mauka of Makawao town. It is a forested recreational area with popular hiking trails.

**B. Geographic Site Data:** The island of Maui consists of two volcanoes: Haleakalā, an active volcano dating from approximately 1.1 million years ago that forms east Maui, and an extinct volcano dating from approximately 1.6 million years ago that forms Mauna Kahalawai, the west Maui mountains. Haleakalā last erupted as recently as 1790 (Juvik and Juvik 1998). The two volcanoes are separated by a low, flat plain. Maui is a part of Maui Nui, which is made up of several volcanoes that once formed a single island. Moloka‘i, Maui, Lāna‘i, and Kaho‘olawe were all a part of this large island until sea levels began to rise about 400,000 years ago (Hawaiian Volcano Observatory 1998).

**C. Physical Site Data:** Waihou Spring Forest Reserve covers approximately 186 acres and includes all or parts of the following geographic features: Kahakapao Gulch, Kailua Gulch, and Waihou Spring. It is located within the ahupua‘a of Makawao and sits atop the aquifers of Makawao and Haiku (Figure 2). The average annual rainfall is ranges from approximately 40 to 59 inches. With elevation ranging from 3300 to 3900 feet, this relatively small Forest Reserve contains only three soil types: mostly OND (Olinda loam, 12 to 20 percent slopes) with smaller areas of ONC (Olinda loam, 4 to 12 percent slopes) with rRK (Rock land) soils in the gulches

Figure 2: Hydrological features of Waihou Spring Forest Reserve



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(Figure 3) . ONC soils are found on smooth, intermediate to high mountain slopes. These slightly acidic soils are 36 to 90 inches deep and are underlain by igneous rock. Erosion hazard ranges from slight on ONC soils to moderate on OND soils. Exposed rock covers 25 to 90 percent of the surface of rRK soils, which are found on all islands over a wide range of geographic conditions. OND soils are classified as highly erodible (HEL), while ONC and rRK soils are classified as potentially HEL.

**D. Pre-Reserve and Early Use History:** Unlike most Forest Reserves established by Hawai‘i’s Territorial government in the early 20<sup>th</sup> century, the land that was set aside for Waihou Spring Forest Reserve in 1909 was open grazing land rather than forested land. Even though the Reserve was created to protect the source of the spring at Waihou, the spring had already been tunneled and its water was being piped to the lower reaches of the adjacent Haleakalā Ranch to water livestock (Hosmer 1909). The intent on establishment of the Forest Reserve was reforestation of the area through tree planting. Haleakalā Ranch was contracted to build cattle fencing for the Reserve in 1913 and the Maui Agricultural Company began tree planting in 1919. Over the years, extensive tree planting was done in the area, with detailed records still available for the period between 1928 and 1949. In addition to providing land cover and watershed protection, these plantings were intended for the study and production of both native and exotic trees suitable for high elevation growth.

**Table 2:** Summary of public land additions and withdrawals (A/W) for Waihou Spring Forest Reserve. See Figure 4 for map descriptions. Data relating to these items are filed at the DOFAW Administrative Office and the State Survey Office.

