AN INVENTORY OF NON-NATIVE TIMBER RESOURCES ON HAWAII – A SUPPLEMENT TO THE 1999 WAIAKEA AND HAMAKUA TIMBER INVENTORY REPORTS

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Executive summary:

In 1999/2000 an inventory of non-native timber resources was conducted on 1,160 acres in Kalopa, Waimea, Honuaula, and Kiolakaa-Keaa on the island of Hawaii. Primary survey objectives were to provide a supplement to Waiakea and Hamakua timber inventory reports from 1999, produce accurate forest type maps, quantify forest composition and structure, and provide net wood volume estimates by species for non-native timber stands.

The project area was mapped using remote imagery analysis followed by ground truthing, revealing 40 timber stands in 21 forest types. Forest sampling was conducted on a grid of fixed radius plots throughout the landscape. Map grid points were established at 5 acre intervals, and every ninth point (45 acres) was systematically sampled in the field. Because most of the stands in this survey were smaller than 45 acres, supplemental grid points were randomly selected and sampled within stands that were most representative of a given area or forest type.

The sum of wood volume in all forest types exceeded 7,400,000 net cubic feet, or approximately 39,000,000 net board feet assuming a conversion factor of five board feet per cubic foot. Timber plantations within the four locations were dominated by *Eucalyptus robusta, E. saligna, E. microcorys, Cryptomeria japonica, Fraxinus uhdei,* and *Casuarina equisetifolia.* These species appeared to be poorly to moderately suited to the growing conditions found in the four locations, with mean annual increment (MAI) values ranging between 45-280 gross ft^3 $acre^{-1}$ $year^{-1}$. In Honuaula and Kiolakaa-Keaa this range may accurately describe growth potential due to limitations from shallow soil or low rainfall. However, Kalopa and Waimea were characterized by higher rainfall and deeper soils. For the latter two areas, this MAI range is probably an underestimate of true growth potential because a majority of the surveyed timber resources were either over-mature, or were not actively managed after planting. Several eucalyptus stands in Kalopa and Waimea had more moderate MAI rates of 190-280 gross ft^3 $acre^{-1}$ $year^{-1}$.

The survey intensity and resulting volume analyses of this study were designed to provide guidelines for long-term forest management, and were not intended to be the basis for conducting timber sales.

Introduction:

From December, 1999 to January, 2000, the Hawaii Forestry and Communities Initiative (HFCI) timber survey crew conducted an inventory that supplemented previous work in Waiakea and Hamakua on the island of Hawaii (Constantinides and Cannarella, 1999; Constantinides et al., 1999). All three surveys focused on non-native timber resources, and the work summarized in this report will hereafter be referred to as the Hawaii Supplemental Survey, or HSS. The HSS was conducted in four areas (Table 1) and was designed to include a majority of DOFAW-managed timber stands on Hawaii that were not surveyed and summarized in the Waiakea and Hamakua reports.

Table 1. Summary of HSS study locations. ***Note:*** *Kalopa Section acreage was previously reported as part of the total timber acreage for the Hamakua inventory, but was not assessed for volume at that time (Constantinides et al., 1999). The HSS simply quantified the timber volume contained in the same Kalopa Section acreage. In contrast, both acreage and volume data for the remaining three locations are reported here for the first time.*

Location	Acres	Forest Reserve (FR) or Natural Area Reserve (NAR)
Kalopa Section	476	Hamakua FR
North of Waimea town	164	Kohala FR and Puu O Umi NAR
Honuaula	355	Honuaula FR and Waiaha Springs FR
Kiolakaa – Keaa	165	Kau FR
Total acres	1,160	

The primary objectives of the HSS inventory were to:

1. Provide a supplement to previous Waiakea and Hamakua timber inventories.
2. Produce accurate forest type maps.
3. Quantify forest composition and structure.
4. Provide net wood volume estimates by species.

With the exception of 10 acres in Kalopa State Park, all of the surveyed timber resources were located on lands owned or managed by the Division of Forestry and Wildlife (DOFAW). The four survey locations represented a wide range in environmental conditions (Table 2) due to their scattered geographical distribution.

Table 2. Summary of environmental conditions at four HSS sampling locations.

Location	Elevation Range (ft)	Annual Rain (in)	General soil conditions (Soil Conservation Service, 1972)
Kalopa Section	2000-2500	85	Deep silt loams and silty clay loams
North of Waimea town	3200-4100	60	Deep silty clay loams
Honuaula – Stand 8344	2300-3000	60	Shallow sandy loams and silty loams
Honuaula – All others	5200-6600	30	Shallow sandy loams and silty loams
Kiolakaa – Keaa	2000-2200	70	Shallow rocky soils, high organic content

Survey methodology:

Historical survey maps, satellite imagery and aerial photographs were used to develop initial timber stand boundaries. During field inventory work, the survey crew verified and updated these boundaries while concurrently assigning forest types to each stand based on primary timber species, age, and stand composition.

A survey plot grid was created and overlain on a map of the island of Hawaii with one point for every five acres. Using a random start, field plots were sampled at every ninth grid point (45 acres) within the four locations. Because many of the stands were smaller than 45 acres and were scattered, additional grid points were randomly selected within stands that were most representative of a given area or forest type. Between 2-6 plots were sampled in each of these representative stands, roughly proportional to stand size.

Circular sample plots were 0.10 acres in size, with a fixed radius of 37.24 feet. All tree species (Appendix A) larger than 5.5" diameter at breast height (DBH) were numbered and measured for DBH as "main plot" trees. Total height and defect assessments were recorded for every fifth main plot tree within each species observed on the plot. Defects were visually estimated and recorded as a percentage deduction of wood volume for the bottom-, middle-, and top-third of the tree. Regeneration data were recorded by tallying stems of all woody species in a DBH range of 1.6-5.5" within a nested 0.05 acre (26.33 feet in radius) "sub-plot." The field crew tied yellow or orange flagging at 100-foot intervals along all plot access lines.

Three primary overstory, understory, and groundcover species on or near each plot point were recorded in order of decreasing abundance. These data were based on qualitative visual assessments, and did not represent actual stem counts. Other descriptive data collection included slope, aspect, and weather conditions.

Survey data were analyzed using Forestry Projection System software version 5.3b (Forest Biometrics, 1999). Gross wood volume calculations represented main stem volume from tree base to tree tip. Merchantable wood volume calculations were based on 16 foot log sections, a minimum top diameter of four inches, a stump height of one foot, and a minimum DBH of eight inches. Net wood volume calculations were based on merchantable wood volume minus deductions due to tree defects. Defect percentages were calculated using the formula:

Defect (%) $= (V_m\text{-}V_n / V_m) \times 100$, where V_m = merchantable volume, and V_n = net volume.

Once the initial survey was completed, all stand acreage and plot data were post-stratified by forest type. Acreage from some unique or very small stands that had not been sampled was assigned to the forest type that best approximated their stand structure. Volume calculations were based on data from all cruised stands within each forest type. These data were subsequently used to predict volume in non-cruised stands of the same type, and in the same location. All tree species tallied during the survey were included in volume analyses, though some may currently be considered non-merchantable.

Only one local taper profile was available for volume analyses of species encountered during this survey, necessitating the use of taper profiles from alternate species and regions (Appendix B).

Survey results:

The 1999/2000 timber plantation maps for the four HSS locations contained 40 timber stands totaling 1,158 acres, excluding 2 acres of clearings (Figures 1a-1d). Total wood volume estimates from the HSS exceeded 7,400,000 net cubic feet. Analyses of stand volumes based on primary timber species revealed that various eucalyptus species represented 81% of the total volume, with sugi (*Cryptomeria japonica*) as 8%, tropical ash (*Fraxinus uhdei*) as 4%, ironwood (*Casuarina equisetifolia*) as 4%, and silk oak (*Grevillia robusta*) as 3% (Table 3).

If the entire timber resource represented in this report were harvested and cut into sixteen foot logs, current wood volume in log diameter classes of 4-8", 8-12", and 12+" would equal 1,114,348, 1,486,620, and 4,844,634 net cubic feet, respectively (15%, 20%, and 65% of the total net volume, respectively). Detailed stand-level statistics for stands containing one or more sample plots are presented in Appendix C. Three stands were not sampled due to their small size and unique composition, including mixed coniferous species and Norfolk Island pine (*Araucaria excelsa*).

Volume results expressed in units of mean cubic feet per acre were derived from statistical sampling, and are therefore estimates. Standard error (SE) analyses of mean volume estimates per acre were used to assess the strength of field survey data at the 80 percent probability level. Sampling intensity in the HSS was typically low with 1-6 sample plots per measured stand. Most stands had SE values ranging from 7-26% of the mean, while stand 8343 in Honuaula had an extremely high SE value at 80% of the mean (Table 4).

Most stands consisted of only one or two dominant species components, though stand 8202 in Kiolakaa-Keaa contained seven different species (Table 5). Net stand volume ranged from 77-97% of gross volume, while volume deductions attributed to visible defects ranged from 1-22 percent (Table 5).

In terms of relative abundance, non-native species were tallied as the primary overstory species on all HSS plots, and as the secondary overstory species on 95% of the HSS plots. Native ohia (*Metrosideros polymorpha*) and koa (*Acacia koa*) were recorded as secondary overstory species on 5% of the HSS plots. With the exception of a notable population of Kopiko (*Psychotria* spp.) in the understory at Kalopa, non-native species dominated understory and groundcover layers in all four locations (Table 6).

Figure 1a. State non-native timber resources represented by primary overstory species in Kalopa, Hamakua Forest Reserve.

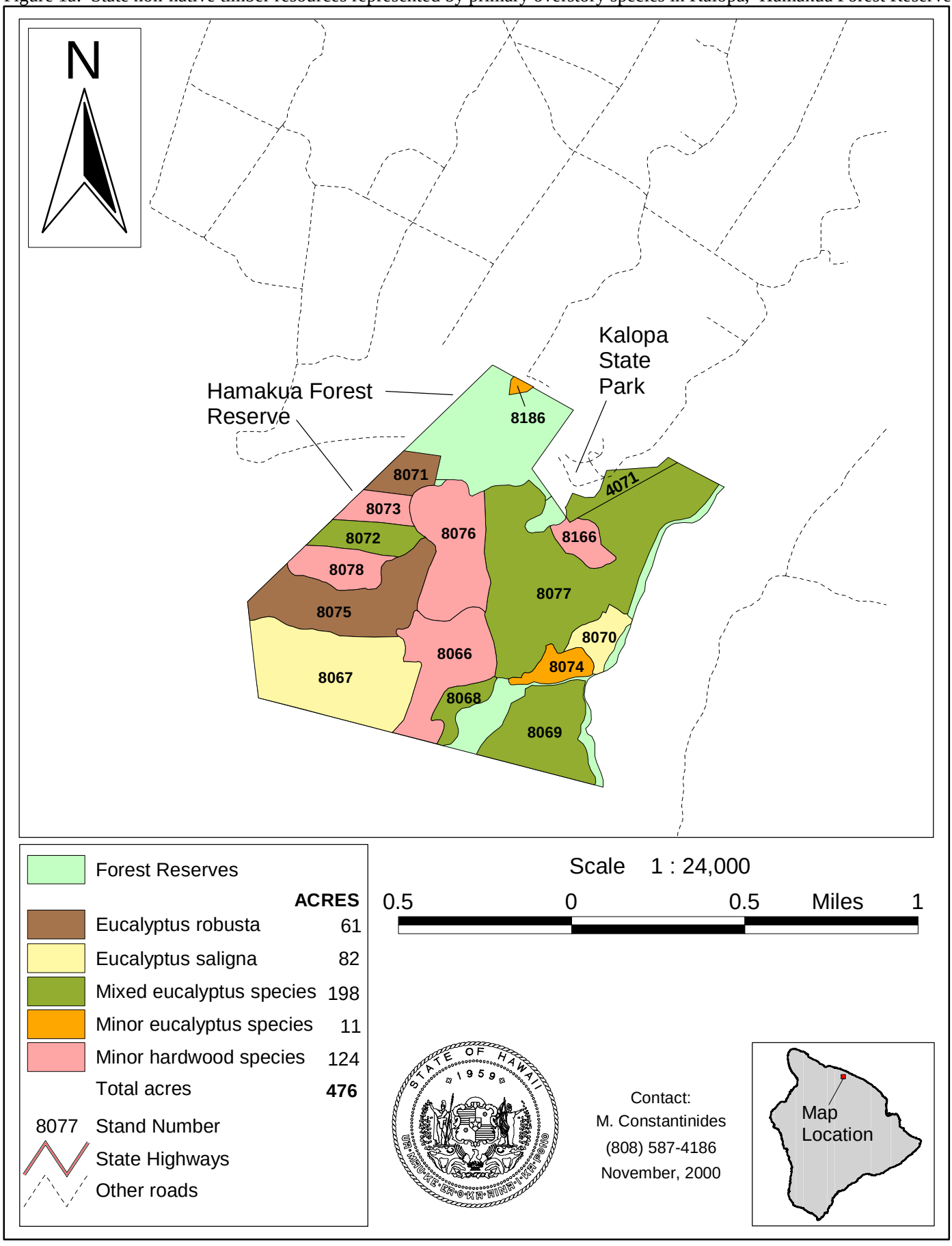

Figure 1b. State non-native timber resources represented by primary overstory species in Waiaha Springs and Honuaula Forest Reserves.

