Nā Pali-Kona Forest Reserve

Management Plan

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 Nā Pali-Kona 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 Nā Pali-Kona Forest Reserve was established by Governor's Proclamation in 1907, for the purpose of protecting the water supply to adjacent agricultural lands. It is located in northwest Kaua‘i, and is currently comprised of two non-contiguous areas of land totaling over 23,000 acres of public land. Hawai‘i's only Wilderness Preserve, the Alaka‘i, is located within the boundaries of Nā Pali-Kona Forest Reserve's wet eastern section. The area contains unique, high-quality native ecosystems and many rare and endangered endemic plants and animals. A small number of exotic timber plantations exist in the western section of the Reserve. Infrastructure consists primarily of Na Ala Hele Trails, rough roads, picnic areas, and basic campsites. Public hunting (birds and mammals) is allowed in Nā Pali-Kona Forest Reserve.

DOFAW's current principle objective for the management of Nā Pali-Kona Forest Reserve is to maintain highest quality native ecosystems habitat for threatened, endangered, and rare plants and animals and the associated healthy watershed. 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 Nā Pali-Kona Forest Reserve are as follows:

1. Watershed Values - management and staff costs only;
2. Native Ecosystems - management and staff costs only;
3. T&E and Rare Species Management - $340,000 annual costs plus management and staff costs;
4. Resource Protection - $105,000 annual costs, $160,000 one-time costs, plus management and staff costs;
5. Invasive Species Control - $105,000 annual costs plus management and staff costs;
6. Game Animal Management - $5,000 one-time costs plus management and staff costs;
7. Commercial Activity - Management and staff costs only;
8. Additional Public Activity - $45,000 one-time costs plus management and staff costs.

Details of these priorities and costs can be found in Table 5 on page XX 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 increased hunting opportunities and additional fencing projects.

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NĀ PALI-KONA FOREST RESERVE
MANAGEMENT PLAN SIGNATURE PAGE

Kaua'i District certification: This plan was prepared by a team of Division of Forestry and Wildlife (DOFAW) staff to provide a management framework for Nā Pali-Kona Forest Reserve.

Alvin M. Kyono – DOFAW Kaua'i Branch Manager — Date 12/14/09

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 Nā Pali-Kona Forest Reserve.

Paul J. Conry – DOFAW Administrator — Date 12/8/09

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

PLAN DEVELOPMENT PROCESS TIMELINE

Nā Pali-Kona Forest Reserve, Kaua‘i

Stage of Development	Date Achieved	Comments
Branch review	June 2008	Incorporated
DOFAW review	December 2008	Incorporated
Partner agency consultation	February 2009	• Two responses received from targeted community members • Six responses received from partners and other government agencies
Public consultation	May 2009	• Press release May 8, 2009 • Plan posted on DOFAW website from May 1 to May 26, 2009 • One response received
DOFAW approval	June 2009	None
BLNR approval	November 2009	None

I. INTRODUCTION

The State of Hawai‘i Department of Land and Natural Resources (DLNR) 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 Nā Pali-Kona Forest Reserve, which fits under the overall forest reserve management plan for Kaua‘i. This Management Plan addresses concerns and strategies only on the public lands in Nā Pali-Kona Forest Reserve.

This management plan for the Nā Pali-Kona 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 Kaua‘i Branch office) and documents obtained from the Land Division, Survey Division, 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 Hawai‘i Comprehensive Wildlife Conservation Strategy, the Hawaii Biodiversity and Mapping Program, the Kaua‘i Watershed Management Plan, the Kaua‘i Invasive Species Council's Action Plan, 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 Nā Pali-Kona 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. NĀ PALI - KONA FOREST RESERVE DESCRIPTION

Nā Pali-Kona Forest Reserve is located in the central to northwest areas of the island of Kaua‘i, in the Districts of Waimea and Hanalei. The Reserve was established by Governor's Proclamation on June 12, 1907 (Atkinson 1907), with the primary objective of forest protection; the area was perceived to have few other uses and the accompanying protection of

the water supply to adjacent agricultural lands was viewed as having "tremendous value" (Hosmer 1907). Nā Pali and Kona are the names of the two ancient districts or moku'āina in which the Forest Reserve land lies (Armstrong 1983).

Kaua'i has higher rates of species endemism than other Hawaiian Islands (Mitchell et al. 2005) and Nā Pali-Kona Forest Reserve contains an excellent representation of important ecosystems. DOFAW's current principle objective for the management of Nā Pali-Kona Forest Reserve is to maintain Highest Quality Native Ecosystems habitat for threatened, endangered, and rare plants and animals and the associated healthy watershed.

A. Location and Description:

On Kaua'i, DOFAW has direct management responsibility for nine Forest Reserves, which encompass approximately 76,000 acres. Nā Pali-Kona Forest Reserve consists of approximately 23,019 acres (Table 1). All public lands within the Forest Reserve System are managed directly by DOFAW. The state-owned portion of the Nā Pali-Kona Forest Reserve is comprised of three sections of land, two of which are non-contiguous plus the Alaka'i Wilderness Preserve. For the purpose of this management plan, the land sections will be designated 1 (makai), 2 (mauka), and 3 (Alaka'i Wilderness Preserve). Figure 1 shows the current extent of Nā Pali-Kona Forest Reserve and the management sections referred to in this management plan.

Ku'ia Natural Area Reserve and Kōke'e State Park separate Sections 1 and 2 of Nā Pali-Kona Forest Reserve. Section 1 is bounded by Nā Pali Coast State Park makai and to the east and by Pu'u Ka Pele Forest Reserve to the west. Nā Pali Coast State Park and Hono o Nā Pali Natural Area Reserve also bound Section 2 on the northern makai side, with Pu'u Ka Pele Forest Reserve to the west and Section 3, the Alaka'i Wilderness Preserve to the east. Section 3, the Alaka'i Wilderness Preserve, is bordered to the west by Section 2 and by Halele'a Forest Reserve to the east. Lands south of Sections 2 and 3 are privately owned.

Table 1: State of Hawai'i Tax Map Key (TMK) parcels currently comprising Nā Pali-Kona Forest Reserve.

TMK Number	Tax Acres (entire TMK)	GIS Acres (entire TMK)	GIS Forest Reserve Acres
(4) 1-4-001:014 (portion)	3,659.0	5,926.1	3,130.6
(4) 5-9-001:001 (portion)	7,991.5	8,160.1	1,009.5
(4) 1-4-001:003 (portion)	21,160.8	21,217.0	18,878.6 *
			23,018.7

* Including 10,378.8 GIS acres comprising the Alaka'i Wilderness Preserve

B. Physical Site Data:

Annual Rainfall: The Nā Pali-Kona Forest Reserve receives annual rainfall ranging from less than 40 inches in the northeast makai regions of Section 1 to more than 300 inches at Mt. Wai'ale'ale in the southeast corner of Section 3 (Figure 2).

Figure 1: Current extent of Na Pali-Kona Forest Reserve - Public Lands.
Sections labelled according to Management Plan text.

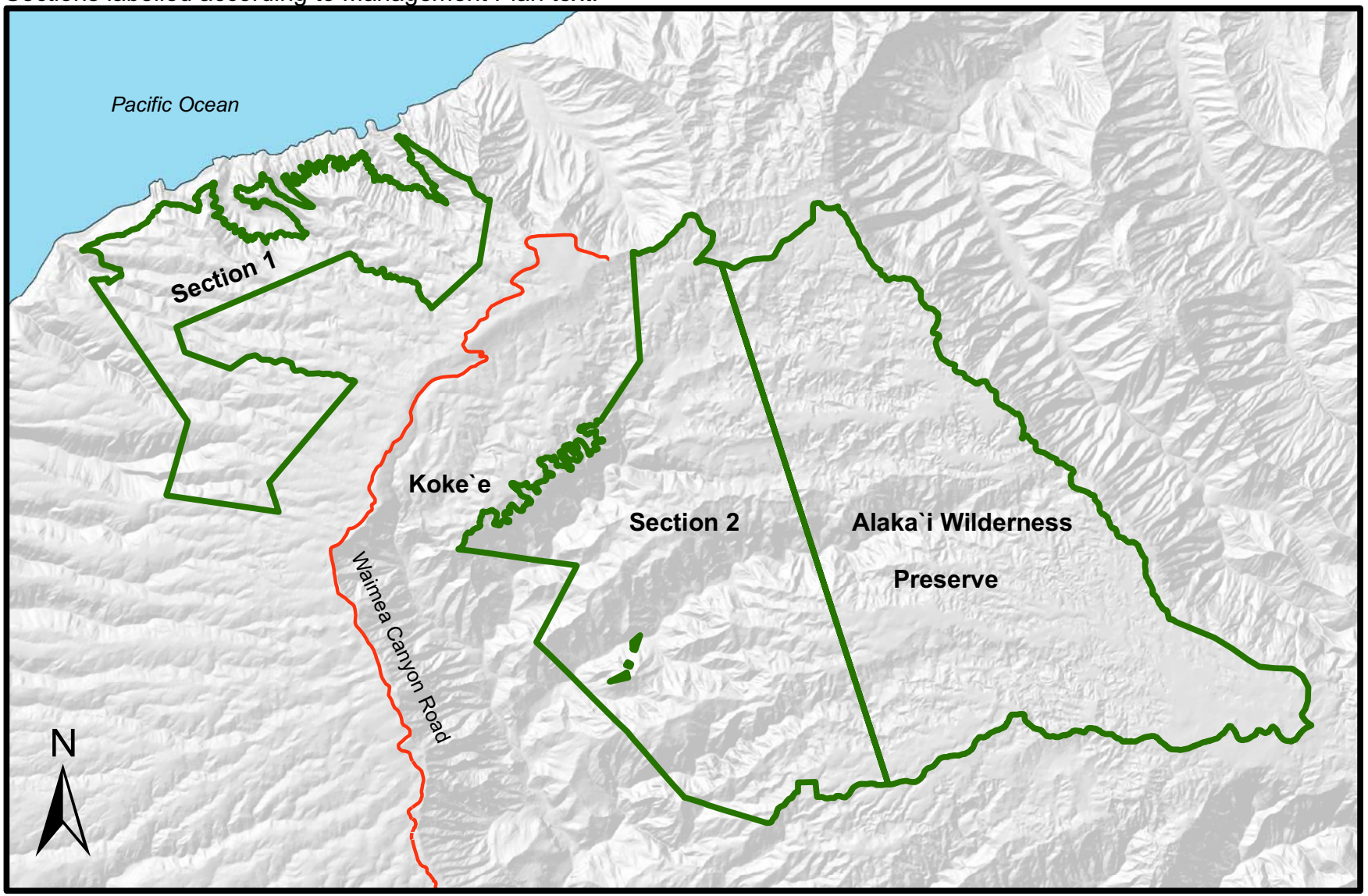

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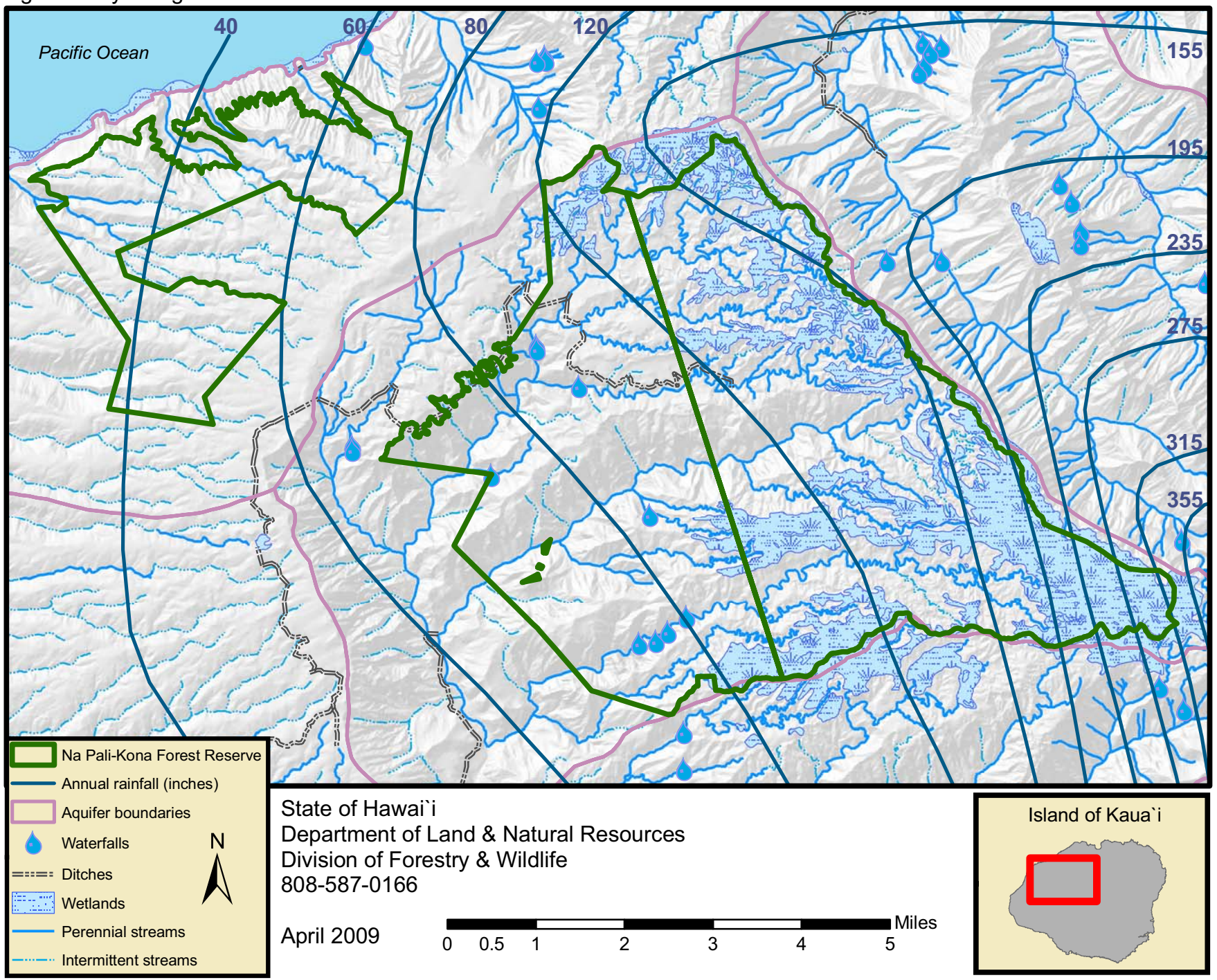
Figure 2: Hydrologic features of Na Pali-Kona Forest Reserve



Geographic and Hydrologic Features: Section 1 contains all or portions of the following geographic features: Kālepa Ridge, Puʻu Nianiau (3,682 ft.), Honopū Valley, Awaʻawapuhi Valley, Nuʻalolo Valley, Kaʻahole Valley, Kawaiʻula Valley, Poʻopoʻoiki Valley, Kuʻia Valley, Paʻaiki Valley, Miloliʻi Ridge, Mākaha Valley, Mākaha Ridge, Kauhao Valley, and Kopakaka Ridge. There are perennial streams (Figure 2) in Honopū Valley, Awaʻawapuhi Valley, Nuʻalolo Valley, Kawaiʻula Valley, Poʻopoʻoiki Valley, Kuʻia Valley, and Paʻaiki Valley, as well as several intermittent streams in other valleys (USGS topographical map). Elevation in the Section 1 of Nā Pali-Kona Forest Reserve ranges from 1,000 ft. along the makai border to 4,000 ft. along the border with Kōkeʻe State Park.

Section 2 contains all or portions of the following geographic features: the Alakaʻi Swamp, Waimea Canyon, Kohua Ridge, Hipalau Valley, Kawai Iki Ridge, Kawai Iki Valley, Kaluahāʻula Ridge, and Nāwaimaka Valley. Hydrologic features in the wet mauka section are extensive, and include Kauaikinanā Stream, Kawaikōī Stream, Waiakoali Stream, Kawaikōī Stream, Moeloa Falls, Poʻomau Stream, Mōhihi Stream and Mōhihi Falls, Āwini Stream and Āwini Falls, Koaiʻe Stream, Waiʻalae Stream and Waiʻalae Falls, Loli River, as well as many intermittent streams. Aquifer systems fed by the Nā Pali-Kona Forest Reserve include Nā Pali for the makai section and Waimea for the mauka (DLNR aquifer GIS layer).

