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# **Moloka'i Forest Reserve**

## Management Plan

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November 2009

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 Moloka‘i 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.

The Moloka‘i Forest Reserve was established by Governor’s Proclamation in 1912 for the purpose of protecting and permanently maintaining mountain forests in order to ensure continued regular stream flow. The Reserve is spread across east Moloka‘i and is currently comprised of several non-contiguous areas totaling over 11,500 acres of public land. Ecosystems and terrain vary widely; western sections are generally drier and more accessible, while eastern sections are generally wetter, more mountainous, and contain higher quality native ecosystems. Several exotic timber plantations exist in western sections of the Reserve. Infrastructure consists primarily of Na Ala Hele Trails, rough roads, and a picnic area with a basic campsite. Public hunting (birds and mammals) is allowed in Moloka‘i Forest Reserve.

DOFAW’s current principle objectives for the management of Moloka‘i Forest Reserve are to maintain a healthy watershed; protect forest resources from fire, insects, and disease; and maintain habitat for threatened, endangered, and rare plants and animals. Management priorities were divided into eight categories and ranked on a qualitative basis. Summaries of management priorities and estimated State funds budgeted for planned management projects in Moloka‘i Forest Reserve are as follows:

1. Watershed Values – \$35,000 one-time costs plus management and staff costs;
2. Resource Protection - \$70,750 one-time costs, \$21,500 annual costs, plus management and staff costs;
3. Invasive Species Control – approximately \$55,000 in annual costs;
4. Threatened and Endangered Species Management- variable one-time costs, \$75,000+ annual costs, plus management and staff costs;
5. Native Ecosystems - \$20,000 annual costs plus management and staff costs;
6. Game Animal Management - \$13,000 annual costs plus management and staff costs;
7. Commercial Activity - Management and staff costs only;
8. Additional Public Activity - \$50,500 annual costs plus management and staff costs.

Details of these priorities and costs can be found in Table 4 on page 37 of the plan.

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

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**MOLOKA'I 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 Moloka'i Forest Reserve.

*for*   
John S. Cumming – DOFAW Maui Branch Manager

12-14-09  
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 Moloka'i Forest Reserve.

  
Paul J. Conry – DOFAW Administrator

12/8/09  
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.

  
Laura H. Thielen – BLNR Chairperson

Approved by the Board  
of Land and Natural  
Resources at its meeting  
held November 19, 2009

## DEVELOPMENT PROCESS TIMELINE

Moloka'i Forest Reserve, Moloka'i (DOFAW Maui Branch)

<b>Stage of Development</b>	<b>Date Achieved</b>	<b>Comments</b>
Branch review	November 2008	Incorporated
DOFAW review	March 2009	Incorporated
Partner agency consultation	April 2009	<ul style="list-style-type: none"> <li>• One response received from targeted community member</li> <li>• Nine responses received from partners and other government agencies</li> </ul>
Public consultation	July 2009	<ul style="list-style-type: none"> <li>• Press release June 24, 2009</li> <li>• Plan posted on DOFAW website June 24 to July 22, 2009</li> <li>• No responses received.</li> </ul>
DOFAW approval	October 2009	None
BLNR approval	November 2009	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.

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 Moloka'i 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 Moloka'i Forest Reserve.

This management plan for the Moloka'i 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) Revised Recovery Plan for Hawaiian Forest Birds and Draft Recovery Plan for Blackburn's Sphinx Moth, the Hawai'i Biodiversity and Mapping Program, Hawai'i's Comprehensive Wildlife Conservation Strategy, 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 Moloka'i Forest Reserve Management Plan by the Chairperson of 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. MOLOKA'I FOREST RESERVE DESCRIPTION**

The public lands of Moloka'i Forest Reserve currently encompass approximately 11,690 acres (Table 1); it is the only State of Hawai'i forest reserve on Moloka'i. The Territorial Government set aside the Reserve by Governor's Proclamation on September 11, 1912, the object of which

was “to protect and to permanently maintain the forest cover on the upper mountainous parts of the island, so that the sources of water – the springs and streams thereon – may be safeguarded, and as far as possible the regularity of their flow assured” (Hosmer 1912). All public lands within the Moloka‘i Forest Reserve, unless otherwise stated, are managed directly by DOFAW.

DOFAW’s current principle objectives for the management of Moloka‘i Forest Reserve are to maintain a healthy watershed, to protect forest resources from fire, insects, and disease, and to maintain habitat for threatened, endangered, and rare plants and animals.

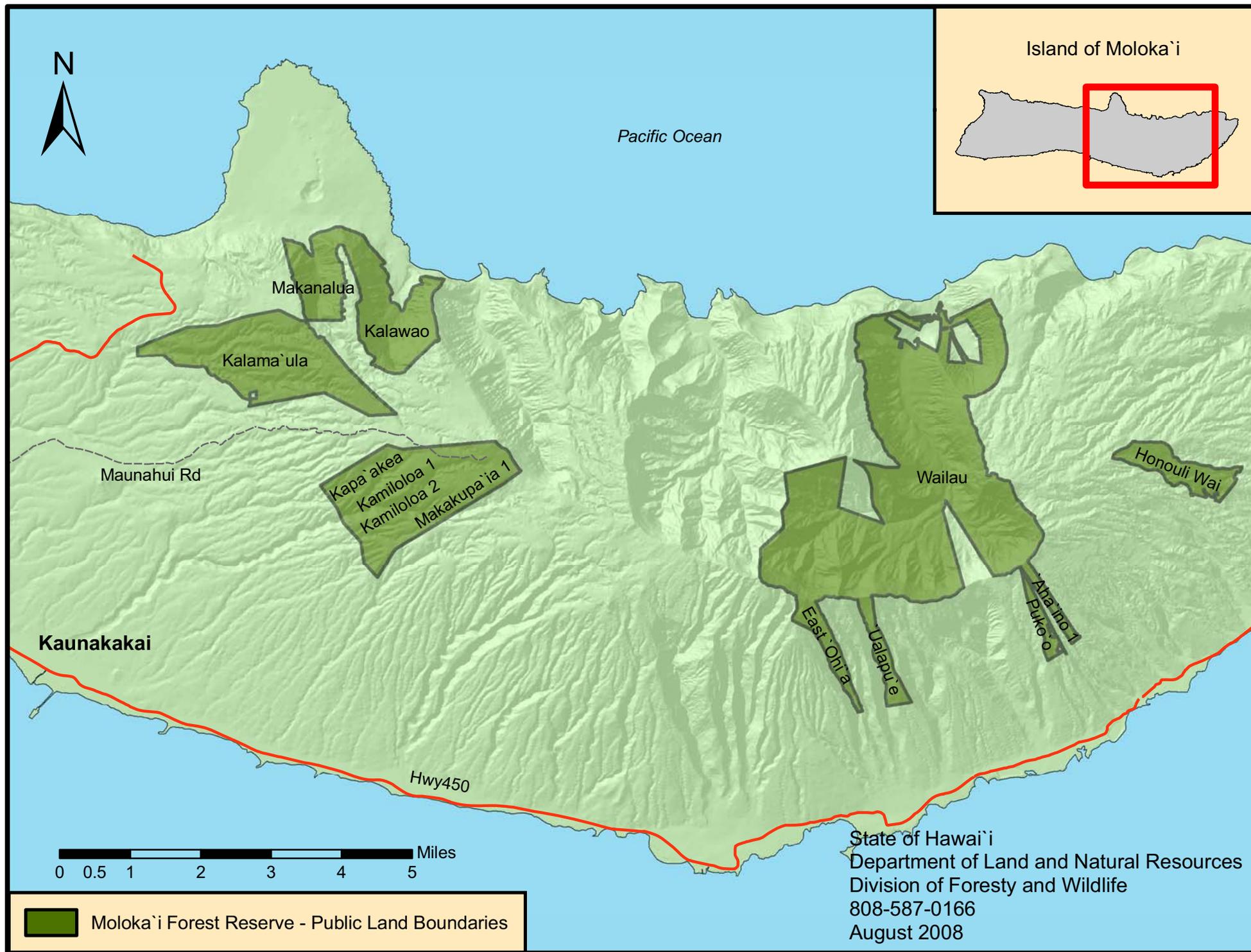
**Table 1.** Government Tax Map Key (TMK) parcels currently comprising public lands of Moloka‘i Forest Reserve.

<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) 6-1-001:002	State of Hawai‘i	7,213.8	7,132.8	1,521.0
(2) 5-2-014:003	State of Hawai‘i	1,612.7	1,626.0	1,626.0
(2) 5-4-003:025	State of Hawai‘i	1,750.0	1,740.2	1,740.2
(2) 5-9-006:002	State of Hawai‘i	8,540.0	7,616.1	5,769.4
(2) 5-6-006:011	State of Hawai‘i	220.0	223.6	223.6
(2) 5-6-006:026	State of Hawai‘i	194.1	200.0	200.0
(2) 5-7-005:005	State of Hawai‘i	124.0	109.6	109.6
(2) 5-7-005:013	State of Hawai‘i	102.2	104.4	104.4
(2) 5-8-015:007	State of Hawai‘i	1,188.0	1,217.8	396.0
				<b>11,690.2</b>

**A. Location and Description:** Moloka‘i Forest Reserve is spread across the wetter, more elevated eastern half of Moloka‘i; the current public lands of the Reserve are comprised of several non-contiguous land units (Figure 1). The western section of Moloka‘i Forest Reserve consists of three separate areas: (1) the steep cliffs mauka of the 500-foot contour line that rise from the peninsula at Kalaupapa, Makanalua, and Kalawao, all of which is also a part of the Kalaupapa National Historical Park; (2) the mauka portion of the ahupua‘a of Kalama‘ula; and (3) the mauka portions of the ahupua‘a of Kapa‘akea, Kamiloloa 1 & 2, and Makakupa‘ia. The eastern section consists of two non-contiguous areas: (1) most of the ahupua‘a of Wailau and the mauka portions of the ahupua‘a of East ‘Ohi‘a, ‘Ualapu‘e, Pūko‘o, and ‘Aha‘ino 1; and (2) the mauka portion of the ahupua‘a of Honouli Wai.

**B. Geographic Site Data:** Two main shield volcanoes, East Moloka‘i (Wailau) and West Moloka‘i (Mauna Loa), formed the island of Moloka‘i between 1.5 and 1.9 million years ago (Coastal Geology Group 2007). A smaller third volcano formed the peninsula of Kalaupapa. The main features of Moloka‘i today include the summits of the two main volcanoes (Kamakou at 4,970 ft. and Mauna Loa at 1,381 ft.) and the massive sea cliffs along the northeast shore of the island. Moloka‘i 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).

Figure 1: Current extent of Moloka'i Forest Reserve - Public Lands. Ahupua`a are labelled.



**C. Physical Site Data:** Moloka‘i Forest Reserve is spread across a large part of the island and covers a wide variety of terrain; the physical site data reflect this. Annual rainfall for the Forest Reserve ranges from less than 40 inches in the southernmost part of the west section to over 150 inches at higher elevations in the east. Figure 2 details the hydrologic features of the Forest Reserve. Elevation varies greatly from approximately 200 ft. in the valleys to 4970 ft. at the peak of Kamakou, with most of the lands at intermediate altitudes.

The western sections cover the mauka areas of the ahupua‘a of Makaanalua, Kalawao, Kalama‘ula, Kapa‘akea, Kamiloloa 1 and 2, and Makakupa‘ia. These sections contains all or portions of the following geographic features: Waihānau Valley and Stream, Pu‘ukauwā, Wai‘ale‘ia Valley and Stream, Waianui Gulch, Mokomoko Gulch, Waihi‘i Stream, Kapuna Spring, Kapuna Spring Water Reserve (owned by the County of Maui), Kapa‘akea Gulch, Kaunakakai Gulch, Pu‘umakaili‘ili‘i, Pu‘ukae‘o, and a segment of the Moloka‘i Irrigation System (USGS topographical map). The eastern sections cover much of the ahupua‘a of Wailau, as well as the mauka areas of East ‘Ōhi‘a, ‘Ualapu‘e, Pūko‘o, and ‘Aha‘ino 1, all of which are contiguous with Wailau. Also included is the mauka area of Honouli Wai. The contiguous Wailau sections contain all or portions of the following geographic features: Wailau Stream (the longest and largest perennial stream on Moloka‘i), Kahawai iki Stream, Kukuinui Ridge, Nā‘ehu Peak, Pu‘u o Wailau, Oloku‘i Peak, Kolo Ridge, Pōhākaunoho Ridge, Pūlena Stream, Kamakou Peak, Kaholo a Pele Peak, Pāku‘i Peak, Kīlau Peak, ‘Ōhi‘a Gulch, Kahananui Gulch, Waiakeakua Stream, Kūapu‘uiki Spring, Pu‘ulua, Kawaiuliuli Peak, Pu‘u‘ōhelo, as well as several waterfalls and many intermittent streams. The Honouli Wai section contains Keahu o Kū Hill and Honouli Wai Stream. Aquifer systems fed by the Moloka‘i Forest Reserve include Kualapu‘u, Kahanui, and Kamiloloa (western section); and Wailau, ‘Ualapu‘e, and Waialua (eastern sections) (DLNR aquifer GIS layer).

The soils in Moloka‘i Forest Reserve are varied, with 21 different map units represented (Foote et al. 1967). The west sections have the most variety in soil types; no one type dominates the area. Of the 12 soil types present, five are classified as highly erodible land (HEL) and six are potentially HEL (Figure 3). The eastern sections are dominated by two HEL soil types: rRT (Rough Mountainous Land) and CO (Colluvial land). rRT soils are found on all islands; they are not stony and occur on steep mountainous land with many drainage channels. The soil mantle is very thin and overlays saprolite, which is usually permeable to roots and water. This soil type is best suited for water supply, wildlife habitat, and recreation. CO soils consist of steep talus slopes only on Moloka‘i in isolated windward valleys. This land type is used for watershed and for wildlife habitat. These sections also contain smaller areas of seven other soil types, three of which are HEL and four of which are potentially HEL.