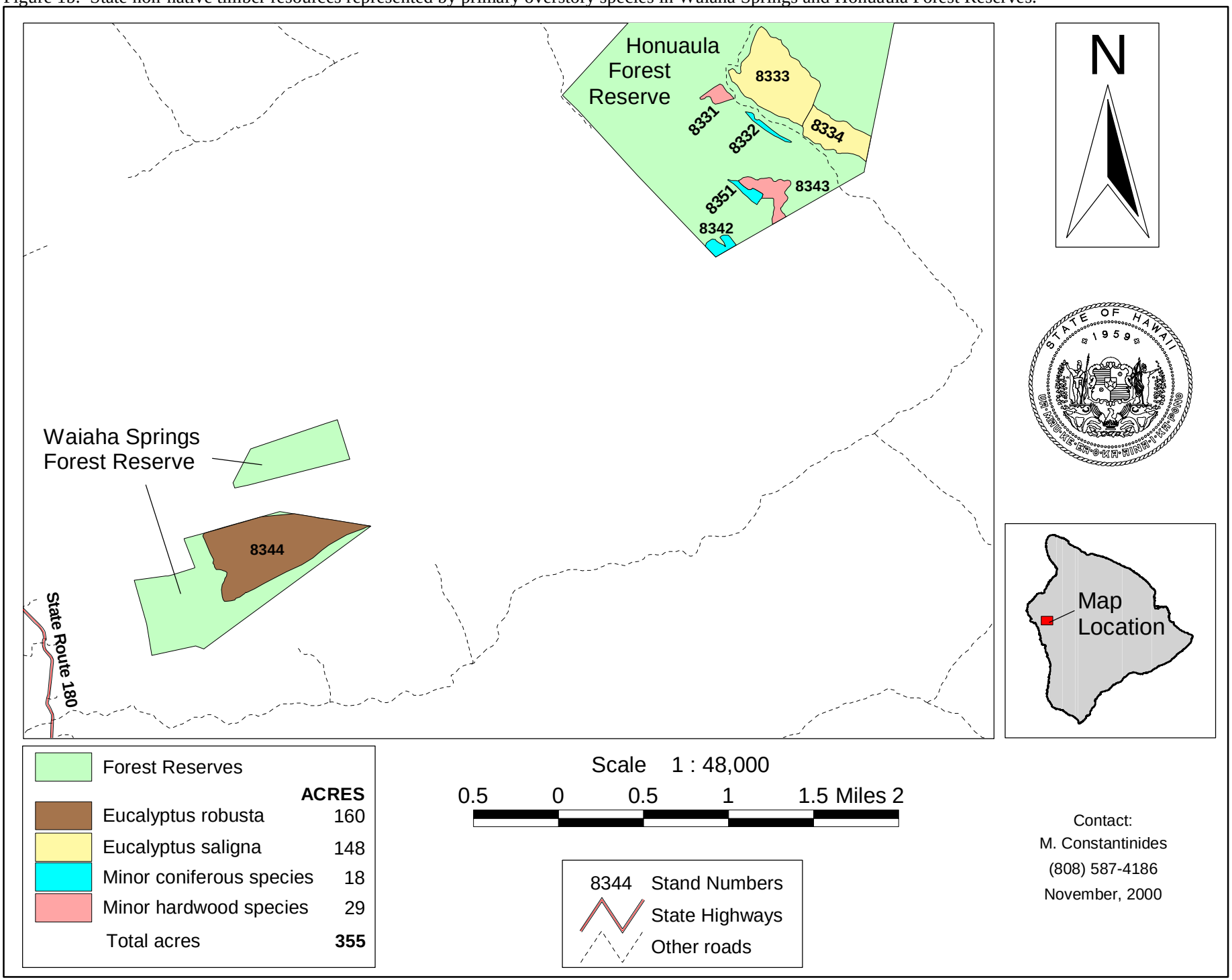

Figure 1c. State non-native timber resources represented by primary overstory species near Waimea town.

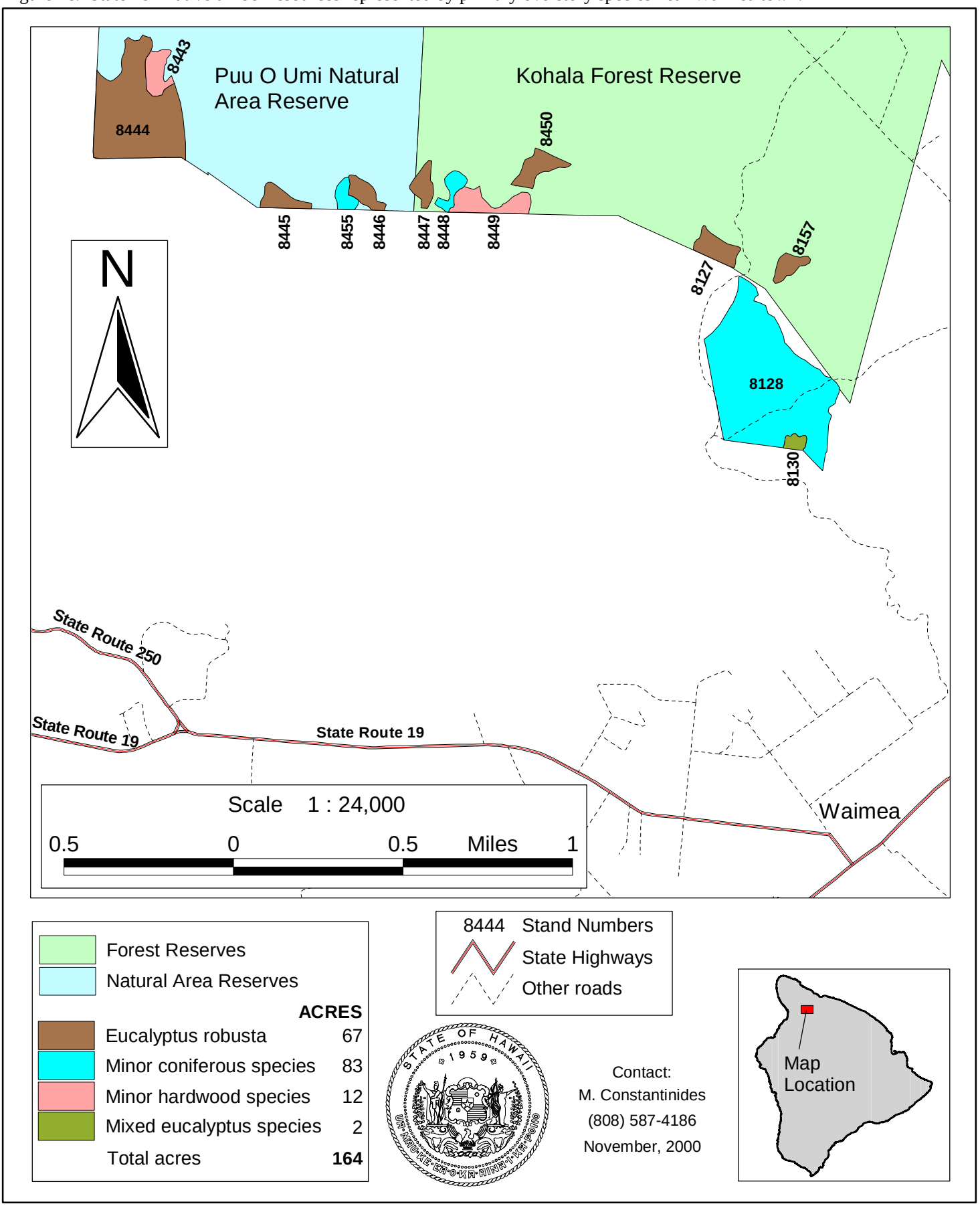

Figure 1d. State non-native timber resources represented by primary overstory species in Kiolakaa - Keaa, Kau Forest Reserve.

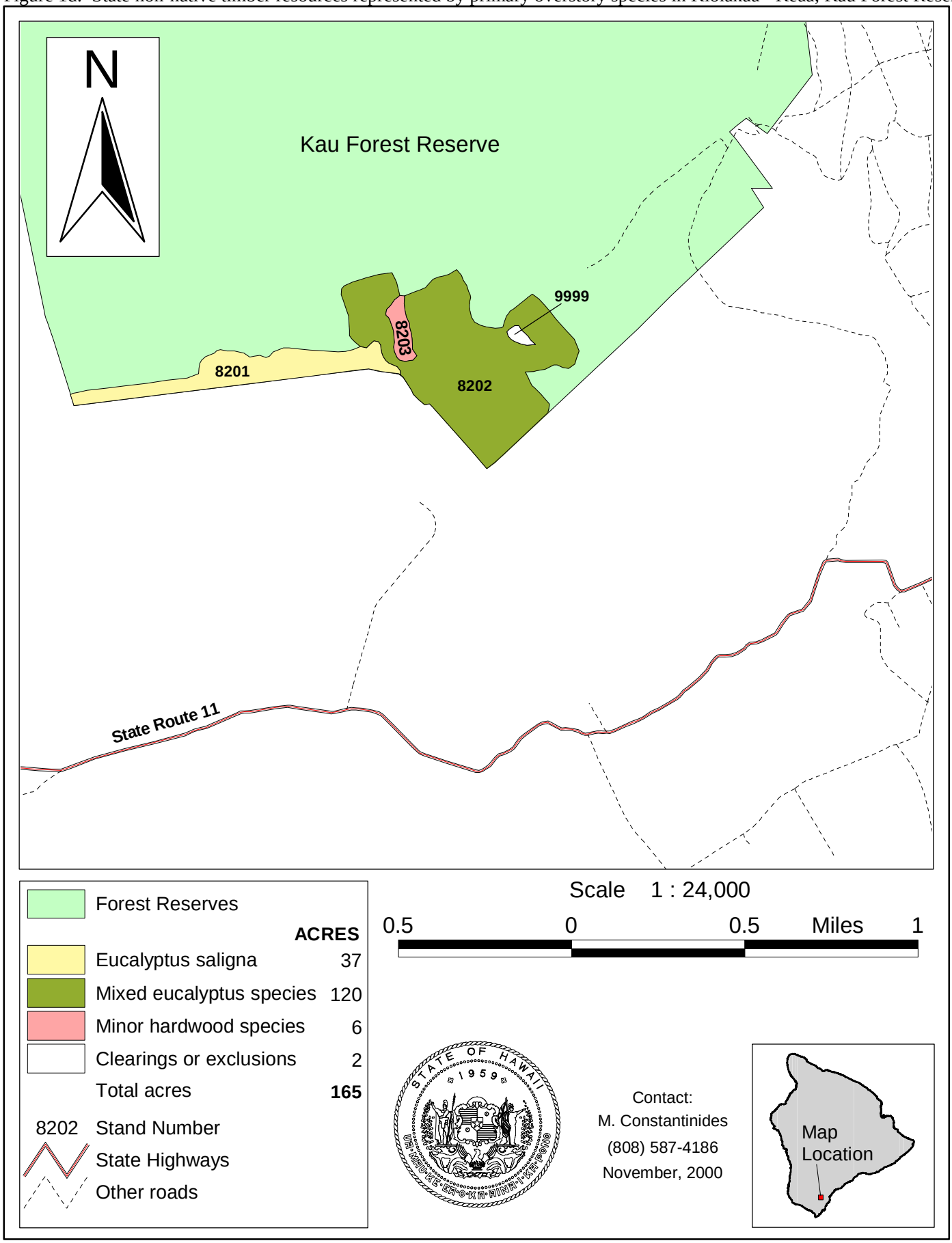

Table 3. Descriptive stand-level statistics for the HSS. Stocking and DBH indices represent all trees with a minimum DBH of two inches, while volume indices represent all logs with a minimum small-end diameter of 4 inches.