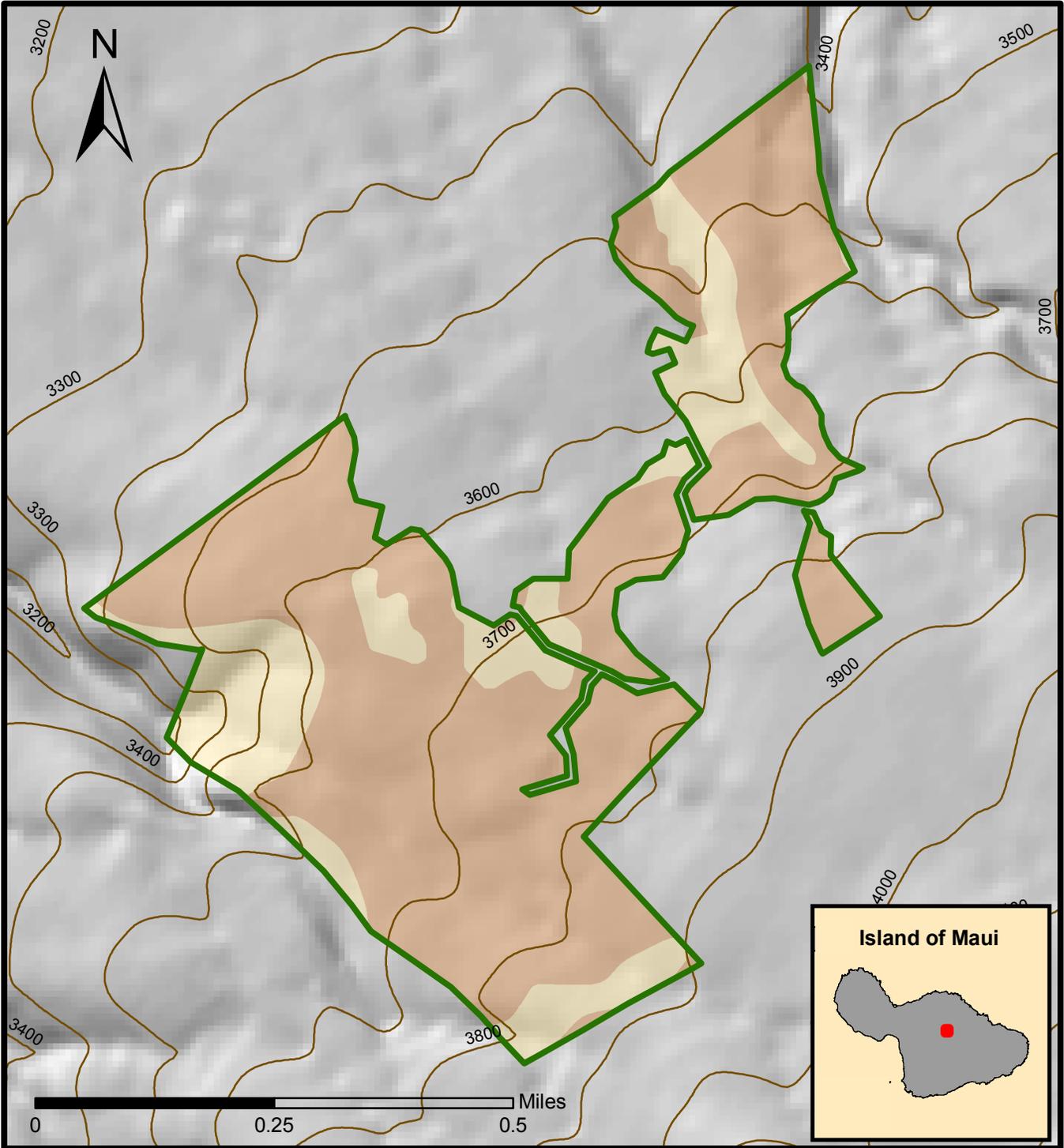
Action	Date	A/W	Description	Action acres	Copy of Survey Furnished (CSF)	TMK
Governor’s Proclamation	05-Jun-1909	A	Land set aside for Waihou Spring Forest Reserve	84.0 */1	2003	(2) 2-3-006:004 (2) 2-3-006:003
Executive Order 1471	12-Sept-1951	A */2	Land set aside for Waihou Spring Forest Reserve	73.6	11239	(2) 2-3-006:004
Executive Order 3326	18-Feb-1986	A	Addition to Waihou Spring Forest Reserve; 9 parcels including old Olinda House Lots and abandoned Government roads	116.73	20288	(2) 2-4-013:054 (2) 2-4-013:001 (2) 2-4-013:002 (2) 2-4-015:002 (2) 2-4-015:003 (2) 2-4-015:004 (2) 2-4-015:006 (2) 2-4-015:012 (2) 2-4-015:027

\*/1 Includes 74.0 acres of Government land (Haleakalā tract at Makawao) and 10.0 acres of private land at Makaehu [sic]

\*/2 This action does not truly add acreage to the Forest Reserve; it is a redundant action that covers the same Government land set aside in the Governor’s Proclamation of 1909

**Kuleana Parcels:** There are no Kuleana parcels within Waihou Spring Forest Reserve.

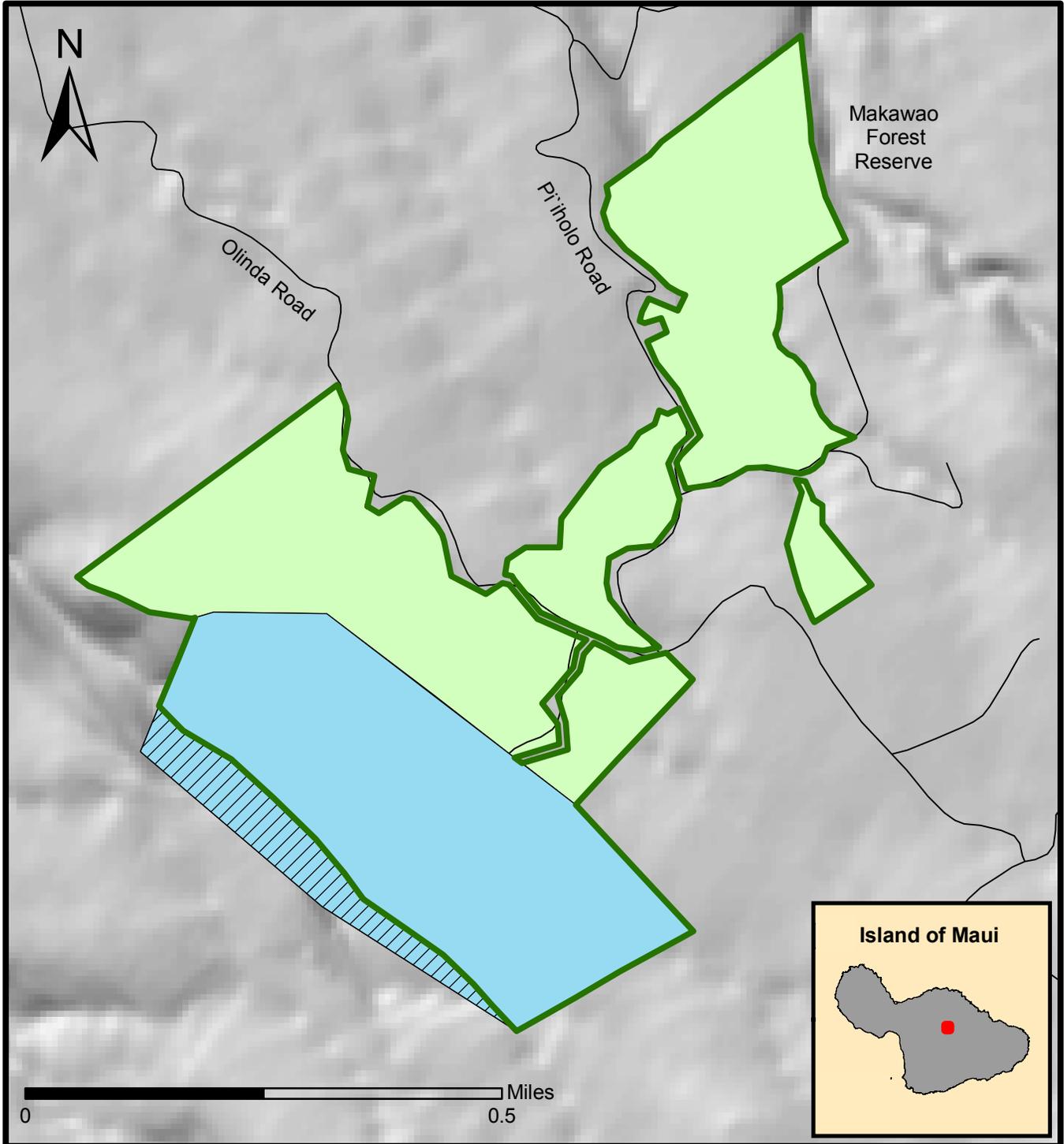
Figure 3: Soils and elevation at Waihou Spring Forest Reserve



