ECONOMIC ANALYSIS
OF
PROPOSED CRITICAL HABITAT DESIGNATION
FOR HAWAIIAN PICTURE-WING FLIES
STATE OF HAWAI'I

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EXECUTIVE SUMMARY

1. PURPOSE OF THE ECONOMIC ANALYSIS

The purpose of this report is to identify and analyze the potential economic impacts associated with the proposed critical habitat designation for 11 species of Hawaiian picture-wing flies. This information is intended to assist the Secretary in determining whether the benefits of excluding particular areas from the designation outweigh the benefits of including those areas in the designation.

2. FINAL ECONOMIC ANALYSIS OF PROPOSED RULE

This final report analyzes the proposed designation as described in the proposed rule. The analysis does not reflect changes to the proposed critical habitat designation made in the final rule. Consequently, the description of the habitat designation in the final rule may differ from maps and figures presented in the analysis. And since no public comments were received on the draft economic analysis, there are no substantive changes between this final economic analysis and the draft analysis.

3. DESCRIPTION OF THE HABITAT

The Service is proposing to designate 22 critical habitat units for 11 species of Hawaiian picture-wing flies. As indicated in Map ES-1 and summarized in Table ES-1, the units are located on four of the major islands of Hawai'i: Kaua'i (Kaua'i County), O'ahu (City & County of Honolulu), Moloka'i (part of Maui County), and Hawai'i (Hawai'i County). Hawai'i Island is often referred to as the "Big Island" to distinguish it from the State of Hawai'i as a whole.

Each unit is 1-acre square in size and shape. However, the combined area of the 22 units totals only 18 acres because some of the O'ahu units overlap. Ten of the units are owned by the State of Hawai'i, one is owned by the City & County of Honolulu, and seven are privately owned.

Most of the units are located in mountainous areas having rugged terrain—on Maps ES-2, 3, 4 and 5 yellow Xs show the locations of critical habitat units. The exceptions are four units in West Hawai'i: Kipuka at 4,900 ft, Gaspar's Dairy, Pauahi and Waiea.

Eighteen of the units are in the State Conservation District which limits economic use of the lands as well as their development potential. Four of the units are in the State Agricultural District which limits uses to crop farming, grazing, support facilities, and homes for the operators and employees. Regardless of the restrictions on use, large-lot agricultural subdivisions for luxury homes have occasionally been approved and developed on land that is in the State Agricultural District. None of the units is in the State Urban District or Rural District.

Nineteen of the units are in land management areas that emphasize preservation and/or land stewardship, and generally limit other uses of the land. In addition, all of the O'ahu units are within existing critical habitat for the 'elepaio and for threatened and endangered plants. On the Big Island, the Waihaka Gulch unit is within the critical habitat for the plant *Phyllostegia velutina.*

Consistent with the above, 17 of the units are included in lands managed as nature preserves, forest reserves, watersheds, or for wilderness recreation.

On the Big Island, four units are used for grazing cattle: Pauahi, Gaspar's Dairy, Kipuka at 4,900 ft, and Pit Crater. In addition, the Pauahi unit is in an area that was planted in *koa* (*Acacia koa,* a hardwood) as part of a commercial timber operation, and the Gaspar's Dairy unit is in an area that is planned for *koa.*

Also on the Big Island, the Upper Hamakua Ditch passes through or near the Kohala Mountains unit. This ditch provides irrigation water to farms on the Hamakua coast.

Many of the units are also used for recreation. Specifically, recreational hunting is allowed in all of the government-owned units that are within the Conservation District. Also, hiking trails are known to exist in or near the following units: Palikea and Wailupe on O'ahu, Pu'u Kolekole on Moloka'i, and Waiakea Forest and Kohala Mountains on the Big Island.

None of the units is in the path of urban development.

Finally, four of the units are proposed for 4(b)(2) exclusion from critical habitat designation for non-economic reasons: Pu'u Kolekole on Moloka'i and Gaspar's Dairy, Kipuka at 4,900 ft, and Pit Crater on the Big Island.

4. THREATS TO THE SPECIES AND HOST HABITAT

Threats to the picture-wing flies and to the plants they depend upon include: non-native plants; feral ungulates (pigs, goats, and cattle); non-native insects (western yellow-jacket wasp and several species of ants); and fire. Table ES-2 summarizes the various threats specific to each proposed critical habitat unit.

5. ECONOMIC IMPACTS

a. Past Costs

No conservation efforts have been undertaken in the past (i.e., before December 2006) for the 11 species because the picture-wing flies were not listed until May 9, 2006.

b. Future PV Costs and Annualized Costs

Table ES-2 shows the future impacts of habitat-related conservation efforts for the Hawaiian picture-wing flies, listed by proposed critical habitat unit. Future costs cover a 20-year period; dollar amounts are expressed in 2006 purchasing power; and, for the present-value (PV) costs, the valuation date is January 1, 2007.