**D. Pre-Reserve and Early Use History:** Human presence on Moloka‘i dates to at least 600 A.D.; a settlement identified from this era existed in Hālawa Valley and east Moloka‘i in general is rich in archaeological sites. The main valleys along the north coast of Moloka‘i, from Kalaupapa to Hālawa, had dense human populations and large areas of irrigated taro fields (Juvik and Juvik 1998), while the south coast was lined with constructed fishponds. Archaeological sites are located within Moloka‘i Forest Reserve at Makaanalua, Kamiloloa, and Wailau.

Figure 2: Hydrologic features of Moloka'i Forest Reserve - A: western sections, B: eastern sections

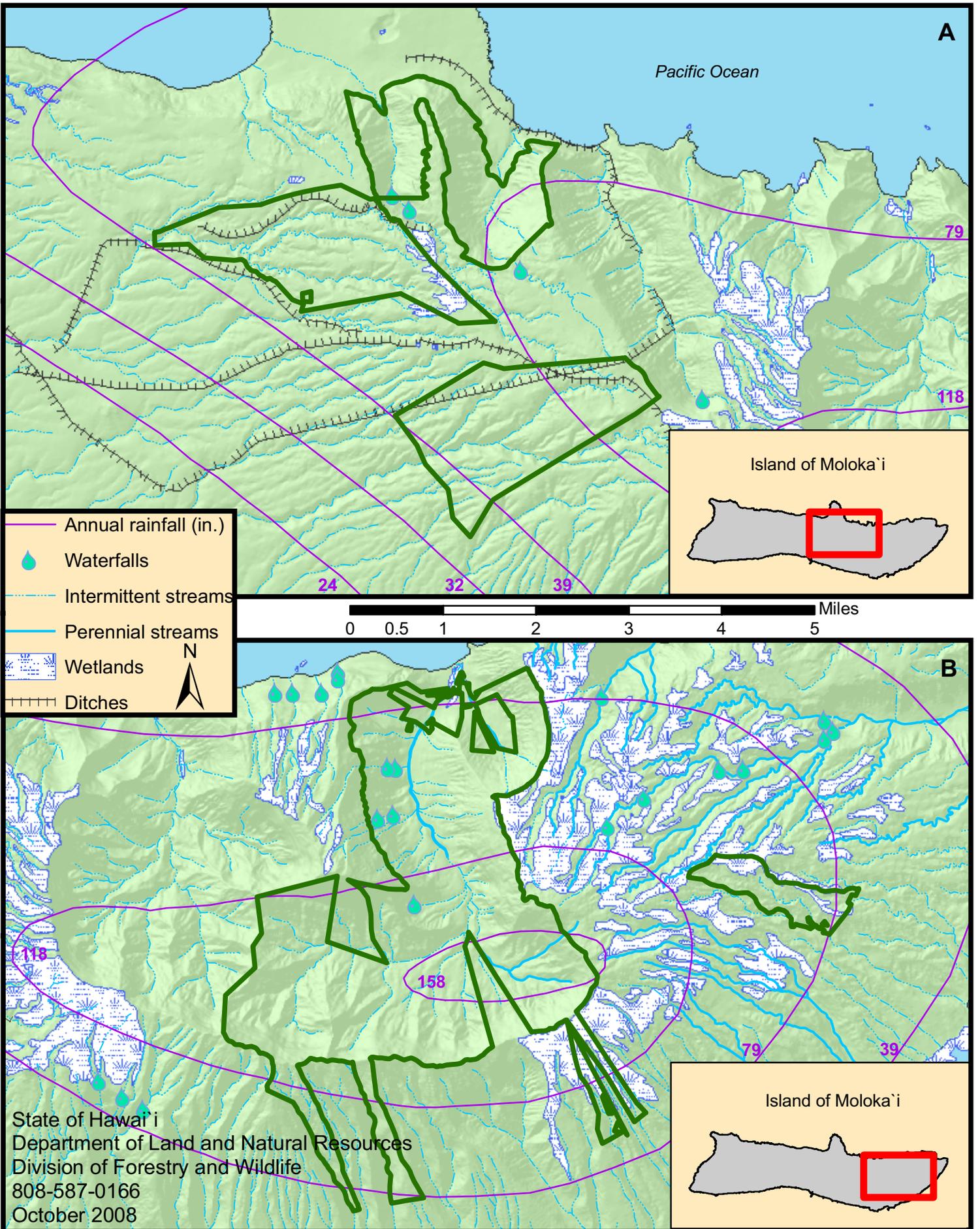
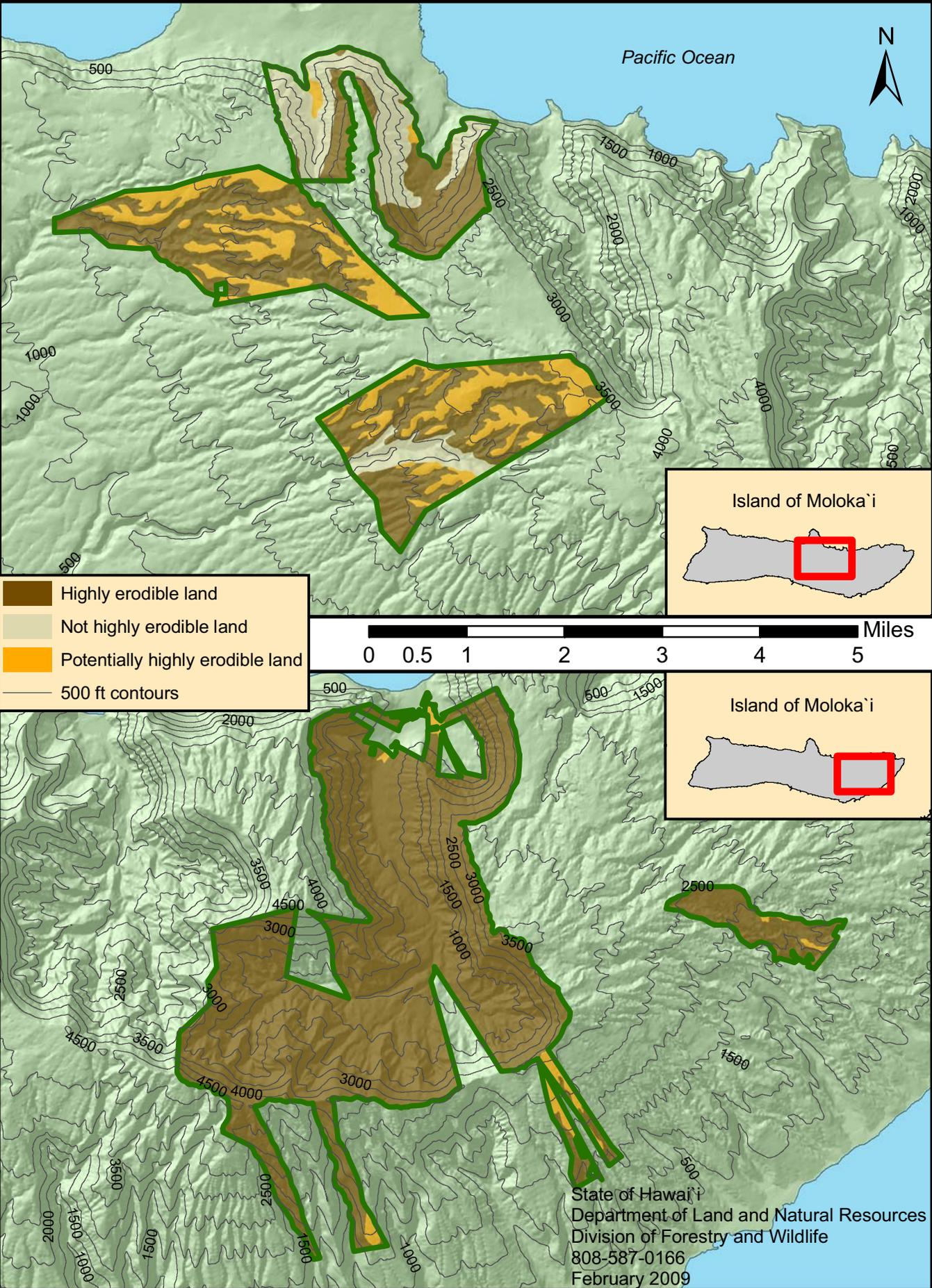


Figure 3: Soil erodibility and elevation in Moloka'i Forest Reserve.



Moloka‘i has two ancient district divisions (moku‘āina), Ko‘olau and Kona (Armstrong 1983), and parts of Moloka‘i Forest Reserve lie in both.

Captain George Dixon, an English sea captain, is believed to be the first westerner to visit Moloka‘i in 1786. Kamehameha I took control of Moloka‘i in 1795 and the first Christian missionaries established on the island in the 1830s (Encyclopædia Britannica 2008). Ranching began on Moloka‘i in the first half of the 19<sup>th</sup> century when Kamehameha V set up a country estate on the island (Moloka‘i Destination Specialist Program 2005), part of which is now the Moloka‘i Ranch. Rudolph Meyer, a native of Germany and one of the first western farmers on Moloka‘i, served as ranch manager for King Kamehameha V (Meyer 1982). Meyer married Kalama Waha, a High Chiefess from Moloka‘i, and became an influential citizen and a major landowner on the island. During the time of Kamehameha V’s ranch, royal cattle were placed under kapu and deer were released on the island; by the turn of the century, most of the accessible forest on Moloka‘i had been destroyed (Griffith 1902). A report from 1904 (Hall) stated that “the only forest now remaining in the mountains of Moloka‘i is found at elevations above 1,500 feet at the east end of the island”.

The 1912 proclamation of the Moloka‘i Forest Reserve was driven by the desire to protect Moloka‘i’s watershed for future agricultural needs. The initial boundaries proposed for the Forest Reserve were according to the judgment of the Territorial Superintendent of Forestry at the time and incorporated a great deal of privately owned land; these boundaries have changed over time (Table 2). Historical correspondence in the DOFAW files indicate that most of the private land owners involved were in favor of the Reserve and were already excluding cattle from the forest and reforesting areas where needed. Exceptions did occur, however; extensive correspondence exists between the Superintendent of Forestry and private landowners regarding fencing disputes on Forest Reserve lands. Efforts to reforest areas with various imported tree species such as Silk Oak, Tamarisk, and Egyptian Locust were attempted through the early years of Moloka‘i Forest Reserve, mostly in the western sections.

Conflicts between the Territorial government and the Meyer Estate over private lands within Moloka‘i Forest Reserve occurred repeatedly through the first half of the twentieth century. The Territory complained that Meyer lands were still being used for grazing, which was damaging the watershed; fencing debates ensued. The Meyers accused the government of coveting the water rights to their lands. In the 1920s, the Territory of Hawai‘i began condemnation proceedings to acquire land from the Meyer Estate for addition to the Forest Reserve. Appeals on both sides kept the case active for over 20 years. The final decision ruled in favor of the government; 1,145 acres of land at Kahanui were awarded to the Territory in 1952 (Meyer 1982). R. W. Meyer Ltd. retained the land’s water rights in perpetuity. Tenure of this land remains controversial to this day; Maui County has never acknowledged the State’s interest in these lands, the Meyers apparently still pay the property taxes, and the land has never been formally added to the Forest Reserve.

The Hawaiian Homes Commission Act of 1920 established the first homesteads for people of at least 50% Hawaiian blood in Kalama‘ula and Ho‘olehua (Hawai‘i Department of Agriculture 1999) and Moloka‘i is still commonly known as “the most Hawaiian island”. Portions of Hawaiian homelands at Pālā‘au and Kalaupapa were included in the Moloka‘i Forest Reserve

from 1930 to 1984. In 1968, the Moloka‘i Irrigation System was completed, bringing water from Waikolu Valley through a tunnel in Moloka‘i Forest Reserve to Kualapu‘u Reservoir and central Moloka‘i (Hawai‘i State Department of Agriculture 2003)

The Moloka‘i Ranch entered into a 20-year surrender agreement with the Territory of Hawai‘i in 1939, which kept their private Forest Reserve lands at Kaunakakai, Makakupa‘ia, and Kawela under State management. This agreement was renewed in 1951 for an additional 50-year term. The Ranch resumed management of these lands when the agreement expired in 2001, although they still cooperate with the State for management of public hunting opportunities. In 1973, all Moloka‘i Forestry records, files, maps and correspondence were transferred to Maui in a jurisdictional transfer of the Moloka‘i Forestry program to the Maui District. Recent issues relating to Moloka‘i Forest Reserve center mostly around reconciliation of boundary changes over the years.

Kalaupapa National Historic Park was established in 1980 as a reminder of the forced isolation of Hansen’s disease patients at the Kalaupapa peninsula from 1866 to 1969. In 1989, the Hawai‘i Board of Land and Natural Resources entered into a 20-year cooperative agreement with the National Parks Service (NPS) for management of Forest Reserve lands at Kalaupapa and Kalawao. At the time of writing, NPS is undergoing a public planning process for the future of the Park. It is anticipated that the aforementioned cooperative agreement will be extended in 2009 and that NPS will continue its management of these lands.

**Table 2:** Summary of public land additions and withdrawals (A/W) for Moloka‘i 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	11-Sep-1912	A	Establishment	44,674 (13268 ac. public */1, 31,406 ac. private, and exceptions */2)	2235	Many–Forest Reserve originally covered much of the island from Kalama‘ula to Hālawā
Governor’s Proclamation	24-Mar-1930	A	Modification of Forest Reserve boundary	2,183 (including 103 private) */3	5505	(2) 5-2-013:005 (2) 5-2-013:033 (2) 5-2-013:006 (2) 5-2-013:007 (portion) (2) 6-1-001:001 (portion) (2) 6-1-001:002 (portion)
Governor’s Proclamation	02-May-1938	W	Portion of land of Kamalō – removed by request of Bishop Estate trustees	405 (private)	8558	(2) 5-5-001:006 (portion) (2) 5-5-001:011 (portion)

Executive Order 975	09-Feb-1942	W	Portion of land of Kalama‘ula – transferred to County of Maui for establishment of Kapuna Spring Water Reserve	5.34	9615	(2) 5-2-014:029
Executive Order 3270	27-Dec-1984	W	Removal of Hawaiian Homelands added to Forest Reserve in Gov. Proc. of 24-Mar-1930	613.68	None provided; refer to CSF 5505 above	(2) 5-2-013:006 (2) 5-2-013:007 (portion) (2) 6-1-001:001 (portion)
Executive Order 3298	16-Sep-1985	W	Land set aside for establishment of Oloku‘i and Pu‘u Ali‘i Natural Area Reserves	2,950 */4	20,227 20,229	(2) 5-9-006-002 (portion) (2) 6-1-001-002 (portion)

\*/1 Proclamation includes “those portions of Government lands known as Kalamaula (1,621 acres), Kapaakea (220 acres), Kamiloloa I (490 acres), Kamiloloa 2 (550 acres), Makakupaia mauka (490 acres), Puaahala (163 acres), East Ohia (220 acres), Kahananui (182 acres), Ualapue (194 acres), Pukoo (124 acres), Ahaino (96 acres), Honouliwai (378 acres), and Wailau (8,540 acres) on the Island of Moloka‘i, altogether an area of 13,268 acres.”