-  Waihou Spring Forest Reserve
-  100 ft. elevation contours
- Soils**
-  Highly erodible land
-  Potentially highly erodible land

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Figure 4: Historical boundary changes and current extent of Waihou Spring Forest Reserve



**Legend**

-  Waihou Spring Forest Reserve - current State land
-  Private Land
-  Governor's Proclamation (1909)
-  EO 3326 (1986)

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**Documented Activities/Leases/Deeds/Permits:** Of the few land use agreements associated with Waihou Spring Forest Reserve (Table 3), most pertain to water use, reflecting the main purpose of the Reserve.

**Table 3.** Land use agreements associated with Waihou Spring Forest Reserve

Type of Action	Action Number	Duration	Description	Area	Copy of Survey Furnished (CSF)	TMK
Land office deed	27041	Dated 21-Aug-1979; perpetual	County of Maui; non-exclusive easement for waterline and drainage purposes (Easement 2)	3180 ft. <sup>2</sup>	18272	(2) 2-4-013:054
Land office deed	28526	Approved in 1996 but not yet executed	Verizon, Hawai'i Inc.; utility easement	Unknown	Unknown	(2) 2-4-013:001 (2) 2-4-013:002 (2) 2-4-015:006
Land office deed	27641	Dated 12-Jan-1987; perpetual	County of Maui; non-exclusive easement for drainage purposes	970 ft. <sup>2</sup>	20,457	(2) 2-4-015:006

Maui Electric Company, Ltd. (MECO) has a power line that crosses TMKs (2) 2-4-015: 004, 006, and 012. Currently, neither DOFAW nor MECO has been able to locate a formal land use agreement for this zone..