Location & Stand	Cover type	Primary species	Acres	Age in years	Stocking trees ac^{-1}	DBH range	Mean DBH	--Mean ft^3 ac^{-1}-- Gross	Net	MAI[B] ft^3 ac^{-1} yr^{-1}	Total net volume (ft^3) -- by log minimum diameter -- 4-8”	8-12”	> 12”	Row sub-totals
Kalopa														
8066	CE55	*Casuarina equisetifolia*	41	66	323	2-38	14	8,935	6,936	135	24,613	54,828	205,617	285,057
8074	EM77	*Eucalypts microcorys*	10	66	183	2-36	19	18,449	17,809	280	15,715	28,308	132,281	176,304
8186[A]	EM77	*Eucalypts microcorys*	1	66	183			18,449	17,809		2,222	4,003	18,706	24,932
8071[A]	ER77	*Eucalyptus robusta*	11	66	344			14,447	12,643		6,143	14,592	122,128	142,863
8075	ER77	*Eucalyptus robusta*	50	66	344	2-60	15	14,473	12,720	219	28,612	65,625	543,044	637,282
8067	ES55	*Eucalyptus saligna*	71	66	253	2-39	13	6,881	5,582	104	42,055	71,625	282,644	396,324
8070	ES77	*Eucalyptus saligna*	11	66	450	2-41	11	14,023	12,975	212	11,078	20,792	110,860	142,729
8068	EX55	Mixed eucalyptus	9	66	280	2-23	11	5,460	4,546	83	5,705	13,350	23,220	42,275
4071[A]	EX66	Mixed eucalyptus	10	66	634			11,121	9,725		9,633	17,783	70,805	98,221
8069[A]	EX66	Mixed eucalyptus	40	66	634			11,121	9,725		37,675	69,548	276,909	384,131
8077	EX66	Mixed eucalyptus	124	66	634	2-46	10	11,125	9,725	169	118,174	218,152	868,582	1,204,908
8072	EX77	Mixed eucalyptus	15	66	250	2-45	17	14,336	10,847	217	11,333	15,406	139,218	165,957
8073	FU55	*Fraxinus uhdei*	11	66	300	2-34	10	5,614	5,301	85	4,801	8,205	42,651	55,657
8078	FU55	*Fraxinus uhdei*	17	66	130	2-28	12	3,246	2,494	49	3,660	9,796	29,947	43,404
8166	FU66	*Fraxinus uhdei*	10	66	333	2-42	12	10,778	9,250	163	8,487	16,024	67,989	92,501
8076	GR55	*Grevillia robusta*	45	66	305	2-31	10	5,647	4,891	86	16,410	34,351	167,866	218,627
Kalopa totals			476								346,316	662,388	3,102,467	4,111,172
Honuaula														
8342[A]	CJ55	*Cryptomeria japonica*	8	65	100			6,843	6,326		3,250	5,271	40,189	48,711
8351	CJ55	*Cryptomeria japonica*	6	65	100	2-36	22	6,843	6,326	105	2,448	3,970	30,272	36,691
8344	ER55	*Eucalyptus robusta*	160	65	380	2-40	12	7,563	6,159	116	136,288	168,009	681,822	986,119
8333	ES22	*Eucalyptus saligna*	106	65	278	2-33	9	3,528	2,815	54	76,659	94,836	126,569	298,064
8334	ES22	*Eucalyptus saligna*	43	65	438	2-28	7	3,213	2,232	49	29,121	28,265	39,257	96,643
8331[A]	FU22	*Fraxinus uhdei*	7	65	355			4,447	3,557		5,675	7,963	12,328	25,965
8343	FU22	*Fraxinus uhdei*	21	65	355	2-29	9	4,447	3,557	68	16,557	23,233	35,970	75,760
8332	CX	Mixed coniferous species	4	65	NA	NA	NA	NA	NA		NA	NA	NA	NA
Honuaula totals			355								269,998	331,547	966,407	1,567,953

[A]Stand statistics extrapolated from cruised stands of the same cover type in the same area.
[B]Mean annual increment (MAI) estimates provided only for surveyed stands. MAI = gross volume / age.

Table 3 (continued).

Location & Stand	Cover type	Primary species	Acres	Age in years	Stocking trees ac^{-1}	DBH range	Mean DBH	--Mean ft^3 ac^{-1}-- Gross	Net	MAI[B] ft^3 ac^{-1} yr^{-1}	---------- Total net volume (ft^3) ---------- -- by log minimum diameter -- 4-8”	8-12”	> 12”	Row sub-totals
Waimea														
8455	AE	*Araucaria excelsa*	3	62	NA	NA	NA	NA	NA		NA	NA	NA	NA
8443	CE22	*Casuarina equisetifolia*	5	62	500	2-13	7	2,816	2,040	45	8,029	2,372	0	10,402
8449	CE22	*Casuarina equisetifolia*	7	62	250	6-24	12	3,588	2,359	58	6,478	4,625	6,117	17,221
8128	CJ44	*Cryptomeria japonica*	77	62	502	2-28	11	7,496	6,539	121	258,155	161,912	84,122	504,190
8448	CJ44	*Cryptomeria japonica*	3	62	270	4-32	16	7,108	5,865	115	4,333	5,675	8,172	18,181
8127[A]	ER66	*Eucalyptus robusta*	5	62	457			9,137	6,656		7,635	9,766	17,877	35,278
8157[A]	ER66	*Eucalyptus robusta*	3	62	457			9,137	6,656		4,610	5,897	10,793	21,300
8444	ER66	*Eucalyptus robusta*	42	62	507	2-34	13	8,530	6,016	138	60,204	77,287	116,370	253,861
8445	ER66	*Eucalyptus robusta*	4	62	340	4-37	16	11,703	9,476	189	6,596	11,850	20,407	38,853
8446	ER66	*Eucalyptus robusta*	4	62	390	2-33	12	6,262	5,260	101	3,480	4,890	11,618	19,988
8447[A]	ER66	*Eucalyptus robusta*	4	62	457			9,137	6,656		5,330	6,818	12,480	24,628
8450	ER66	*Eucalyptus robusta*	5	62	200	2-46	24	13,231	10,212	213	3,607	9,928	41,608	55,143
8130	EX	Mixed eucalyptus	2	62	NA	NA	NA	NA	NA		NA	NA	NA	NA
Waimea totals			164								368,457	301,020	329,564	999,045
Kiolakaa - Keaa														
8201	ES22	*Eucalyptus saligna*	37	64	335	2-29	8	3,125	2,310	49	20,077	21,938	43,674	85,689
8202	EX55	Mixed eucalyptus	120	64	214	2-42	14	6,556	5,633	102	105,624	168,354	402,522	676,500
8203	GR11	*Grevillia robusta*	6	64	310	2-13	7	1,601	905	25	3,876	1,373	0	5,249
9999	XX	Clearing	2	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA
Kiolakaa – Keaa totals			165								129,577	191,665	446,196	767,438

[A]Stand statistics extrapolated from cruised stands of the same cover type in the same area.
[B]Mean annual increment (MAI) estimates provided only for surveyed stands. MAI = gross volume / age.

Table 4. Inventory precision analyses for non-native timber stands measured during the HSS. All volume data are presented in units of gross cubic feet.

Stand	Acres	Sample plots	Mean $ft^3\ ac^{-1}$	SE[A] $ft^3\ ac^{-1}$	Percent SE[B]	---- 80% CI[C] ---- Low $ft^3\ ac^{-1}$	High $ft^3\ ac^{-1}$
Kalopa							
8066	41	3	8,935	1,611	18	5,897	11,974
8067	71	4	6,881	1,308	19	4,739	9,023
8068	9	1	5,460	NA	NA	NA	NA
8070	11	3	14,023	2,529	18	9,253	18,793
8072	15	1	14,336	NA	NA	NA	NA
8073	11	1	5,614	NA	NA	NA	NA
8074	10	3	18,449	1,713	9	15,219	21,679
8075	50	5	14,473	2,151	15	11,175	17,770
8076	45	4	5,647	1,019	18	3,978	7,316
8077	124	5	11,125	2,351	21	7,520	14,729
8078	17	1	3,246	NA	NA	NA	NA
8166	10	4	10,778	995	9	9,149	12,407
Honuaula							
8333	106	4	3,528	907	26	2,043	5,013
8334	43	5	3,213	371	12	2,644	3,781
8343	21	2	4,447	3,570	80	0	15,435
8344	160	5	7,563	534	7	6,745	8,381
8351	6	1	6,843	NA	NA	NA	NA
Waimea							
8128	77	6	7,496	659	9	6,523	8,469
8443	5	1	2,816	NA	NA	NA	NA
8444	42	4	8,530	1,065	12	6,786	10,274
8445	4	2	11,703	1,003	9	8,616	14,790
8446	4	1	6,262	NA	NA	NA	NA
8448	3	1	7,108	NA	NA	NA	NA
8449	7	1	3,588	NA	NA	NA	NA
8450	5	1	13,231	NA	NA	NA	NA
Kiolakaa - Keaa							
8201	37	5	3,125	388	12	2,530	3,720
8202	120	5	6,556	1,060	16	4,931	8,181
8203	6	1	1,601	NA	NA	NA	NA

[A]SE represents standard error of the mean.

[B]Percent SE = ((standard error / mean) x 100) within each row of data.

[C]Confidence intervals (CI) associated with standard error estimates represent the range of gross cubic foot volume per acre that is 80% likely to contain the true mean volume per acre.

Table 5. Component net volume by stand, and volume defect analyses for the HSS.

Stand	Type	Acres	------ mean ft^3 ac^{-1} ------ Gross	Merch	Net	-- Percent -- Net[A]	Defect[B]	---------- Component net volume per acre by species[C] (ft^3 ac^{-1}) ---------- ER	ES	EM	CJ	FU	MQ	GR	CE	TC	AN	AE	AK	MP
Kalopa																				
8066	CE55	41	8,936	8,462	6,936	78	18		404				1,666	651	4,215					
8074	EM77	10	18,449	18,027	17,809	97	1			17,809										
8075	ER77	50	14,473	14,070	12,720	88	10	9,395	2,960	136				230						
8067	ES55	71	6,881	6,516	5,582	81	14	137	4,280				602	563						
8070	ES77	11	14,023	13,577	12,975	93	4		11,345	1,470				161						
8068	EX55	9	5,460	5,184	4,546	83	12		1,387	2,714				445						
8077	EX66	124	11,125	10,618	9,725	87	8	3,570	3,687	983				1,484						
8072	EX77	15	14,336	13,935	10,847	76	22	4,431	4,695			1,354		367						
8073	FU55	11	5,614	5,379	5,301	94	1					5,301								
8078	FU55	17	3,246	3,112	2,494	77	20					1,605		559	330					
8166	FU66	10	10,778	10,343	9,250	86	11		600			8,533		117						
8076	GR55	45	5,647	5,346	4,891	87	9					195		3,198		1,270				228
Honuaula																				
8351	CJ55	6	6,843	6,463	6,326	92	2				5,034								1,292	
8344	ER55	160	7,563	7,041	6,159	81	13	5,327				689	52							91
8333	ES22	106	3,528	3,022	2,815	80	7		2,815											
8334	ES22	43	3,213	2,642	2,232	69	16		2,232											
8343	FU22	21	4,447	4,115	3,557	80	14					3,524							33	

[A]Percent net = (net / gross) x 100

[B]Percent defect = ((merch – net) / merch) x 100

[C]AE = Araucaria excelsa; AK = Acacia koa; AN = Alnus nepalensis; CE = Casuarina equisetifolia; CJ = Cryptomeria japonica; EM = Eucalyptus microcorys; ER = Eucalyptus robusta; ES = Eucalyptus saligna; FU = Fraxinus uhdei; GR = Grevillia robusta; MP = Metrosideros polymorpha; MQ = Melaleuca quinquenervia; TC = Toona ciliata.