\*/2 Proclamation states “Excepting and reserving therefrom all the cultivated or agricultural land in the valleys of Hālawā, Wailau, Pelekunu, and Waikolu, and all land on Waikolu and Makanalua that may be used or required for public purposes, and all flat land along the shore at the foot of the bluff; also, on the privately owned lands of Mapulehu, Kainalu, and Puniohua 1 & 2 such as areas of grazing land as may lie between the forest line herein described and forest fences now existing or to be constructed by the owners of those lands.”

\*/3 Including 610 acres at Pālā‘au, Apana 3 and a portion of Kalaupapa turned over by the Hawaiian Homes Commission.

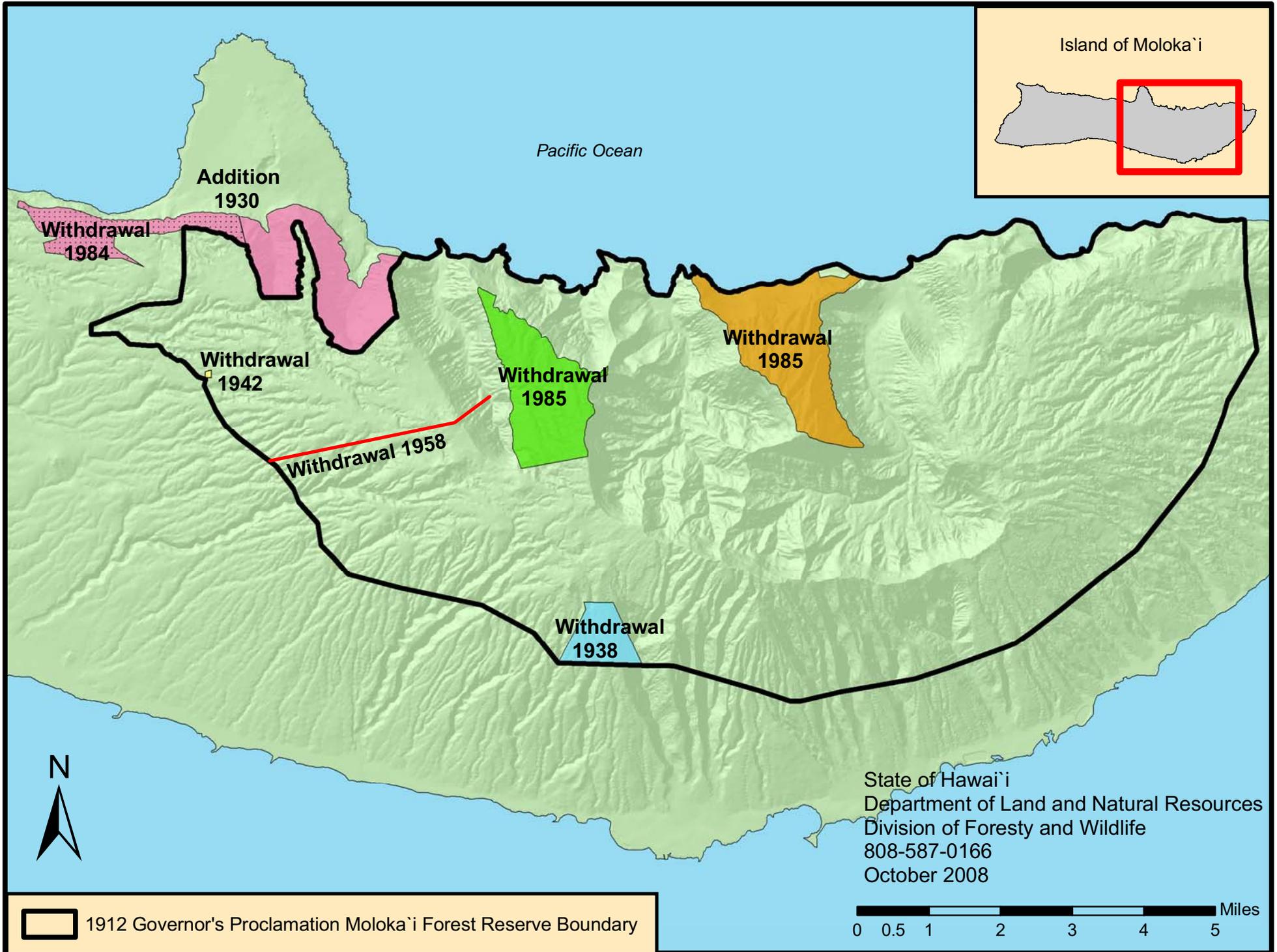
\*/4 Oloku‘i NAR = 1,683 GIS acres, Pu‘u Ali‘i NAR = 1,320 GIS acres

Changes in Government land boundaries that did not involve a Governor’s Proclamation or Executive Order have also occurred over the years. The initial 1912 boundaries for Moloka‘i Forest Reserve encompassed most of the eastern half of the island and included both Government lands and those of many private landowners. Lands within this sweeping boundary affected by changing (and sometimes poorly documented) tenure history include: (1) Pua‘ahala – Government land at 1912 Proclamation but sold to private landowner in 1920; (2) Kahananui – 50/50 Government/private ownership from 1912 Proclamation to the present and therefore is not directly addressed in this management plan; (3) Keopukaloa – sold to the Government in 1952 but never formally added to the public lands of the Forest Reserve; (4) Kahanui – condemned Meyer lands as described previously and (5) Makanalua and Kalawao – Forest Reserve lands within the boundaries of Kalaupapa National Historic Park, which was established in 1980.

**Kuleana Parcels:** A few dozen Kuleana parcels exist at the mouths of Kahawai iki and Wailau Streams. Only six (6) of these, however, comprising approximately 137 acres, are completely surrounded by public Forest Reserve lands. In addition to these properties at Wailau, there are two parcels surrounded by public Forest Reserve lands at Honouli Wai (1.7 acres total) and one at Puko‘o (5.4 acres).

**Documented Activities/Leases/Deeds/Permits:** A variety of land use has occurred in Moloka‘i Forest Reserve over the years. Although much grazing occurred on the private lands of the

Figure 4: Moloka'i Forest Reserve - historic land additions and withdrawals (year indicated).



Forest Reserve in the early ranching days, few grazing leases on Government lands were issued. Some of the older documents for these agreements are missing and/or incomplete, perhaps having been lost in the transfer of records from Moloka‘i to Maui branch.

**Table 3.** Land use agreements associated with Moloka‘i Forest Reserve

Type of Action	Action Number	Duration	Description	Acres	Copy of Survey Furnished (CSF)	TMK
General Lease	635	17-Aug-1908 to 17-Aug-1923	Antone Rodriquez; East ‘Ōhi‘a	287	Not specified	(2) 5-6-006:011
General Lease	Unknown	? to 01-Jan-1925	Kahananui	182	Unknown	Unknown
General Lease	Unknown	? to 28-Jun-1928	Wailau	8,540	Unknown	Unknown
Surrender Agreement	N/A	1939 to 1951, renewed 1951 to 2001	Moloka‘i Ranch lands at Kaunakakai	1241	Not specified	(2) 5-3-003:005
General Lease	3953	25-Jan-1957 to 22-Oct-1972	USA Department of the Navy; lands at Kahanui, Kalama‘ula, Kapa‘akea, Kamiloloa, Makakupa‘ia, Kaunakakai, Kawela */1	1,145.0 1,612.6 1,750.0 1,240.0 4,504.0	Not specified	(2) 5-2-014:001 (2) 5-2-014:003 (2) 5-4-003:025 (2) 5-3-003:005 (2) 5-4-003:026
Land Office Deed	27833	17-Dec-1990 in perpetuity	Grant of easement; Moloka‘i Ranch for 2 non-exclusive water pipeline easements */2	1.712	20,358	(2) 5-4-003:025
Revocable Permit	162	Unknown	Record missing	Unknown	Unknown	Unknown
Cooperative Agreement	CA 8896- 9-8004	16-Aug-1989 to 16-Aug-2009	Between National Parks Service and HI State Board of Land and Natural Resources; Kalaupapa	~2850	Not specified	(2) 6-1-001:002

\*/1 Includes private lands that were under surrender agreement to the State at the time. Lease was renewed and modified at 1-5 year terms throughout its duration.

\*/2 Only Easement B at Kamiloloa 1 & 2 and Makakupa‘ia Nui is in public Forest Reserve land.

### **E. Vegetation:**

The terrain, climate, and resulting vegetation in Moloka‘i Forest Reserve are diverse, resulting in 20 different types of vegetative cover (Hawai‘i Biodiversity and Mapping Program 2005) (Figures 5a and 5b). According to DOFAW’s 2001 Draft Management Guidelines, Moloka‘i Forest Reserve contains all four levels of vegetation classification (Figure 6): Highest Quality Native Ecosystems (V-1), Predominantly Native Areas (V-2), Considerably Disturbed Areas (V-

Figure 5a: Vegetative cover - western sections of Moloka'i Forest Reserve  
 (Hawai'i Biodiversity and Mapping Program 2005)

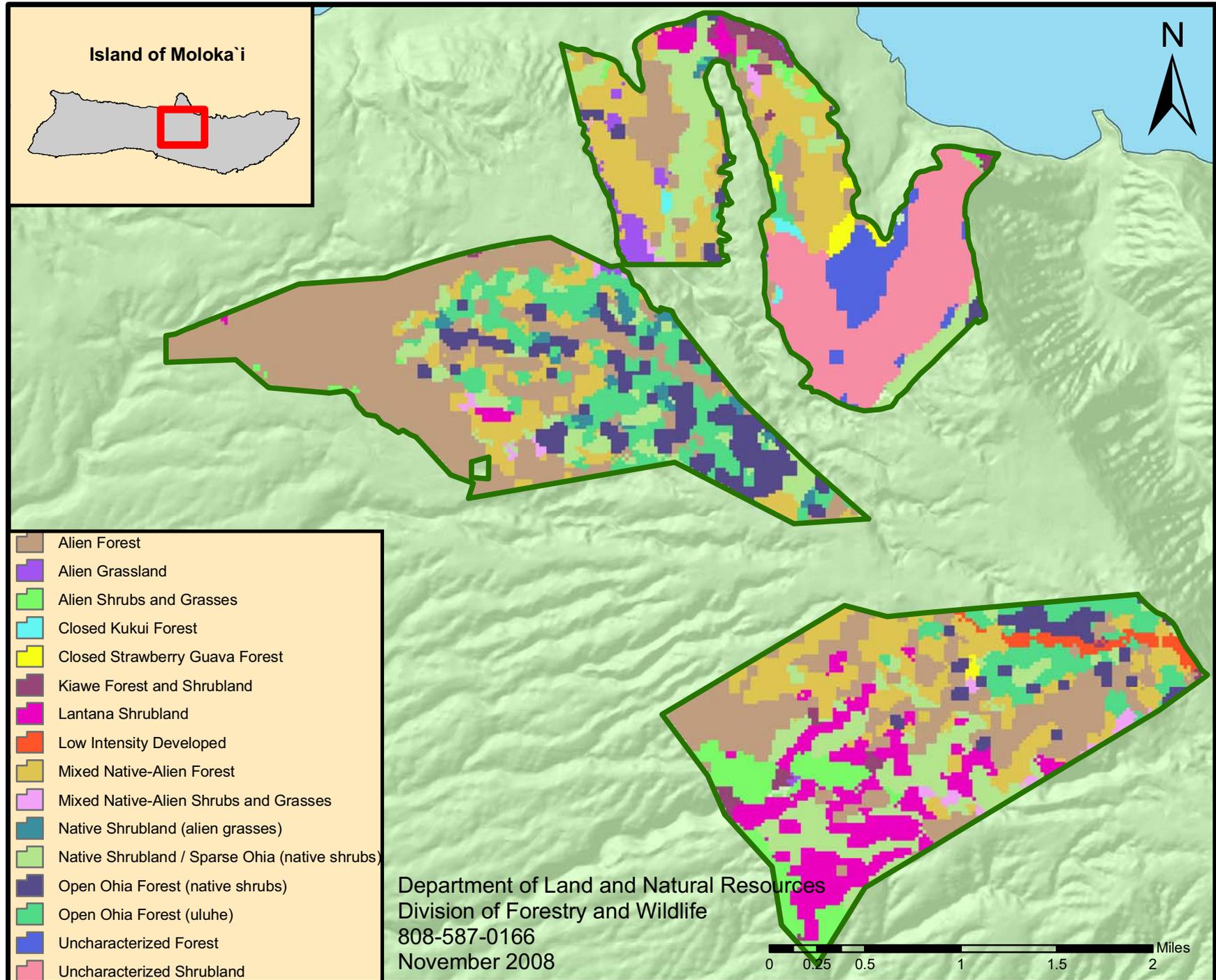


Figure 5b: Vegetative cover - eastern sections of Moloka'i Forest Reserve  
(Hawai'i Biodiversity and Mapping Program 2005)