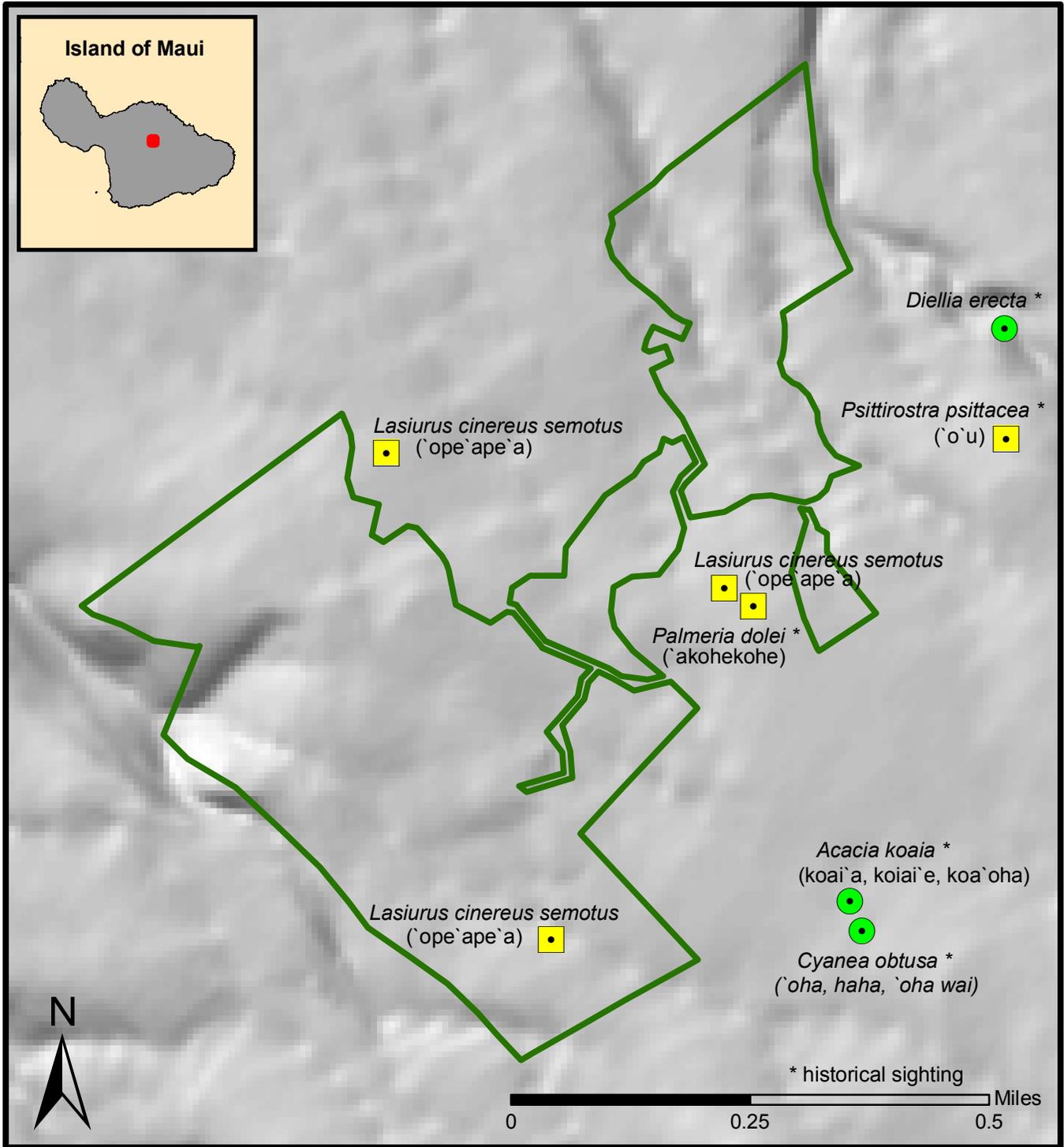
**E. Vegetation:** Indicative of its history as prior grazing lands, the vegetation at Waihou Spring Forest Reserve consists predominantly of non-native plantation forest with some native trees remaining, mostly in the steeper gulch areas. Species include 'ōhi'a (*Ohia lehua*), 'ala'a (*Pouteria sandwicensis*), hala pepe (*Pleomele* spp.), koa (*Acacia koa*), olopua (*Nestegis sandwicensis*), pilo (*Coprosma* spp.), and *Cyrtandra* spp. According to the Vegetation Classes in DOFAW's 2001 Draft Management Guidelines, the entire Forest Reserve is classified as V-4: Badly Degraded Areas. V-4 Units are areas that are severely degraded or highly altered from their natural state. They may be lands that were cleared for other uses, or are currently eroded, forest plantations, or are dominated by non-native species.

**Rare Plants:** No Federal or State listed rare plants are currently recorded within the boundaries of Waihou Spring Forest Reserve, although historical occurrences have been recorded nearby (Figure 5). *Ochrosia haleakalae*, a candidate species for listing which is considered rare by DOFAW's Plant Extinction Prevention Program, may be found in the Kailua Gulch area (F. Duvall, personal communication, unreferenced)

**Critical Habitat:** Waihou Spring Forest Reserve contains no critical habitat as designated by the US-ESA.

**Timber Species:** Most of the plantation timber at Waihou Springs Forest Reserve dates from the first half of the 20<sup>th</sup> century. Species include Bluegum eucalyptus (*Eucalyptus globulus*), Cluster pine (*Pinus pinaster*), Loblolly pine (*Pinus taeda*), and an assortment of other pines and hardwood trees (Klingensmith 1969) (Figure 6). In 1961, an 8.5 acre spacing study was