Table 5 continued.

Stand	Type	Acres	------ mean ft^3 ac^{-1} ------ Gross	Merch	Net	-- Percent -- Net[A]	Defect[B]	---------- Component net volume per acre by species[C] (ft^3 ac^{-1}) ---------- ER	ES	EM	CJ	FU	MQ	GR	CE	TC	AN	AE	AK	MP
Waimea																				
8443	CE22	5	2,816	2,310	2,040	72	12	566							1,473					
8449	CE22	7	3,588	3,121	2,359	66	24								2,359					
8128	CJ44	77	7,496	6,638	6,539	87	1				5,973						567			
8448	CJ44	3	7,108	6,524	5,865	83	10				5,469				395					
8444	ER66	42	8,530	7,849	6,016	71	23	6,016												
8445	ER66	4	11,703	11,029	9,476	81	14	8,127										1,349		
8446	ER66	4	6,262	5,715	5,260	84	8	2,785			108				2,367					
8450	ER66	5	13,231	12,710	10,212	77	20	10,212												
Kiolakaa - Keaa																				
8201	ES22	37	3,125	2,732	2,310	74	15		2,214					95						
8202	EX55	120	6,556	6,152	5,633	86	8	1,155	2,707	840	43		563	140						184
8203	GR11	6	1,601	1,224	905	57	26			86				525						294

[A]Percent net = (net / gross) x 100

[B]Percent defect = ((merch – net) / merch) x 100

[C]AE = Araucaria excelsa; AK = Acacia koa; AN = Alnus nepalensis; CE = Casuarina equisetifolia; CJ = Cryptomeria japonica; EM = Eucalyptus microcorys; ER = Eucalyptus robusta; ES = Eucalyptus saligna; FU = Fraxinus uhdei; GR = Grevillia robusta; MP = Metrosideros polymorpha; MQ = Melaleuca quinquenervia; TC = Toona ciliata.

Table 6. Primary understory and groundcover vegetation observed during the HSS. Values in parentheses represent the percentage of sample plots within each region on which each species was observed as dominant, with a minimum of 10 percent. See Appendix A for species common names.

	Kalopa	Honuaula	Waimea	Kiolakaa-Keaa
Understory				
	Psychotria spp. (54) *Psidium* spp. (17) *Fraxinus uhdei* (14)	*Eucalyptus saligna* (53) *Fraxinus uhdei* (41)	*Psidium* spp. (38) *Metrosideros polymorpha* (25) *Cryptomeria japonica* (13)	*Schinus terebinthifolius* (36) *Psidium* spp. (27) *Grevillia robusta* (18)
Groundcover				
	Psidium spp. (46)	Grasses (29) *Passiflora mollissima* (12)	*Psidium* spp. (56) *Cibotium* spp. (19) Zingiberaceae family (13)	*Psidium* spp. (81)

Discussion and planning implications:

The non-native timber plantings measured in the HSS appeared to exhibit poor to moderate mean annual increment (MAI) growth rates both within, and among species. Species adaptation to the study locations, stand age and climatic conditions were probably the primary factors that influenced stand growth. Current within-species productivity differences can not be attributed to varying stand management or maintenance, since little has been conducted historically.

Analyses of MAI (Table 3) and climatic conditions (Table 2) suggested that soil conditions and annual rainfall exerted the primary influence on timber productivity in Honuaula and Kiolakaa-Keaa. In these areas soils were generally shallow and rocky. It is also notable that with the exception of stand 8344, all Honuaula stands were located above 5200 feet in elevation where rainfall was limited to approximately 30 inches per year. Under these conditions growth rates for all measured species ranged from only 25-116 $ft^3\ ac^{-1}\ yr^{-1}$. Those for *Eucalyptus saligna* were uncharacteristically low, with MAI values of approximately 50 $ft^3\ ac^{-1}\ yr^{-1}$.

In contrast, soils were relatively deep and annual rainfall ranged from 60-80 inches in the Kalopa and Waimea locations. MAI values for most species in these locations were relatively higher, ranging from 45-280 $ft^3\ ac^{-1}\ yr^{-1}$. MAI values exceeded 165 $ft^3\ ac^{-1}\ yr^{-1}$ in several eucalyptus stands. It is probable that stand age (62-66 years) was the principal cause of these moderate MAI rates, giving a deceptive view of potential productivity. Based on long-term growth data, MAI values probably exceeded 200 $ft^3\ ac^{-1}\ yr^{-1}$ for most broad-leaved species, and ranged from 350-550 $ft^3\ ac^{-1}\ yr^{-1}$ for *Eucalyptus microcorys* at approximately age 30 (DOFAW, unpublished). At current ages, most stands in these locations are probably over-mature and have stagnated. However, many of the surviving trees are extremely large and have impressive form – characteristics that suggest previous periods of vigorous growth. Productivity of the timber species studied would probably increase significantly with intensified stand management and modified species-site selections in future rotations.

Qualitative data collection for the relative abundance of primary and secondary species in the four locations revealed a predominance of non-native overstory trees. Understory and groundcover vegetation composition differed among the four survey locations: Kopiko and guava (*Psidium* spp.) were most common at Kalopa; *Eucalyptus saligna* and tropical ash seedlings dominated the understory at Honuaula, and banana poka (*Passiflora mollissima*) appears to be spreading throughout Honuaula Forest Reserve; guava, ginger (Zingiberaceae family), and sugi seedlings were observed in Waimea; guava and Christmas berry (*Schinus terebinthifolius*) formed dense thickets under the forest canopy in Kiolakaa – Keaa. Most of these non-native species are considered invasive. If current commercial timber resources were harvested, control of invasive species would probably be required at some locations prior to planting and establishment of future forests.

Total wood volume estimates for surveyed non-native timber resources exceeded 7,400,000 net cubic feet, or approximately 37,000,000 net board feet – primarily in log diameters of 12 inches or larger. Timber stands with type codes of "22" or lower have grown poorly and from a commercial timber standpoint represent a salvage opportunity at best. Timber stands with type

codes of “44” or higher contained over 91% of the timber resources in the HSS, where total net volume exceeded 6,800,000 cubic feet, or approximately 34,000,000 board feet.

Analyses of survey precision indicated that reported mean values for timber volume estimates were moderately robust. In 15 of 17 stands assessed, standard error values ranged from 7-21% of mean volume estimates (Table 4). Stands 8333 and 8343 in Honuaula had standard error values that were 26% and 80% of mean volume estimates, respectively. Though sampling precision was poor for these two estimates, these stands represented less than 3% of the total timber resources measured in the HSS.

Visible defect in standing trees ranged from 1-22% in sampled timber stands. *Eucalyptus microcorys* and sugi appeared to be most sound, with defect typically ranging from 1-2%. *Eucalyptus robusta* was relatively susceptible to branch or top breakage and developing seams trunk surfaces – defect analyses for this species ranged from 8-23%. Ironwood (*Casuarina equisetifolia*) stands also had high defect analyses ranging from 12-24% due to breakage, extensive branching, and stem flutes. The entire inventory of timber volume measured in the HSS is essentially a mature or over-mature resource, and future wood volume growth could potentially be offset by volume losses due to mortality, decay and breakage.

The four locations generally have good access primarily through an extensive gravel road network, though paved roads provided access up to the timber plantation boundaries in Kalopa in Kiolakaa - Keaa. In order to implement intensive forest management activities, some road sections would have to be improved prior to heavy equipment operations.

The volume data in this report are not intended to be the basis for negotiation of timber sale contracts, but rather a guideline to long term timber management planning within the surveyed areas. Careful weighing or scaling of timber removed from harvest sites is highly recommended for all harvest contracts.

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Appendix A. Botanical classification for species tallied during the HSS work.

TREE SPECIES

Latin genus and species	Common name
Acacia koa	Koa
Alnus nepalensis	Nepal alder
Araucaria excelsa	Norfolk Island pine
Casuarina equisetifolia	Ironwood
Cheirodendron trigynum	Olapa
Coprosma spp.	Pilo
Cryptomeria japonica	Sugi
Eucalyptus microcorys	Tallow-wood
Eucalyptus robusta	Swamp mahogany
Eucalyptus saligna	Sydney blue gum
Fraxinus uhdei	Tropical ash
Grevillia robusta	Silk oak
Melaleuca quinquenervia	Paper bark
Metrosideros polymorpha	Ohia
Myoporum sandwicense	Naio
Psychotria spp.	Kopiko
Toona ciliata	Australian red cedar
Schinus terebinthifolius	Christmas berry
Sophora chrysophylla	Mamane

UNDERSTORY AND GROUNDCOVER SPECIES

Latin genus and species	Common name
Cibotium spp.	Hapuu
Dicranopteris linearis	Uluhe fern
Dodonaea viscosa	Aalii
Freycinetia arborea	Ieie
Nephrolepis multiflora	Sword fern
Psidium spp.	Guava
Cordyline terminalis	Ti Leaf
Passiflora mollissima	Banana poka
Rubus spp.	Raspberry
Setaria palmifolia	Palm grass
Styphelia tameiameiae	Pukiawe

Plants in other families

Zingiberaceae	Ginger family

Appendix B. Species assignments by taper profile class for volume analyses.

Species analyzed using a Hawaiian *Flindersia brayleyana* taper profile:

1. *Acacia confusa*
2. *Acacia koa*
3. *Acacia mearnsii*
4. *Alnus nepalensis*
5. *Casuarina equisetifolia*
6. *Cheirodendron trigynum*
7. *Fraxinus uhdei*
8. *Grevillia robusta*
9. *Metrosideros polymorpha*
10. *Psychotria* spp.
11. *Schinus terebinthifolius*
12. *Toona ciliata*

Species analyzed using a Hawaiian *Eucalyptus saligna* taper profile:

1. *E. microcorys* (bark thickness coefficients 1.5 times those of *E. saligna*)
2. *E. robusta* (bark thickness coefficients 2.0 times those of *E. saligna*)
3. *E. saligna*
4. *Melaleuca quinquenervia* (bark thickness coefficients 2.0 times those of *E. saligna*)

Species analyzed using a Pacific Northwest *Thujua plicata* (Western red cedar) taper profile:

1. *Araucaria excelsa*
2. *Cryptomeria japonica*

Appendix C. Stand tables for surveyed stands.

Guidelines for interpreting stand table data:

1. Stand tables summarize sample plot analyses using one-inch DBH classes. Statistics provided for each DBH class include trees per acre, basal area per acre (ft^2), average tree height (feet), and cubic foot volume per acre. Gross cubic volume represents the tree bole from tree base to tree tip. Merchantable wood volume calculations were based on 16 foot log sections, a minimum top diameter of four inches, a stump height of one foot, and a minimum DBH of eight inches. Net wood volume represents merchantable volume minus deductions due to tree defects.

2. For each stand, statistics are first presented by tree species. The last row of each species section gives a species summary (species codes typically use the first initial from both genus and species names). The species summary shows average DBH, total trees per acre, total basal area per acre, and total volume per acre.