For units that are proposed for critical habitat, the total PV costs are estimated at about $923,000 to $6.712 million for undiscounted costs, about $741,000 to $5.115 million using a 3% discount rate, and about $592,000 to $3.775 million using a 7% discount rate. The corresponding annualized costs are about $46,100 to $335,600 for undiscounted costs, about $49,800 to $343,800 using a 3% discount rate, and about $55,800 to $356,300 using a 7% discount rate.

For units that are to be excluded (i.e., the 4(b)(2) exclusions for non-economic reasons), the total PV costs are estimated to be about $222,000 to $1.755 million for undiscounted costs, about $178,000 to $1.325 million using a 3% discount rate, and about $142,000 to $966,000 using a 7% discount rate. The corresponding annualized costs are about $11,100 to $87,700 for undiscounted costs, about $12,000 to $89,100 using a 3% discount rate, and about $13,400 to $91,200 using a 7% discount rate.

c. Future PV Cost by Activities

Table ES-4 shows the PV costs itemized by unit and by activity, including low and high costs calculated at 0%, 3% and 7% discount rates. As shown, the costs cover:

— Conservation management to control threats to the picture-wing flies and their host plants:

- exclosure fencing to exclude feral ungulates (all units)
- control of nonnative plants (all units)
- control of wasps, with the control covering about 200 acres of surrounding land (all units)
- control of ants (all but six units)
- control of fire (all but six units)

— Lost *koa* production from 2 acres (Pauahi and Gaspar's Dairy units).

— Loss of cattle grazing from 4 acres (Pauahi, Gaspar's Dairy, Kipuka at 4,900 ft, and Pit Crater) due to the exclosure fencing.

— Loss of property values related to the loss of long-term development potential (Pauahi, Waiea, Gaspar's Dairy, and Kipuka at 4,900 ft units).

— Section 7 consultations (most units) related to game management, watershed and preservation management, assistance to a nonprofit organization for the purchase of Honouliuli Preserve, and subsidies for *koa.*

For every unit, the most expensive items under the high estimates involve conservation management to control wasps, followed by control of nonnative plants, then ants, and then fencing to exclude feral ungulates. Further, these costs are higher in mountainous areas than they are for agricultural land because of the more difficult access and terrain. For the low estimate, the cost of controlling wasps and ants is estimated to be zero under the assumption that there may be no effective and approved control.

For private landowners, additional costs of significance include the value of lost *koa* production in two units (Pauahi and Gaspar's Dairy units), and the loss of property value for three units (Pauahi, Gaspar's Dairy, and Kipuka at 4,900 ft units).

No costs or welfare benefits are anticipated for the following activities in or near the proposed critical habitat units:

— Commercial logging of eucalyptus trees near the Waiakea Forest unit.

— Residential and related development within the 20-year analysis period (Pauahi, Waiea, Gaspar's Dairy and Kipuka at 4,900 ft).

— Maintenance of an irrigation ditch that passes through or near the Kohala Mountains unit.

— Recreation (hunting and hiking) in or near many of the units.

— Native Hawaiian traditional and cultural gathering and access rights.

— Public observing of Hawaiian picture-wing flies.

d. Ranking of Units by Future PV Costs

Table ES-5 shows the ranking of units in order of descending costs for each combination of low and high estimates, and the three discount rates—a low ranking indicates a high cost, and vice versa. For the high estimates, the ranking for the 3% discount rate is also illustrated in Figure ES-1.

As indicated by the rankings, the highest PV costs are for the Wailupe and Makaha Valley units on O'ahu. The costs and rankings are high because of conservation management to control threats in the mountains, and anticipated costs for section 7 consultations related to game management (hunting) and preservation activities.

At the other extreme, the four Palikea units are ranked low because they overlap. In effect economies are provided because a single 1-acre area provides critical habitat for four separate species. If the costs for the four overlapping units were combined, then the total cost would be similar to that for other critical habitat units located in the mountains. A similar situation applies to the two Kaluaa Gulch units.

For the high estimates, the ranking does not change with a change in discount rates (see Table ES-5). However, the ranking for the low estimates and the 3% discount rate is slightly different from that for the high estimates (see Table ES-5 and Figure ES-1). Also, a change in the discount rates changes the rankings for the low estimates, but not significantly.

6. UNQUANTIFIABLE IMPACTS

Tables ES-3 and 4, and Figure ES-1 include all anticipated costs related to conservation efforts for the Hawaiian picture-wing flies.