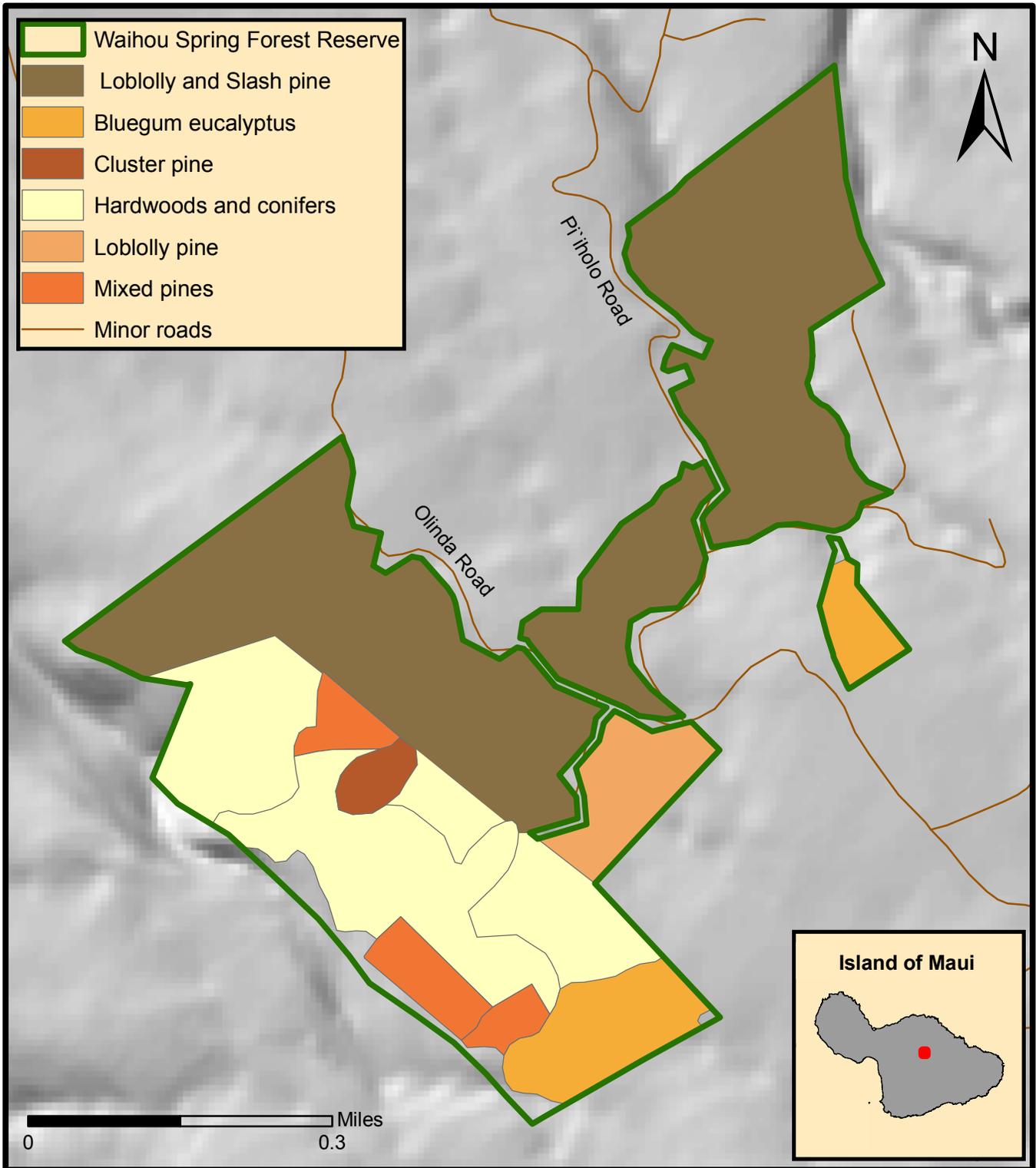
Figure 5: Rare species documented in and around Waihou Spring Forest Reserve (Hawai'i Biodiversity and Mapping Program 2008)



-  Rare animal
-  Rare plant
-  Waihou Spring Forest Reserve

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Figure 6: Timber plantations at Waihou Spring Forest Reserve.



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conducted using Loblolly pine. In 1986, approximately 117 acres of unencumbered State land was added to the Forest Reserve. This land was subsequently planted with a mix of Loblolly pine and Slash pine (*Pinus elliottii*) (G. Shishido, personal communication, unreferenced). DOFAW's 2001 Draft Management Guidelines for Forest Products classify the entire Reserve as F-2: Secondary – these are areas where limited small-scale harvesting or salvage is allowed (<10 acres harvested per year.) Permits and/or licenses are required with appropriate restrictions.

**Invasive plant species:** Gorse (*Ulex europaeus*) has been a problem weed in the area ever since the establishment of the Forest Reserve. Banana poka (*Passiflora mollissima*) has been found in the area - establishment is a risk and should be prevented. Black wattle (*Acacia mearnsii*) and English ivy (*Hedera helix*) are also a concern in the area.

**F. Wildlife:** Waihou Forest Reserve hosts a variety of wildlife, both native and introduced.

**Native species:** The 'ōpe'ape'a (Hawaiian hoary bat, *Lasiurus cinereus semotus*) is commonly seen both within the boundaries of Waihou Spring Forest Reserve (Figure 5) and also in the area surrounding the Reserve (Hawai'i Biodiversity and Mapping Program 2008). This species roosts in trees and has often been associated with non-native vegetation (U.S. Fish and Wildlife Service 1998). Forest birds that may be seen in the area include the 'amakihi (*Hemignathus virens*), 'apapane (*Himatione sanguinea*), 'alauahio (*Paroreomyza montana newtoni*), and occasionally 'i'iwi (*Vestiaria coccinea*) (F. Duvall, personal communication, unreferenced). Historical records of sightings within close proximity of the Forest Reserve include two endangered forest birds: 'ākohekohe (Crested honeycreeper, *Palmeria dolei*) and 'ō'ū (*Psittirostra psittacea*).

**Introduced species:** A variety of introduced song and game birds can be observed in Waihou Spring Forest Reserve, along with Axis deer (*Axis axis*), along with the occasional feral pigs (*Sus scrofa*) and goats (*Capra hircus hircus*). Other introduced animals present in the area include chickens (*Gallus gallus*), Small Indian mongoose (*Herpestes auropunctatus*), and rats.

**G: Access:** Waihou Spring Forest Reserve is an easily accessible and popular day use area.

**Vehicular Access:** The Forest Reserve can be reached from Olinda Road or Pi'iholo Road (Figure 1); parking is available outside the gate off Olinda Road. The Forest Reserve and parking area are open only during daylight hours.

**Trails:** Na Ala Hele is the State of Hawai'i Trail and Access Program; it is administered by DOFAW. Primary management activities of Na Ala Hele include constructing, restoring and maintaining trails and access roads through utilization of staff and partnerships with community volunteers. The Reserve contains one Na Ala Hele trail – the Waihou Spring Trail, which follows the old Waihou Spring Forest Reserve tree plantation road and descends southward to the gulch below (Figure 1).