Section 3, the Alakaʻi Wilderness Preserve, contains all or portions of the following geographic features: the Alakaʻi Swamp, Koali summit (4,185 ft.), and Hipalau Valley. In addition to the major portion of the Alakaʻi Swamp, hydrologic features include the Loli River and the following streams: Kawaikōī, Waiakoali, Koaiʻe, Waiʻalae, Halehaha, Halepaʻakai, as well as many intermittent streams. Elevations in Sections 2 and 3 range from approximately 1,300 ft. in the Waimea Canyon to 4,500 ft. in the Alakaʻi Swamp.

Soil Types: The soils in Nā Pali-Kona Forest Reserve are varied, with over 30 types of map units represented (Foote et al. 1967). Section 1 is dominated by rRR (Rough Broken Land), and rRO (Rock Outcrop) soils. rRR soils occupy very steep lands broken by many drainage channels and are common in gulches and on mountainsides of all Hawaiian islands except Oʻahu. Soil depth is variable, runoff is rapid, and erosion is active; this soil is classified as HEL (highly erodible land) and although it is sometimes used for pasture and woodland, it is best suited for watershed and wildlife habitat. rRO soils are characterized by exposed bedrock on over 90% of the surface area. These soils occur in sloping and mountainous areas on all Hawaiian Islands and are suitable for water supply, wildlife habitat, and recreation.

Section 2 is dominated by rRO (as described above), rRT (Rough Mountainous Land) and KSKF (Kokeʻe silty clay loam, 35 to 70 percent slopes) soils. rRT soils are also 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 classified as HEL and is used for water supply, wildlife habitat, and recreation. KSKF soils are well drained and occur only on the uplands of Kauaʻi; runoff is rapid and erosion potential is severe. This soil type is also classified as HEL and is used for water supply, wildlife habitat, and woodland.

Section 3, the Alakaʻi Wilderness Preserve, is dominated by rRT soils (as described above) but also contains significant amounts of two wetland soil types: rAAE (Alakaʻi mucky peat, 0 to 30 percent slopes) and rWAF (Waiʻaleʻale mucky silty clay loam, 30 to 70 percent slopes). rAAE soils occur on mountaintops and high ridges on Kauaʻi and Oʻahu and are classified as potentially HEL. The water table in these areas is very high and the surface layer is mucky peat with clay beneath. Permeability is very slow below the muck, runoff is slow, and erosion hazard is slight. rWAF soils are located on high upland slopes of Kauaʻi and are HEL. The surface layer is mucky peat, under which is found silty clay loam and then rock. Permeability is moderate, runoff is rapid, and erosion hazard is severe. Both these soils are used for water supply and wildlife habitat.

C. Pre-Reserve and Subsequent Use History:

Most historic human use of the Nā Pali-Kona Forest Reserve area was likely along the coastline, which is now a part of Nā Pali Coast State Park. There is evidence of extensive pre-contact population and agriculture along the Nā Pali coast and up into the valleys located there. Archaeological findings in the area include house sites, taro terraces, irrigation ditch lines, heiau, burial caves, and trails. It is doubtful if the high, upland areas of Nā Pali-Kona Forest Reserve were very populated, although bird hunters, travelers, and others used these areas; examples include trails passing to the uplands from the Nā Pali coast, trails through the Alakaʻi Swamp, and remnants of an irrigation ditch found in the uplands on the north side of the Koaiʻe River (Bennett 1931). Kapukapaʻa Ridge, part of which is the boundary between the ahupuaʻa of Makaweli and Waimea, is also the location of an ancient trail that leads to the top of Mt. Waiʻaleʻale (Kanahele 1937).

From the time of its establishment in 1907, Nā Pali-Kona Forest Reserve consisted of both government and private land. Initially, much of the government land was privately leased, though most leases were not renewed after their expiration. In the 1880s, the Knudsen Estate, which leased a large portion of the Waimea uplands, began to eliminate wild cattle from the forested areas of its leased lands and constructed a fence in 1898 to keep their own cattle from entering the forest. Gay and Robinson, who have owned the private forest reserve lands at Makaweli since 1865, were also working at exterminating the wild cattle on their lands and intended to keep stocking densities of their own cattle low to minimize damage to the forest.

Wild cattle, goats, and fire were listed as “enemies of the forest” when the Nā Pali-Kona Forest Reserve was proposed, although it was noted that the area had been remarkably free of fire damage. This was attributed at least in part to a policy of Gay and Robinson that fined those who allowed fires to start on their land. Also noted in the Waimea uplands was “the large number of fine specimens of forest trees not commonly found in the Hawaiian forests” (Hosmer 1907) including ʻōhiʻa lehua, koa, kōlea, kōpiko, ʻōhiʻa hā, ʻiliahi, and kauila. The original Governor’s Proclamation for the establishment of Nā Pali-Kona Forest Reserve included lands within the ahupuaʻa of Waimea, Honopū, Makaweli, and Hanapēpē. By 1907, water was being diverted from the Nā Pali-Kona Forest Reserve for sugar production from the Hanapēpē, Olokele, and Waimea Rivers.

Uses of the Nā Pali-Kona Forest Reserve lands through the twentieth century included continued grazing and fishing interests, with fishermen wanting continued access to forest reserve beaches. Grazing lands were targeted specifically with the cancellation and/or revocation of grazing leases prior to the Forest Reserve extension down to the Nā Pali coastline in 1938.

The border between Waimea and Makaweli has been the source of intermittent disagreements between the State and the Robinson family over the years. The actual border was disputed and resolved in the 1930s. A fence, which was contested by the Robinsons, was then constructed along this border to prevent livestock from entering the forest reserve. During the 1940s, rights of way and access to this area were debated; Division of Forestry staff were having problems accessing the forest reserve as the Robinsons held the only key to the gate in the fence. After Hurricane Iwa knocked down most of this fence in 1982, the Robinsons reported an increase in hunter trespass and requested that the State repair its half of the fence.

Depression-era efforts to alleviate unemployment led to US government-sponsored activities in Nā Pali-Kona Forest Reserve during the 1930s. The Civilian Conservation Corps (CCC) constructed a camp at Kōkeʻe and the Federal Emergency Relief Agency (FERA) did roadwork in the Kōkeʻe region, including a project to build four concrete bridges across streams. In 1941, approximately 15 acres surrounding the CCC's Kōkeʻe Camp were removed from Nā Pali-Kona Forest Reserve and turned over for confidential military installations. This land was restored to the forest reserve in 1950 only to be removed again in 1952 to form a portion of Kōkeʻe Territorial Park, now Kōkeʻe State Park. In 1964, approximately 9,939 acres were set aside (but not removed from Nā Pali-Kona Forest Reserve) to form the Alakaʻi Wilderness Preserve, Hawaiʻi's first and only wilderness preserve.

By the 1960s, helicopters were commonly transporting tourists into the Nā Pali coast area; by the 1970s, the area that is now Nā Pali Coast State Park was recorded as being heavily used, with illegal camping and nudity on the beaches being major problems. Since the 1990s, requests for use and related public interests for the Nā Pali-Kona Forest Reserve include use of forest reserve cabins, permission to conduct research and issues surrounding helicopter access.

Additions and Withdrawals: Changes in the acreage of Nā Pali-Kona Forest Reserve have occurred several times since its establishment. Initial additions were made to stem erosion concerns by incorporating adjacent grazing lands in the Nā Pali coast area. Most changes, however, have been withdrawals that transferred land to other divisions of DLNR, usually to create State Parks and Natural Area Reserves. Table 2 summarizes additions and withdrawals to Nā Pali-Kona Forest Reserve and Figures 3, 4, and 5 show the original extent of the Forest Reserve, additions, and withdrawals, respectively.

Figure 3: Original extent of Na Pali-Kona Forest Reserve - Governor's Proclamation 1907

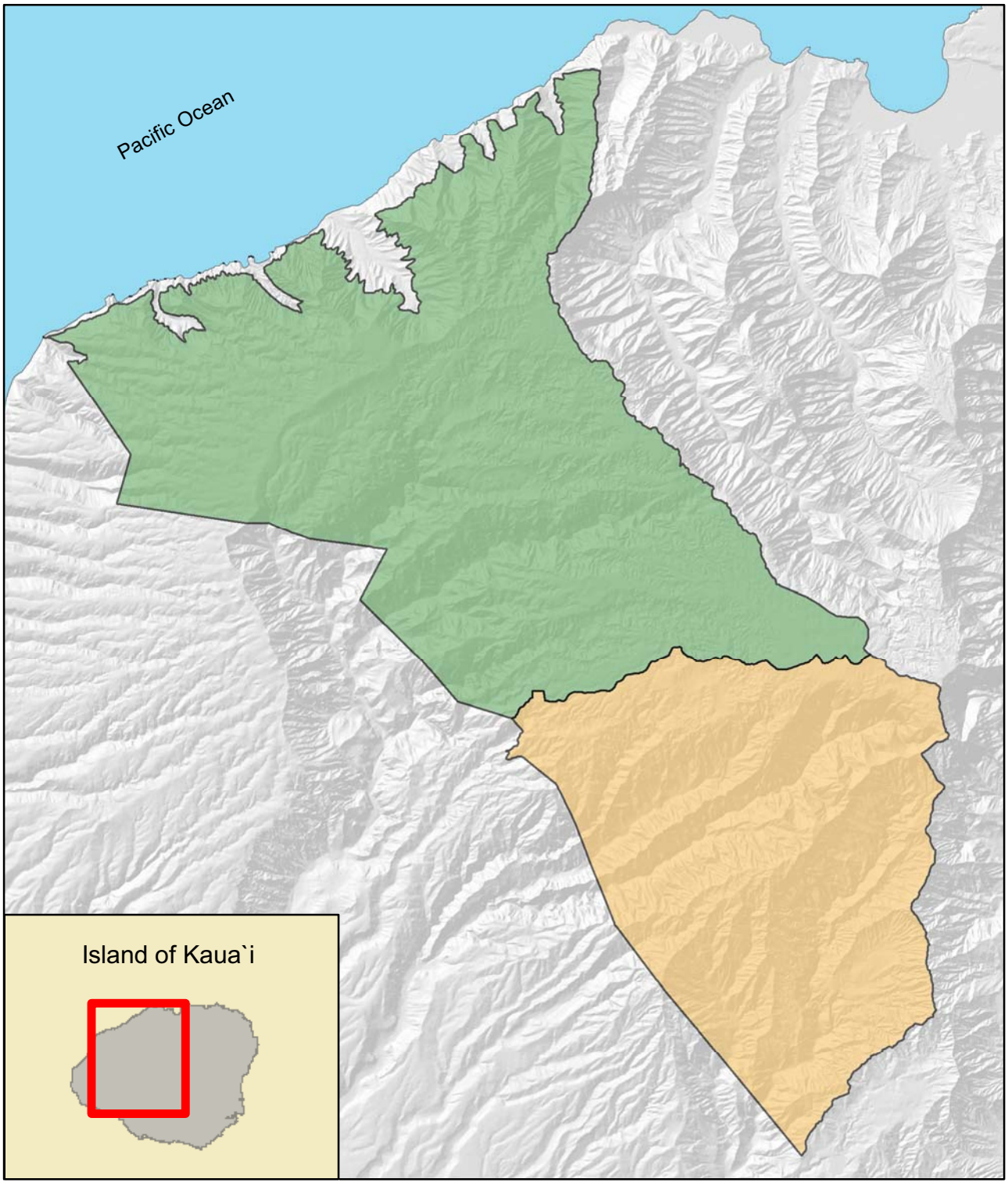


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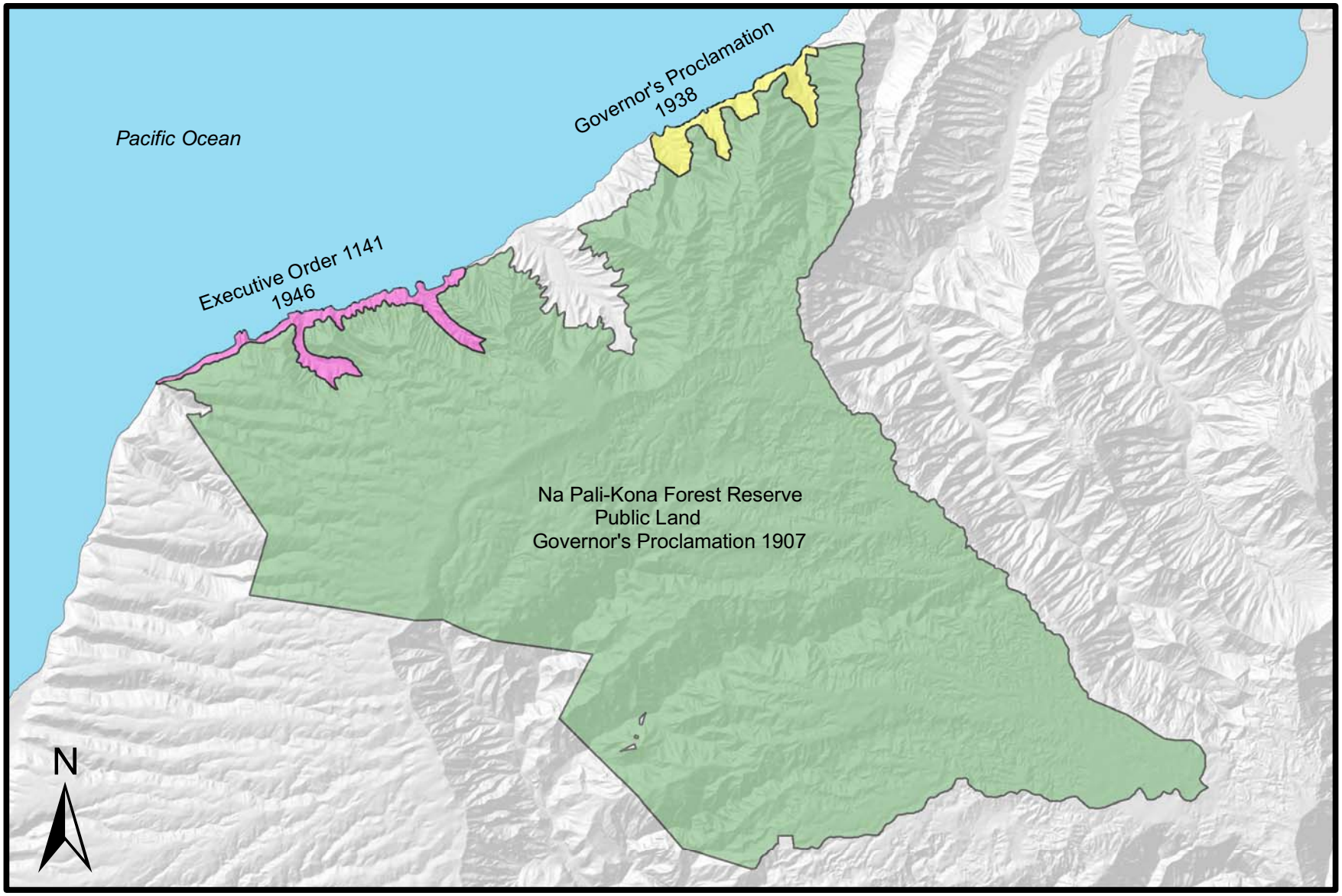
Figure 4: Historic additions (year of addition shown) to Na Pali-Kona Forest Reserve



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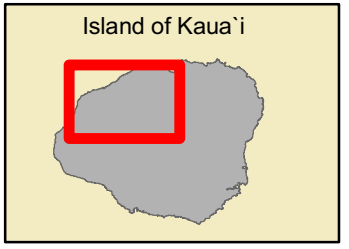