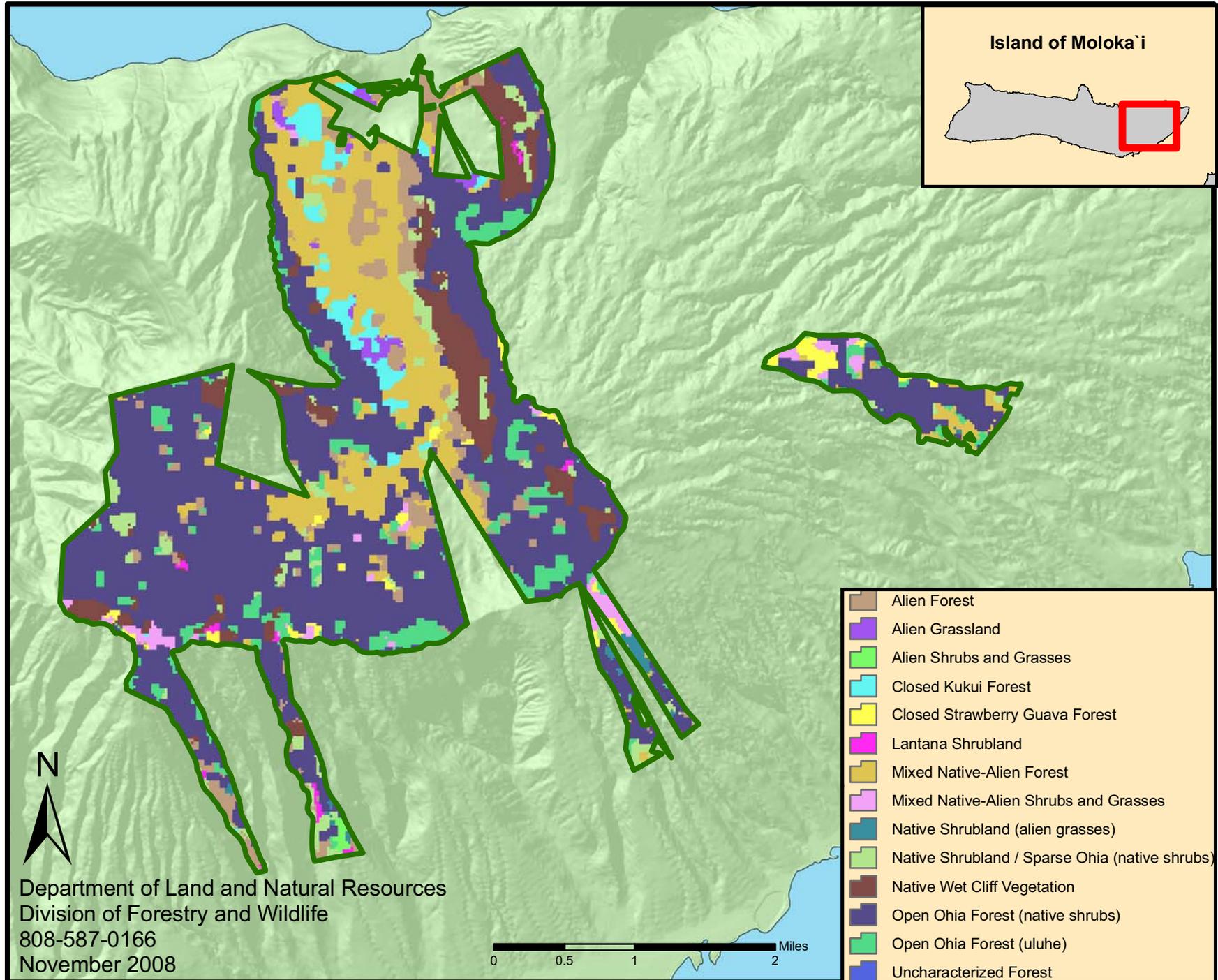
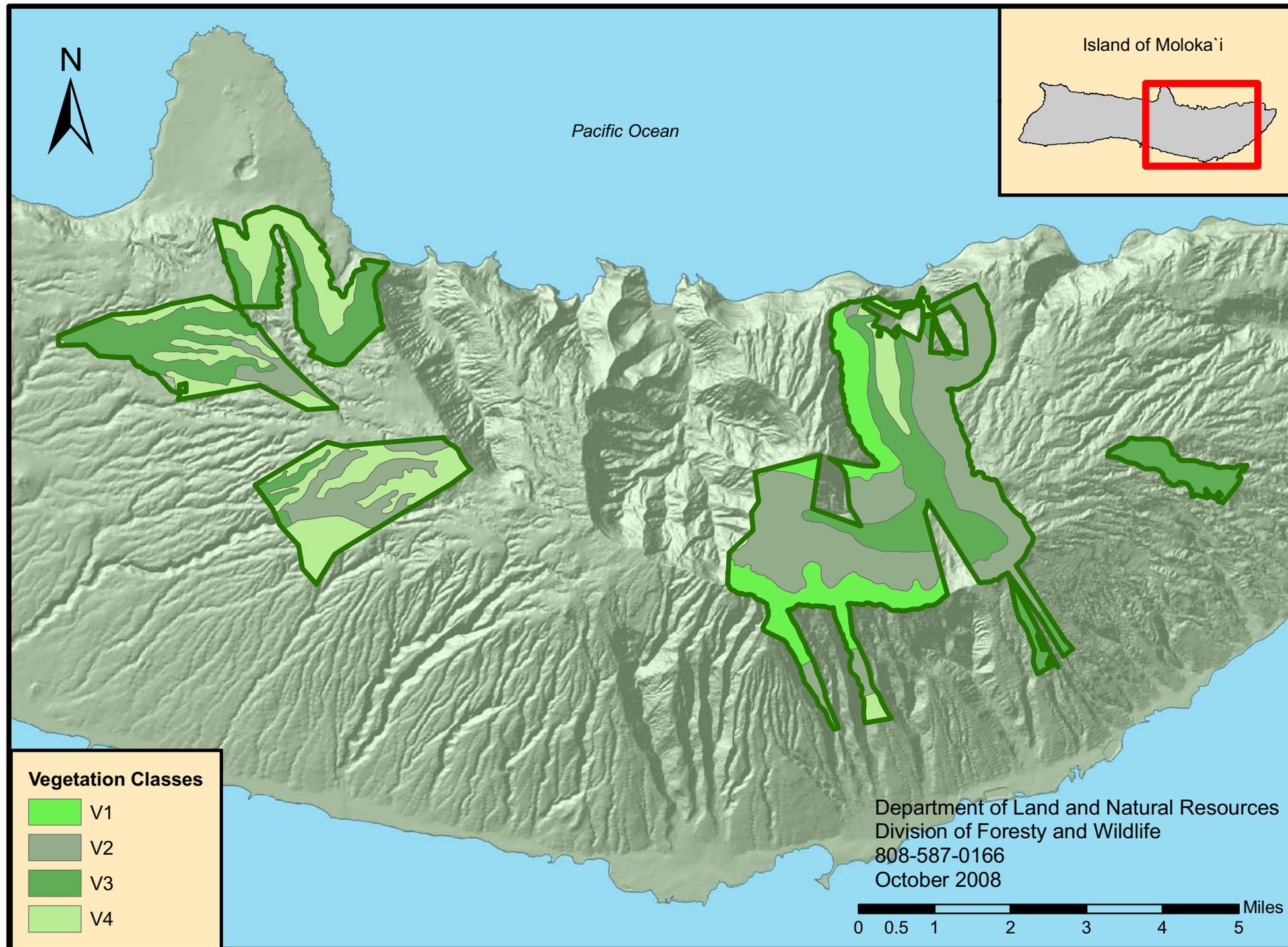


Figure 6: DOFAW's 2001 Draft Management Guidelines for Moloka'i Forest Reserve - Vegetation Classes



3), and Badly Degraded Areas (V-4). V-1 units consist of the highest quality native ecosystems and communities, having minimal disturbance and low levels (less than 10%) of non-native plants in any vegetative layer. V-2 units consist of areas in which native plants predominate in communities that are relatively intact, and are minimally disturbed. They have a significant component of non-native plants (more than 10%). V-3 units consist of areas that have a considerable amount of disturbance. The vegetation in the area does not reflect a naturally evolved species composition, but rather a mixture of small remnant patches dominated by native plants, patches of largely invasive weedy alien plants, and areas of mixed native and non-native plants. 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.

The western sections of the Forest Reserve have predominantly V- 3 and V-4 vegetation, with some V-2 areas in the larger gulches. In the eastern sections, vegetation generally increases in quality from makai to mauka and/or with increased elevation; all four vegetation classifications are represented. Biologically significant V-1 areas exist along the mountain ridge separating north and south Moloka‘i and on the west pali of Wailau valley. DOFAW is in the process of updating its Management Guidelines; Maui Branch staff has indicated a need to modify the Vegetation Class boundaries within Moloka‘i Forest Reserve, especially in Wailau.

Management objectives for exceptional quality V-1 areas are to protect and perpetuate them by preventing non-sustainable activities or intensities of use. Permitted activities in these areas are minimally disruptive, and will be focused on ecosystem restoration. Management of V-2 areas is intended to prevent activities or intensities of use that create further significant degradation of native plant or animal communities and encourage activities or intensities of use that are beneficial to those communities. Permitted activities may have a higher level of disturbance than in V-1 areas, provided they remain within sustainable levels. V-3 areas are managed to prevent activities or intensities of use that result in degradation of unique native species and secondary forest resources (water supply, erosion control & aesthetic values). Permitted activities may have high levels of disturbance, as long as they don't negatively impact remaining native plant populations and have an eventual net benefit to other resources like water or an improved vegetative cover for other activities. Native plant conservation may be focused at a species, rather than an ecosystem level. Management objectives for V-4 areas are to prevent activities or intensities of use that result in degradation of watershed cover or soils. These areas are where the most disruptive activities would be allowed, such as large-scale commercial forestry, game habitat manipulation, etc. Native plant conservation is mainly focused at the species level.

**Rare Plants:** The 2004 Hawai‘i Biodiversity and Mapping Program contains 41 listings for rare plants (Appendix 1) within the Forest Reserve boundaries. According to the United States Endangered Species Act (US-ESA), 34% of these plant species are listed endangered, 15% are candidates to list as threatened, and 37% are species of concern. Discussions are underway with cooperators to develop fenced exclosures that would protect selected populations of rare plants from wildlife damage.

**Critical Habitat:** Moloka‘i Forest Reserve contains a total area of 6,873 acres of critical habitat for 22 species of plants and 747 acres of critical habitat for Blackburn’s sphinx moth (*Manduca*

*blackburnii*) (Figure 7). Critical habitat is also defined by the US-ESA, and designates the ecosystem elements that must be present and properly functioning to assure the continued existence of a particular species. Appendix 2 lists all species for which critical habitat exists within Moloka‘i Forest Reserve.

**Timber Species:** Plantings of exotic tree species were initiated in the early twentieth century on Moloka‘i. Most plantings on the island took place in the western areas of Moloka‘i Forest Reserve (Wong et al. 1968) and were intended to improve the watershed and to provide a supply of fuelwood and fenceposts. Surveys of these plantings, consisting of at least ten different tree species, have continued into the present time (Figure 8).

DOFAW’s 2001 Draft Management Guidelines designate Moloka‘i Forest Reserve as containing three of four possible levels of Forest Products classification (Figure 9): Primary (F-1, forest products are a primary objective), Personal (F-3, small scale non-commercial harvesting or salvage is allowed), and Restricted (F-4, forest products are not normally an objective). The Primary (F-1) areas mostly coincide with the timber plantations described above. All classification levels have restrictions regulated by DOFAW and require appropriate permits and/or licenses.

**Invasive plant species:** DOFAW prioritizes plant species that may be considered invasive or weedy for management attention in its Forest Reserves. These priorities change over time and DOFAW works with its partners to determine target species for control. Many non-native plants, some of which are considered weeds, are present in many areas of the Forest Reserve. See Appendix 3 for a list of weedy plants that are of current management concern in Moloka‘i Forest Reserve. The area that currently receives the most weed management is the border between Makakupa‘ia and the Nature Conservancy’s (TNC) Kamakou Preserve. TNC/East Moloka‘i Watershed Partnership (EMoWP) and DOFAW cooperate to manage weeds in this area.

## **F. Wildlife:**

Moloka‘i Forest Reserve provides habitat for a range of wildlife, including endemic, introduced, and game species. Introduced game species provide public hunting opportunities in the Forest Reserve; more details can be found in section J. Other Public Uses below.

**Native species:** Rare endemic wildlife on Moloka‘i that has been listed by the US-ESA and/or the State of Hawai‘i includes birds, insects, and land snails (Appendix 1). Rare listed birds consist of the oloma‘o (Moloka‘i thrush, *Myadestes lanaiensis*), kākāwahie (Moloka‘i creeper, *Paroreomyza flammea*), ‘ō‘ū (*Psittirostra psittacea*), and ‘i‘iwi (*Vestiaria coccinea*). The oloma‘o, kākāwahie and ‘ō‘ū all have not been seen for ten years or longer (U.S. Fish and Wildlife Service 2006) and have been included as target species in the Rare Bird Discovery Protocol of the USFWS, which provides guidelines for the possible rediscovery of species that are extremely rare or possibly extinct. The ‘i‘iwi, while not an uncommon Hawaiian forest bird, is rare on the island of Moloka‘i. Other rare forest birds on Moloka‘i include ‘amakihi (*Hemignathus virens*) and ‘apapane (*Himatione sanguinea*) (Mitchell et al. 2005). The ‘a‘o (Newell’s shearwater, *Puffinus newelli*) and the ‘ua‘u (Hawaiian petrel, *Pterodroma sandwichensis*) have also been observed in the Forest Reserve at Wailau (F. Duvall, personal

Figure 7: US-ESA Critical Habitat on Moloka`i.