**Designated Helicopter Landing Zones:** None.

**Restricted Watershed:** There are no areas designated as restricted watershed on the island of Maui.

## **H: Infrastructure:**

**Trails:** Waihou Spring Trail (see section G: Access above for details)

**Campsites:** None.

**Fences:** A boundary fence exists on lands adjacent to Haleakalā Ranch (SW edge of the Forest Reserve). This fence, which the Ranch helps to maintain, keeps cattle out of the Forest Reserve.

**Public Restrooms:** None.

**Shelters/Picnic Areas:** None.

**Other:** An old house, built in 1917 as the Territorial Forester's quarters, is still in use as a private residence inside the Forest Reserve.

**I: Archaeological and Historical Sites:** No known archaeological sites exist within the Forest Reserve (Mann et al. 2003). Historical sites include the old nursery road, a building foundation, a well shaft, and some unidentified stonework in the original south section of the Forest Reserve. Old pipes from a stream diversion used to supply water to the adjacent Haleakalā Ranch can also be seen inside Kailua Gulch.

## **J. Additional Public Use:**

**Hiking:** The popular Waihou Spring Trail has two sections (Figure 1). The first section is the upper loop, which is an easy walk of about ¼ mile. The second section is of moderate difficulty, with a length of approximately one mile and a change in elevation of approximately 400 feet; it follows the Waihou Spring Forest Reserve tree plantation road and descends southward to the bottom of the Waihou Spring.

**Dogs:** Dogs are allowed on-leash but must remain on the Waihou Spring Trail.

### **Activities *not* allowed in Waihou Spring Forest Reserve:**

- Public hunting – DOFAW's 2001 Management Guidelines classify the area as A-4: Game Control (supervised) for Game Animal Management. These areas are designated for animal removal only by staff or agency designees because of environmental sensitivity, remoteness, or public safety.
- Camping
- Horseback riding
- Mountain bikes, dirt bikes, and all terrain/utility vehicles
- Open fires

**Non-Timber Forest Product Collection:** Non-timber forest products may be collected with a permit within the Reserve. Examples include:

- Wood products (e.g. firewood, poles)

- *Pinus* spp. (pine) cones and boughs
- Mushrooms
- Others on approval

Gathering of material from plant species that are not on Federal or State threatened and endangered species lists is permitted and regulated by DOFAW through standard Forest Reserve System permit procedures. Gathering of plant materials from threatened or endangered species may be allowed if individuals have obtained a Special Use Permit from DOFAW. Either a Collection Permit or Commercial Harvest Permit is required for gathering logs, firewood, greenery for floral arrangements, and other forest products. Permit applications for gathering forest material or products can be obtained from the DOFAW Maui office. These permits are available, upon approval, free of charge (depending on quantity) for personal, non-commercial use or at a fee for certain quantities, for resale, or for commercial purposes. Public use permits available in conjunction with the Forest Reserve System are described in Hawai'i Administrative Rules (HAR) §13-104.

**General Recreation:** DOFAW's 2001 Draft Management Guidelines consist of four categories for Recreation Management: R-1 (Heavy Use Areas), R-2 (Medium Use Areas), R-3 (Light Use Areas), and R-4 (Restricted Areas). The entire Waihou Spring Forest Reserve is designated R-2; these are areas where outdoor recreation is limited or controlled, or where it may be integrated with other uses. Facilities are not highly developed and include trails, rustic shelters, or unimproved campsites. Waihou Spring Forest Reserve is a popular day use area on Maui; it is easily accessible and has trails that are appropriate for all age levels.

#### **K. Threats:**

**Weeds/Invasive plants:** Gorse (*Ulex europaeus*), banana poka (*Passiflora mollissima*), black wattle (*Acacia mearnsii*), and English ivy (*Hedera helix*). Other weeds as problems present.

**Vandalism:** Vandalism is a problem in all State forest reserves. Currently, the forestry house in the Reserve is occupied; this resident presence in the area is helpful to reduce vandalism.