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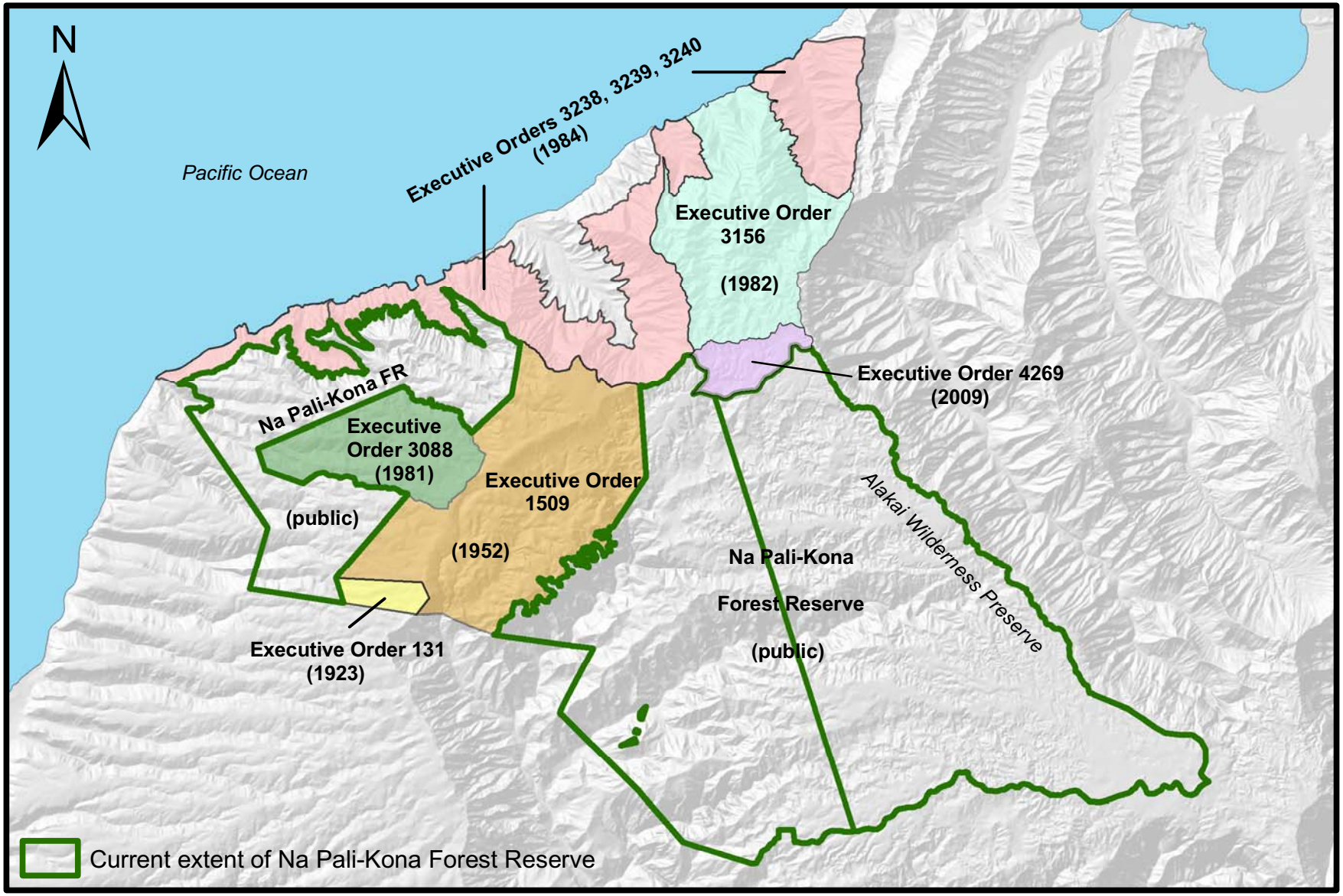
Figure 5: Historic withdrawals (color areas, year of withdrawal shown) and current extent of Na Pali-Kona Forest Reserve.[15]



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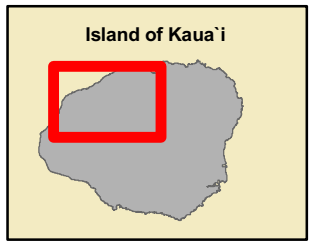

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Table 2. Summary of public land additions and withdrawals (A/W) for Nā Pali-Kona Forest Reserve. Data relating to these items are filed at the DOFAW Administrative Office and the State Survey Office.

Action	Date	A/W	Description	Acres	CSF	TMK
Governor's Proclamation	12-Jun-1907	A	Establishment	60,540 *(including 19,890 private)* */1	1757	(4) 1-4-001:002 (4) 1-4-001:003 */2 (4) 1-4-001:013 (4) 1-4-001:014 (4) 1-4-001:020 (4) 5-9-001:001 (4) 5-9-001:016 (all portions)
Executive Order 131	24-Jan-1923	W	Land set aside for addition to Pu'u Ka Pele Park	244 */3	2602	(4) 1-4-001:002 (portion)
Governor's Proclamation	02-May-1938	A	Incorporation of previous grazing land, extension to coastline	535	6318	(4) 5-9-001:001 (portion)
Executive Order 960	19-Nov-1941	W	Land withdrawn for military use	15.7	2389	(4) 1-4-001:003 (portion)
Executive Order 1141	25-Mar-1946	A	Area between current FR and the sea from Kalalau to Miloli'i	573.1	10270	(4) 1-4-001:014 (portion) */4
Executive Order 1355	10-Feb-1950	A	Cancellation of EO 960 – return of land by military	15.7	2389	(4) 1-4-001:003 (portion)
Executive Order 1509	15-May-1952	W	Land set aside for establishment of Kōke'e State Park	4,640 */5	11444-A	(4) 1-4-001:013 */6 (4) 5-9-001:016 */7 (4) 1-4-001:020 (portion)
Executive Order 3088	02-Nov-1981	W	Land set aside for establishment of Ku'ia Natural Area Reserve	1,341 */8	18816	(4) 1-4-001:020 (portion)
Executive Order 3156	20-Dec-1982	W	Land set aside for establishment of Hono o Nā Pali Natural Area Reserve	3,150 */9	18813	(4) 5-9-001:001 (portion)
Executive Order 3238	01-May-1984	W	Cancellation of EO 1141 – land used to establish Nā Pali Coast State Park	573.1	10270	(4) 1-4-001:014 (portion)
Executive Order 3239	01-May-1984	W	Land set aside for addition to Nā Pali Coast State Park	4,010	19797	(4) 5-9-001:001 (portion)
Executive Order 3240	01-May-1984	W	Land set aside for intended addition to Nā Pali Coast State Park	(180) */10	19821	(4) 5-9-001:001 (portion)
Executive Order 4269	23-Mar-2009	W	Land removed for addition to Hono o Nā Pali Natural Area Reserve	486	24702	(4) 1-4-001:003 (portion)

*/1 Private lands are ~23,297 GIS acres,
*/2 Encloses 3 Kuleana TMKs totaling 8.0 GIS acres
*/3 Approximate GIS acres; amount withdrawn from Nā Pali-Kona FR not specified in EO

*/4 Plus 8 Kuleana TMKs totaling 6.9 acres in Honopu Valley
*/5 Koke‘e State Park = 4,385 GIS acres
*/6 Encloses ~86 small State-owned TMKs
*/7 Encloses 2 small State-owned TMKs
*/8 Ku‘ia NAR = 1,581 GIS acres
*/9 Hono o Nā Pali NAR = 3,092 GIS acres
*/10 Land already removed in EO 3156

Kuleana Parcels: Three privately owned in-holdings or kuleanas with a total of approximately eight acres of land remain within the boundaries of Nā Pali-Kona Forest Reserve. All three kuleana parcels are in Koai‘e Canyon.

Documented Activities/Leases/Deeds/Permits: Due to the remote and rugged nature of much of Nā Pali-Kona Forest Reserve, few leases have been issued for land use in the area. Most lease activity has been related to grazing, and only one water-related revocable permit remains active to the present time. Table 3 gives a summary of lease and permit activity in Nā Pali-Kona Forest Reserve over the years.

Table 3. Historical leases and permits associated with Nā Pali-Kona Forest Reserve. Data relating to these items are filed at the State Land Division Office.

Type	Action	Lease Period	Description	Acres	TMK
General Lease	GL 112	27-Dec-1887 to 27-Dec-1917	Gay and Robinson; entire ahupua‘a of Waimea	Not specified	4-1-4-001:014 (portion) 4-1-4-001:020 4-1-4-001:013 4-5-9-001:016 (portion) 4-1-4-001:002 (portion) 4-1-4-001:003 (portion)
General Lease	GL 164	01-Jun-1890 to 01-Jun-1921	Valdemar Knudsen; ahupua‘a of Kekaha, Poku, Waiawa, Mokihana, Miloli‘i, Nuololo (sic), and Mana	Not specified	4-1-4-001:014 (portion) 4-5-9-001:001 (portion)
General Lease	GL 345	25-Jul-1883 to 25-Jul-1913	D.W. Pua et al. – transferred to W.E.H. Deverill 11-Dec-1891; ahupua‘a of Hanakapiai	Not specified	4-5-9-001:001 (portion)
General Lease	GL 453	07-Jul-1892 to 07-Jul-1917	William Kinney; Hanakoa, Pohakuau area	~7000	4-5-9-001:001 (portion)
General Lease	GL 1299	27-Nov-1920 to 27-Nov-1935	W.H. Rice Sr.; Hanakapiai pasturage	260	(4) 5-9-001:001
General Lease	GL 1300	27-Nov-1920 to 27-Nov-1935	Axel Blackstead – transferred to George Kaeo 28-Oct-1925; Hanakoa pasturage	275	(4) 5-9-001:001

General Lease	RP 6074	15-Sep-1983 to 30-Nov-2000	Kaua‘i Mountain Tours, Inc.; 4WD tours along Camp 10 Rd	N/A	(4) 1-4-001:002 (4) 1-4-001:003 (4) 1-4-001:013
Revocable Permit	ADC RP	Annual renewal – current	HI State Agribusiness Development Corporation to Kekaha Agriculture Assn.; water from Koke‘e Ditch system	N/A	4-1-4-001:003 (portion)

D. Vegetation:

The terrain, climate, and resulting vegetation in Nā Pali-Kona Forest Reserve is diverse, covering large areas from mauka to makai (Figure 6). Native vegetation is well represented. The predominant vegetation types in Section 1 include: alien shrubland and forest, native dry cliff vegetation, native mesic to dry forest and shrubland, and closed koa/‘ōhi‘a forest. Predominant vegetation types in section 2 include: alien shrubland and forest, open and closed koa/‘ōhi‘a forest, native wet and dry cliff vegetation, open and closed ‘ōhi‘a forest, ‘ōhi‘a/‘ōlapa forest, native wet forest/shrubland, and bog vegetation.

According to DOFAW’s 2001 Draft Management Guidelines, Nā Pali-Kona Forest Reserve contains all four levels of vegetation classification (Figure 7A): Highest Quality Native Ecosystems (V-1), Predominantly Native Areas (V-2), Considerably Disturbed Areas (V-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.

Section 1 of the Forest Reserve has predominantly V-4 vegetation on the pali areas and V-3 vegetation in the uplands. Section 2 moves from V-4 to V-3 from west to east; this directional transition continues as V-2 into the Alaka‘i Wilderness Preserve, whose vegetation is almost entirely V-1 through its eastern half. Management objectives for these exceptional 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

Figure 6: Vegetative cover in Na Pali-Kona Forest Reserve (Hawai`i Natural Heritage Program/GAP Analysis Program, 2005).[19]

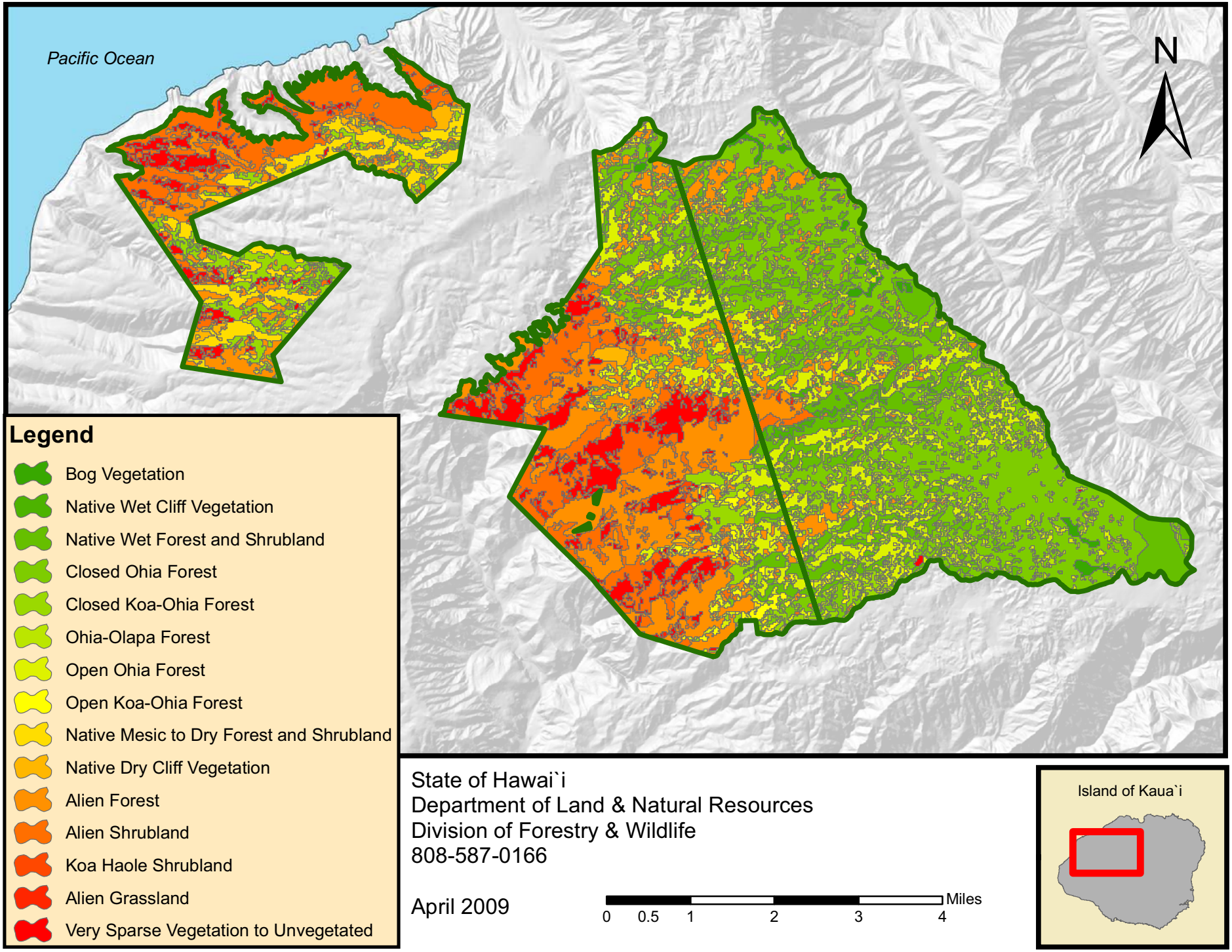
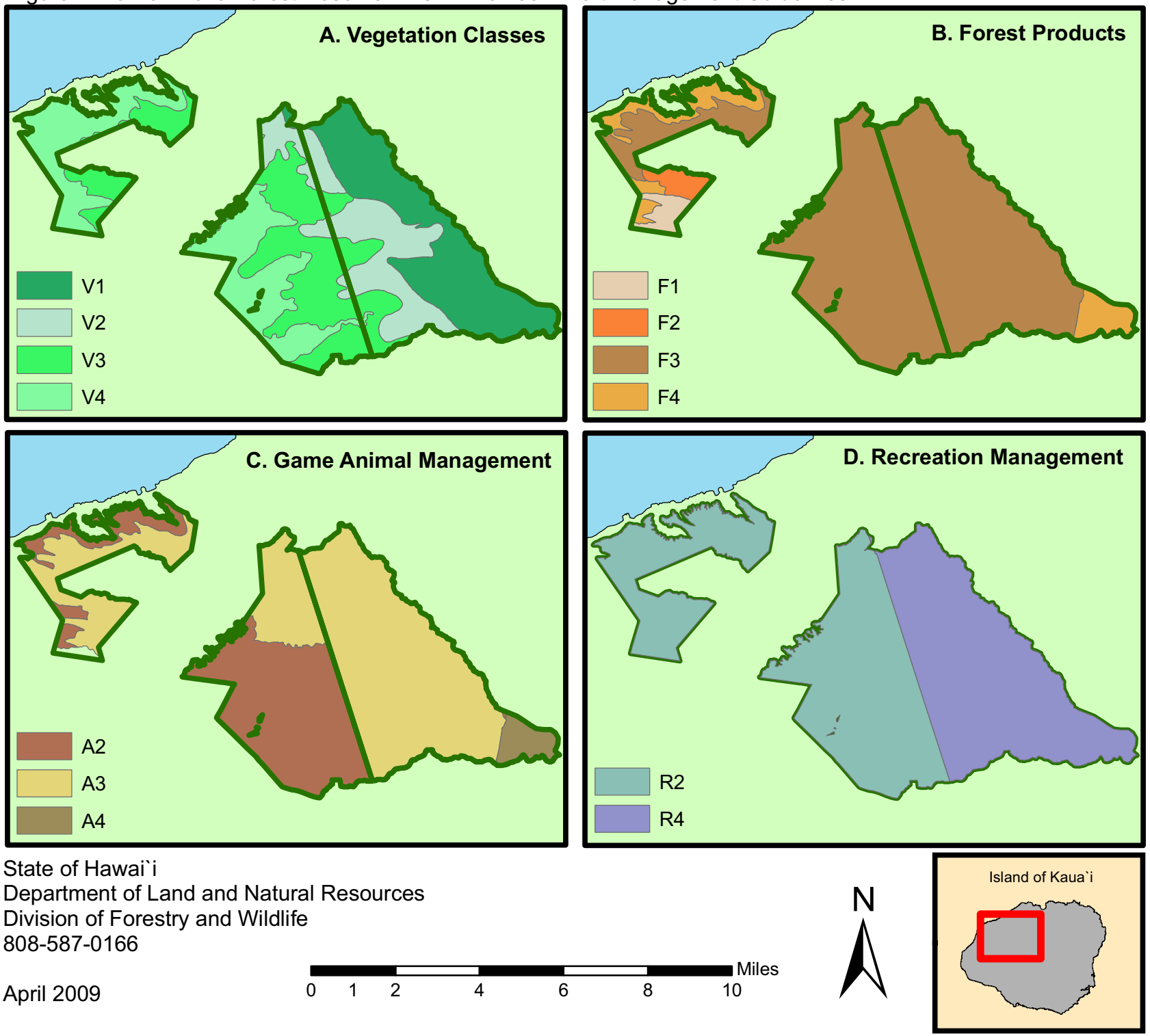