3. After all species for a particular stand have been listed, two final rows provide stand level summary statistics. The first row represents all trees with a DBH of two inches or larger. The second row represents only trees with a minimum DBH of eight inches. Stand level summaries show average DBH, total trees per acre, total basal area per acre, and total volume per acre. Stand level volume totals may differ slightly from those reported in Tables 1-3 due to rounding errors.

Appendix C (Continued).

Stand 8066

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Merch	Net
			Eucalyptus saligna				
	24	119	3.3	11	418	407	403
ES summary:	24	119	3.3	11	418	407	404
			Melaleuca quinquenervia				
	6	55	3.3	1	9	0	0
	9	60	3.3	1	25	22	19
	12	54	3.3	3	41	38	29
	14	68	3.3	4	68	64	56
	16	70	3.3	5	92	87	74
	17	72	6.7	11	209	199	170
	19	74	3.3	7	133	127	107
	21	75	3.3	8	164	157	131
	24	78	3.3	10	217	208	180
	25	87	3.3	11	260	251	231
	27	80	3.3	13	277	266	227
	38	85	3.3	26	548	527	436
MQ summary:	21	73	43.3	99	2049	1950	1666
			Grevillia robusta				
	18	102	3.3	6	198	191	168
	20	100	3.3	7	238	230	199
	25	99	3.3	11	359	348	283
GR summary:	21	100	10.0	25	797	771	651
			Casuarina equisetifolia				
	17	110	6.7	10	365	352	332
	18	101	3.3	6	197	190	147
	21	50	10.0	25	422	395	205
	22	103	6.7	17	572	554	426
	24	107	10.0	32	1098	1065	920
	25	95	3.3	11	341	330	192
	27	103	6.7	27	869	843	791
	28	105	3.3	14	476	462	354
	30	106	3.3	16	539	523	401
	32	106	3.3	18	595	577	442
CE summary:	24	99	56.7	177	5478	5295	4215
			Psychotria spp.				
	2	8	113.3	2	20	0	0
	4	25	73.3	6	64	0	0
	6	42	16.7	3	50	0	0
	7	49	3.3	1	15	0	0
	10	65	3.3	2	41	37	0
PY summary:	4	37	210.0	15	193	38	0

Appendix C (Continued).

Stand 8066: continued

	Average DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Volume (ft^3): Merch	Volume (ft^3): Net
			----- Stand Level Summary -----				
All trees:	13.6		323	327	8935	8462	6936
Merch trees:	22.5		113	313			

Stand 8067

	DBH (in)	Height (ft)	Trees (stems)	Basal Area	Volume (ft^3): Gross	Volume (ft^3): Merch	Volume (ft^3): Net
			Eucalyptus saligna				
	10	69	2.5	1	35	32	29
	11	73	2.5	2	46	43	38
	12	77	2.5	2	52	49	45
	13	85	5.0	5	139	132	124
	15	87	2.5	3	91	87	78
	16	85	2.5	4	106	102	89
	18	95	2.5	4	136	131	118
	19	97	2.5	5	168	163	146
	20	100	5.0	11	362	350	313
	22	104	2.5	7	231	224	199
	23	104	2.5	7	237	230	201
	25	110	5.0	17	616	599	512
	26	112	2.5	9	335	326	286
	27	113	2.5	10	354	345	307
	28	118	2.5	10	392	381	344
	29	117	2.5	11	419	408	361
	30	118	2.5	12	452	440	392
	39	130	2.5	21	805	786	690
ES summary:	22	106	52.5	142	4985	4838	4280
			Eucalyptus robusta				
	24	86	2.5	8	175	168	137
ER summary:	24	86	2.5	8	175	169	137

Appendix C (Continued).

Stand 8067: continued

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Merch	Net
			Melaleuca quinquenervia				
	6	54	2.5	0	7	0	0
	10	63	2.5	1	22	20	16
	13	73	5.0	5	94	88	69
	14	69	2.5	3	52	49	38
	15	65	2.5	3	58	55	48
	19	74	2.5	5	104	99	76
	20	74	2.5	5	108	103	79
	22	75	2.5	7	133	127	89
	30	80	2.5	13	259	249	183
MQ summary:	17	70	25.0	42	840	793	602
			Grevillia robusta				
	7	66	2.5	1	16	0	0
	8	68	5.0	2	41	36	28
	9	70	2.5	1	30	27	21
	15	78	5.0	6	158	151	124
	21	83	2.5	6	163	157	129
	30	88	2.5	12	330	318	259
GR summary:	16	75	20.0	28	742	691	563
			Coprosma spp.				
	2	20	5.0	0	0	0	0
CP summary:	2	20	5.0	0	1	0	0
			Psychotria spp.				
	2	24	95.0	2	20	0	0
	4	35	35.0	3	38	0	0
	6	42	5.0	1	15	0	0
	7	46	7.5	2	34	0	0
	8	45	5.0	2	29	24	0
PY summary:	4	39	147.5	10	137	25	0
			----- Stand Level Summary -----				
All trees:	12.9		252	229	6881	6516	5582
Merch trees:	20.1		99	219			

Appendix C (Continued).

Stand 8068

	DBH (in)	Average Height (ft)	Trees (stems)	Basal Area	Values per acre — Volume (ft^3) Gross	Merch	Net
			Eucalyptus saligna				
	17	109	10.0	16	575	556	475
	23	117	10.0	29	1096	1067	911
ES summary:	20	113	20.0	45	1672	1624	1387
			Eucalyptus microcorys				
	12	74	10.0	8	185	173	120
	18	87	10.0	18	470	451	383
	19	89	20.0	39	1063	1024	894
	21	92	10.0	24	664	641	583
	23	94	10.0	29	804	777	731
EM summary:	19	91	60.0	118	3187	3068	2714
			Grevillia robusta				
	11	59	10.0	6	126	115	102
	17	78	10.0	15	394	376	341
GR summary:	14	69	20.0	21	521	492	445
			Psychotria spp.				
	2	12	120.0	3	18	0	0
	4	32	60.0	5	61	0	0
PY summary:	3	32	180.0	8	79	0	0
			----- Stand Level Summary -----				
All trees:	11.2		279	191	5460	5184	4546
Merch trees:	18.3		99	183			

Appendix C (Continued).

Stand 8070

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Merch	Net
			Eucalyptus saligna				
	9	64	3.3	2	35	31	30
	10	74	3.3	2	45	41	39
	11	100	6.7	4	147	138	137
	12	100	6.7	5	176	167	166
	13	80	16.7	15	428	406	389
	17	125	16.7	26	1068	1036	990
	19	135	3.3	7	305	297	285
	20	140	3.3	7	334	326	313
	22	148	3.3	9	413	403	387
	24	156	6.7	22	1067	1046	1001
	25	183	3.3	11	642	631	552
	30	174	3.3	16	874	858	821
	31	176	3.3	17	930	913	877
	33	181	3.3	20	1076	1058	1014
	34	183	3.3	21	1156	1137	1090
	40	194	3.3	30	1668	1641	1575
	41	190	3.3	31	1709	1681	1671
ES summary:	22	168	93.3	244	12081	11818	11345
			Eucalyptus microcorys				
	21	155	3.3	8	358	349	347
	22	103	3.3	9	278	270	235
	23	127	3.3	10	371	362	338
	30	133	3.3	16	601	587	548
EM summary:	24	130	13.3	43	1610	1570	1470
			Melaleuca quinquenervia				
	4	14	6.7	1	3	0	0
MQ summary:	4	14	6.7	1	3	0	0
			Grevillia robusta				
	11	69	3.3	2	56	52	42
	17	85	3.3	5	141	135	118
GR summary:	14	77	6.7	7	198	188	161
			Psychotria spp.				
	2	7	246.7	5	57	0	0
	4	21	80.0	7	65	0	0
	6	35	3.3	1	7	0	0
PY summary:	3	23	330.0	13	130	0	0
			----- Stand Level Summary -----				
All trees:	11.2		449	309	14023	13577	12975
Merch trees:	21.8		113	295			

Appendix C (Continued).

Stand 8072

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Merch	Net
			Eucalyptus saligna				
	27	133	10.0	39	1623	1586	1493
	39	142	10.0	83	3499	3422	3201
ES summary:	33	137	20.0	122	5123	5008	4695
			Eucalyptus robusta				
	43	148	10.0	101	3481	3406	2113
	45	150	10.0	110	3810	3728	2316
ER summary:	44	149	20.0	211	7292	7135	4431
			Fraxinus uhdei				
	15	130	10.0	12	509	491	475
	20	137	10.0	21	933	908	878
FU summary:	17	134	20.0	33	1443	1400	1354
			Grevillia robusta				
	8	81	10.0	4	103	89	84
	9	85	10.0	4	121	108	101
	11	92	10.0	7	206	192	180
GR summary:	9	86	30.0	14	431	391	367
			Psychotria spp.				
	2	13	140.0	3	21	0	0
	4	42	20.0	2	25	0	0
PY summary:	2	28	160.0	5	47	0	0
			----- Stand Level Summary -----				
All trees:	16.8		250	385	14336	13935	10847
Merch trees:	27.8		89	380			

Appendix C (Continued).

Stand 8073

	DBH (in)	Average Height (ft)	Trees (stems)	Basal Area	Values per acre: Volume (ft^3) Gross	Merch	Net
			Fraxinus uhdei				
	10	50	10.0	5	99	88	77
	15	113	10.0	12	459	441	440
	16	86	10.0	14	406	389	383
	19	93	10.0	20	607	585	582
	32	110	10.0	56	1872	1818	1792
	34	111	10.0	63	2115	2055	2024
FU summary:	23	100	60.0	170	5561	5379	5301
			Psychotria spp.				
	2	7	240.0	5	53	0	0
PY summary:	2	7	240.0	5	53	0	0
			----- Stand Level Summary -----				
All trees:	10.4		299	176	5614	5379	5301
Merch trees:	22.8		60	170			

Appendix C (Continued).

Stand 8074

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Merch	Net
			Eucalyptus microcorys				
	7	69	3.3	1	19	0	0
	8	97	6.7	2	69	59	59
	9	86	6.7	3	79	70	69
	10	93	10.0	5	158	145	144
	11	101	10.0	7	206	192	190
	12	100	13.3	10	324	306	306
	13	105	6.7	6	198	189	189
	14	94	6.7	7	207	197	184
	15	127	6.7	8	312	301	298
	16	125	10.0	14	524	507	507
	17	138	3.3	5	215	209	207
	18	145	3.3	6	252	245	245
	19	148	3.3	7	286	279	276
	20	153	3.3	7	326	318	314
	21	174	13.3	32	1608	1575	1575
	23	170	3.3	10	468	459	459
	24	171	3.3	10	511	501	495
	25	178	6.7	23	1146	1125	1055
	26	179	3.3	12	621	609	602
	27	183	3.3	13	680	668	660
	28	195	13.3	57	3092	3040	3040
	29	190	6.7	31	1614	1587	1569
	30	195	3.3	16	879	864	843
	33	204	10.0	59	3292	3242	3201
	36	213	3.3	24	1346	1327	1311
EM summary:	21	197	163.3	376	18446	18027	17809
			Psychotria spp.				
	2	18	20.0	0	3	0	0
PY summary:	2	18	20.0	0	4	0	0
			----- Stand Level Summary -----				
All trees:	19.4		183	377	18449	18027	17809
Merch trees:	20.7		159	376			

Appendix C (Continued).