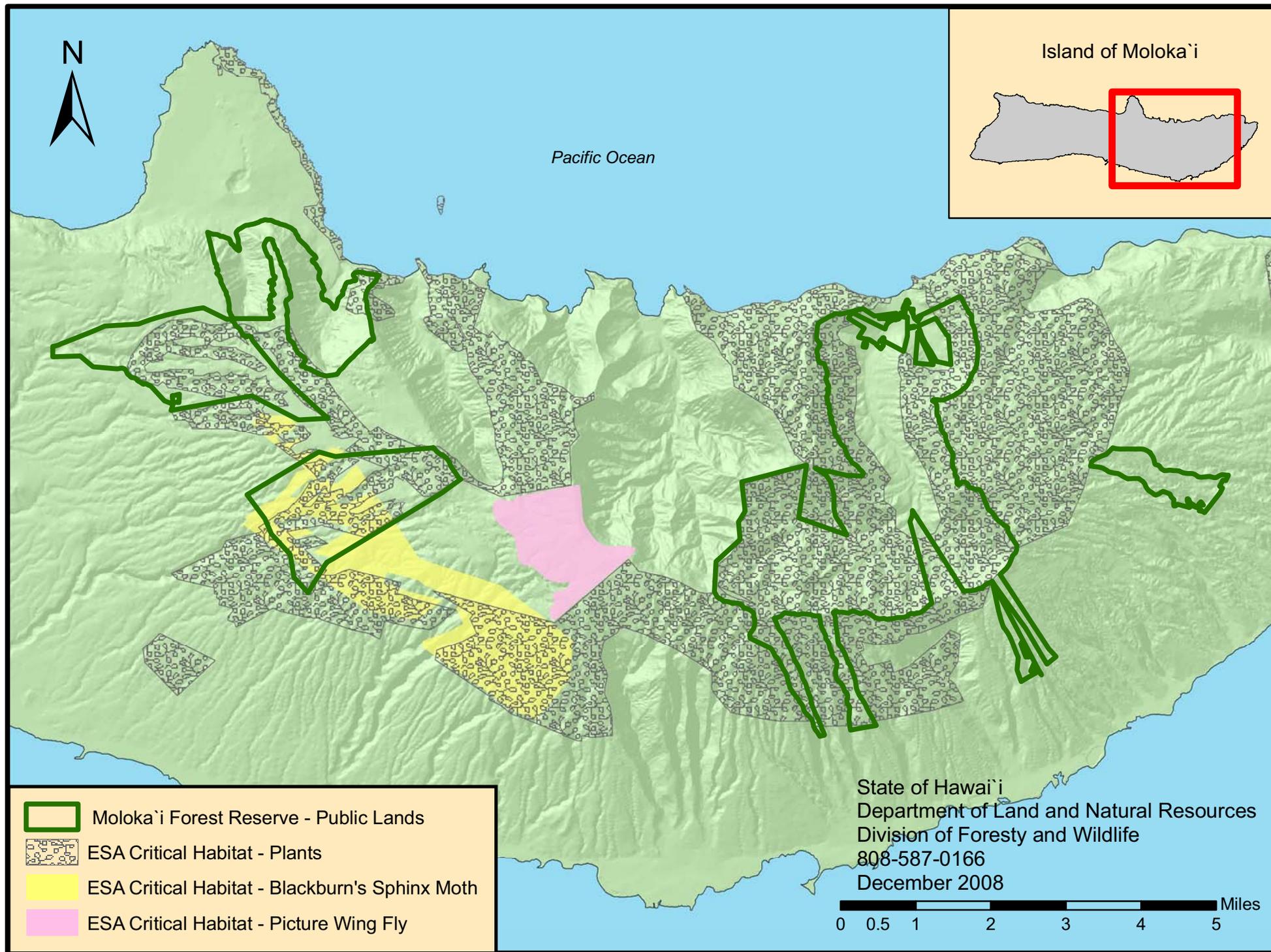


Figure 8: Timber plantations in western sections of Moloka'i Forest Reserve (2000 survey). No plantations exist in eastern sections.

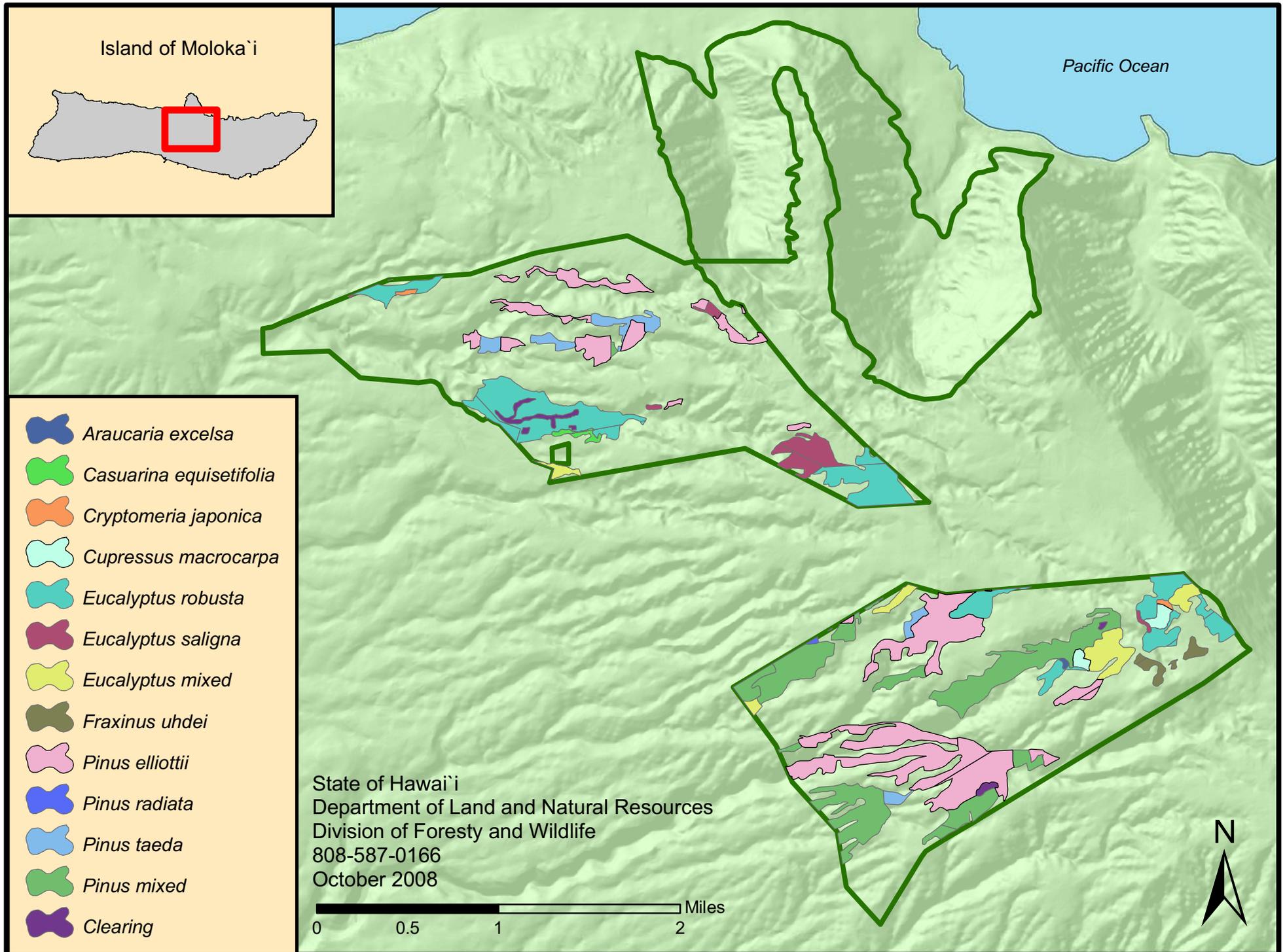
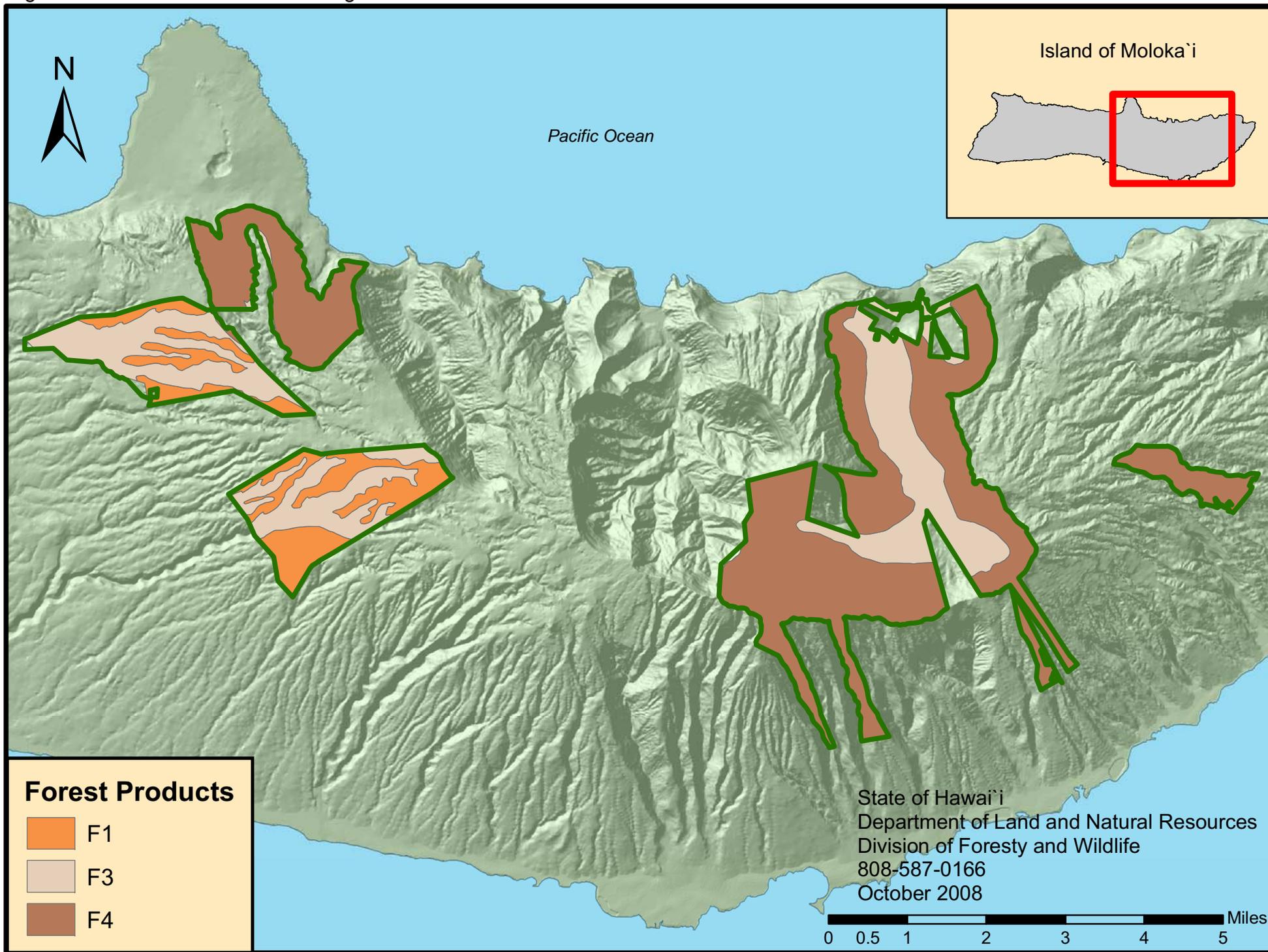


Figure 9: DOFAW's 2001 Draft Management Guidelines for Moloka'i Forest Reserve - Forest Products.



communication, unreferenced and Kozar et al. 2007); population surveys are planned. Until recent discoveries on Kaua‘i, it was believed that Moloka‘i housed the last breeding colonies for these two species. Hawai‘i’s only land mammal, the Hawaiian hoary bat (*Lasiurus cinereus semotus*) also occurs in the Forest Reserve.

Rare endemic invertebrates are also found in Moloka‘i Forest Reserve. Insects include a Hawaiian picture-wing fly (*Drosophila differens*), the Pacific megalagrion damselfly, a rare moth (*Omiodes monogramma*), and the Blackburn’s sphinx moth (*Manduca blackburni*), which was historically found on the island (U.S. Fish and Wildlife Service 2003). US-ESA critical habitat exists for the Blackburn’s sphinx moth (Figure 7), in the hope that it may one day be re-established on Moloka‘i. In December 2008, critical habitat on Moloka‘i was also designated for 12 species of Hawaiian picture-wing flies (U.S. Fish and Wildlife Service 2008), including *D. differens*, although this area does not coincide with the Forest Reserve. Several species of *Partulina* land snails also occur here (F. Duvall, personal communication, unreferenced); small enclosures are being constructed to protect them from rats and predatory snails.

Rare endemic aquatic species are also present in Moloka‘i Forest Reserve, particularly in the isolated, high quality streams at Wailau. Four goby fishes (‘o‘opu alamo‘o - *Lentipes concolor*, ‘o‘opu nakea - *Awaous stamineus*, ‘o‘opu nopili - *Sicyopterus stimpsoni*, and ‘o‘opu okuhe - *Eleotris sandwicensis*) and a shrimp (‘o‘pae kala‘ole - *Atyoida bisulcata*) may be found here (Moloka‘i Aquatic Species Distribution GIS Layer).

**Introduced species:** Non-native animals that can be found in the Forest Reserve include feral species such as dogs, cats, chickens, goats, and pigs. Other animals that may be found in the Forest Reserve include Indian mongoose, rats, mice, Axis deer, many birds, and a great many invertebrate species, primarily insects. Many of these introduced animals are detrimental to the forest, causing erosion, damaging native plants, spreading disease, as well as providing competition for and preying upon native animals.

**G: Access:** DOFAW provides public access to the Kalama‘ula and Kapa‘akea/Kamiloloa/Makakupa‘ia sections of Moloka‘i Forest Reserve. The Hawai‘i State Department of Health (HDOH), with assistance from the US National Park Service, manages access to areas within the Kalaupapa National Historic Park (Makanalua and Kalawao). These areas lie within Kalawao County, whose Mayor is the Director of HDOH and where access is governed by HRS Title 11 Chapter 168. According to the HDOH Hansen’s Disease Branch, entrance to Kalawao County is limited to those who possess a written invitation from a resident. Wailau valley may be reached by sea during the calm summer months. All other sections of the reserve are in remote and steep areas that have little or no road or trail access. Combined with the fact that many of these sections are also surrounded by private lands, it is difficult for the Division to provide safe and legal access opportunities to certain areas.