Figure 7: Na Pali-Kona Forest Reserve - DOFAW's 2001 Draft Management Guidelines



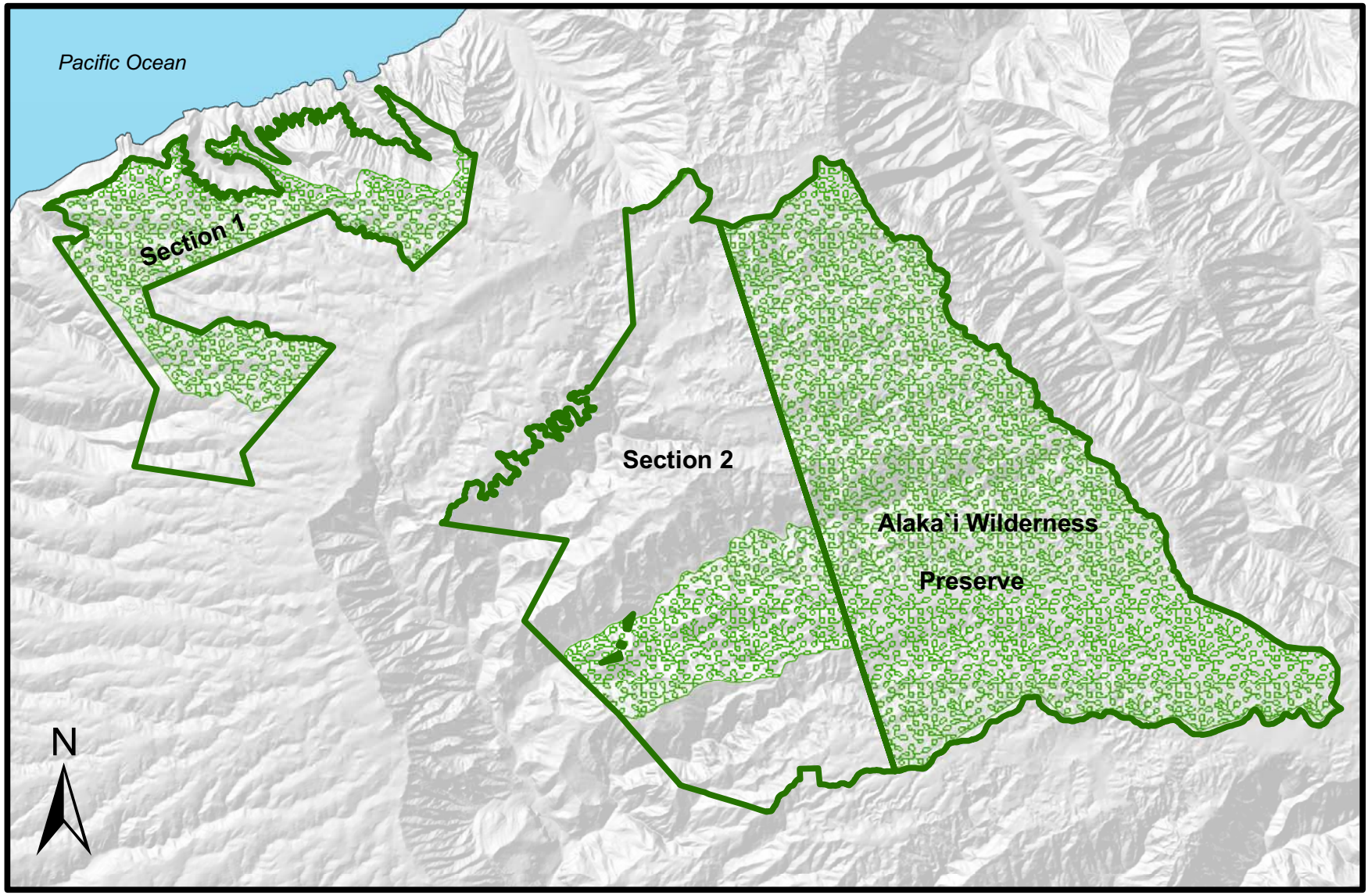
secondary forest resources (water supply, erosion control & aesthetic values). Permitted activities may have high levels of disturbance, as long as they don't negatively impact remaining native plant populations and have an eventual net benefit to other resources like water or an improved vegetative 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 and Critical Habitat: Native vegetation is well represented in Nā Pali-Kona Forest Reserve. The 2004 Hawai'i Biodiversity and Mapping Program contains 124 listings for rare vegetation (Appendix 1) within the Forest Reserve boundaries, 109 of which are plants and three of which are ecosystem types defined by vegetation. According to the United States Endangered Species Act (US-ESA), 61% of these plant species are listed endangered, 3% are listed threatened, 15% are candidates to list as threatened, and 10% are species of concern. Another 45 plant species were recently proposed for listing (U.S. Fish and Wildlife Service 2008). The new proposal lists plant species according to six ecosystem types: lowland mesic, lowland wet, montane mesic, montane wet, dry cliff and wet cliff. Many plants are extremely rare and are included on the Plant Extinction Prevention list as species that have 50 or fewer individuals remaining in their natural habitat. Nā Pali-Kona Forest Reserve contains a large amount of critical habitat (also subject to change with the new USFWS proposal) for many native plant species (Figure 8). 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 currently exists in Nā Pali-Kona Forest Reserve. Proposed changes to critical habitat and listed species are outlined in Appendix 3.

DOFAW manages several fenced plant enclosures, both within the Nā Pali-Kona Forest Reserve, the adjacent Koke'e State Park, and, along with USFWS staff, within the Alaka'i Wilderness Preserve. There are seven of these enclosures along the eastern edge of the Alaka'i, ranging in area from 3.1 to 9.8 acres (total fenced area of approximately 43.7 acres). The purpose of these enclosures is to protect existing rare plants and wild populations and to provide areas to restore and expand these species. Exclosures within the Alaka'i are also being used to exclude ungulates from areas to document positive or negative changes in the naturally occurring vegetation. Out plantings of rare species are conducted when possible in order to increase wild populations.

Timber Species: Various timber species have been planted in the Forest Reserves over the years, both to improve the watershed and to provide forest products such as fuelwood, fenceposts, and building material. DOFAW's Draft Management Guidelines designate Nā Pali-Kona Forest Reserve as containing all four levels of forest products classification (Figure 7B): Primary (F-1, forest products are a primary objective), Secondary (F-2, limited small scale harvesting or salvage is allowed), Personal (F-3, small scale non-commercial harvesting or salvage is allowed), and Restricted (F-4, forest products are not normally an objective). All classification levels have restrictions regulated by DOFAW and require appropriate permits and/or licenses.

Figure 8: Total area of plant critical habitat currently within Na Pali-Kona Forest Reserve.



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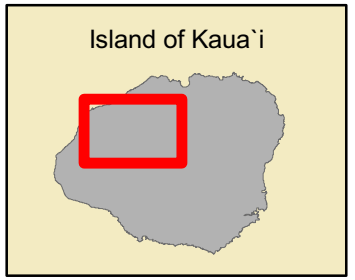
Division of Forestry and Wildlife
(808) 587-0166

April 2009

Plant Critical Habitat

0 0.5 1 2 3 4 Miles



A small number of timber plantings were established in Sections 1 and 2 of Nā Pali-Kona Forest Reserve in the 1960s, including *Cryptomeria japonica* (sugi pine), *Pinus elliottii* (slash pine), and *Eucalyptus robusta* (swamp mahogany) (Figure 9). Study of these plantings is ongoing - growth data are updated every few years. There are no timber plantings in the Alakaʻi Wilderness Preserve.

Invasive Plant Species: Invasive plant species receive constant management attention throughout most State lands in Hawaiʻi. A wide variety of non-native plants, some of which are considered invasive, are spread throughout many areas of the Forest Reserve. See Appendix 4 for a list of invasive plant species that are of greatest management concern in the Nā Pali-Kona Forest Reserve. Control of incipient invasions is especially important in the Alakaʻi Wilderness Preserve due to its high quality native ecosystem – see Section J. Threats below.

E. Wildlife:

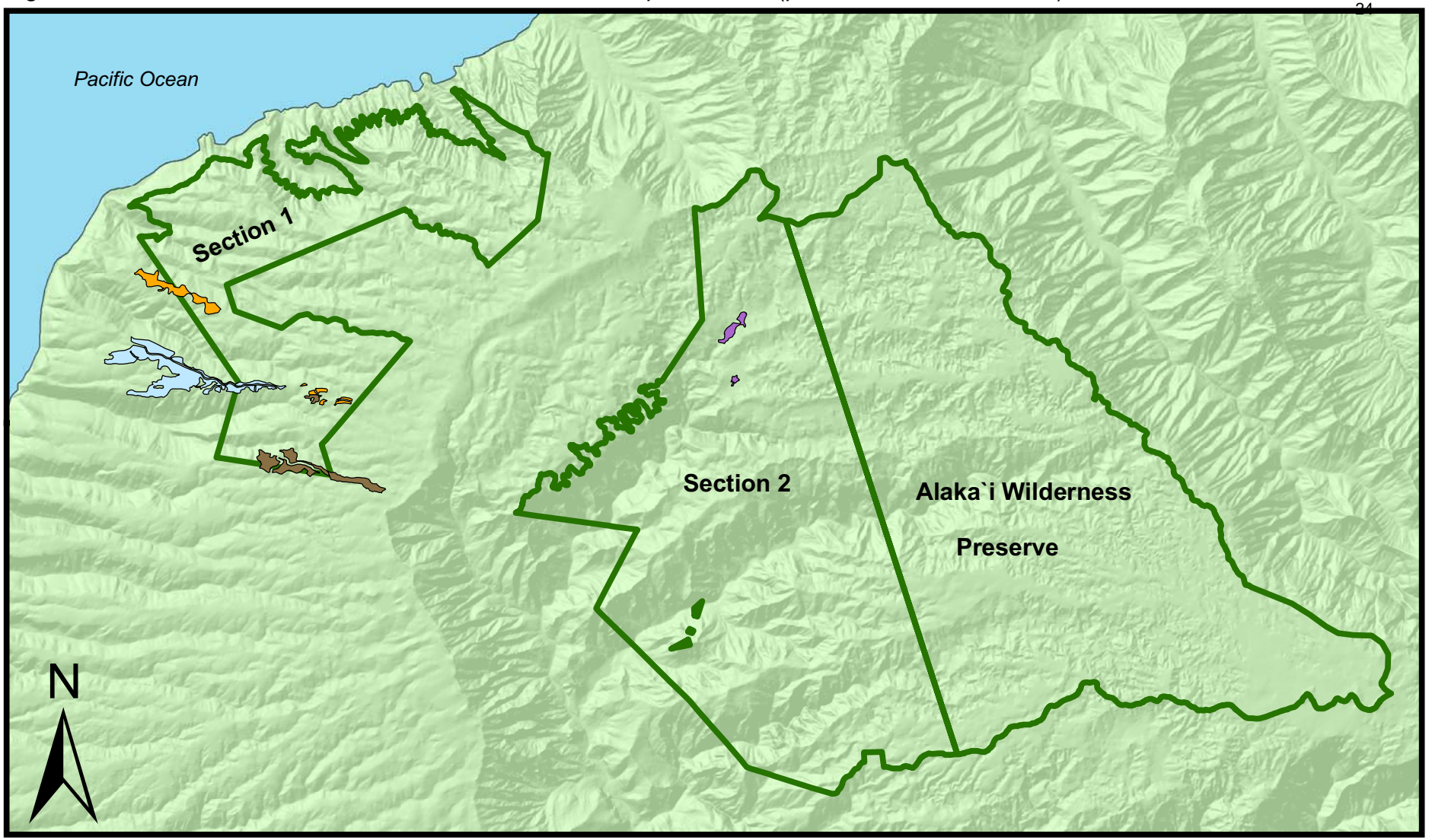
Nā Pali-Kona Forest Reserve harbors a diverse range of endemic, native, and introduced wildlife. Some species were deliberate introductions, whereas others were introduced accidentally. Introduced species have varying degrees of negative effects on the native ecosystem. The forest reserve also supports several introduced game species, both mammals and birds, providing public hunting opportunities. Refer to section J. Other Public Uses below for more details on game species and hunting in Nā Pali-Kona Forest Reserve. DOFAW's Wildlife Program and its partners manage native wildlife conservation efforts, invasive animal issues, and hunting within the Forest Reserves.

Endemic and native animals: The US-ESA lists several endemic species within Nā Pali-Kona Forest Reserve (Appendix 1), including birds, insects, and the Hawaiian hoary bat. Currently, US-ESA critical habitat within the Forest Reserve has only been designated for plants, not animals. Critical habitat for akekeʻe (*Loxops caeruleirostris*), akikiki (*Oreomystis bairdi*), and *Drosophila attigua* has been proposed within the Forest Reserve (US Fish and Wildlife Service 2008) (Appendix 3).

Hawaiian forest birds, having suffered many extinctions, are of particular conservation concern and the Alakaʻi Wilderness Preserve, one of the most remote and least disturbed areas of the Forest Reserve, provides important habitat for Kauaiʻi's rare bird species. Current ranges and planned recovery areas within Nā Pali-Kona Forest Reserve have been mapped for the kāmaʻo (*Myadestes myadestinus*), puaiohi (*Myadestes palmeri*), Kauaʻi ʻōʻō (*Moho braccatus*), and ʻakikiki (*Oreomystis bairdi*) (U.S. Fish & Wildlife 2006). The puaiohi is the subject of a recovery project (U. S. Geological Survey 2005); birds are being bred in captivity at the Maui Bird Conservation Center and Keauhou Bird Conservation Center (on the Big Island), managed by the San Diego Zoo's Institute for Conservation Research and released in the Alakaʻi Wilderness Preserve, where they have been breeding successfully. Other partners involved in this project include DOFAW, USGS, and USFWS.