Stand 8075

	Average		Values per acre			
	DBH	Height	Trees	Basal	Volume (ft^3)	
	(in)	(ft)	(stems)	Area	Gross	Merch	Net
			Eucalyptus saligna				
	33	173	2.0	12	623	612	606
	43	185	2.0	20	1076	1058	1050
	48	190	2.0	25	1338	1315	1303
ES summary:	42	183	6.0	57	3038	2986	2960
			Eucalyptus robusta				
	7	39	2.0	1	6	0	0
	9	55	4.0	2	28	24	21
	14	86	4.0	4	102	97	85
	15	91	2.0	2	61	59	52
	19	107	2.0	4	113	109	96
	20	140	8.0	17	643	626	586
	21	114	2.0	5	145	140	123
	22	105	2.0	5	147	142	100
	23	75	4.0	12	233	223	183
	24	130	2.0	6	211	205	203
	26	127	4.0	15	480	468	411
	27	168	2.0	8	336	329	307
	29	100	2.0	9	233	226	160
	30	135	4.0	20	663	647	566
	32	138	2.0	11	382	373	356
	34	141	6.0	38	1308	1279	1125
	36	163	2.0	14	555	544	525
	40	149	2.0	17	614	601	527
	41	150	4.0	37	1292	1264	1109
	43	152	2.0	20	711	696	610
	44	153	4.0	42	1491	1460	1279
	60	135	2.0	39	1167	1138	959
ER summary:	30	137	68.0	329	10931	10662	9395
			Eucalyptus microcorys				
	20	120	2.0	4	155	150	135
EM summary:	20	120	2.0	4	155	151	136
			Fraxinus uhdei				
	7	45	2.0	0	8	0	0
FU summary:	7	45	2.0	0	8	0	0
			Casuarina equisetifolia				
	4	24	4.0	0	3	0	0
	6	35	2.0	0	5	0	0
	7	55	2.0	0	9	0	0
CE summary:	5	35	8.0	1	19	0	0

Appendix C (Continued).

Stand 8075: continued

	Average		Values per acre			
DBH	Height	Trees	Basal	Volume (ft^3)		
(in)	(ft)	(stems)	Area	Gross	Merch	Net
			Grevillia robusta			
6	55	2.0	0	7	0	0
8	77	6.0	2	56	48	46
9	52	2.0	1	16	14	12
12	47	2.0	2	26	24	21
13	67	2.0	2	43	40	34
15	90	4.0	5	148	142	115
GR summary: 11	70	18.0	12	299	271	230
			Psychotria spp.			
2	5	208.0	5	0	0	0
4	14	32.0	3	20	0	0
PY summary: 2	12	240.0	7	22	0	0
		----- Stand Level Summary -----				
All trees: 14.8		344	411	14473	14070	12720
Merch trees: 28.6		89	401			

Stand 8076

	Average		Values per acre			
DBH	Height	Trees	Basal	Volume (ft^3)		
(in)	(ft)	(stems)	Area	Gross	Merch	Net
			Toona ciliata			
19	93	2.5	5	151	146	133
22	101	2.5	6	210	203	186
23	103	2.5	7	247	239	220
25	92	2.5	9	251	242	230
31	135	2.5	13	525	513	498
TC summary: 24	105	12.5	40	1386	1346	1270
			Fraxinus uhdei			
2	5	95.0	2	0	0	0
4	11	15.0	1	9	0	0
26	82	2.5	9	243	234	194
FU summary: 5	12	112.5	13	253	234	195
			Metrosideros polymorpha			
29	87	2.5	12	318	306	228
MP summary: 29	87	2.5	12	318	307	228

Appendix C (Continued).

Stand 8076: continued

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Merch	Net
			Grevillia robusta				
	13	79	2.5	2	62	59	56
	14	83	2.5	3	75	71	68
	16	89	5.0	7	209	200	200
	17	97	2.5	4	127	122	115
	19	97	7.5	15	470	454	425
	20	65	2.5	5	120	114	103
	21	101	2.5	6	197	190	178
	23	120	7.5	22	828	806	727
	25	107	2.5	9	290	281	260
	26	120	2.5	9	347	338	310
	28	111	2.5	11	370	359	329
	30	125	2.5	12	471	459	423
GR summary:	21	102	42.5	104	3572	3460	3198
			Unknown species				
	4	22	10.0	1	8	0	0
XX summary:	4	22	10.0	1	8	0	0
			Psychotria spp.				
	2	18	90.0	2	16	0	0
	4	42	25.0	2	31	0	0
	6	58	2.5	0	8	0	0
	7	65	5.0	1	33	0	0
	8	70	2.5	1	19	0	0
PY summary:	3	44	125.0	7	109	0	0
			----- Stand Level Summary -----				
All trees:	10.3		305	177	5647	5346	4891
Merch trees:	22.5		60	165			

Appendix C (Continued).

Stand 8077

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Merch	Net
			Eucalyptus saligna				
	10	80	2.0	1	28	26	26
	11	90	2.0	1	39	37	34
	12	84	2.0	2	48	46	41
	14	90	2.0	2	64	61	55
	15	74	2.0	2	60	57	54
	16	83	2.0	3	77	74	60
	17	98	4.0	6	211	203	184
	20	105	2.0	4	156	151	136
	21	107	2.0	5	177	172	154
	25	135	2.0	7	286	279	247
	31	123	2.0	11	405	395	354
	34	127	2.0	12	483	472	427
	38	132	4.0	32	1247	1217	1101
	46	139	2.0	23	912	891	807
ES summary:	25	106	32.0	111	4200	4087	3687
			Eucalyptus robusta				
	7	63	2.0	0	8	0	0
	10	79	2.0	1	23	20	19
	11	84	2.0	1	28	26	24
	12	90	4.0	3	76	71	67
	13	92	2.0	2	44	42	38
	16	103	2.0	3	78	75	68
	17	106	2.0	3	88	85	77
	21	117	2.0	5	154	149	136
	23	115	6.0	18	531	516	444
	26	128	2.0	7	235	229	214
	27	130	2.0	8	260	254	236
	30	136	2.0	10	332	325	304
	32	140	2.0	11	388	380	356
	35	147	2.0	13	470	460	416
	39	150	2.0	17	601	588	555
	40	155	2.0	17	629	616	609
ER summary:	24	113	38.0	119	3954	3843	3570
			Eucalyptus microcorys				
	14	117	2.0	2	76	73	71
	15	118	2.0	2	87	84	81
	16	119	2.0	3	100	96	93
	18	120	4.0	7	254	246	236
	22	125	2.0	5	193	188	173
	33	125	2.0	12	412	402	326
EM summary:	20	121	14.0	32	1125	1092	983

Appendix C (Continued).

Stand 8077: continued

	Average DBH (in)	Average Height (ft)	Trees (stems)	Basal Area	Volume (ft^3) Gross	Volume (ft^3) Merch	Volume (ft^3) Net
			Fraxinus uhdei				
	2	5	4.0	0	0	0	0
	4	12	4.0	0	2	0	0
	7	30	2.0	1	6	0	0
FU summary:	4	13	10.0	1	9	0	0
			Grevillia robusta				
	9	75	4.0	2	41	36	34
	9	83	6.0	3	77	69	65
	11	80	4.0	3	70	65	58
	14	115	6.0	7	251	240	235
	15	103	2.0	3	86	83	77
	16	105	2.0	3	98	95	89
	17	100	8.0	12	407	391	371
	20	113	2.0	4	164	159	149
	21	114	2.0	5	175	170	160
	25	119	2.0	7	263	256	241
GR summary:	15	98	38.0	47	1637	1570	1484
			Unknown species				
	2	25	8.0	0	1	0	0
	4	44	8.0	1	10	0	0
XX summary:	3	34	16.0	1	12	0	0
			Psychotria spp.				
	2	9	392.0	9	61	0	0
	4	29	88.0	8	84	0	0
	6	46	4.0	1	13	0	0
	10	69	2.0	1	28	26	0
PY summary:	3	33	486.0	18	188	26	0
			----- Stand Level Summary -----				
All trees:	9.8		634	329	11125	10618	9725
Merch trees:	21.6		122	310			

Appendix C (Continued).

Stand 8078

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Merch	Net
			Fraxinus uhdei				
	17	90	5.0	8	225	216	198
	19	93	5.0	10	303	292	267
	26	101	5.0	19	605	586	532
	28	103	5.0	21	690	669	606
FU summary:	23	97	20.0	58	1825	1765	1605
			Grevillia robusta				
	14	88	5.0	6	166	158	151
	22	100	5.0	14	448	433	408
GR summary:	19	94	10.0	19	614	592	559
			Casuarina equisetifolia				
	2	6	10.0	0	2	0	0
	15	75	5.0	7	167	159	71
	27	95	5.0	20	616	595	257
CE summary:	16	46	20.0	27	786	755	330
			Psychotria spp.				
	2	10	70.0	2	10	0	0
	4	30	10.0	1	9	0	0
PY summary:	2	15	80.0	2	21	0	0
			----- Stand Level Summary -----				
All trees:	12.3		129	107	3246	3112	2494
Merch trees:	21.8		39	104			

Appendix C (Continued).

Stand 8128

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Merch	Net
			Alnus nepalensis				
	17	81	1.7	3	71	68	67
	44	107	1.7	18	527	510	499
AN summary:	33	94	3.3	20	600	579	567
			Cryptomeria japonica				
	2	22	6.7	0	1	0	0
	4	34	23.3	2	23	0	0
	6	47	30.0	6	118	0	0
	7	43	43.3	12	213	0	0
	8	46	55.0	19	366	323	316
	9	55	70.0	31	666	604	603
	10	47	50.0	27	502	458	457
	11	60	61.7	41	891	828	810
	12	63	30.0	24	530	496	475
	13	55	35.0	32	625	582	572
	14	55	16.7	18	335	312	308
	15	62	21.7	27	537	504	487
	16	65	20.0	28	571	536	536
	17	58	6.7	11	187	174	174
	18	68	5.0	9	176	166	163
	19	65	10.0	20	371	347	347
	20	89	3.3	7	175	166	165
	22	72	1.7	4	84	79	77
	23	73	1.7	5	92	86	84
	24	65	5.0	16	279	257	257
	28	78	1.7	7	143	134	131
CJ summary:	11	67	498.3	344	6896	6058	5973
			----- Stand Level Summary -----				
All trees:	11.5		501	364	7496	6638	6539
Merch trees:	12.6		398	345			

Appendix C (Continued).

Stand 8166

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Merch	Net
			Eucalyptus saligna				
	34	140	2.5	16	672	658	599
ES summary:	34	140	2.5	16	673	658	600
			Fraxinus uhdei				
	2	13	95.0	2	14	0	0
	4	28	5.0	0	4	0	0
	5	36	2.5	0	5	0	0
	6	43	5.0	1	15	0	0
	7	61	15.0	4	87	0	0
	8	18	7.5	3	24	19	0
	9	59	5.0	2	44	39	38
	10	70	2.5	1	30	27	24
	11	75	2.5	2	47	43	37
	12	81	7.5	6	170	160	142
	13	79	10.0	9	238	225	195
	14	91	7.5	8	253	242	214
	15	96	2.5	3	97	93	82
	16	101	5.0	7	244	235	206
	18	110	7.5	13	475	460	401
	19	114	7.5	15	568	551	482
	20	117	10.0	22	826	801	741
	21	117	5.0	12	470	456	426
	22	115	2.5	6	238	231	194
	23	160	7.5	22	1100	1076	897
	25	172	7.5	26	1385	1358	1226
	26	139	2.5	9	397	387	342
	28	145	2.5	11	475	465	409
	29	135	5.0	23	955	932	924
	30	151	2.5	12	561	550	483
	42	181	2.5	24	1220	1198	1058
FU summary:	14	147	235.0	245	9954	9558	8533
			Grevillia robusta				
	11	65	2.5	2	38	35	33
	14	102	2.5	3	95	91	83
GR summary:	13	83	5.0	4	134	127	117
			Psychotria spp.				
	2	13	85.0	2	12	0	0
	4	28	5.0	0	4	0	0
PY summary:	2	15	90.0	2	18	0	0
			----- Stand Level Summary -----				
All trees:	12.1		332	267	10778	10343	9250
Merch trees:	19.8		120	257			

Appendix C (Continued).