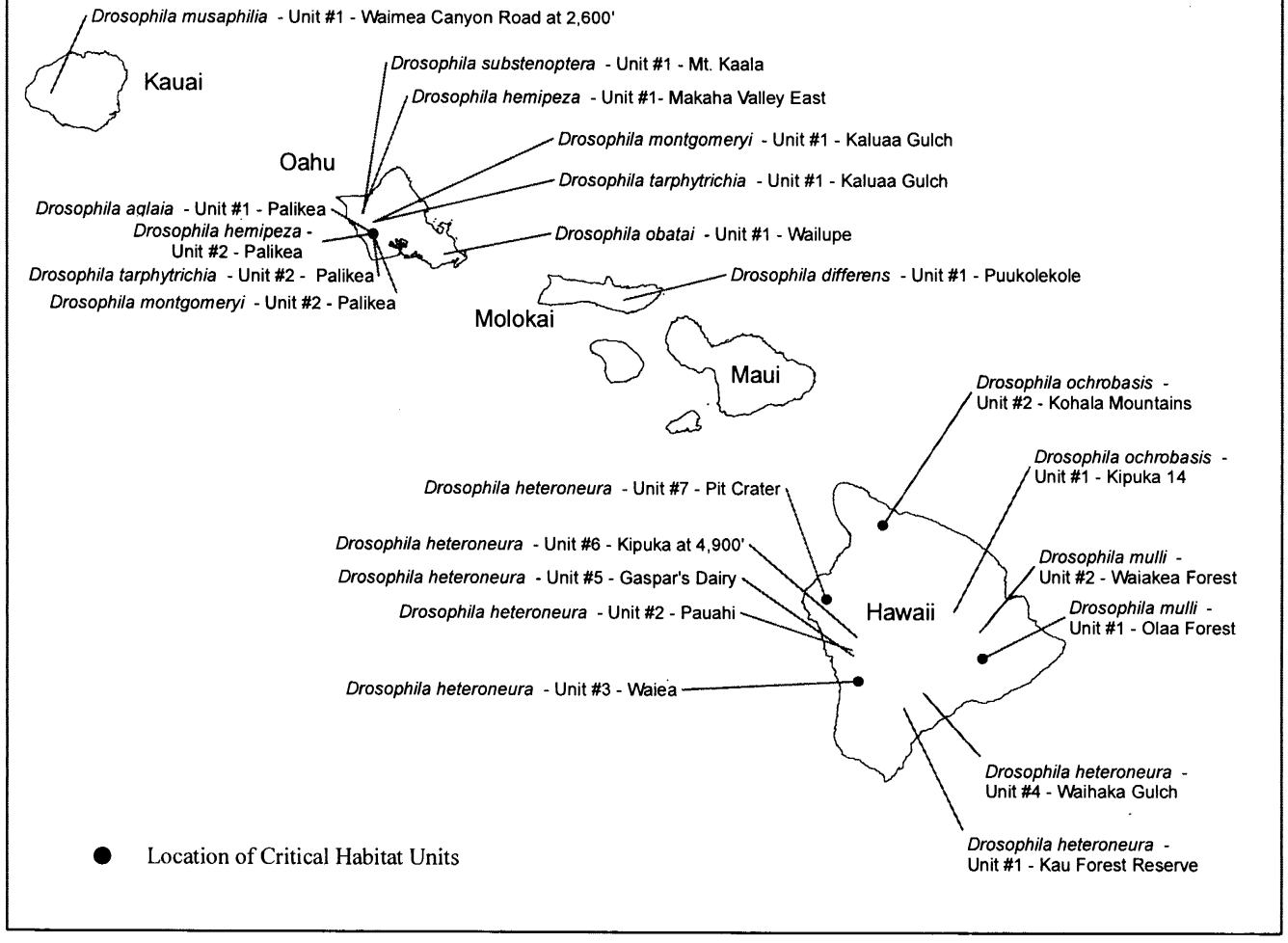
On the other hand, the benefits of preserving the Hawaiian picture-wing flies are not addressed in the analysis since there are (1) no biological studies on the likely changes in species populations, and (2) no known economic studies on the per-unit value of these species or comparable species.

7. SOURCES OF UNCERTAINTY

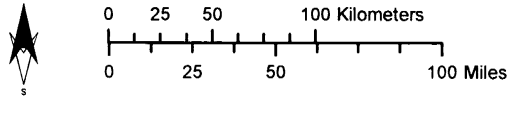
Major sources of uncertainty for the above analysis include the following items:

- Conservation management to control threats: whether active management of the threats would actually occur given the lack of legal obligations, high costs, and the lack of proven and approved methods for wasp and ant control; the amount of effort that would be required to manage the threats; and which organization would actually pay the costs of managing the threats.
- *Koa* operations: whether one of the landowners will reduce *koa* plantings by 1 acre or plant 1 acre of land elsewhere; future State and Federal subsidies for *koa; koa* growth rates and yields; and future *koa* prices.