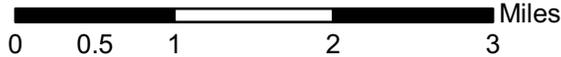
**Vehicular Access:** No major roads lead directly to Moloka‘i Forest Reserve, although Highway 460 provides access to the Maunahui Road (also known as Moloka‘i Forest Reserve Road) about 3.5 miles northwest of Kaunakakai (Figure 10). This four-wheel drive (4WD) road is maintained by DOFAW and passes through land owned by the Department of Hawaiian Homelands (DHHL) and Moloka‘i Ranch before entering the Kapa‘akea/Kamiloloa/Makakupa‘ia section of

Figure 10: Access to the western sections of Moloka'i Forest Reserve. Other sections of the Reserve have no public access.



-  Moloka'i Forest Reserve - Public Lands
-  Na Ala Hele trails
-  Minor roads/trails
-  Major roads

Department of Land and Natural Resources  
 Division of Forestry and Wildlife  
 808-587-0166  
 October 2008



Island of Moloka'i

An inset map of the island of Moloka'i, with a red rectangular box highlighting the western portion of the island, corresponding to the area shown in the main map.

the Forest Reserve. Vehicles are not permitted on the section of the road that continues southbound back to Highway 460 through Makakupa'ia. There is a network of rough roads and trails within Moloka'i Forest Reserve; stretches of road/trail that lie within the Forest Reserve boundaries are only periodically maintained by DOFAW, therefore vehicular access may be difficult.

**Trails:** Na Ala Hele, DLNR's Trail and Access System, manages five trails within the Forest Reserve: Maunahui Road, Kahanui Road, Kahanui A, Kahanui B, and Kaulahuki (Figure 10). The hub of the trail system is Waikolu Lookout, whose facilities are accessible to those with disabilities.

**Designated Helicopter Landing Zones:** None.

**Restricted Watershed:** No areas are designated as restricted watershed on the island of Moloka'i.

**H: Infrastructure:** Infrastructure to support the various public use and resource management programs has been built and maintained over the years (Figure 10).

**Campsites:** Waikolu Lookout provides the only official campsite in Moloka'i Forest Reserve.

**Fences:** The 1912 Governor's Proclamation that created Moloka'i Forest Reserve described a long fence that ran from the boundary between Kahanui and Kalama'ula to the boundary between Kawela and Makolelau. This fenceline formed a large portion of the southern and eastern borders of the initial Forest Reserve, crossing both private and Government lands. Plans are underway to repair this boundary fence through east Moloka'i; EMoWP will cooperate with DOFAW in this effort.

DOFAW currently maintains two boundary fences in the area. The first is a fence for State lands in upper Kalama'ula; DOFAW has cooperated with the adjacent Meyer Estate on this task since the establishment of the Forest Reserve. The second is a fence that runs approximately ½ mile south of the Forest Reserve boundary from Kapa'kea to Makakupa'ia. This fence is on DHHL lands but has been managed by DOFAW since the early 1900s; it prevents cattle entering the steep lands of the Forest Reserve.

**Public Restrooms:** Waikolu Lookout has a flush toilet facility under construction. The recent sale of Moloka'i Ranch, which was to supply water, put construction plans on hold. This facility should be functional by early 2009.

**Shelters/Picnic Areas:** Waikolu Lookout has one shelter with two picnic tables and two open picnic tables.

**Other:** Other infrastructure in Moloka'i Forest Reserve includes:

1. Stream gauges: The United States Geological Survey (USGS) maintains two stream gauges at Kapuna Spring in Kalama‘ula and one at Pūlena Stream in Wailau (streamgauge GIS layer).
2. Moloka‘i Tunnel – A part of the Moloka‘i Irrigation System, this tunnel crosses Forest Reserve land at Kamiloloa, above and below ground, following a linear easement 20 feet wide described in EO 1814. It draws water from Waikolu Valley and was designed for a capacity of twenty-one million gallons of water per day. It is managed by the Hawai‘i State Department of Agriculture.
3. Aqueducts in upper Kalama‘ula – DHHL owns the abandoned Waihānau intake and transmission system, which was formerly used to supply water to DHHL homesteads makai of the Forest Reserve (R. Teruya and S. Yamasoto, personal communication, unreferenced).
4. Watering units for game birds: Providing supplemental water enhances game bird populations and associated hunting opportunities. There are eight watering units located within the Forest reserve: three at Makakupa‘ia, two at Kaulolo, and one each at Kamiloloa, Kapa‘akea, and Kapuna.
5. Hunter check station – This structure, owned and maintained by DOFAW, is located along Maunahui Road where it enters Moloka‘i Ranch land. This location is on the original 1912 Forest Reserve boundary across the private lands at Kaunakakai. Moloka‘i Ranch’s Kaunakakai land was managed by DOFAW as a part of a surrender agreement that lasted from 1939 to 2001. DOFAW and Moloka‘i Ranch still cooperate on hunting access issues.

**I: Archaeological and Historical Sites:** Most of the archeological sites located within or on the boundaries of Moloka‘i Forest Reserve are in the lands of Wailau: Pu‘uhonua of Pu‘uali‘i (undetermined if a terrace or heiau), heiau at Kanane, and Kapala‘alaea Heiau (Summers 1971). Outside of Wailau, there is also Kapua Heiau at Makanalua.

Historical sites, in contrast to archaeological sites, are usually associated with the period following the arrival of westerners. One such site is Lua nā moku ‘iliahi at Kamiloloa, a pit that was dug in the early 1800s on order of Hawaiian Chiefs to approximate the size of a ship’s hold. It was used to measure sandalwood for bargaining with the captains of trading ships.

#### **J. Other Public Uses:**

**Hunting:** General hunting regulations can be found in HRS Title 13 Chapter 121. DOFAW’s 2001 Draft Management Guidelines separates Game Animal Management into four categories: Game Production (A-1), Mixed Game and Other Uses (A-2), Game Control (public) (A-3), and Game Control (supervised) (A-4). All lands within Moloka‘i Forest Reserve are classified as A-2, where game management is an objective integrated with other uses. Although most of the Forest Reserve falls within designated hunting units, some areas have limited or no public access (see Section G: Access above). DOFAW also manages hunting within the mauka State-owned

lands at Keōpuka Loa in east Moloka‘i; this area shares a boundary with Honouli Wai and is also classified A-2.

DOFAW regulates game mammal hunting according to HRS Title 13 Chapter 123. Public hunting areas on Moloka‘i, designated as Units, are described in §13-123-17 and mapped in Chapter 123 Exhibit 6. The western sections of Moloka‘i Forest Reserve lie within Units C, D, and E, while the eastern sections lie within Units A and B. Feral pigs (*Sus scrofa scrofa*) and goats (*Capra hircus hircus*), and Axis deer (*Axis axis*) are the designated game mammals in Moloka‘i Forest Reserve.

DOFAW regulates game bird hunting according to HRS Title 13 Chapter 122. Public game bird hunting areas on Moloka‘i, also designated as Units, are described in §13-122-11.3 and mapped in Chapter 122 Exhibit 6. The western sections of Moloka‘i Forest Reserve lie within Units C, D, and E. No game bird hunting is permitted in the eastern sections of the Forest Reserve. Game birds on Moloka‘i include Ring-necked pheasant (*Phasianus colchicus*), Green pheasant (*Phasianus versicolor*), Gambel’s quail (*Callipepla gambelii*), California quail (*Callipepla californica*), Japanese quail (*Coturnix coturnix japonica*), Erckels’ francolin (*Francolinus erckelii*), Chuckar partridge (*Alectoris chukar*), Gray francolin (*Francolinus pondicerianus*), Black Francolin (*Francolinus francolinus*), Barred dove (*Geopelia striata*), Spotted dove (*Streptopelia chinensis*), and Wild turkey (*Meleagris gallopavo*).

Rules concerning mammal hunting are currently being updated to allow for expanded hunting opportunities. Information regarding current seasons and bag limits for all game species can be obtained by contacting the DOFAW Maui or Moloka‘i offices.

**Camping:** Camping in the Forest Reserves is allowed only with a permit and at official campsites. Moloka‘i Forest Reserve has only one official campsite, which is located at Waikolu Lookout. Permits are currently free of charge and must be obtained in advance from the DOFAW Maui or Moloka‘i offices.

**Fishing:** There are no fishing opportunities in Moloka‘i Forest Reserve.

**Hiking:** Hiking opportunities exist along Maunahui Road (Moloka‘i Forest Reserve Road), which is managed by Na Ala Hele. Maunahui Road loops from Highway 460 at Kalama‘ula, mauka to the Forest Reserve, then back down to Highway 460 (foot traffic only) at Makakupa‘ia. This trail passes by the Lua nā moku ‘iliahi (sandalwood measuring pit) and leads to Waikolu Lookout, whose facilities are accessible to individuals with disabilities. The Waikolu Lookout provides camping, picnic tables and a simple shelter, toilet facilities, as well as sweeping views of Waikolu Valley.

Hiking is also allowed on the other rough roads and trails within the western section of the Forest Reserve, although these may be only periodically maintained by DOFAW. It is recommended that hikers wear bright colored clothing as hunters also use the area. The eastern sections of Moloka‘i Forest Reserve currently have no public access and DOFAW maintains no trails or roads here.

**Horseback Riding:** Horseback riding is permitted on Moloka‘i Forest Reserve Road.

**Dirt Bikes, All Terrain/Utility Vehicles (ATV/UTVs) and Mountain Bikes:** Street legal dirt bikes and mountain bikes are allowed on designated roads only. Users are advised to check with DOFAW to confirm locations where bikes are allowed. ATVs and UTVs are not allowed within the Forest Reserve.

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

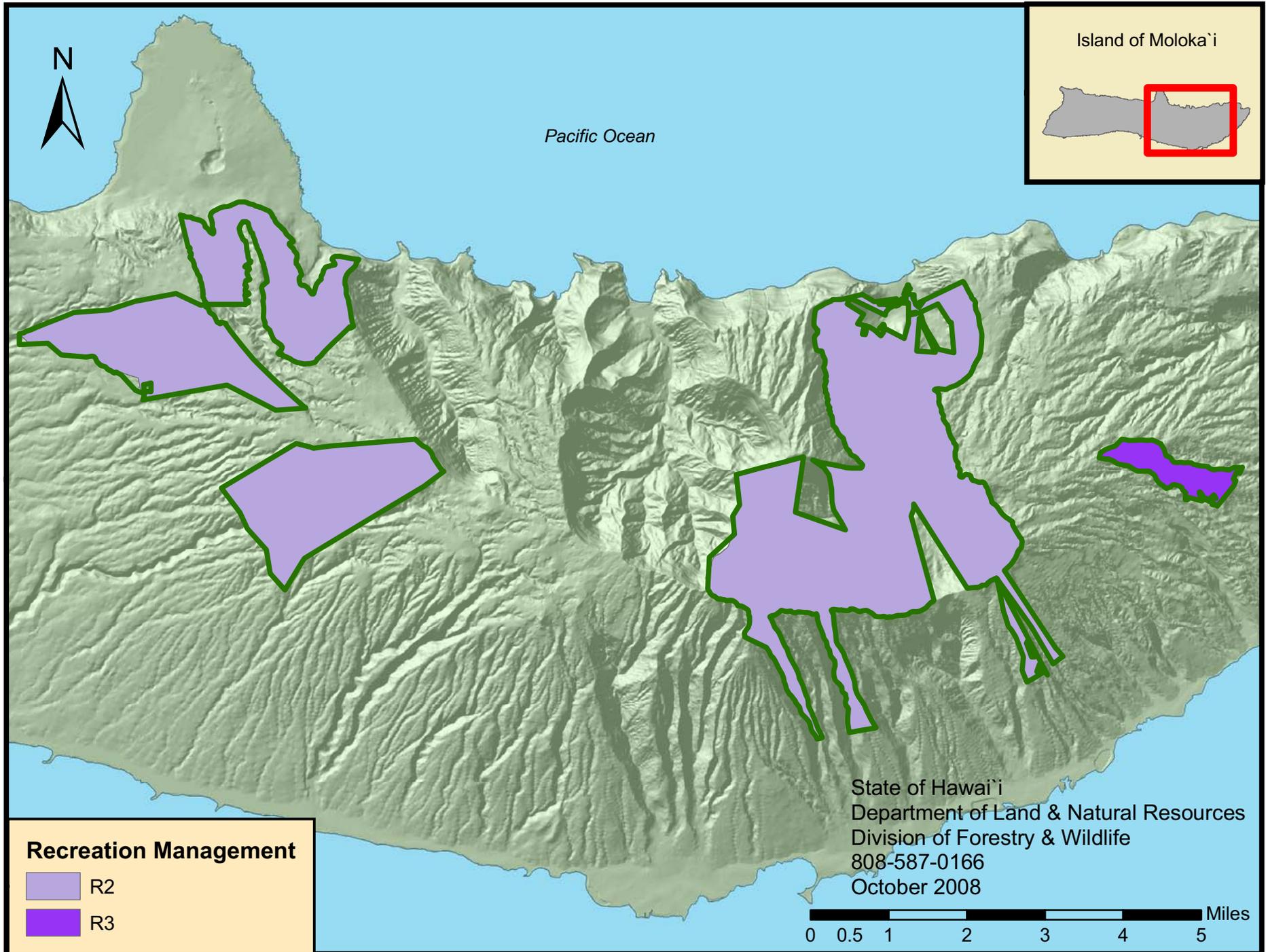
- a. Firewood
- b. Ferns
- c. Flowers
- d. Fruits
- e. *Psidium* spp. (guava) poles
- f. *Alexia oliviformis* (maile)
- g. Mushrooms
- h. *Pinus* spp. (pine) cones & boughs
- i. Tree seedlings
- j. Bamboo
- k. *Cordyline terminalis* (ti)
- l. Others on approval

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, maile, greenery for floral arrangements, and other forest products. Permit applications for gathering forest material or products can be obtained from the DOFAW Maui or Moloka‘i offices. 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.

**Picnicking:** Four picnic tables (two in the open and two in a shelter) are available at Waikolu Lookout. This site is also accessible to people with disabilities.