Stand 8201

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Volume (ft^3): Merch	Volume (ft^3): Net
			Eucalyptus saligna				
	2	24	16.0	0	3	0	0
	4	41	28.0	2	34	0	0
	6	55	4.0	1	15	0	0
	7	57	20.2	5	110	0	0
	8	85	12.0	4	123	107	106
	9	46	6.0	3	45	40	25
	10	83	8.0	4	127	117	113
	11	78	4.0	3	72	67	56
	12	77	6.0	5	127	119	109
	14	70	4.2	4	110	104	98
	15	104	6.0	7	260	250	231
	17	97	2.0	3	102	99	83
	19	101	2.0	4	133	129	108
	20	14	2.0	4	37	31	0
	21	106	2.0	5	168	163	136
	22	108	2.0	5	186	181	152
	25	113	2.2	7	274	266	224
	27	117	4.0	16	591	576	484
	29	120	2.0	9	346	337	283
ES summary:	11	91	132.6	94	2870	2592	2214
			Metrosideros polymorpha				
	2	24	4.0	0	0	0	0
	4	41	4.0	0	4	0	0
MP summary:	3	33	8.0	0	6	0	0
			Grevillia robusta				
	17	95	2.0	3	101	97	95
GR summary:	17	95	2.0	3	101	97	95
			Schinus terebinthifolius				
	2	18	136.0	3	25	0	0
	4	28	36.0	3	34	0	0
	6	12	4.4	1	6	0	0
	7	38	8.2	2	31	0	0
	8	39	4.0	1	20	17	0
	9	42	4.2	2	29	25	0
ST summary:	3	31	192.8	12	148	43	0
			----- Stand Level Summary -----				
All trees:	7.7		335	110	3125	2732	2310
Merch trees:	15.0		74	91			

Appendix C (Continued).

Stand 8202

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Merch	Net
			Eucalyptus saligna				
	4	90	4.0	0	9	0	0
	7	105	4.0	1	37	0	0
	8	102	6.0	2	72	63	59
	10	105	4.0	2	78	73	68
	12	108	2.0	2	57	55	50
	16	122	4.0	6	227	220	217
	18	114	2.0	4	133	129	119
	19	114	4.0	8	298	289	267
	22	116	2.0	5	200	194	179
	25	126	2.0	7	274	268	251
	26	98	2.0	7	233	226	210
	30	115	2.0	10	355	345	252
	32	120	2.0	11	418	407	395
	42	123	2.0	19	705	688	634
ES summary:	19	110	42.0	84	3104	2961	2707
			Eucalyptus robusta				
	2	6	16.0	0	3	0	0
	4	23	12.0	1	8	0	0
	6	77	6.0	1	23	0	0
	7	54	4.0	1	16	0	0
	8	62	2.0	1	12	10	9
	9	70	2.0	1	17	15	14
	12	89	2.0	2	39	36	33
	15	105	2.0	2	70	67	51
	16	107	2.0	3	81	78	71
	17	107	2.0	3	91	88	83
	21	122	2.0	5	155	150	138
	22	125	4.0	11	344	335	307
	36	146	2.0	14	498	487	446
ER summary:	12	75	58.0	45	1363	1270	1155
			Eucalyptus microcorys				
	2	18	4.0	0	0	0	0
	4	48	4.0	0	4	0	0
	6	70	2.0	0	8	0	0
	7	77	2.0	1	12	0	0
	11	97	2.0	1	39	37	35
	12	98	2.0	2	48	45	41
	14	115	6.0	6	221	212	202
	16	108	4.0	5	179	173	168
	23	121	2.0	6	205	199	192
	24	118	2.0	6	212	206	199
EM summary:	13	85	30.0	28	935	876	840

Appendix C (Continued).

Stand 8202: continued

	Average DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Volume (ft^3): Merch	Volume (ft^3): Net
			Melaleuca quinquenervia				
	12	60	2.0	2	28	26	22
	19	68	2.0	4	77	73	64
	21	75	2.0	5	95	91	75
	22	65	2.0	5	95	90	84
	24	72	2.0	6	117	112	97
	35	78	2.0	13	258	247	218
MQ summary:	23	70	12.0	35	672	642	563
			Fraxinus uhdei				
	2	77	4.0	0	2	0	0
FU summary:	2	77	4.0	0	2	0	0
			Metrosideros polymorpha				
	4	24	4.0	0	3	0	0
	7	42	4.0	1	17	0	0
	8	50	4.0	1	25	21	19
	9	52	6.0	2	46	41	31
	11	66	2.0	1	31	29	26
	12	70	4.0	3	73	68	61
	14	81	2.0	2	54	52	44
MP summary:	9	52	26.0	12	254	213	184
			Grevillia robusta				
	9	44	2.0	1	13	11	10
	10	54	2.0	1	19	17	16
	15	70	4.0	5	125	118	112
GR summary:	13	59	8.0	7	158	148	140
			Schinus terebinthifolius				
	2	6	16.0	0	0	0	0
	4	16	12.0	1	8	0	0
	7	35	4.0	1	13	0	0
ST summary:	4	13	32.0	2	22	0	0
			Cryptomeria japonica				
	15	57	2.0	2	45	42	42
CJ summary:	15	57	2.0	2	46	43	43
			----- Stand Level Summary -----				
All trees:	13.6		214	216	6556	6152	5633
Merch trees:	18.3		112	205			

Appendix C (Continued).

Stand 8203

	DBH (in)	Average Height (ft)	Trees (stems)	Basal Area	Values per acre — Volume (ft^3) Gross	Merch	Net
			Eucalyptus microcorys				
	9	84	10.0	4	103	90	85
EM summary:	9	84	10.0	4	104	90	86
			Metrosideros polymorpha				
	7	44	20.0	6	91	0	0
	9	55	10.0	5	92	82	69
	10	61	10.0	6	123	112	95
	11	64	10.0	7	163	151	128
MP summary:	9	56	50.0	23	471	346	294
			Grevillia robusta				
	2	5	20.0	0	0	0	0
	4	14	20.0	2	13	0	0
	6	15	10.0	2	16	0	0
	7	34	20.0	5	70	0	0
	8	40	10.0	3	52	44	34
	9	45	30.0	13	221	194	145
	11	54	10.0	7	128	117	82
	12	58	10.0	8	161	149	103
	13	60	10.0	9	195	182	159
GR summary:	8	54	140.0	50	860	688	525
			Cheirodendron trigynum				
	2	7	20.0	0	4	0	0
	4	22	20.0	2	16	0	0
	8	50	20.0	6	118	99	0
CT summary:	5	36	60.0	9	139	99	0
			Psychotria spp.				
	2	10	40.0	1	6	0	0
	6	7	10.0	2	21	0	0
PY summary:	3	9	50.0	3	28	0	0
			----- Stand Level Summary -----				
All trees:	7.2		309	88	1601	1224	905
Merch trees:	9.8		129	68			

Appendix C (Continued).

Stand 8333

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Volume (ft^3): Merch	Volume (ft^3): Net
			Eucalyptus saligna				
	2	6	70.0	2	19	0	0
	4	21	45.0	4	35	0	0
	6	36	20.0	4	53	0	0
	7	96	27.5	7	239	0	0
	8	51	15.0	5	97	83	70
	9	58	7.5	3	69	62	58
	10	46	7.5	4	70	63	61
	11	68	7.5	5	119	111	104
	12	81	10.0	8	223	210	205
	13	90	7.5	7	214	204	198
	14	80	5.0	5	148	141	132
	15	83	7.5	9	263	251	236
	16	102	5.0	7	240	232	215
	17	78	7.5	12	316	303	256
	19	93	5.0	10	308	297	280
	20	88	2.5	5	161	155	142
	23	101	2.5	7	238	230	216
	24	102	2.5	8	261	253	237
	33	94	2.5	15	435	421	397
ES summary:	10	89	257.5	128	3517	3022	2815
			Sophora chrysophylla				
	2	6	10.0	0	2	0	0
	4	21	10.0	1	8	0	0
SO summary:	3	13	20.0	1	11	0	0
			----- Stand Level Summary -----				
All trees:	9.2		277	129	3528	3022	2815
Merch trees:	14.6		94	111			

Appendix C (Continued).

Stand 8334

	DBH (in)	Average Height (ft)	Trees (stems)	Basal Area	Volume (ft^3) Gross	Volume (ft^3) Merch	Volume (ft^3) Net
			Eucalyptus saligna				
	2	14	128.0	3	19	0	0
	4	36	100.0	9	111	0	0
	6	59	36.0	7	144	0	0
	7	62	26.0	7	153	0	0
	8	60	18.0	6	135	116	104
	9	85	6.0	3	78	70	67
	10	23	8.0	4	45	38	0
	11	53	12.0	8	152	140	120
	12	84	12.0	9	274	259	221
	13	77	12.0	11	296	280	208
	14	90	2.0	2	66	63	54
	15	93	6.0	7	233	223	191
	16	95	2.0	3	90	86	74
	19	103	4.0	8	270	262	256
	20	103	2.0	4	149	144	123
	21	105	2.0	5	166	161	137
	25	110	2.0	7	243	236	200
	26	112	2.0	7	264	257	217
	28	114	2.0	9	308	300	255
ES summary:	8	92	382.0	119	3204	2642	2232
			Myoporum sandwicense				
	2	14	56.0	1	8	0	0
MS summary:	2	14	56.0	1	9	0	0
			----- Stand Level Summary -----				
All trees:	7.1		437	121	3213	2642	2232
Merch trees:	13.7		91	94			

Appendix C (Continued).

Stand 8343

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Volume (ft^3): Merch	Volume (ft^3): Net
			Fraxinus uhdei				
	2	11	100.0	2	15	0	0
	4	24	100.0	9	86	0	0
	7	46	10.0	3	42	0	0
	8	50	10.0	4	69	60	52
	9	57	10.0	4	89	79	72
	10	62	5.0	3	63	57	49
	11	57	10.0	7	134	123	80
	13	77	5.0	5	124	117	102
	14	92	10.0	11	334	318	292
	15	90	15.0	18	555	531	469
	16	91	5.0	7	213	204	177
	17	95	10.0	15	493	474	409
	19	104	5.0	10	335	323	278
	20	107	5.0	10	367	356	305
	22	115	5.0	13	479	465	399
	29	137	5.0	23	986	964	834
FU summary:	9	104	310.0	144	4392	4078	3524
			Akacia koa				
	9	55	5.0	2	42	37	32
AK summary:	9	55	5.0	2	42	37	33
			Myoporum sandwicense				
	2	11	30.0	1	4	0	0
	4	24	10.0	1	8	0	0
MS summary:	3	14	40.0	2	13	0	0
			----- Stand Level Summary -----				
All trees:	8.7		355	148	4447	4115	3557
Merch trees:	15.2		105	133			

Appendix C (Continued).

Stand 8344

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Merch	Net
			Eucalyptus robusta				
	2	7	4.0	0	0	0	0
	4	21	12.0	1	7	0	0
	7	45	4.0	1	14	0	0
	8	35	10.0	3	38	30	30
	9	57	2.0	1	14	12	11
	10	63	4.0	2	39	35	31
	11	68	2.0	1	25	23	20
	12	73	4.0	3	65	60	52
	13	75	2.0	2	39	36	35
	14	81	2.0	2	48	45	40
	15	60	8.0	10	168	158	124
	16	88	2.0	3	67	64	56
	17	108	2.0	3	92	88	82
	18	93	2.0	4	90	86	75
	19	96	2.0	4	102	98	86
	20	139	4.0	9	319	310	182
	21	121	2.0	5	153	149	145
	23	114	2.0	6	172	167	163
	24	42	2.0	6	74	68	54
	25	108	4.0	14	384	372	322
	27	70	4.0	16	293	280	272
	28	100	8.0	34	876	849	687
	29	114	2.0	9	265	258	224
	30	115	2.0	10	285	278	241
	31	116	2.0	10	306	298	258
	33	177	2.0	12	511	502	496
	35	121	2.0	13	397	387	335
	38	123	2.0	16	471	459	397
	39	124	2.0	17	497	485	419
	40	122	2.0	17	513	500	476
ER summary:	20	110	104.0	234	6342	6114	5327
			Melaleuca quinquenervia				
	16	75	2.0	3	61	58	52
MQ summary:	16	75	2.0	3	61	58	52
			Metrosideros polymorpha				
	4	12	4.0	0	2	0	0
	21	71	2.0	5	112	107	90
MP summary:	12	32	6.0	5	115	107	91

Appendix C (Continued).