Hawaiian seabirds also occur in the uplands of Nā Pali-Kona Forest Reserve. The ʻakēʻakē (Band-rumped storm-petrel, *Oceanodroma castro*), ʻaʻo (Newell's Townsend's shearwater,

Figure 9: Na Pali-Kona Forest Reserve - non-native timber plantations (planted from 1962 - 1965)



Legend

- *Cryptomeria japonica*
- *Eucalyptus robusta*
- *Pinus elliottii*
- Mixed pine

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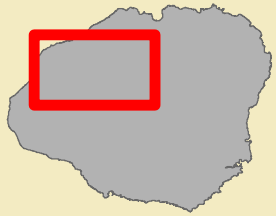
April 2009

0 0.5 1 2 3 4 Miles



Puffinus auricularis newelli) and ʻuaʻu (Hawaiian petrel, *Pterodroma sandwichensis*) all nest at high elevation, inland locations and have been recorded by their calls at areas within the Forest Reserve (N. Holmes, personal communication, unreferenced), mostly on the pali at Nuʻalolo, Awaʻawapuhi, and Honopū. There are also numerous records adjacent to the Alakaʻi Wilderness Preserve on the pali at Wainiha. All three species are are listed by the US-ESA, however only the ʻuaʻu has been mapped by the US-ESA within the boundary of Nā Pali-Kona Forest Reserve.

Native and endemic insects are also present in the forest reserve and three species are currently listed by the US-ESA: the Pacific Megalagrion damselfly (*Megalagrion pacificum*), the Pomace fly (*Drosophila musaphila*), and a moth (*Omiodes monogramma*). Listing of *Drosophila attigua*, a large species of Hawaiian picture-wing fly, has been proposed (US Fish and Wildlife Service 2008). Habitat may also exist for the extremely rare Fabulous green sphinx moth (*Tinostoma smaragditis)*, which has only been found on Kauaʻi and was once thought to be extinct. It is likely there are many other insects and invertebrates that are unique to the Nā Pali-Kona Forest Reserve, however these types of organisms are generally not well studied and it is expected that many remain to be described.

Because Nā Pali-Kona Forest Reserve contains many isolated, high quality streams, it is also home to four endemic aquatic species: a shrimp (ʻoʻpae kalaʻole - *Atyoida bisulcata*) and three goby fishes (ʻoʻopu nakea - *Awaous stamineus*, ʻoʻopu alamoʻo - *Lentipes concolor* and ʻoʻopu nopili - *Sicyopterus stimpsoni*) (Hawaiʻi Gap Analysis Program 2002).

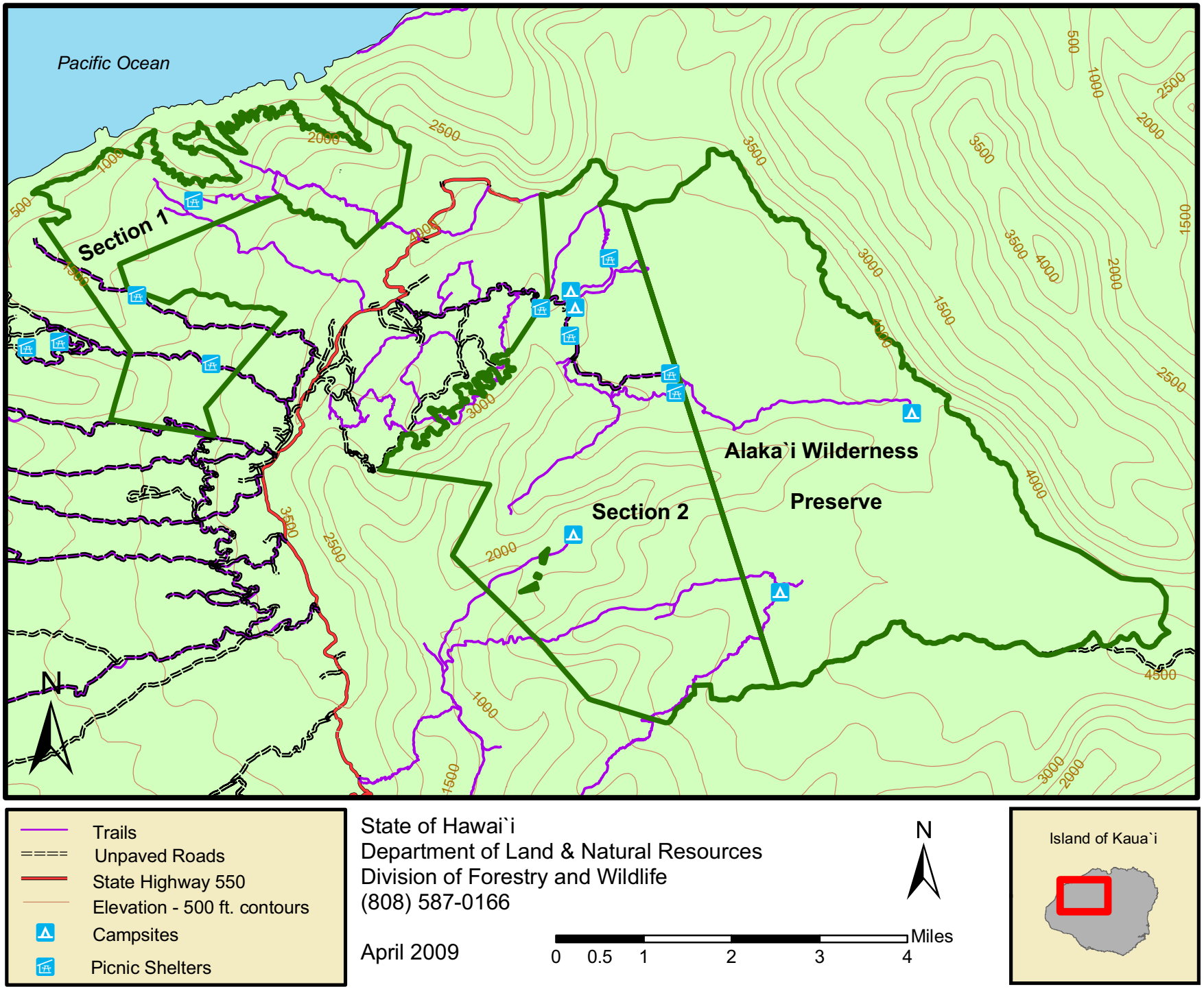
Introduced species: The Forest Reserve also hosts populations of a variety of introduced animals, including birds, mammals, and invertebrates. A variety of birds were observed in the Alakaʻi Swamp area of the Nā Pali-Kona Forest Reserve in a 2004 survey (Appendix 5). This area has a broad representation of both endemic and introduced bird species. Introduced mammals in the Forest Reserve and the Alakaʻi include mice, rats, and feral pigs, goats, deer, cats and dogs. Introduced invertebrates that are considered pests in the area include mosquitoes that carry avian diseases, koa seed predator insects, and slugs that destroy native plants seedlings, to name a few.

F. Access:

Vehicular Access: No major roads lead directly into Nā Pali-Kona Forest Reserve, although there is access from minor roads off Waimea Canyon Drive (State Highway 550), which is paved (Figure 10). For access to Section 1, Mākaha Ridge Road passes through the reserve, providing access to Miloliʻi Ridge Road, a portion of which is in the Nā Pali-Kona Forest Reserve. Four-wheel drive access to Section 2 of the reserve can be reached using Mōhihi-Camp 10 Road. Roads mentioned are periodically maintained by DOFAW.

Trails: Na Ala Hele, the State of Hawaiʻi Trail and Access program, manages several trails (Figure 10) in the Nā Pali-Kona Forest Reserve: Awaʻawapuhi Trail (no amenities), Nuʻalolo Cliffs Trail (shelters, tables), Nuʻalolo Trail (no amenities) and Miloliʻi Vista Trail (shelters) in Section 1; Pihea Trail (camping, parking, shelters, tables), Alakaʻi Swamp Trail (parking, shelter, tables, toilets), Kawaikōī Stream Trail (camping, shelters, tables, toilets), Mōhihi

Figure 10: Na Pali-Kona Forest Reserve access and recreational features



Camp 10 Road (bridges, camping, shelters, tables, toilets), Po‘omau Canyon Lookout Trail (no amenities), Kohua Ridge Trail (no amenities) and Koai‘e Canyon Trail (camping, shelters, tables, toilets) in Section 2. The Mōhihi-Waialae Route (camping, shelters, tables, toilets) extends from Mōhihi-Camp 10 Road into Section 3, the Alaka‘i Wilderness Preserve. Improvements are needed to promote increased hunting access along the portion of this trail that leads to the Waialae Cabin campsite. Other hiking trails maintained by DOFAW include Kekaha Plantation Ditch Trail and Kaluahā‘ula-Waialae trail.

DLNR Emergency Helicopter Landing Zones: Landing zones are present in Section 2 at Lonomea and in the Alaka‘i Wilderness Preserve at Waialae, Drinking Glass, and Koai‘e.

Restricted Watershed: No areas are designated as Restricted Watershed on the island of Kaua‘i.

G. Infrastructure: Infrastructure to support the various public use and resource management programs has been built and maintained over the years.

Campsites: Campsites (Figure 10) consist of five facilities: Kawaikōī, Sugi Grove, and Lonomea campsites in Section 2 and Waialae Cabin and Koai‘e Stream Gauge campsites in the Alaka‘i Wilderness Preserve.

Fences: Excepting plant enclosures, no fences are managed by DOFAW in Nā Pali-Kona Forest Reserve. The KWA has a plan to begin construction of a fence in the eastern Alaka‘i area in 2009 (TNC Hawai‘i Chapter 2008). This fence is intended to protect the Alaka‘i’s unique ecosystem and the rare species found within. The future fence will be approximately 4.48 miles long and will enclose approximately 595 acres of the Alaka‘i Wilderness Preserve, in addition to over 1400 acres of adjacent private land. DOFAW, as a member of the KWA, has assisted in funding this fence and will monitor and assist in its maintenance.

Public restrooms: Composting toilet facilities are available at in Section 2 at Alaka‘i viewpoint, Waiakoali picnic area, and at Kawaikōī, Lonomea, and Sugi Grove campsites. A composting toilet is also available in the Alaka‘i Wilderness Preserve at the Waialae Cabin campsite.

Shelters/Picnic Areas: Sheltered picnic areas (Figure 10) are available in Section 1 at Miloli‘i, Nu‘alolo Cliff Trail and Koki‘o Ke‘o Ke‘o; in Section 2 at Waiakoali, Alaka‘i Viewpoint, and Pihea, and in Section 3 at Mōhihi-Camp 10 and Mōhihi Ditch Trail.

Other: There are five stream gauges located in Nā Pali-Kona Forest Reserve, all of which are maintained by the United States Geological Survey. Gauges are located in Kawaikōī, Waiakoali, and Mōhihi Streams in Section 2 and Waialae and Koai‘e Streams in the Alaka‘i Wilderness Preserve.

H. Archaeological and Historical Sites:

According to Wendell Clark Bennett's survey of 1928-29, there are two archaeological sites located on the border of the current forest reserve and the Nā Pali Coast State Park: sites 192 and 193, both of which are house sites with accompanying taro terraces in Nu'alolo Valley. There is one site from Bennett's survey within the current boundaries of the mauka section of Nā Pali-Kona Forest Reserve; site 38, which is an irrigation ditch located to the north of the Koai'e River (Bennett 1931).

A 1993 archaeological reconnaissance survey of Koke'e discusses some of the ridge roads in the makai section of Nā Pali-Kona Forest Reserve (McMahon 1993). These roads generally pass from Koke'e State Park through Nā Pali-Kona Forest Reserve and into Pu'u Ka Pele Forest Reserve. This survey found ti plants along Kauhao Ridge Road and recommended further surveying. Other sites nearby the current forest reserve are discussed briefly in the previous section D. Pre-Reserve and Early Use History.

Historical sites currently located in Nā Pali-Kona Forest Reserve include the Koke'e Ditch and the Waialae Cabin. The Koke'e Ditch irrigation system was constructed between 1923 and 1926 to supply irrigation water to upland sugar plantations in west Kaua'i (Wikipedia contributors 2006). The Mōhihi portion of the ditch, which diverted water from Mōhihi Stream, is now abandoned (Hawai'i State Department of Agriculture 2003). The Civilian Conservation Corps (CCC) constructed the Waialae Cabin in the 1930s. In the past, the US Geological Survey used the cabin when maintaining stream gauges in the area; currently, it is for DOFAW use only.

I. Other Public Uses:

Hunting: General hunting regulations can be found in HRS Title 13 Chapter 121. Nā Pali-Kona Forest Reserve contains all four Game Animal management classes (Figure 7C) according to DOFAW's Draft Management Guidelines: A-1: Game Production, A-2: Mixed Game and Other Uses, A-3: Game Control (public), and A-4: Game Control (supervised). In A-1 areas, game management is a primary objective; hunting seasons and bag limits provide maximal sustained public hunting opportunities and benefits and include Game Management Areas. In A-2 areas, game management is an objective integrated with other uses. Habitat may be manipulated for game enhancement and game populations are managed to acceptable levels using public hunting. In A-3 areas, resource protection is the primary objective, with emphasis on native plant communities and watersheds. Seasons and bag limits are designed for public hunting to reduce impacts to native resources. A-4 areas are designated for animal removal only by staff or agency designees due to environmental sensitivity, remoteness, or public safety.

DOFAW's Wildlife Program regulates game mammal hunting according to HRS Title 13 Chapter 123. Public hunting areas, designated as Units, are described in §13-123-15 and mapped in Chapter 123 Exhibit 2. Section 1 of Nā Pali-Kona Forest Reserve lies entirely within Unit H, Section 2 lies within Unit E to the north and south and within Unit B in between, and Section 3, the Alaka'i Wilderness Preserve, lies entirely within Unit E. Game mammals include feral pigs (*Sus scrofa scrofa*), feral goats (*Capra hircus hircus*), and Columbian black-tailed deer (*Odocoileus hemionus columbianus*).

DOFAW's Wildlife Program regulates game bird hunting according to HRS Title 13 Chapter 122. Public game bird hunting areas on Kaua'i, also designated as Units, are described in §13-122-11.6 and mapped in Chapter 122 Exhibit 12. Section 1 of Nā Pali-Kona Forest Reserve lies entirely within Unit H and Section 2 lies within Unit B between Mōhihi Stream and Waialae Stream. No game bird hunting is permitted in the Alaka'i Wilderness Preserve. Game birds on Kaua'i include Ring-necked pheasant (*Phasianus colchicus*), Green pheasant (*Phasianus versicolor*), White-winged pheasant (*Phasianus colchicus* subspecies), Erckels' francolin (*Francolinus erckelii*), Japanese quail (*Coturnix coturnix japonica*), Chuckar partridge (*Alectoris chukar*), Gray francolin (*Francolinus pondicerianus*), Black francolin (*Francolinus francolinus*), Barred dove (*Geopelia striata*), and Spotted dove (*Streptopelia chinensis*).

Information regarding current seasons and bag limits for all game species can be obtained by contacting the DLNR Lihue office at 3060 Eiwa Street, Room 306, Lihue, Hawai'i 96766; phone (808) 274-3433.

Camping: Camping is allowed in Nā Pali-Kona Reserve on a permit basis at official campsites only (Figure 10) and is regulated by Hawaii Administrative Rules (HAR) §13-104-19. Permits for Kawaikōī, Sugi Grove, Koai'e, Waialae, and Lonomea campsites are available from the DLNR Lihue office.

Fishing: Fishing for 'o'opu is permitted in the Koai'e and upper Waiakoali streams. Fishing for trout, where present, is permitted when in season. Information regarding current seasons and limits for fish can be obtained by contacting the DLNR Lihue office.