**Litter:** Items are sometimes dumped in the Reserve; geocaching and dog waste are notable problems.

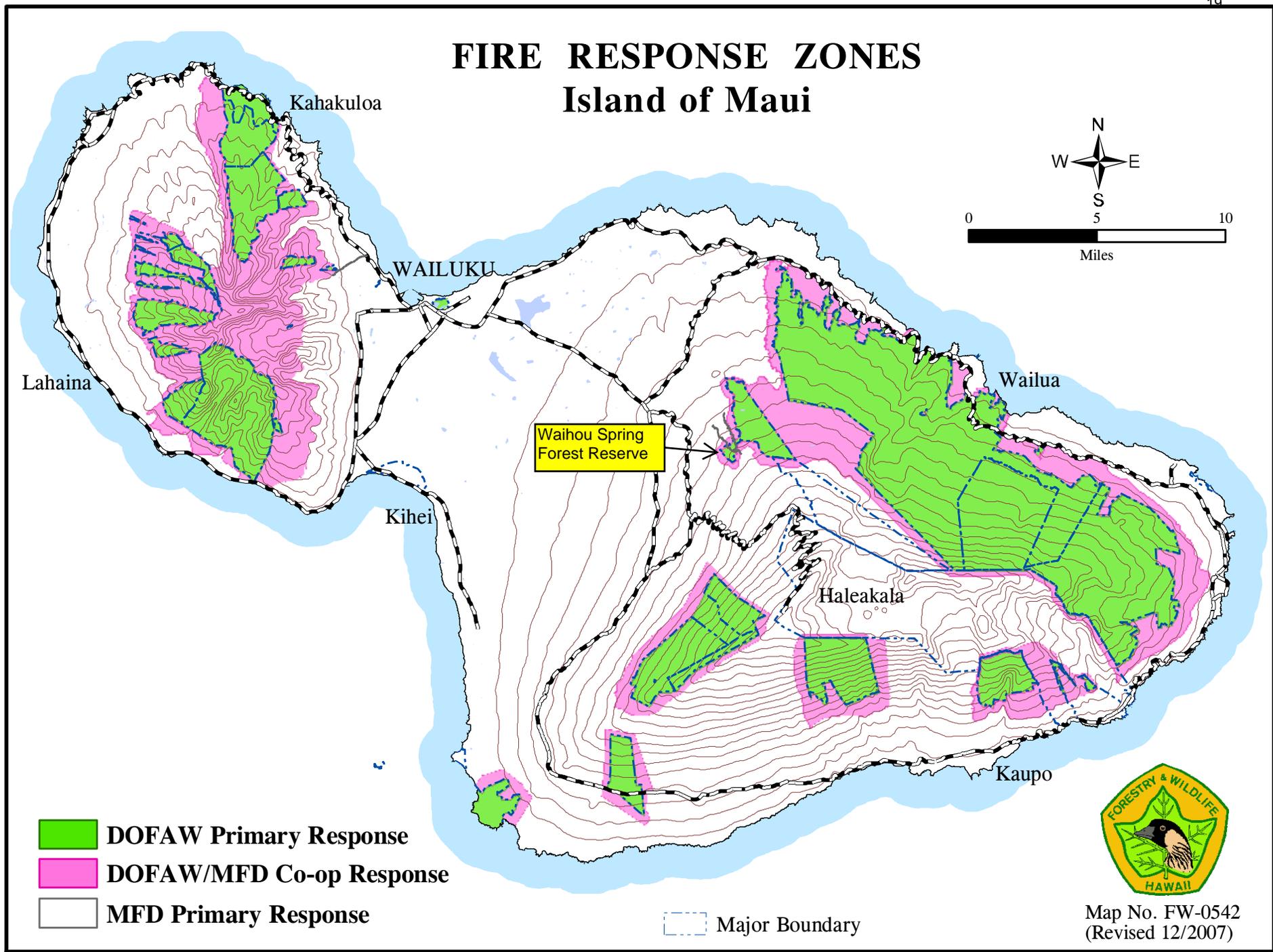
**Fire:** Historically, small fires have been common in the area, especially along the Maui Electric Company, Ltd. Power line easement that crosses the Forest Reserve. DOFAW is the primary responder for fighting fires in the Forest Reserve (Figure 7).

#### **L. Revenue:**

According to HRS §183.5, the department shall:

(5) Devise and carry into operation, ways and means by which forests and forest reserves can, with due regard to the main objectives of title 12, be made self-supporting on whole or in part.

# FIRE RESPONSE ZONES Island of Maui



Revenue in Waihou Spring Forest Reserve comes primarily from the occasional permitted sale of wood products. Commercial trail use is not allowed in Waihou Spring Forest Reserve as per the Maui Na Ala Hele Advisory Council.

### **III. MANAGEMENT**

**A. Past Planning:** Although there have been no formal prior management plans for Waihou Spring Forest Reserve, the area lies within the East Maui Watershed Partnership (EMWP) lands. The EMWP is an organization that partners federal, state, and private landowners to preserve the watershed and native forest areas in East Maui through natural resource management projects and community outreach.

#### **B. Summary of Existing Management Activities**

Management activities are currently focused on maintenance of the watershed through maintenance of forest health in the area. An important component of this effort is weed control; gorse is a persistent concern in the area. Trail maintenance, planting of native trees, and removing fallen trees in order to manage fire fuel loads are other ongoing projects.

#### **C. Management Objectives and Goals:**

In the Draft Umbrella Management Plan for each District, broad management priorities for each forest reserve were derived from the mandates that regulate DOFAW activities, including the Draft Management Guidelines and Administrative Rules, as well as input from Branch staff. These management priorities were divided into eight categories:

- Watershed Values (aquifer recharge and erosion control)
- Resource Protection (fire, insects, and disease)
- Invasive Species Control (incipient and established plants and animals)
- T&E Species Management (Federal and State listed and rare plants and animals)
- Native Ecosystems (landscape level protection)
- Game Animal Management (areas managed for public hunting and/or habitat enhancement for game animals)
- Commercial Activity (income generating activities such as timber, tours, etc.)
- Additional Public Activity (non-income generating uses, such as recreation, cultural activities, personal gathering, educational or research activities, and events among others)

Each category has been ranked on a qualitative scale of 1 to 8 with 1 as higher priority and 8 as lower priority. Table 1 is an excerpt from the Maui District Forest Reserves Draft Umbrella Management Plan and lists qualitative rankings of the management priority categories for Waihou Spring Forest Reserve. The priority rankings in this table reflect what staff at the DOFAW Maui Branch office hopes to accomplish with anticipated funding.