Stand 8344: continued

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Volume (ft^3): Merch	Volume (ft^3): Net
			Fraxinus uhdei				
	2	15	104.0	2	16	0	0
	4	28	88.0	8	83	0	0
	6	53	14.0	3	51	0	0
	7	50	16.0	4	77	0	0
	8	48	14.0	5	86	73	69
	9	52	4.0	2	33	29	28
	10	46	10.0	5	92	82	80
	11	60	4.0	3	55	51	47
	12	63	2.0	2	34	32	29
	13	66	4.0	4	85	79	72
	15	72	2.0	2	60	57	51
	16	74	2.0	3	70	67	60
	18	79	2.0	4	94	90	82
	24	100	2.0	6	202	195	166
FU summary:	6	58	268.0	52	1045	761	689
			----- Stand Level Summary -----				
All trees:	11.9		379	294	7563	7041	6159
Merch trees:	19.4		133	275			

Appendix C (Continued).

Stand 8351

	DBH (in)	Average Height (ft)	Trees (stems)	Basal Area	Values per acre — Volume (ft^3) Gross	Merch	Net
			Fraxinus uhdei				
	2	10	20.0	0	3	0	0
	6	65	10.0	2	45	0	0
	7	36	10.0	3	39	0	0
FU summary:	5	30	40.0	5	88	0	0
			Akacia koa				
	17	97	10.0	16	509	490	445
	23	104	10.0	29	968	938	846
AK summary:	20	101	20.0	45	1478	1429	1292
			Cryptomeria japonica				
	25	88	10.0	34	756	713	713
	30	96	10.0	49	1168	1110	1110
	33	100	10.0	59	1468	1399	1399
	36	104	10.0	71	1884	1810	1810
CJ summary:	31	97	40.0	213	5278	5034	5034
			----- Stand Level Summary -----				
All trees:	22.0		100	263	6843	6463	6326
Merch trees:	28.1		60	258			

Appendix C (Continued).

Stand 8443

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Merch	Net
			Eucalyptus robusta				
	10	68	20.0	11	212	190	177
	13	79	20.0	19	428	403	388
ER summary:	12	73	40.0	30	641	594	566
			Casuarina equisetifolia				
	2	5	100.0	2	0	0	0
	4	13	120.0	10	77	0	0
	6	28	20.0	4	49	0	0
	7	36	20.0	5	76	0	0
	8	45	40.0	14	239	204	178
	9	52	80.0	36	686	608	579
	10	59	20.0	11	237	216	183
	11	65	20.0	14	330	306	247
	12	72	20.0	16	405	379	284
CE summary:	7	68	440.0	115	2104	1715	1473
			Cheirodendron trigynum				
	7	35	20.0	5	70	0	0
CT summary:	7	35	20.0	5	71	0	0
			----- Stand Level Summary -----				
All trees:	7.4		500	151	2816	2310	2040
Merch trees:	10.1		220	123			

Appendix C (Continued).

Stand 8444

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Merch	Net
			Eucalyptus robusta				
	2	14	20.0	0	2	0	0
	4	25	45.0	4	32	0	0
	6	49	15.0	3	40	0	0
	7	44	12.5	3	43	0	0
	8	39	40.0	14	167	135	132
	9	29	20.0	9	85	69	68
	10	41	37.5	20	254	223	138
	11	44	12.5	8	109	98	92
	12	55	32.5	26	413	379	352
	13	58	20.0	18	308	286	250
	14	37	30.0	32	367	332	39
	15	18	25.0	31	240	195	0
	16	70	25.0	35	685	650	518
	17	45	17.5	28	367	340	199
	18	69	5.0	9	170	162	117
	19	47	12.5	25	332	309	271
	20	73	2.5	5	109	104	75
	21	113	17.5	42	1260	1222	1141
	22	76	12.5	33	682	654	495
	23	78	2.5	7	151	145	109
	24	75	2.5	8	158	151	130
	25	81	2.5	9	183	176	132
	27	84	2.5	10	218	210	157
	28	85	7.5	32	707	681	605
	32	91	5.0	28	638	615	462
	34	93	5.0	32	728	704	526
ER summary:	14	83	430.0	470	8459	7849	6016
			Metrosideros polymorpha				
	2	14	25.0	1	3	0	0
	4	39	15.0	1	17	0	0
	6	56	2.5	0	9	0	0
	7	64	5.0	1	31	0	0
MP summary:	4	32	47.5	4	63	0	0
			Cheirodendron trigynum				
	2	14	25.0	1	3	0	0
	4	25	5.0	0	4	0	0
CT summary:	2	16	30.0	1	8	0	0
			----- Stand Level Summary -----				
All trees:	13.1		507	475	8530	7849	6016
Merch trees:	15.8		337	460			

Appendix C (Continued).

Stand 8445

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Merch	Net
			Eucalyptus robusta				
	4	27	20.0	2	14	0	0
	6	44	15.0	3	37	0	0
	7	47	35.0	9	129	0	0
	8	53	10.0	3	54	44	37
	9	61	15.0	7	117	101	83
	11	51	20.0	13	198	179	173
	12	85	15.0	12	280	262	219
	13	77	5.0	5	99	93	80
	14	81	5.0	5	120	114	97
	15	101	15.0	18	510	488	364
	16	88	5.0	7	168	161	137
	17	77	5.0	8	168	160	154
	18	94	5.0	9	226	217	183
	20	100	15.0	33	878	848	712
	21	102	15.0	36	988	956	801
	22	112	5.0	13	390	378	354
	23	107	15.0	43	1226	1189	993
	25	108	10.0	34	959	931	787
	27	119	5.0	20	606	590	519
	28	118	5.0	21	646	629	523
	29	30	5.0	23	219	191	128
	33	128	5.0	30	938	915	776
	37	134	5.0	37	1211	1182	999
ER summary:	17	107	255.0	392	10193	9638	8127
			Metrosideros polymorpha				
	4	17	30.0	3	22	0	0
	7	36	5.0	1	18	0	0
MP summary:	5	20	35.0	4	41	0	0
			Araucaria excelsa				
	10	59	5.0	3	63	58	52
	11	65	5.0	4	83	78	71
	12	69	5.0	4	90	84	78
	13	74	5.0	5	115	109	103
	14	78	5.0	5	131	124	118
	15	82	10.0	13	329	313	307
	17	78	5.0	7	176	167	165
	17	92	5.0	8	220	210	208
	19	93	5.0	10	256	244	243
AE summary:	15	81	50.0	58	1468	1391	1349
			----- Stand Level Summary -----				
All trees:	15.6		340	454	11703	11029	9476
Merch trees:	18.4		235	436			

Appendix C (Continued).

Stand 8446

	Average DBH (in)	Average Height (ft)	Trees (stems)	Basal Area	Volume (ft^3) Gross	Volume (ft^3) Merch	Volume (ft^3) Net
			Eucalyptus robusta				
	2	6	20.0	0	4	0	0
	4	20	40.0	3	25	0	0
	6	35	20.0	4	41	0	0
	7	42	10.0	3	33	0	0
	9	53	20.0	9	138	119	116
	15	75	10.0	12	257	243	233
	19	83	20.0	39	897	860	817
	27	57	10.0	40	607	573	528
	30	97	10.0	49	1210	1172	1088
ER summary:	14	80	160.0	160	3216	2969	2785
			Metrosideros polymorpha				
	2	7	60.0	1	13	0	0
	4	22	80.0	7	66	0	0
	7	43	10.0	3	42	0	0
MP summary:	4	27	150.0	11	122	0	0
			Casuarina equisetifolia				
	7	35	10.0	3	37	0	0
	10	47	10.0	5	92	82	59
	13	57	10.0	9	188	176	139
	14	60	10.0	11	231	217	183
	15	62	10.0	13	282	265	217
	17	66	10.0	16	367	348	288
	33	87	10.0	60	1605	1546	1478
CE summary:	18	69	70.0	118	2805	2638	2367
			Cryptomeria japonica				
	13	36	10.0	9	119	107	107
CJ summary:	13	36	10.0	9	119	108	108
			----- Stand Level Summary -----				
All trees:	11.8		389	297	6262	5715	5260
Merch trees:	18.9		139	273			

Appendix C (Continued).

Stand 8448

	DBH (in)	Average Height (ft)	Trees (stems)	Basal Area	Volume (ft^3) Gross	Volume (ft^3) Merch	Volume (ft^3) Net
			Metrosideros polymorpha				
	7	47	10.0	3	44	0	0
MP summary:	7	47	10.0	3	45	0	0
			Casuarina equisetifolia				
	18	92	10.0	19	572	550	395
CE summary:	18	92	10.0	19	572	551	395
			Cryptomeria japonica				
	4	6	20.0	2	25	0	0
	7	16	10.0	3	23	0	0
	8	21	20.0	7	72	61	61
	9	25	10.0	4	51	44	44
	10	30	10.0	5	69	61	61
	11	34	10.0	7	91	82	82
	12	38	40.0	31	463	422	422
	14	46	20.0	21	350	323	323
	15	52	10.0	12	213	197	197
	16	54	10.0	14	242	225	224
	17	37	20.0	32	417	375	373
	21	59	20.0	48	816	753	753
	22	70	10.0	26	496	462	420
	23	74	10.0	29	558	519	474
	24	76	10.0	31	622	580	521
	25	78	10.0	34	689	644	575
	32	92	10.0	56	1284	1218	932
CJ summary:	16	80	250.0	363	6491	5973	5469
			----- Stand Level Summary -----				
All trees:	16.2		269	384	7108	6524	5865
Merch trees:	17.3		230	377			

Appendix C (Continued).

Stand 8449

	DBH (in)	Average Height (ft)	Values per acre: Trees (stems)	Basal Area	Volume (ft^3): Gross	Volume (ft^3): Merch	Volume (ft^3): Net
			Metrosideros polymorpha				
	6	32	20.0	4	47	0	0
	7	37	20.0	5	71	0	0
MP summary:	6	34	40.0	9	119	0	0
			Casuarina equisetifolia				
	6	32	10.0	2	24	0	0
	7	33	20.0	5	69	0	0
	8	29	30.0	10	124	102	76
	9	37	30.0	13	188	163	136
	10	44	30.0	16	267	239	203
	11	40	20.0	13	200	180	146
	13	43	10.0	9	147	134	107
	14	45	20.0	21	348	320	253
	19	50	10.0	20	343	321	242
	23	55	10.0	29	537	506	391
	24	58	20.0	63	1217	1151	801
CE summary:	13	55	210.0	203	3469	3121	2359
			----- Stand Level Summary -----				
All trees:	12.5		250	211	3588	3121	2359
Merch trees:	14.1		179	195			

Appendix C (Continued).

Stand 8450

	DBH (in)	Average Height (ft)	Trees (stems)	Basal Area	Values per acre — Volume (ft^3) Gross	Merch	Net
			Eucalyptus robusta				
	2	5	40.0	1	0	0	0
	15	50	10.0	12	180	167	156
	17	57	20.0	32	511	480	441
	18	60	20.0	35	596	562	514
	24	57	10.0	31	489	462	449
	25	77	10.0	34	696	668	624
	26	79	10.0	37	767	737	672
	27	81	10.0	40	840	808	725
	30	69	10.0	49	878	837	631
	34	91	10.0	63	1435	1385	1126
	37	95	10.0	75	1731	1672	1302
	39	120	10.0	83	2416	2353	1816
	46	104	10.0	115	2664	2572	1751
ER summary:	25	102	180.0	607	13208	12710	10212
			Metrosideros polymorpha				
	4	6	20.0	2	23	0	0
MP summary:	4	6	20.0	2	23	0	0
			----- Stand Level Summary -----				
All trees:	23.6		199	609	13231	12710	10212
Merch trees:	28.2		139	606			