Hiking: Numerous opportunities exist for hiking in Nā Pali-Kona Reserve. See Section F: Access above for trails information.

Horseback Riding: Horseback riding is allowed on Camp 10 Road, Miloli'i Vista Trail, and Koai'e Canyon Trail.

Dirt Bikes, All Terrain Vehicles (ATVs) and Mountain Bikes: Dirt bikes are allowed on Camp 10 Road if registered by the County Division of Motor Vehicles. ATVs are not allowed in Nā Pali-Kona Reserve. Mountain bikes are allowed on Camp 10 Road and Miloli'i Vista Trail.

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

a. *Passiflora mollissima* (banana poka) vines
b. Eucalyptus firewood
c. Ferns
d. Flowers
e. Fruits
f. *Psidium* spp. (guava) poles
g. *Alexia oliviformis* (maile)

h. *Melicope anisata* (mokihana)
i. *Pinus* spp. (pine) cones & boughs

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, endangered, or other equally rare species may be allowed if individuals have obtained a special permit from the DLNR Administrative office in Honolulu. Harvesting permits are required for gathering firewood, maile, and greenery for floral arrangements. Permit applications for gathering plant material can be obtained from the DLNR Lihue office at 3060 Eiwa Street, Room 306, Lihue, Hawai‘i 96766; phone (808) 274-3433. These permits are available, upon approval, free (for common personal use items) of charge or at a fee, depending on the purpose. Public Use Permits available in conjunction with the Forest Reserve System are described in HAR §13-104.

Picnicking: Eight open shelters with picnic tables exist in Nā Pali-Kona Forest Reserve. They are available for day use without a permit or can be reserved with a permit. See Section G: Infrastructure above for more information.

General Recreation - Nā Pali-Kona Forest Reserve contains two of four possible Recreation management classes (Figure 7D) according to DOFAW's Draft Management Guidelines: R-2 and R-4. The majority of the Nā Pali-Kona Forest Reserve (Sections 1, 2, and part of the Alaka‘i Wilderness Preserve) is classified as R-2, Medium Use Areas, where outdoor recreation is limited, controlled, or integrated with other uses. Facilities in these areas are not highly developed and include trails, rustic shelters, or unimproved campsites. All of Section 3, the Alaka‘i Wilderness Preserve is classified as R-4, consisting of Restricted Areas where outdoor recreation is heavily restricted or controlled, if permitted at all and where trails are the main feature considered. R-4 areas may be classified "restricted" due to hazardous conditions, fragile ecosystems, limited accessibility or other management practices incompatible with recreational activities. Refer to the previous Sections G: Access and H: Infrastructure for more detailed information on recreational facilities in Nā Pali-Kona Forest Reserve.

J. Threats:

Threats to Nā Pali-Kona Forest Reserve are varied, and include alien plants, plant disease, insects, and introduced animals. This Forest Reserve contains high quality and unique native ecosystems - minimizing these threats is essential to maintain these areas.

Invasive plants often out-compete native plants and may even cause a complete replacement of a previous native ecosystem; relevant examples include *Miconia calvescens* in Tahiti and strawberry guava (*Psidium cattleianum*) in Hawai‘i. Other negative effects of invasive plants include species extinctions, loss of habitat and food sources for native birds and insects, loss of ecosystem diversity, increased fire risk, and increased soil erosion, which can lead to stream and coral reef ecosystem damage. Possible human sources of plant invasions at Nā Pali-Kona Forest Reserve include hikers, hunters, and vehicles on trails and roads, as well as

gardens at the nearby cabins at Koke‘e. Non-human sources of invasive plants include pigs, birds, and wind, all of which can spread seed.

Plant disease is also a concern for Nā Pali-Kona Forest Reserve. Two diseases that are of particular concern are ‘ōhi‘a rust and koa wilt. ‘Ōhi‘a rust (*Puccinia psidii*) was found to be widespread throughout the State shortly after its discovery in Hawai‘i in 2005 (Killgore and Heu 2007). In addition to native ‘ōhi‘a, this fungus has a wide host range; the Hawai‘i Department of Agriculture has imposed a quarantine to restrict the importation of all plants and plant parts from the family Myrtaceae from areas known to be infested with ‘ōhia rust in an attempt to reduce the risk of importation of new strains. Movement of Myrtaceae between islands is also discouraged. Koa wilt (putative *Fusarium oxysporum*) has also been observed on Kaua‘i (Friday and Dudley 2007). This potentially fatal fungal disease is especially prevalent below 2,500 feet altitude and can be spread via infected plants and seed, and contaminated equipment such as tires, boots, and pruning tools. Research is underway in Hawai‘i to identify wilt resistant trees.

Invasive animals are also a major threat to native ecosystems in the Forest Reserve. Feral ungulates, including pigs, goats, deer, and cattle will disturb ground cover and may cause erosion. The spectacular views of Waimea Canyon erosion are partially a result of high goat populations. Pigs spread seeds of exotic plants in their feces and create wallows that provide breeding areas for mosquitoes. *Culex quinquefasciatus,* a mosquito that was introduced to Hawai‘ì in the 1800s, is the usual vector of avian malaria (*Plasmodium relictum)* and avian pox (*Poxvirus avium*). These two diseases have been extremely detrimental to Hawaiian birds, especially at low and mid elevations. Other invasive insect pests that may threaten the Forest Reserve include *Myoporum* thrips, which are a pest on species similar to naio; *Erythrina* gall wasp (*Quadrastichus erythrinae*), a serious recent pest of wiliwili; koa seed predators (*Araecerus levipennis* and *stator* spp. and *Cryptophlebia illepida*); and *Vespula* spp. wasps, which are voracious predators of native insects and are aggressive to humans. Introduced birds provide competition for native birds, are a reservoir for disease, and disperse non-native seeds. Although Kaua‘i has remained free of the Indian mongoose (*Herpestes auropunctatus*) and therefore has more ground nesting birds than other Hawaiian Islands, rats and feral cats and dogs prey on native birds, reducing their numbers.

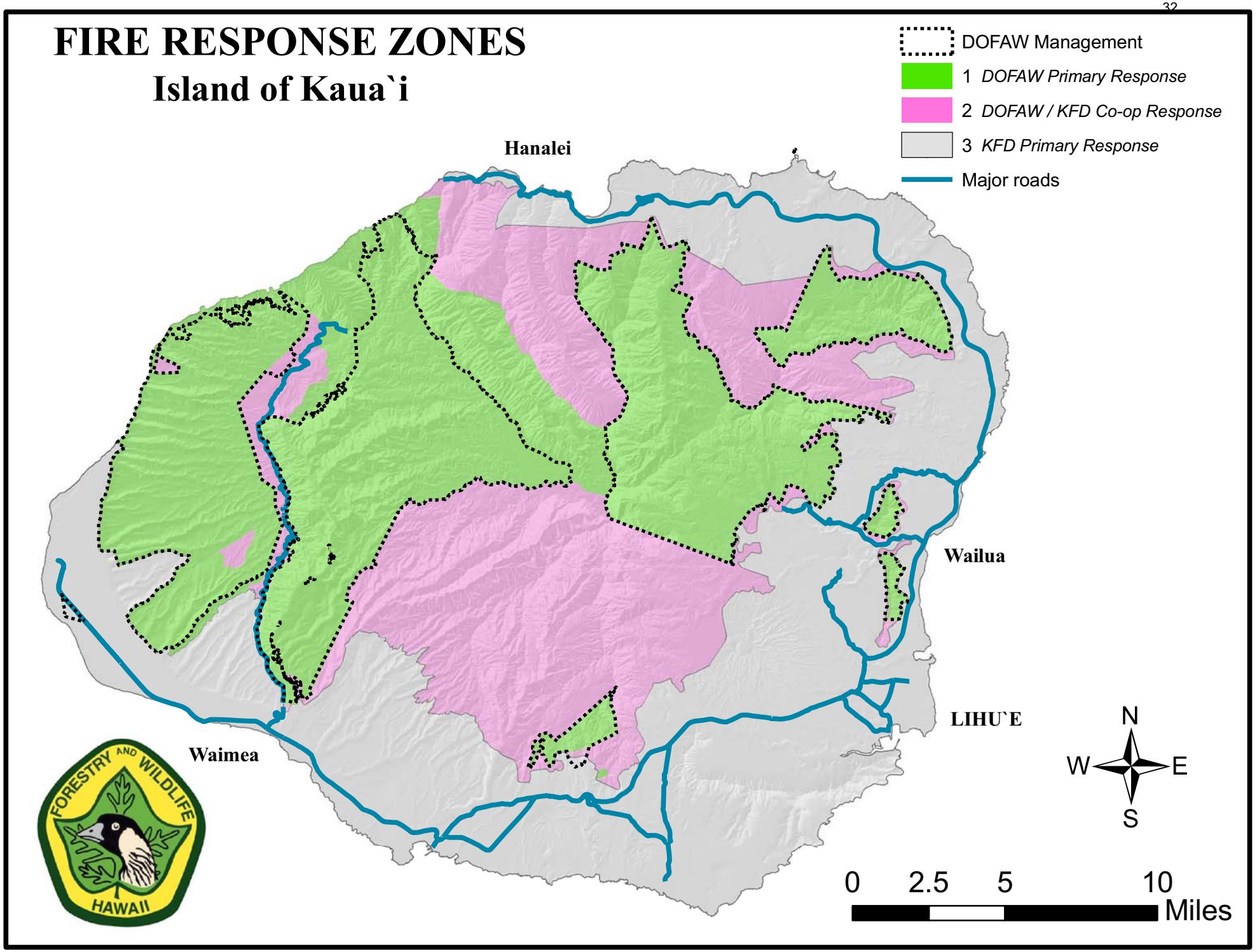
Few, if any, ecosystems in Hawai‘i are adapted to fire. Fire risk is often higher where non-native vegetation predominates; these fires, however, can spread. Fire is usually not a major threat in Nā Pali-Kona Forest Reserve due to its wet environmental conditions. Figure 11 shows fire response zones and jurisdictions for the island of Kaua‘i.

K. 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.

Figure 11: Fire response zones for the island of Kaua`i



Revenue in the Nā Pali-Kona Forest Reserve comes primarily from the sale of forest products in the form of downed logs as per HRS §183-16. Potential income-generating projects could include harvest of existing timber plantings and salvage of dead/damaged koa. Opportunities exist for income from commercial trail use by ecotourism companies; Nu‘alolo and Awa‘awapuhi trails are available for this purpose. All camping in the forest reserve is currently free of charge, but fees are being considered.

III. MANAGEMENT

A. Past Planning:

The Kaua‘i Branch of the DLNR Division of Forestry completed a management plan for Nā Pali State Forest Management Area in 1970. At the time, major management considerations listed were: “watershed protection, the improvement of vegetative cover for wildland recreation, erosion control, game management, and where applicable, preservation of native flora and fauna”. Recommendations to purchase adjacent private lands were made to ensure future management continuity. Plans included further establishment of picnic areas, campgrounds, and hiking trails, but prohibited road construction and cabin or housing type development. Commercial timber sites were noted to exist in the reserve, but plans were to manage only for wilderness type use rather than for commercial timber resources. Damage in valleys and lowland areas due to grazing, feral ungulates, and the burning of land for pasture were noted, along with accompanying noxious plant problems and the ongoing establishment of “desirable plants and trees for wildland recreation and protection purposes.” Interesting points in this plan included completely phasing out grazing and associated leases, designation of smoking areas, specification that no planting would be done for timber production purposes, and discussion surrounding the possible re-establishment of a controlled pig population in Kalalau Valley.

The 2005 Kaua‘i Watershed Management Plan was compiled by the Kaua‘i Watershed Alliance (KWA) in an effort to coordinate the major landowners of the Kaua‘i watershed in its management. The KWA includes Department of Water of the County of Kaua‘i, Grove Farm Company Inc., Kamehameha Schools, Kaua‘i Ranch LLC, Lihu‘e Land Company, McBryde Sugar Company Ltd., Namahana Farms, the National Tropical Botanical Garden Princeville in Hanalei, and DLNR. Portions of the Nā Pali-Kona Forest Reserve are included both in the plan's Core1 (East Alaka‘i A4) and Core 2 (East and West Alaka‘i A3, Kōke‘e Mesic Areas, and Kohua Ridge A2 & A3) management areas. Programs in this plan, whose budget extends to 2011, include ungulate management, weed management, and watershed monitoring. As part of the weed management portion of this plan, GIS maps were developed for distribution of Kahili ginger, Australian tree fern and strawberry guava in the Kaua‘i watershed. Partners in this effort include the Nature Conservancy (TNC), the Koke‘e Resource Conservation Program (KRCP), the Kaua‘i Invasive Species Council (KISC), and DOFAW. KRCP has an ongoing volunteer program that performs weeding according to KWA’s GIS mapping effort.

The U.S. Fish and Wildlife Service (USFWS) has been working with many partner agencies to develop and update the Revised Recovery Plan for Hawaiian Forest Birds, the latest

version of which was published in 2006. This statewide planning effort has been going on for over 20 years and seeks to address the recovery of 21 taxa of forest birds in Hawai‘i. A prior USFWS plan, Kaua‘i Forest Birds, was published in 1983.
KISC published a 2007 Action Plan that seeks to address invasive species issues on an island-wide basis. Target species for control include both plants and animals, and emphasis is placed on early detection through efforts such as the creation of a plant prevention field guide, roadside surveys, workshops, and public awareness through community education and specific topics to target audiences.

The Plant Extinction Prevention (PEP) program seeks to address the declining trend of PEP species by implementing recovery actions such as monitoring and collecting the seeds, fruit, or vegetative cuttings of each individual of a PEP species. The objectives described attempt to preserve the genetic variability represented by all of the remaining individuals of the species within these areas. The PEP program is presently compiling the Kaua‘i list that will prioritize actions for species restoration on island.

B. Summary of Existing Management Activities:

Management of the Forest Reserve System is guided by HAR Title 13, Chapter 104, Activities within Forest Reserves, which includes subchapters 1: General Provisions, 2: Public Use, and 3: Permits.

In 1964, the Board of Land and Natural Resources established Regulation 2: Concerning the Establishment, Regulation and Protection of Alaka‘i Wilderness Preserve, Island of Kaua‘i “for the purpose of preserving, protecting and conserving all manner of flora and fauna”. Regulation 2 set provisions for the Alaka‘i Wilderness Preserve additional to those of Regulation 1 of the current Division of Forestry. In 1979, Act 216, SLH 1979 mandated that the Rules of Practice and Procedure of the Division of Forestry and Wildlife be converted into a format common to all State rules. In 1981, Regulation 2 was repealed and replaced by HAR Title 13 Chapter 3, which in addition to the provisions of Chapter 104 (Activities within forest reserves), includes the following restrictions for the Alaka‘i Wilderness Preserve:

1. The introduction of lantana (*Lantana camara*), black wattle (*Acacia decurrens*), firetree (*Myrica faya*), blackberry (*Rubus penetrans*), or any other plants or animals deemed objectionable is prohibited;
2. Mining, grazing of horses, cattle, or any other domestic animal is prohibited;
3. There shall be no clearing, or construction of buildings, vehicular roads, or horse trails except as necessary in emergencies involving human safety, fire or the like, or as needed to effectuate plant or animal eradication programs or similar projects beneficial to the area;
4. Overnight camping is prohibited, except at the Koai‘e camp and the Waialae camp.

Currently, management is guided by DOFAW’s 2001 Draft Management Guidelines, as described above in their applicable sections. A more detailed description of these guidelines may be found online at http://hawaii.gov/dlnr/dofaw/guidelines.

C. Management Objectives and Goals:

In the Draft Umbrella Management Plan for each Branch of the Division, 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)
- Threatened and Endangered (T&E) Species Management (Federally listed, 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 4 is based on an excerpt from the Kaua‘i Forest Reserves Draft Umbrella Management Plan and lists qualitative rankings of the management priority categories for Nā Pali-Kona Forest Reserve and for the Alaka‘i Wilderness Preserve, which although still a part of the Nā Pali-Kona Forest Reserve, is generally treated as a separate management unit.