**Table 3:** Waihou Spring Forest Reserve and associated management priority categories (from DOFAW's Maui District Forest Reserves Draft Umbrella Management Plan)

Forest Reserve Section Name	Watershed Values	Resource Protection	Invasive Species Control	T&E Species Mgmt.	Native Ecosystems	Game Animal Mgmt.	Commercial Activity	Additional Public Activity
Waihou Spring	1	3	4	7	6	8	5	2

Table 4 expands on these management priority categories, listing general management actions to address the objectives, along with tactical goals, action items, and estimated cost associated with these actions.

**Table 4:** Management priorities and associated plans for Waihou Spring Forest Reserve. Estimated cost refers to State funds.

Management Priority	General Management Action	Tactical Goals	Action Items	Estimated Cost
<b>Watershed Values</b>	Mitigate soil erosion and water runoff	Maintain vegetative cover through multi-level canopy cover	<ul style="list-style-type: none"> <li>Promote forest health using silvicultural and best management practices</li> <li>Understory thinning of pines</li> </ul>	Staff and mgmt costs
<b>Additional Public Activity</b>	Maintain recreational fruit collection	Maintain current level of mgmt in plum tree area	Weed and fertilize  Additional plantings of plums and natives	\$1000/yr
	Maintain trail system	Maintain current level of management in the area	Conduct trail maintenance: chainsaw, weed eater, ditch witching, trail tread maintenance as needed	Staff and mgmt costs
	Improve public relations	Establish buffer around FR boundaries	Remove trees impacting neighbors	\$30,000/yr
<b>Resource Protection</b>	Maintain forest health	Mitigate wildland fire risk	Work with MECO to locate/develop a formal land use agreement for this power line  Require relocation of power lines underground or improve maintenance of MECO power line route	Staff and mgmt costs
			Cooperate with community in the creation and implementation of community wildfire protection plan	Staff and mgmt costs
		Mitigate downed tree fuel accumulation  Minimize gorse and black wattle growth	Mechanical and chemical vegetation control	\$5000/yr

<b>Management Priority</b>	<b>General Management Action</b>	<b>Tactical Goals</b>	<b>Action Items</b>	<b>Estimated Cost</b>
<b>Invasive Species Control</b>	Identify and control invasive species to reduce impact of invasive species on the forest	Support continued applied research to develop biocontrol agents	Continue to work with cooperating agencies such as TNC, NRCS, HDOA, UH-CTAHR, Central Maui SWCD, EMWP, USGS-BRD, USFWS, and others	Staff and mgmt costs
		Control noxious weeds as per HAR Chapter 68 – Dept. of Agriculture Weed Rules	Control gorse via current practices	\$20,000/yr for all weeds
		Control of other weedy species using manual and chemical control methods	Banana poka, English ivy, black wattle etc.	
<b>Commercial Activity</b>	Provide opportunities for forest product collection	Identify potential locations and species	Issue minor harvesting permits	Staff and mgmt costs
		Promote forest product revenue enhancement including biomass sales	Work with HFIA, local wood workers, and others	Staff and mgmt costs
<b>Native Ecosystems</b>	Prevent degradation and enhance, where possible, biodiversity of the area	Prevent crowding and/or shading out of native trees	Clear around individual native trees	\$5000/yr
	Educate public about native vegetation	Small scale native plantings in plum tree area	Appropriate species specific to the area with support from cooperators	\$5000/yr
<b>T&amp;E Species Mgmt.</b>	Support bat habitat	Use appropriate management practices	Encourage MECO to improve powerline corridor	Staff and mgmt costs
			Avoid large individual tree removal during pupping season (Apr-Oct)	Staff and mgmt costs
	Locate rare species in FR	Encourage research	Work with PEP program, UH, etc.	Staff and mgmt costs
<b>Game Animal Mgmt.</b>	Reduce or maintain low numbers of ungulates in FR to minimize damage to vegetation	Monitor Axis deer and feral pig populations to determine damage levels	Use data to establish tolerable ungulate level	Staff and mgmt costs
			Conduct special hunts as needed	\$1000/hunt

#### **D. Overall Measures of Success**

Measures of success for individual forest reserve management plans can be derived from the State of Hawai‘i’s annual variance reports. Measures of success that may be applicable to the Waihou Spring Forest Reserve include:

- Miles of unpaved access road and trail maintenance

- Number of volunteer service projects
- Acres of noxious plants controlled
- Acres of erosion controlled
- Acres of fire protection area
- Miles of fence constructed
- Miles of fence maintained
- Acres of enclosure developed
- Number of rare, threatened, or endangered plant/animal species protected
- Number of special use permits issued
- Number of minor harvesting permits issued
- Number of appurtenant features maintained

#### **IV. FUTURE RECOMMENDATIONS**

**A. Desired Outcome for the Forest Reserve:** The original extent of Waihou Spring Forest Reserve has historical significance for Hawai'i forestry – staff wishes to increase awareness of this while preserving the area and enhancing public enjoyment.

**B. Future Recommendations:**

- Develop plan for expanded land use on former homestead land - e.g. educational facilities (highlighting conservation/natural resource management), and/or expanded trails (possible compliance with Americans with Disabilities Act or dog park)
- Convert house to provide volunteer accommodation or interpretive center
- Compile historical planting history
- Increase enforcement presence
- Work with Maui County to resolve ownership of roads passing through the Forest Reserve

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