**General Recreation:** Moloka‘i Forest Reserve contains two of four possible Recreation Management categories according to DOFAW’s 2001 Draft Management Guidelines (Figure 11): R-2 (Medium Use Areas) and R-3 (Light Use Areas). R-2 designates 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. R-3 designates areas where recreation is limited to certain areas or to occasional use due to impacts on resources or programs. Trails are the main recreational feature, and their use may be restricted. The

Figure 11: DOFAW's 2001 Draft Management Guidelines for Moloka'i Forest Reserve - Recreation Management



eastern section of Honouli Wai is designated R-3 while the remainder of Moloka'i Forest Reserve is designated R-2.

### **K. Threats:**

Invasive and weedy plants pose a threat to native ecosystems in the Forest Reserve, especially in more intact areas such as those designated V-1 and V-2 by DOFAW's Draft Management Guidelines. Weedy plants often out-compete and replace native plants, which in turn reduces habitat and food sources for native invertebrates.

Animal threats in Moloka'i Forest Reserve are varied. Ungulates including deer, goats, and pigs contribute to soil erosion, destroy native plants, spread invasive seeds, and may serve as disease reservoirs. Pig wallows also serve as breeding habitat for mosquitoes, including *Culex quinquefasciatus*, the primary vector of avian malaria (*Plasmodium relictum*) and avian pox (*Poxvirus avium*). These two diseases have been devastating to native forest bird populations at mid and low elevations. Introduced birds are relatively resistant to these diseases, serving as reservoirs and providing competition for native birds. Koaia seed predators, including rats, mice, and insects (*Araecerus levipennis* and *stator* spp. and *Cryptophlebia illepida*) reduce seed stock for these native trees. Indian mongoose (*Herpestes auropunctatus*) and feral cats and dogs prey on native birds and may carry parasites that affect other animals and/or humans. Feral dogs, often abandoned hunting dogs, may pose a safety risk for people in the Forest Reserve.

Fire has caused damage to the Forest Reserve in the past and continues to be a threat, especially in the drier western sections that have more human presence. Other threats to Moloka'i Forest Reserve include climate change, socio-economic issues that lead to crimes such as resource theft and vandalism, and releases of non-native species, both accidental and intentional.

### **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.

Revenue in Moloka'i Forest Reserve comes primarily from the sale of forest products by means of minor harvesting permits. These permits cover dead or dying trees as per HRS §183-16. The Na Ala Hele advisory group on Moloka'i has recommended against the use of trails by commercial tour operators, therefore no revenue is generated in this manner. All camping in the forest reserve is currently free of charge, although fees are being considered. Non-native timber plantations may be considered for commercial forestry purposes in the future.

## **III. MANAGEMENT**

### **A. Past Planning:**

A document written by Theo. C. Zschokke, Assistant Superintendent of Forestry, entitled “A Report on Conditions in the Western Part of the Moloka‘i Forest Reserve” is located in the DOFAW Forestry files; it is undated but appears to have been written circa 1951. This report described current conditions in the area of Moloka‘i Forest Reserve lying west of the ridge between Kamalo and Kapualei. Interesting points in this historical report include:

1. Dieback of lehua forest, even in areas without livestock, was attributed to the presence of a bark beetle. While the mature lehua forest was decadent, there appeared to be no danger that the lehua would be exterminated, as young trees were springing up even in the mixed forest below the lehua.
2. Destructive erosion occurring on the slopes of Kawela, enough so as to ruin farms and fishponds along the island’s southern coast.
3. Existence of large wild goat populations and ensuing forest damage at Īloli and Kaunakakai, Kawela, and Kamalō Gulches. A recommendation was made to place poisoned salts in suitable areas and to conduct hunts to shoot the survivors.
4. A summary of the fencing along private lands was made, showing locations, owners, yardage and condition of fencelines. Generally, Moloka‘i Ranch and the Hawaiian Homes Commission had stockproof fences, Bishop Estate was in the process of constructing fences, and Meyer Estate had poor condition and broken fences.
5. Reforestation plans were addressed in four different categories: tree planting in the fog belt, slide control, planting in brush, and planting near the Forest Reserve fence. Species historically recommended for the fog belt, some of which would not be considered appropriate today due to increased knowledge about potential weedy or invasive qualities, include *Albizzia montana* and *A. molucana*, *Casuarina quadrivalvis* and *C. montana*, silver oak (*Grevillea robusta*), *Eucalyptus* spp., Monterey cypress (*Cupressus macrocarpa*), redwood (*Sequoia sempervirens*), camphor (*Cinnamomum camphora*), and koa (*Acacia koa*). The tree considered best for slide control and planting in brush was listed as *C. quadrivalvis*, although many other exotic species were mentioned as well. As the area was grassland, planting near the Forest Reserve fence was done to produce future fence posts; recommended species included paper bark, madre cacao, and molave.

EMoWP published a strategic plan for the south slopes of east Moloka‘i in 2004. This report contains a summary of activities from 1998 to 2003 and projections for 2004 to 2009. Planned activities include feral animal control (fencing, hunting, live trapping and aerial shooting), weed control, fire management, construction of sedimentation ponds, and monitoring programs. EMoWP covers over 25,000 acres of land across east Moloka‘i; DOFAW is one of its many partners. In August 2008, the East Moloka‘i Watershed Partnership 2015 South Slope Management Plan was finalized. This is a comprehensive plan for EMoWP lands, including those adjacent to the Moloka‘i Forest Reserve at Makakupa‘ia; the plan spans from 2009 to 2015.

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

Currently, management of Moloka‘i Forest Reserve is guided by HAR of DOFAW, Title 13, Chapter 104, Rules Regulating Activities within Forest Reserves, which includes subchapters 1:

General Provisions (purpose, definitions, penalty), 2: Public Use (litter, fire, hunting, fishing, firearms, conduct, etc.), and 3: Permits (camping, collecting, special use, etc.). DOFAW has four full-time staff based on Moloka‘i. Current management activities focus on fuel reduction projects in Makakupa‘ia, weed management adjacent to TNC’s Kamakou Preserve, and maintenance of boundary fences.

All of Moloka‘i Forest Reserve lies within the State Conservation District as defined by HAR Title 13, Chapter 5 of the Office of Conservation and Coastal Lands. Most lands are designated as Resource (R) subzone, the objective of which is to develop, with proper management, areas to ensure sustained use of the area’s natural resources. A small amount of land within the Forest Reserve (e.g. Kaunakakai Gulch, Kamakou and Olokui areas, and mauka Honouli Wai) is designated Protective (P) subzone, the objective of which is to protect valuable resources in designated areas such as restricted watersheds, marine, plant and wildlife sanctuaries, significant historic, archaeological, geological, and volcanological features and sites, and other designated unique areas. HAR Title 13 Chapter 5 also restricts land uses based on these subzones.

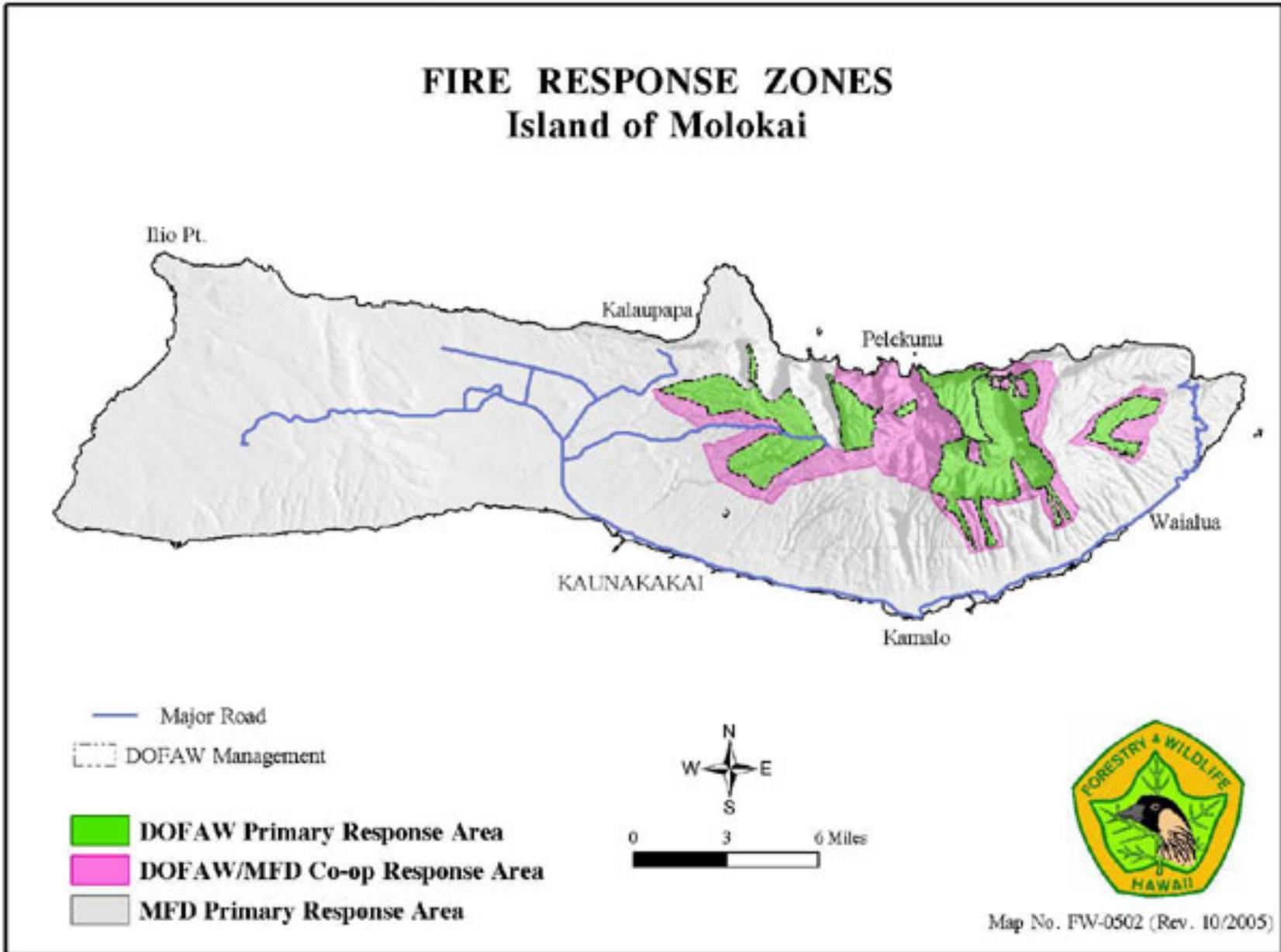
DOFAW and TNC will begin implementation of their Makakupa‘ia Fire Mitigation Plan in 2009. The purpose of this plan is to protect TNC’s Kamakou Preserve and sections of the Moloka‘i Forest Reserve from potential wildland fire threats originating from lower elevations. This area has a history of frequent fire activity; fires often start near Kaunankakai and spread mauka. The most recent fire in the area started on August 29, 2009 and was declared controlled nine days later. The fire burned approximately 7,800 acres total, roughly 600 of which were within the Makakupa‘ia section of the Molokai Forest Reserve. The majority of the fuels burned in this fire were molasses grass, pine duff, a‘ali‘i understory, plantation pine trees and other various plant species; no structures were damaged in the Forest Reserve. The fire also burned into a small portion of the Kamakou Preserve. Mitigation plan efforts focus primarily on the widening of fuel break corridors using various fuel reduction methods (e.g. falling and chipping, herbicide applications, weeding of dead plant material). Reduction of fuels within the designated area is specifically aimed at creating conditions that will not carry crown fires or allow flame heights of greater than eight feet to occur. Reducing the size and intensity of wildland fires also reduces the release of greenhouse gases and their effect on climate change. DOFAW shares firefighting duties with the Moloka‘i Fire Department (MFD) on some of its lands (Figure 12).

Management of public hunting in Moloka‘i Forest Reserve currently provides generous allowances to encourage mammal hunting in accessible areas of the Forest Reserve. Hunters are presently allowed to hunt on Saturdays, Sundays, and State holidays throughout most, and sometimes all of the year. Harvests allow two pigs, two goats, and any amount of axis deer each day with no season limit.

### **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:

Figure 12: Moloka'i Fire Response Zones



- 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 Molokaʻi 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:** Molokaʻi 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
Molokaʻi	1	2	7	4	3	5	8	6

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. A generalized summary of Table 4 is as follows:

- 1. Watershed Values:** Managing the Forest Reserve to protect and promote watershed values is centered on supporting and promoting aquifer recharge and the reduction of soil erosion.
  - a. Soil erosion control is focused on maintenance of groundcover and keeping ungulate populations at a tolerable level, initially with State and public hunting.
  - b. Increasing lands under Forest Reserve status and cooperating with the EMoWP to promote aquifer recharge through land management.
- 2. Resource Protection:** Resource protection is centered on controlling and minimizing the effects of fire, insects, disease, and illegal activity on Forest Reserve resources.
  - a. Fire mitigation is focused on implementation of a region-specific plan.
  - b. Collecting data for the Hawaiʻi Fire Danger Rating System helps to keep staff aware of risk conditions.
  - c. Outside consultation aids in making informed decisions to reduce insect and disease damage in the forest.
- 3. Native Ecosystem Management:** Native habitat protection and restoration.

- a. Collaboration with research and management agencies to develop management strategies for native species ecosystems.
  - b. Removal of undesirable flora and fauna from remote and/or recognized high quality native areas.
- 4. Threatened, Endangered, and Rare Species Management:**
- a. Collection of population data for native snails and ground nesting seabirds will provide a framework for future conservation efforts.
  - b. Maintenance of existing plant enclosures and construction of new ones in cooperation with the Plant Extinction Prevention Program (PEP) and other agencies.
- 5. Game Animal Management:** Game animal management is centered on expanding mammal-hunting opportunities, conducting special hunts as needed, conducting annual animal surveys, and sustaining game bird populations.
- 6. Additional Public Activity:** Increasing public access to the Forest Reserve and maintaining existing infrastructure.
- 7. Invasive Species Control:** Control of both incipient and established plants and animals. DOFAW uses both chemical and mechanical weed control on a regular basis and supports biological control under appropriate circumstances.
- a. Invasive plant control is achieved with input from cooperators, including labor and expertise.
  - b. Support of biological control research may help to control invasive plants and animals.
- 8. Commercial Activity:** Income generating activities.
- a. Commercial use of the Forest Reserve is focused on providing opportunities for wood-based forest product collection.
  - b. No commercial trail activity is permitted within the Forest Reserve as per the Na Ala Hele Moloka'i Advisory Trail Group.