Table 4: Nā Pali-Kona Forest Reserve and associated management priority categories.

Forest Reserve Section Name	Resource Protection	Watershed Values	Invasive Species Control	T&E Species Mgmt.	Native Ecosystems	Game Animal Mgmt.	Commercial Activity	Additional Public Activity
Nā Pali-Kona	6	1	4	2	3	5	8	7
Alaka‘i Wilderness Preserve	6	2	4	3	1	5	8	7

Table 5 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 5 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 reducing animal populations by increasing public hunting.
    b. Maintaining a healthy ecosystem will promote watershed recharge; structured monitoring to assess impacts will be implemented.

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 presuppression is focused on maintenance of firebreaks, buffers, and access roads and trails.
    b. Promoting fire safety awareness, closing areas as needed, and posting signs address public fire safety.
    c. Maintaining a prepared and well-equipped firefighting force optimizes fire response.
    d. DOFAW wishes to cooperate with agencies seeking to conduct disease and pathogen research that focuses on problems within the Forest Reserve.
    e. DOFAW supports an increased DOCARE enforcement presence to address illegal activity in the Forest Reserve.

3. **Invasive Species Control:** Control of both incipient and established plants and animals.
    a. Invasive plant control is focused on conducting regular ground and aerial surveys, continuing work with KRCP and volunteers, and supporting biological control efforts. Support efforts to prevent establishment of potential ecosystem changing invasive species.
    b. Invasive animal control is focused on the detection and reduction of rodent and feral cat populations.

4. **Threatened, Endangered, and Rare Species Management:**
    a. Rare plant conservation is focused on protecting and enhancing populations of extant species by monitoring wild populations, collecting propagation materials for ex situ propagation and/or seed storage, surveying appropriate areas for additional populations, mitigation of threats as needed (fenced exclosures, feral animal control, alien weed suppression), and reintroduction of individuals in appropriate protected areas within and outside of the Forest Reserve.
    b. Rare animal conservation consists of protecting native forest birds (puaiohi recovery project and Kaua‘i forest bird surveys), surveying for native sea bird nesting sites and working with the Hawai‘i Bat Research Cooperative (HBRC) to conserve Hawaiian Hoary Bats.

5. **Native Ecosystem Management:** Native habitat protection and restoration is focused on protecting portions of the Alaka‘i by working with KWA on fencing and supporting research projects that address ecosystem issues specific to the Forest Reserve.

6. **Game Animal Management:** Game animal management is centered on providing basic public hunting opportunities, conducting special hunts as needed, and conducting annual animal surveys. Hunting rules are currently under revision to increase access and remove bag limits in sensitive areas. More intensive ungulate removal measures are being considered for remote areas of the Alaka‘i Wilderness Preserve, especially within KWA management areas. In conjunction, these actions may contribute to increased protection of native ecosystems and watershed values.

7. **Commercial Activity:** Commercial use of the Forest Reserve is relatively minor and is generally focused on timber products and ecotourism.
    a. Conducting inventory of salvage logs and evaluating permit requests for collection.
    b. Determining trails suitable for ecotourism.

8. **Additional Public Activity:** Nā Pali-Kona Forest Reserve provides basic recreational opportunities such as camping and hiking, collection of non-timber forest products, as well as other uses that are evaluated on a case-by-case basis.

Table 5: Management objectives and associated plans for Nā Pali-Kona Forest Reserve. Estimated cost refers to State funds.

Management Priority	General Management Action	Tactical Goals	Action Items	Estimated Cost
Watershed Values	**Reduce the threat and impact of erosion on reserve resources**	**A**. Reduce ungulate populations.	Increase public hunting in Alakaʻi WP.	Management and staff costs only
	Monitor watershed and ecosystem health	**A.** Conduct regular ecosystem monitoring to assess impacts of threats	Implement threat monitoring by accompanying wildlife staff on surveys along established forest bird transects	Management and staff costs only
Resource Protection	**Reduce the threat and impact of fire on reserve resources**	**A.** Maintain existing firebreaks, buffers, and access roads and trails.	• Repair Alakaʻi swamp trail boardwalk. • Maintain Camp 10 and Miloliʻi roads.	• $150,000 • $25,000/yr
		B. Notify public of safety issues and areas open/closed to public use in order to reduce risk to public users and staff.	As needed determined by the Hawaiʻi fire danger rating system or other catastrophic events.	Management and staff costs only
		C. Maintain public awareness with condition notifications and signs.	• Determine sign locations. • Design and purchase signs.	• $10,000
		D. Maintain a prepared firefighting force.	• Continue annual firefighter safety training. • Update fire equipment.	• Management and staff costs only • $60,000/yr
	Reduce the threat and impact of insects and disease on reserve resources	**A.** Work with other agencies and institutions to identify research projects that would address threat management specific to Nā Pali-Kona FR.	Monitor area (ground and aerial) for incipient threats.	• $20,000/yr
	Increase enforcement support	**B.** Work with DOCARE to increase enforcement presence.	Support increase of enforcement personnel.	Management and staff costs only

Management Priority	General Management Action	Tactical Goals	Action Items	Estimated Cost
Invasive species control	**Reduce degrading impacts of biological agents (native and non-native) on reserve resources**	**A.** Conduct ongoing surveys (ground and aerial) of entire forest reserve for populations of invasive plant species.	• Australian tree fern, *Sphaeropteris cooperi* • Kahili ginger, *Hedychium gardnerianum* • Strawberry guava, *Psidium cattleianum* • Blackberry, *Rubus argutus* • Karakaranut, *Corynocarpus laevigatus* • Fayatree, *Morella faya* • Black wattle, *Acacia mearnsii* • Blackwood acacia, *Acacia melanoxylon* • Beardgrass, *Schizachyrium condensatum* • Daisy fleabane, *Erigeron karvinskianus* • Lantana, *Lantana camara* • Olive, *Olea europaea ssp. africana* • Koster's curse, *Clidemia hirta* • Silk oak, *Grevillea robusta* • Pride of India, *Melia azedarach* • Sacramento bur, *Triumfetta semitriloba* • Java plum, *Syzygium cumini* • Vasey grass, *Paspalum urvillei* • Palmgrass, *Setaria palmifolia* • Glorybush, *Tibouchina herbacea* • Butterfly bush, *Buddleia madagascariensis* • Japanese honeysuckle, *Lonicera japonica* • Banana poka, *Passiflora mollissima* • Rush, *Juncus planifolius* • Carpetgrass, *Axonopus fissifolius* • Yellow-eyed grass, *Xyris complanata*	$20,000/yr
		B. Control target populations of invasive plant species in the FR	• Cooperation between DOFAW, the KRCP, and volunteers. • Specific targets are Australian tree fern, strawberry guava, blackberry, kahili ginger, palmgrass, lantana, and banana poka in Section 2 and the Alaka'i WP	$60,000/yr
		C. Continue support of biological control efforts	• Banana poka • Strawberry guava • Clidemia • Kahili ginger • Blackberry?	Management and staff costs only
		D. Control feral cat and rodent populations where necessary	Purchase necessary supplies (traps, baits) and conduct monitoring	$25,000/yr

Management Priority	General Management Action	Tactical Goals	Action Items	Estimated Cost
T&E and Rare Species Management	**Protect occurrences of listed and rare plants**	**A.** Protect rare plant species by fencing existing populations – construct and maintain fences within the FR	*Alsinidendron viscosum* *Astelia waialeale* *Diellia pallida* *Exocarpus luteolus* *Geranium kauaiense* *Hibiscadelphus distans* *Hibiscus kokio ssp saintjohnianus* *Isodendrion longifolium* *Kokia kauaiensis* *Keysseria erici* *Keysseria helenae* *Lipochaeta fauriei* *Platanthera holochila* *Dubautia waialealae* *Dubautia latifolia* *Labordia pumila* *Labordia helleri* *Lysimachia daphnoides* *Lysimachia kalalauensis* *Phyllostegia wawrana* *Phyllostegia helleri* *Melicope degeneri* *Melicope puberula* *Melicope haupuensis* *Melicope pallida* *Alectryon micrococcus* *Asplenium schizophyllum* *Bonamia menziesii* *Chamaesyce halemanui* *Delissea niihauensis spp. kauaiensis* *Doryopteris angelica* *Euphorbia haeleeleana* *Eurya sandwicensis* *Flueggea neowawraea* *Hedyotis st.-johnii* *Joinvillea ascendens* *Lepidium serra* *Munroidendron racemosum* *Myrsine knudsenii* *Myrsine linearifolia* *Nothocestrum peltatum* *Lanicum beecheyi* *Platydesma rostrata* *Poa mannii* *Poa siphonoglossum* *Psychotria hobdyi* *Pteralyxia kauaiensis* *Remya kauaiensis* *Remya montgoneryi* *Schiedea apokremnos* *Schiedea helleri* *Schiedea membranacea* *Schiedea stellariodes* *Schiedea spergulina* *Schiedea viscose* *Spermolepis hawaiiensis* *Stenogyne campanulata* *Xylosma crenatum*	$100,000/yr

Management Priority	General Management Action	Tactical Goals	Action Items	Estimated Cost
		B. Collect, store, and propagate genetic material (seeds, cuttings, and air layers) of rare plant species	See list from **A.** (above)	$10,000/yr
		C. Out plant rare plant progeny in protected areas within their historic ranges outside Nā Pali-Kona FR	See list from **A.** (above)	$45,000/yr
	Protect listed and rare animals	**A.** Protect and enhance native forest bird populations	• Continue puaiohi recovery project • Continue Kauaʻi forest bird surveys	• $150,000/yr • $25,000/yr
		B. Protect and enhance known native sea bird populations	Continue surveys for nesting sites	$10,000/yr
		C. Work with HBRC biologists to conserve Hawaiian hoary bats	• Assist in identifying monitoring sites • Assist in data collection as needed	Management and staff costs only
Native Ecosystems	**Protect and expand the extent of native dominated ecosystems**	**A.** Protect portions of the Alakaʻi swamp	• Monitor KWA fencing in the NE portion of the Alakaʻi plateau • Assist KWA in the monitoring of ungulate movement	Management and staff costs only
		B. Work with other agencies and institutions to identify research projects that would address native species management needs specific to Nā Pali-Kona FR	• National Tropical Botanical Garden • US Fish and Wildlife Service • The Nature Conservancy • Kauaʻi Watershed Alliance • Kokeʻe Resource Conservation Program • US Department of Agriculture • Kauaʻi Invasive Species Committee And others	Management and staff costs only
Game Animal Management	**Provide public hunting opportunities**	Provide regular hunting under Chapter 123	• Pursue year-round hunting and elimination of bag limits in Alakaʻi WP • Collect harvest data	Management and staff costs only
		Conduct special hunts as needed	Change hunting units, bag limits or seasons as needed within specific areas	Management and staff costs only
		Conduct annual animal surveys	Train personnel to recognize browse and wallow areas	$5000
Commercial Activity	**Provide opportunities for salvage timber collection**	Conduct necessary inventories and scaling of salvageable logs	Issue permits for collection of logs, on approval	Management and staff costs only
	Provide opportunities for eco tour operators to use trails within Nā Pali-Kona FR	Determine which trails are eligible for commercial use	• Nuʻalolo Trail • Awaʻawapuhi Trail	Management and staff costs only
Additional Public Activity	**Provide high quality recreational opportunities**	Provide camping opportunities	Issue camping permits for official camping sites	Management and staff costs only
	Maintain and develop infrastructure	Camping and picnic site maintenance	• Camping sites: Kawaikōī, Sugi Grove, Lonomea, Waialae Cabin and Koaiʻe Stream Gauge • Picnic sites: Miloliʻi, Nuʻalolo Cliff Trail, Kokiʻo Keʻo Keʻo, Waiakoali, Alakaʻi Viewpoint, Pihea, Mōhihi-Camp 10 and Mōhihi Ditch Trail	$45,000

Management Priority	General Management Action	Tactical Goals	Action Items	Estimated Cost
	Provide opportunities for other public uses	Issue special use permits for research, events, cultural uses, etc.	Evaluated as requested.	Management and staff costs only
		Provide access to non-timber resources for non-commercial use.	Issue personal collection permits for items such as: • *Passiflora mollissima* (banana poka) vines • Eucalyptus firewood • Ferns • Flowers • Fruits • *Psidium* spp. (guava) poles • *Alexia oliviformis* (maile) • *Melicope anisata* (mokihana) • *Pinus* spp. (pine) cones & boughs Others where appropriate	Management and staff costs only

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. Initial measures of success that may be applicable to the Nā Pali-Kona Forest Reserve include:

- Miles of trail maintenance
- Miles of unpaved access road maintenance
- Number of volunteer service projects
- Number of game birds harvested
- Number of game mammals harvested
- Number of commercial trail tours
- Number of commercial trail tour patrons
- Number of commercial trail operator permits issued
- 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
- Acres of enclosure maintained
- Number of rare, threatened, or endangered plant/animal species protected
- Number of special use permits issued
- Number of appurtenant features maintained

IV. FUTURE RECOMMENDATIONS

A. Desired Outcome for the Forest Reserve:

The lands that encompass Nā Pali-Kona Forest Reserve are unique in the State of Hawai‘i, comprising a broad range of ecosystems. Especially distinctive is Hawai‘i’s only Wilderness Preserve, the Alaka‘i Wilderness Preserve. This area contains the greatest proportion of intact ecosystems on Kaua‘i; it is an extreme environment that is arguably the wettest on Earth. Many rare plants and animals inhabit the Nā Pali-Kona Forest Reserve; Kaua‘i has a high level of endemism and some species are unique only to the Forest Reserve. Because of these special conditions, continued maintenance of Highest Quality Native Ecosystems habitat areas and the accompanying healthy watershed are essential. Protection of high quality native forest within the Alaka‘i Wilderness Preserve can be accomplished with additional ungulate fencing that ties into the KWA fenceline. Relatively undisturbed montane wet forest, montane wet cliff forest, and unique Kaua‘i bogs in the areas of Halehaha, Halepa‘akai, Koali peak, and Drinking Glass that lie west of the KWA fenceline would be ideal for additional watershed protection. High quality mesic forest sites exist on the north-facing slope of the back of Koai‘e canyon that also warrant additional protection and should be considered for their watershed value.

Maintenance of the forest and the watershed are inseparable and provide both protection for native species and the water supply for residents of Kaua‘i. Strategies for this objective include protecting threatened, endangered, and rare plant and animal species, preservation of critical habitat in cooperation with the US-ESA, removal of incipient invasive species, control of forest pathogens, and management of hunting to reduce ungulate presence in the area. Public access to these State lands is also important; current guidelines providing limited, controlled, and in some cases, restricted access to the simple facilities in Nā Pali-Kona Forest Reserve should continue.

B. Future Recommendations

Future recommendations for Nā Pali-Kona Forest Reserve include wide-ranging strategies to provide continued protection to rare species and the watershed that supports them. Financial recommendations consist of securing funds to enhance watershed values and preserve the water supply for Kaua‘i; this includes enhanced manpower and the creation of positions, especially in the field. Recommendations for field activities include providing research opportunities that are beneficial to management goals, securing habitat designation for rare species not currently protected, and further out plantings of threatened, endangered, and rare plant species. DOFAW staff would also like to support the increase of enforcement personnel for improved resource protection. This plan is intended to be reviewed and updated every five to ten years, both to update management planning and to serve as a timely tool for budget requests.

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VII. APPENDICES

Appendix 1: Threatened, endangered, and rare plant and animal species that have been sighted within Nā Pali-Kona Forest Reserve

Appendix 2: Plant species for which critical habitat exists in Nā Pali-Kona Forest Reserve

Appendix 3: Proposed additions to listed species and critical habitat in Na Pali-Kona Forest Reserve

Appendix 4: Invasive plant species that are already present in or are imminent threats to the Nā Pali-Kona Forest Reserve

Appendix 5: Bird species observed in recent surveys of the Alakaʻi swamp area

Appendix 1: Threatened, endangered, and rare plant and animal species that have been sighted within Nā Pali-Kona 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)
Alsinidendron lychnoides
Alsinidendron viscosum
Asplenium schizophyllum
Astelia waialeale
Bobea timonioides (‘ahakea)
Bonamia menziesii
Caesalpinia kavaiensis (uhiuhi)
Canavalia napaliensis (‘awikiwiki, puakauhi)
Canavalia pubescens (‘awikiwiki, puakauhi)
Chamaesyce atrococca (‘akoko, koko, kokomalei)
Chamaesyce eleanoriae (‘akoko, koko, kokomalei)
Chamaesyce halemanui (‘akoko, koko, kokomalei)
Chamaesyce remyi var kauaiensis (‘akoko, koko, kokomalei)
Chamaesyce remyi var remyi (‘akoko, koko, kokomalei)
Cheirodendron dominii (‘olapa)
Ctenitis squamigera (pauoa)
Cyanea recta (‘oha, haha, ‘oha wai)
Cyperus rockii *
Cyrtandra cyaneoides (ha‘iwale, kanawao ke‘oke‘o)
Cystopteris douglasii
Delissea niihauensis ssp kauaiensis (‘oha, haha, ‘oha wai)
Delissea rivularis (‘oha, haha, ‘oha wai)
Diellia pallida
Diplazium molokaiense
Dissochondrus biflorus
Doodia lyonii
Doryopteris angelica
Dryopteris glabra var. *pusilla*
Dubautia imbricata ssp acronaea (na‘ena‘e)
Dubautia knudsenii ssp knudsenii (na‘ena‘e)
Dubautia knudsenii ssp nagatae (na‘ena‘e)
Dubautia laevigata (na‘ena‘e)
Dubautia latifolia (na‘ena‘e)
*Dubautia microcephala (*na‘ena‘e)
Dubautia plantaginea ssp *magnifolia* (na‘ena‘e)
Euphorbia haeleeleana (`akoko, koko, kokomalei)
Eurya sandwicensis (anini, wanini)
Exocarpos luteolus (heau)
Flueggea neowawraea (mehamehame)
Geranium kauaiense (hinahina, nohoanu)
Gouania meyenii
Hedyotis elatior
Hedyotis tryblium
Hibiscadelphus distans (hau kuahiwi)
Hibiscus kokio ssp *saintjohnianus* (koki‘o ‘ula‘ula)
Huperzia mannii
Isodendrion laurifolium (aupaka)
Isodendrion longifolium (aupaka)
Joinvillea ascendens ssp *ascendens* (‘ohe)
Kauai diverse lowland mesic forest
Kokia kauaiensis (koki‘o)
Labordia helleri (kamakahala)
Lagenifera erici
Lepidium serra (‘anaunau, naunau, kunana)
Lobelia hypoleuca (‘opelu, liua, mo‘owahie)
Lobelia niihauensis (‘oha, haha, ‘oha wai)
Lobelia yuccoides (panaunau)
Lysimachia daphnoides (kolokolo kuahiwi)
Lysimachia glutinosa
Lysimachia kalalauensis

Mariscus rockii *
Melicope cruciata (alani)
Melicope degeneri (alani)
Melicope haupuensis (alani)
Melicope knudsenii (alani)
Melicope macropus (alani) *
Melicope nealae (alani) *
Melicope pallida (alani)
Melicope puberula (alani)
Mixed sedge and grass montane bog
Munroidendron racemosum
Myrsine fosbergii (kolea)
Myrsine knudsenii (kolea)
Myrsine linearifolia (kolea)
Myrsine mezii (kolea)
Myrsine petiolata (kolea)
Neraudia kauaiensis (ma‘aloa, ma‘oloa, ‘oloa)
Neraudia melastomifolia (ma‘aloa, ma‘oloa, ‘oloa)
Nesoluma polynesicum (keahi)
Nothocestrum peltatum (‘aiea)
Ochrosia kauaiensis (holei)
Panicum beecheyi
Peucedanum sandwicense (makou)
Phyllostegia helleri *
Phyllostegia knudsenii
Phyllostegia waimeae
Phyllostegia wawrana
Platanthera holochila
Platydesma rostrata (pilo kea lau li‘i)
Poa mannii
Poa sandvicensis
Poa siphonoglossa
Psychotria grandiflora (kopiko, ‘opiko)
Psychotria hobdyi (kopiko, ‘opiko)
Pteralyxia kauaiensis (kaulu)
Racometrium lanuginosum montane bog
Ranunculus mauiensis (makou)
Remya kauaiensis
Remya montgomeryi
Schiedea helleri
Schidea lychnoides
Schiedea membranacea
Schiedea spergulina var *spergulina*
Schiedea stellarioides (ma‘oli‘oli, laulihilihi)
Sicyos cucumerinus (‘anunu, kupala)
Sicyos lanceoloideus (‘anunu, kupala)
Solanum sandwicense (popolo‘aiakeakua)
Spermolepis hawaiiensis
Stenogyne kealiae
Xylosma crenatum (maua)
Zanthoxylum hawaiiense (hea‘e, a‘e)

Animals

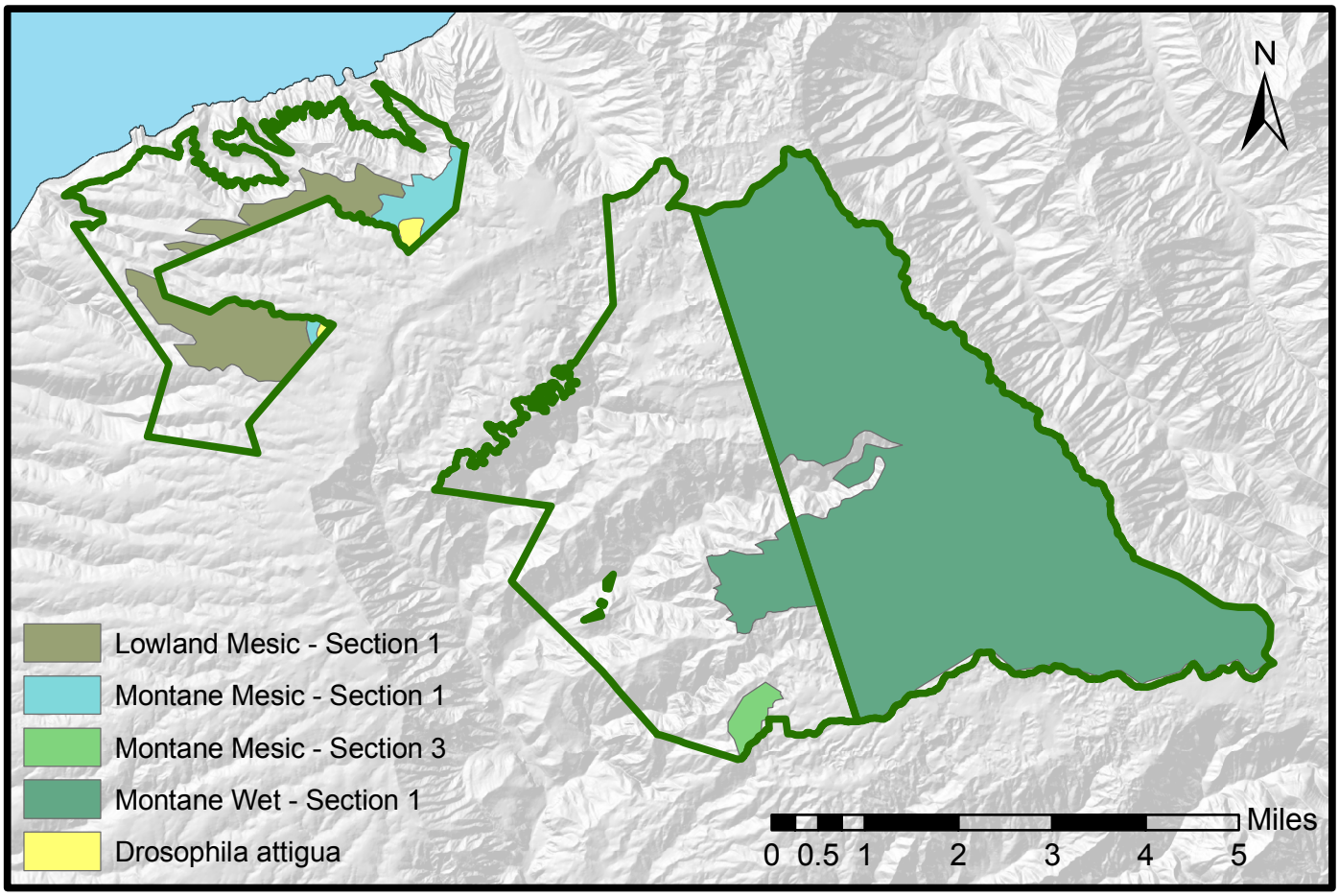
Anas wyvilliana (Hawaiian duck, koloa)
Branta sandvicensis (nene, Hawaiian goose)
Buteo solitarius (‘io, Hawaiian hawk)
Drosophila musaphila (Pomace fly)
Hemignathus ellisianus (Kaua‘i ‘akialoa) **
Hemignathus lucidus hanapepe (Kaua‘i nukupu‘u) *
Lasiurus cinereus semotus (‘ope‘ape‘a, Hawaiian hoary bat)
Megalagrion pacificum (Pacific megalagrion damselfly)
Moho braccatus (‘o‘o‘a‘a, Kaua‘i ‘o‘o) *
Myadestes myadestinus (kama‘o, Large Kauai thrush) *
Myadestes palmeri (puaiohi, Small Kaua‘i thrush)
Omiodes monogramma (moth – previously *Hedylepta monogramma*)
Psittirostra psittacea (‘o‘u) *
Pterodroma sandwichensis (‘ua‘u, Hawaiian dark-rumped petrel)

* Historical sighting, no recent observations
** Likely extinct
(Global Rank)

Appendix 2: Plant species for which critical habitat currently exists in Nā Pali-Kona Forest Reserve (from State of Hawaii critical habitat GIS layer).

Alectryon macrococcus (ʻalaʻalahua, mahoe)
Alsinidendron lychnoides
Alsinidendron viscosum
Bonamia menziesii
Brighamia insignis (alula)
Chamaesyce halemanui (ʻakoko, koko, kokomalei)
Ctenitis squamigera (pauoa)
Delissea rhytidosperma
Delissea undulata
Diellia erecta
Diellia pallida
Diplazium molokaiense
Dubautia latifolia (naʻenaʻe)
Euphorbia haeleeleana (ʻkoko, koko, kokomalei)
Exocarpus luteolus (heau)
Flueggea neowawraea (mehameha me)
Gouania myenii
Isodendrion laurifolium (aupaka)
Kokia kauaiensis (kokiʻo)
Lipochaeta fauriei (nehe)
Lipochaeta micrantha (nehe)
Lobelia niihauensis (ʻoha, haha, ʻoha wai)
Mariscus pennatiformis
Meicope pallida (alani)
Melicope haupuensis (alani)
Munroidendron racemosum
Myrsine linearifolia (kolea)
Nothocestrum peltatum (ʻaiea)
Peucedanum sandwicense (makou)
Phyllostegia knudsenii
Phyllostegia waimeae
Phyllostegia wawrana
Platanthera holochila
Poa manni
Poa sandvicensis
Poa siphonoglossa
Pteralyxia kauaiensis (kaulu)
Remya kauaiensis
Remya montgomeryi
Schiedea apokremnos (maʻoliʻoli)
Schiedea helleri
Schiedea kauaiensis
Schiedea membranacea
Schiedea spergulina spergulina
Schiedea stellarioides (maʻoliʻoli, laulihilihi)
Solanum sandwicense (popoloʻaiakeakua)
Spermolepis hawaiiensis
Wilkesia hobdyi
Xylosma crenatum (maua)
Zanthoxylum hawaiiense (heaʻe, aʻe)

Appendix 3: Proposed additions to listed species and critical habitat in Na Pali-Kona Forest Reserve



Lowland Mesic Plants: Canavalia napaliensis, Chamaesyce eleanoriae, Chamaesyce remyi var. remyi, Charpentiera densiflora, Doryopteris angelica, Dubautia kenwoodii, Labordia helleri, Pittosporum napaliense, Platydesma rostrata, Psychotria hobdyi, Tetraplasandra bisattenuata

Montane Mesic Plants: Chamaesyce remyi var. remyi, Diellia mannii, Labordia helleri, Myrsine knudsenii, Myrsine mezii, Platydesma rostrata, Psychotria grandiflora, Stenogyne kealiae, Tetraplasandra flynnii

Montane Wet Plants: Astelia waialeale, Chamaesyce remyi var. remyi, Dryopteris crinalis var. podosorus, Dubautia kalalauensis, Dubautia waialeale, Geranium kauaiense, Keysseria erici, Keysseria helenae, Labordia helleri, Labordia pumila, Lysimachia daphnoides, Melicope degeneri, Melicope puberula, Myrsine mezii, Phyllostegia renovans, Platydesma rostrata, Psychotria grandiflora, Tetraplasandra flynnii

Wet Cliff Plants: Chamaesyce remyi var. kauaiensis, Chamaesyce remyi var. remyi, Cyanea dolichopoda, Cyrtandra oenobarba, Cyrtandra paliku, Dubautia plantaginea ssp. magnifolia, Lysimachia iniki, Lysimachia pendens, Lysimachia venosa, Platydesma rostrata, Pritchardia hardyi

Animals: Akeke`e (Montane Mesic, Montane Wet), Akikiki (Montane Wet), Drosophila attigua (Montane Mesic, Montane Wet)

(USFWS 2008)

Appendix 4: Invasive plant species that are current management concerns or are imminent threats to the Nā Pali-Kona Forest Reserve

Acacia mearnsii (black wattle)
Acacia melanoxylon (blackwood acacia)
Buddleia madagascariensis (butterfly bush)
Clidemia hirta (Koster's curse)
Corynocarpus laevigatus (karakaranut)
Erigeron karvinskianus (daisy fleabane)
Falcataria moluccana (albizia)
Grevillea robusta (silk oak)
Hedychium gardnerianum (kahili ginger)
Lantana camara (lantana)
Lonicera japonica (Japanese honeysuckle)
Melia azedarach (pride-of-India)
Miconia calvescens (miconia)
Morella faya (fayatree)
Olea europaea ssp. africana (olive)
Paspalum urvillei (Vasey grass)
Passiflora mollissima (banana poka)
Pennisetum setaceum (fountain grass)
Psidium cattleianum (strawberry guava)
Rubus argutus (blackberry)
Schizachyrium condensatum (beardgrass)
Senecio madagascariensis (fireweed)
Setaria palmifolia, (palmgrass)
Sphaeropteris cooperi (Australian tree fern)
Syzygium cumini (Java plum)
Tibouchina urvilleana (glorybush)
Triumfetta semitriloba (Sacramento bur)

Appendix 5: Bird species observed in recent surveys of the Alakaʻi swamp area (Camp et al. 2004).

Endemic
Anas wyvilliana (koloa, Hawaiian duck)
Asio flammeus sandwichensis (pueo, Hawaiian owl,)
Chasiempis sandwichensis (Kauai ʻelepaio)
Hemignathus kauaiensis (Kauai ʻamakihi)
Hemignathus parvus (ʻanianiau)
Himatione sanguinea (ʻapapane)
Loxops caeruleirostris (ʻakekeʻe)
Myadestes palmeri (puaiohi, Small Kauai thrush)
Oreomystis bairdi (ʻakikiki)
Vestiaria coccinea (ʻiʻiwi)

Native
Pluvialis fulva (kolea, Pacific golden plover)

Introduced
Acridotheres tristis (Common myna)
Cardinalis cardinalis (Northern cardinal)
Carpodacus mexicanus (House finch)
Cettia diphone (Japanese bush-warbler)
Copsychus malabaricus (White-rumped shama)
Francolinus erckelii (Erckel's francolin)
Gallus gallus (Feral fowl)
Garrulax canorus (Hwamei)
Geopelia striata (Zebra dove)
Lonchura punctulata (Nutmeg mannikin)
Phasianus colchicus (Ring-necked pheasant)
Paroaria coronata (Red-crested cardinal)
Streptopelia chinensis (Spotted dove)
Zosterops japonicus (Japanese white-eye)