**Table 4:** Management priorities and associated plans for Moloka'i Forest Reserve. Estimated cost refers to State funds.

Management Priority	General Management Action	Tactical Goals	Action Items	Estimated Cost
<b>Watershed Values</b>	Increase amount of lands under Forest Reserve status	Addition of lands at Kahanui, Makanalua, and Keopukaloa	Participate with Land Division to develop BLNR submittals requesting appropriate Executive Order	Mgmt and staff costs only
	Reduce soil erosion	Maintain ungulate populations at tolerable levels	Encourage hunting - State and public. New hunting rules to allow year-round hunting in Units D and E.	Mgmt and staff costs only
			Identify sensitive areas suitable for ungulate fencing projects	Mgmt and staff costs only
	Maintain ground cover	Regulate illegal harvest, conduct post-fire mitigation	Mgmt and staff costs only	

Management Priority	General Management Action	Tactical Goals	Action Items	Estimated Cost
		Exclude cattle from FR	Maintain boundary fences to comply with HRS Chapter 183	\$25,000 for 2009
			Locate and remove cattle with rancher's assistance	\$10,000
	Increase DOFAW's partner role in the EMoWP	Improve communication and coordination between agencies	Establish regular communications, schedules, and protocols with the WP	Mgmt and staff costs only
<b>Resource Protection</b>	Fire mitigation	Reduce hazardous fuel loads within the FR	Implement Makakupa'ia Fire Mitigation Plan with TNC	\$70,750
			Development of further plans	Mgmt and staff costs only
	Monitor weather conditions as they pertain to the Hawai'i Fire Danger Rating System	Maintain Remote Automated Weather Station	Site inspection and instrument rehab annually	\$1500/year
			Use data to determine District fire preparedness levels	Mgmt and staff costs only
			Use data to monitor environmental conditions relating to forest health	Mgmt and staff costs only
Reduce the impact of insect and disease on forest health	Cooperate with knowledgeable agencies to recognize signs and manage problems	Forest health monitoring and implementation of forest management practices	\$20,000/year	
<b>Invasive Species Control</b>	Reduce the impact of invasive species on the Forest Reserve and surrounding areas	Continue work with cooperating agencies, including MoMISC, TNC, NRCS, HDOA, UH-CTAHR, Moloka'i-Lanai SWCD, EMoWP, USGS-BRD, USFWS, and other cooperators	Invasive species technician to work with cooperators to monitor and control invasive species in the FR	\$50,000/year
		Support biological control efforts in Moloka'i Forest Reserve and adjacent lands	Support applied research for potential biocontrol agents, including labor and helicopter time	Variable (~\$5000/year)
<b>T&amp;E Species Mgmt.</b>	Protect and enhance occurrences of listed and rare animals	Conduct surveys and monitoring efforts to obtain baseline data that will be used to help protect endemic land snails	Plan future aerial rodenticide drops in fenced areas to control rats	TBD
			Establish recovery areas surrounded by low voltage electric fencing to exclude predatory snails and rats	\$5000+ each depending on area
		Conduct surveys and monitoring efforts to obtain baseline data that will be used to help protect ground nesting seabirds	Control ground predators (pigs, cats, mongoose)	\$75,000/yr
		Cooperate with PEPP and other agencies to prioritize species protection	<ul style="list-style-type: none"> <li>Protect rare plant species by fencing existing populations.</li> <li>Promote rare plant outplantings.</li> </ul>	Seek funding for fencing and hiring of a nursery worker
		Maintain koai'a enclosure at Makakupa'ia	Inspect and maintain enclosure fencing as needed.	Mgmt and staff costs only

<b>Management Priority</b>	<b>General Management Action</b>	<b>Tactical Goals</b>	<b>Action Items</b>	<b>Estimated Cost</b>
<b>Native Ecosystems</b>	Protect native dominated areas as indicated by V-1 and V-2 areas in DOFAW's 2001 Draft Management Guidelines	Work with other agencies and institutions to identify research projects that would address native species management needs specific to Moloka'i FR	<ul style="list-style-type: none"> <li>National Tropical Botanical Garden</li> <li>US Fish and Wildlife Service</li> <li>The Nature Conservancy</li> <li>US Department of Agriculture</li> <li>Moloka'i Invasive Species Committee</li> <li>EMoWP</li> <li>And others</li> </ul>	Mgmt and staff costs only
		Modify boundaries for vegetation classes in updated Management Guidelines (especially in Wailau)	Participate in DOFAW's planning meetings to update Management Guidelines	Mgmt and staff costs only
	Animal control	Remove animals from remote, inaccessible areas	Aerial shooting in Wailau valley (west side bordering Oloku'i NAR)	\$20,000/year
<b>Game Animal Mgmt.</b>	Provide public hunting opportunities	Provide regular hunting as per Chapter 123	Implement updated rule changes to provide year-round mammal hunting in accessible areas except during bird hunting days. Expand hunting in other areas when access is obtained.	Mgmt and staff costs only
		Conduct special hunts as appropriate	Modify bag limits and/or seasons as necessary within specific areas	Mgmt and staff costs only
		Determine population trends of game mammals	<ul style="list-style-type: none"> <li>Conduct annual aerial surveys.</li> <li>Collect harvest data from hunter check station</li> <li>Train incoming staff to collect information.</li> </ul>	\$8,000/year
		Provide regular hunting as per Chapter 122	Manage bird-hunting seasons.	Mgmt and staff costs only
<b>Commercial Activity</b>	Provide opportunities for wood-based forest product collection	Identify potential locations and species	Issue minor harvesting permit for collection of forest products	Mgmt and staff costs only
		Promote forest product revenue base including biomass sales	Work with Hawai'i Forest Industry Assn., local woodworker groups, and others	Mgmt and staff costs only
<b>Additional Public Activity</b>	Increase public access to the Forest Reserve	Pursue access agreements with adjacent landowners	Meet with potential cooperating landowners	Mgmt and staff costs only
		Maintain and update (as needed) existing historical access agreements	Meet with cooperating landowners (Meyer, DHHL, Pu'u O Hoku Ranch, Moloka'i Ranch, Kawela Homeowners Assn., NPS, etc.) to formalize agreements as appropriate	Mgmt and staff costs only
	Maintain infrastructure	Maintain roads and trails	Grading as needed on roads	\$50,000/year
		Maintain campsite, signage, interpretive displays, etc.	Install toilet and hook up water line for toilet at Waikolu Lookout	Mgmt and staff costs only
		Sign maintenance (hunting, trails, etc.) – age/vandalism, etc.	\$500/year	

## **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 Moloka‘i Forest Reserve include:

- Miles of unpaved access road maintenance
- Number of volunteer service projects
- Number of game birds harvested
- Number of game mammals harvested
- Number of camping permits issued
- Acres of public hunting grounds managed
- 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:**

A primary goal for the Moloka‘i Forest Reserve is the future preservation of a healthy and productive watershed through the maintenance and enhancement of high quality ecosystem areas. The western areas of the reserve have a history of wildfires; plans to reduce unwanted wildfire damage will be implemented in order to protect forest resources. DOFAW also wishes to provide more public hunting opportunities; incorporation of new Forest Reserve lands and access agreements to areas enclosed by private lands will be crucial to this goal.

### **B. Future Recommendations:**

Moloka‘i Forest Reserve is one of Hawai‘i’s most diverse, due to its dispersed and non-contiguous locations across the island. This means that needs are also varied. Recommendations for the Forest Reserve include conducting surveys and inventory of resources in order to collect baseline data for future measurement and comparison. This will require manpower – more DOFAW positions, especially field crew, are required. Also important is an increased enforcement presence in order to alleviate forest resource theft. Climate data collection could be enhanced with the acquisition of more remote automated weather stations. Revenue opportunities and research opportunities that support management goals for the Forest Reserve,

including climate change mitigation, should be pursued. DOFAW Maui Branch staff hopes to review and update this plan every five to ten years, both to update management planning and to serve as a timely tool for budget requests.

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## **VI. APPENDICES**

**Appendix 1:** Rare plant and animal species listed by the US-ESA and /or the State of Hawai‘i that have been sighted within Moloka‘i Forest Reserve

**Appendix 2:** Species for which critical habitat exists within Moloka‘i Forest Reserve

**Appendix 3:** Weed species that are currently receiving treatment in Moloka‘i Forest Reserve

**Appendix 1: Rare plant and animal species listed by the US-ESA and /or the State of Hawai'i that have been sighted within Moloka'i Forest Reserve (Hawai'i Biodiversity and Mapping Program 2008).**

**Plants**

*Acacia koaia* (koai'a, koai'e, koa'oha)  
*Alectryon macrococcus* var *macrococcus*  
 ('ala'alahua, mahoe)  
*Bobea sandwichensis* ('ahakea)  
*Canavalia molokaiensis* ('awikiwiki,  
 puakauhi)  
*Cyanea dunbariae* ('oha, haha, 'oha wai)  
*Cyanea grimesiana* ssp *grimesiana* ('oha,  
 haha, 'oha wai)  
*Cyanea mannii* ('oha, haha, 'oha wai)  
*Cyanea solanacea* ('oha, haha, 'oha wai,  
 popolo)  
*Cyanea solenocalyx* ('oha, haha, 'oha wai)  
*Cyperus fauriei*  
*Cyperus odoratus*  
*Cyrtandra biserrata* (ha'iwale, kanawao  
 ke'oke'o)  
*Cyrtandra filipes* (ha'iwale, kanawao  
 ke'oke'o)  
*Cyrtandra lydgatei* (ha'iwale, kanawao  
 ke'oke'o)  
*Cyrtandra macrocalyx* (ha'iwale, kanawao  
 ke'oke'o)  
*Diella erecta*  
*Diplazium molokaiense*  
*Exocarpos gaudichaudii* (heau)  
*Flueggea neowawraea* (mehamehame)  
*Gardenia remyi* (nanu, na'u)  
*Hedyotis elatior*  
*Hibiscus arnottianus* ssp *immaculatus*  
 (koki'o ke'oke'o)  
*Hibiscus kokio* ssp *kokio* (koki'o 'ula'ula)  
*Joinvillea ascendens* ssp *ascendens* ('ohe)  
*Lindsaea repens* var *macreana*  
*Lobelia dunbariae* ssp *dunbariae* ('oha,  
 haha, 'oha wai)  
*Lobelia dunbariae* ssp *paniculata* ('oha,  
 haha, 'oha wai)  
*Lobelia hypoleuca* ('opelu, liua, mo'owahie)  
*Melicope wailauensis* (alani) \*

*Neraudia sericea* (ma'aloa, ma'oloa, 'oloa)  
*Nothoctrum latifolium* ('aiea)  
*Nothoctrum latifolium* ('aiea)  
*Peperomia rockii* ('ala'ala wai nui)  
*Phyllostegia hispida*  
*Phyllostegia mannii*  
*Phyllostegia stachyoides*  
*Pritchardia lowreyana* (loulou)  
*Sceptridium subbifoliatum* (makou) \*  
*Schideia globosa*  
*Schiedea pubescens*  
*Sicyos cucumerinus* ('anunu, kupala)  
*Stenogyne bifida*  
*Zanthoxylum hawaiiense* (hea'e, a'e)

**Animals**

*Megalagrion pacificum* (Pacific  
 megalagrion damselfly)  
*Myadestes lanaiensis rutha* (Moloka'i  
 thrush, oloma'o) \*  
*Omiodes monogramma* (a moth - prev.  
*Hedylepta monogramma*)  
*Paroreomyza flammea* (Moloka'i creeper,  
 kākāwahie) \*  
*Partulina mighelsiana* (Achatinellid land  
 snail)  
*Partulina proxima* (Achatinellid land snail)  
*Partulina redfieldii* (Achatinellid land snail)  
*Partulina tessellata* (Achatinellid land snail)  
*Partulina virgulata* (Achatinellid land snail)  
*Perdicella helena* (Achatinellid land snail)  
*Psittirostra psittacea* ('ō'ū)  
*Vestaria coccinea* ('i'iwi)

\* Historical sighting, no recent observations  
 (Global Rank)

**Appendix 2: Species for which critical habitat exists within Moloka‘i Forest Reserve  
(Hawai‘i Biodiversity and Mapping Program 2004, USFWS 2008).**

**Plants**

*Adenophorus periens*  
*Alectryon macrococcus* var. *macrococcus*  
*Brighamia rockii*  
*Canavalia molokaiensis*  
*Clermontia oblongifolia* ssp. *brevipes*  
*Cyanea dunbarii*  
*Cyanea procera*  
*Diplazium molokaiense*  
*Fluggea neowaorea*  
*Hesperomannia arborescens*  
*Hibiscus arnottianus* spp. *immaculatus*  
*Labordia triflora*  
*Lysmachia maxima*  
*Mariscus fauriei*  
*Melicope mucronulata*  
*Melicope reflexa*  
*Phyllostegia mannii*  
*Pteris lidgatei*  
*Schiedea lydgatei*  
*Schiedea sarmentosa*  
*Silene alexandri*  
*Stenogyne bifida*

**Animals**

*Manduca blackburni* (Blackburn’s sphinx moth)

**Appendix 3: Weed species that are currently receiving treatment in Moloka‘i Forest Reserve**

*Acacia mearnsii* (black wattle)  
*Acacia melanoxylon* (blackwood acacia)  
*Alpinia zerumbet* (shell ginger)  
*Clidemia hirta* (clidemia, Koster’s curse)  
*Erigeron karvinskianus* (daisy fleabane)  
*Fraxinus uhdei* (tropical ash)  
*Leucaena leucocephala* (koa haole)  
*Mangifera indica* (mango)  
*Melaleuca quinquenervia* (paperbark)  
*Persea americana* (avocado)  
*Phormium tenax* (New Zealand flax)  
*Psidium cattleianum* (strawberry guava, waiawī)  
*Psidium guajava* (common guava)  
*Rosa multiflora* (multiflora rose)  
*Rubus argutus* (blackberry)  
*Schinus terebinthifolius* (Christmas berry)  
*Ulex europaeus* (common gorse)