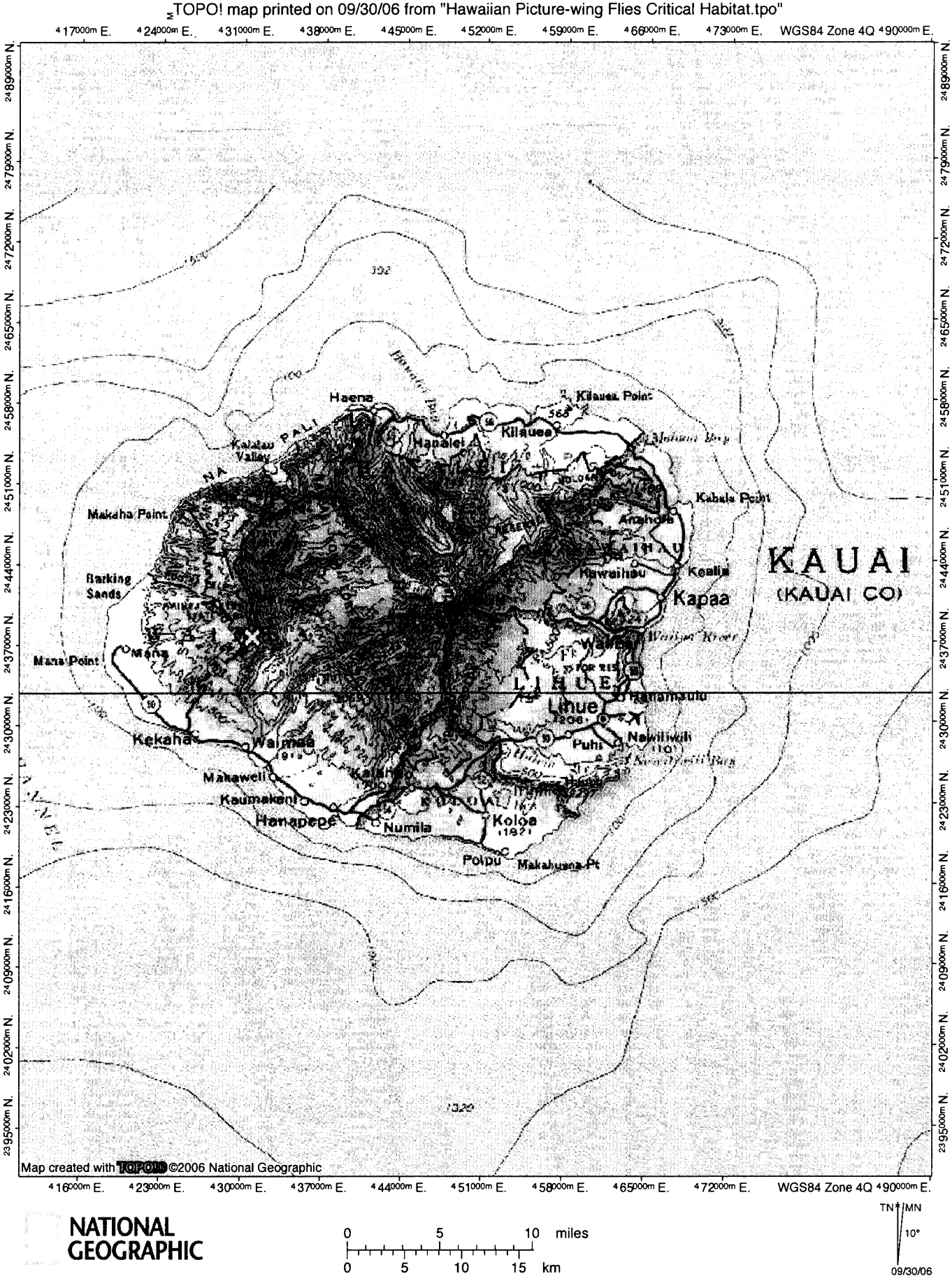
— Property values: the market values of affected properties, and the corresponding shares that are attributable to future development potential.
— Section 7 consultations: the number of future consultations and their costs.



Map 1 - Index Map of Critical Habitat Units for *Drosophila aglaia, D. differens, D. hemipeza, D. heteroneura, D. montgomeryi, D. mulli, D. musaphilia, D. obatai, D. ochrobasis, D. substenoptera,* and *D. tarphytrichia.*



Map ES-2. Kaua'i (Ka)



Map ES-3. O'ahu (Oa)

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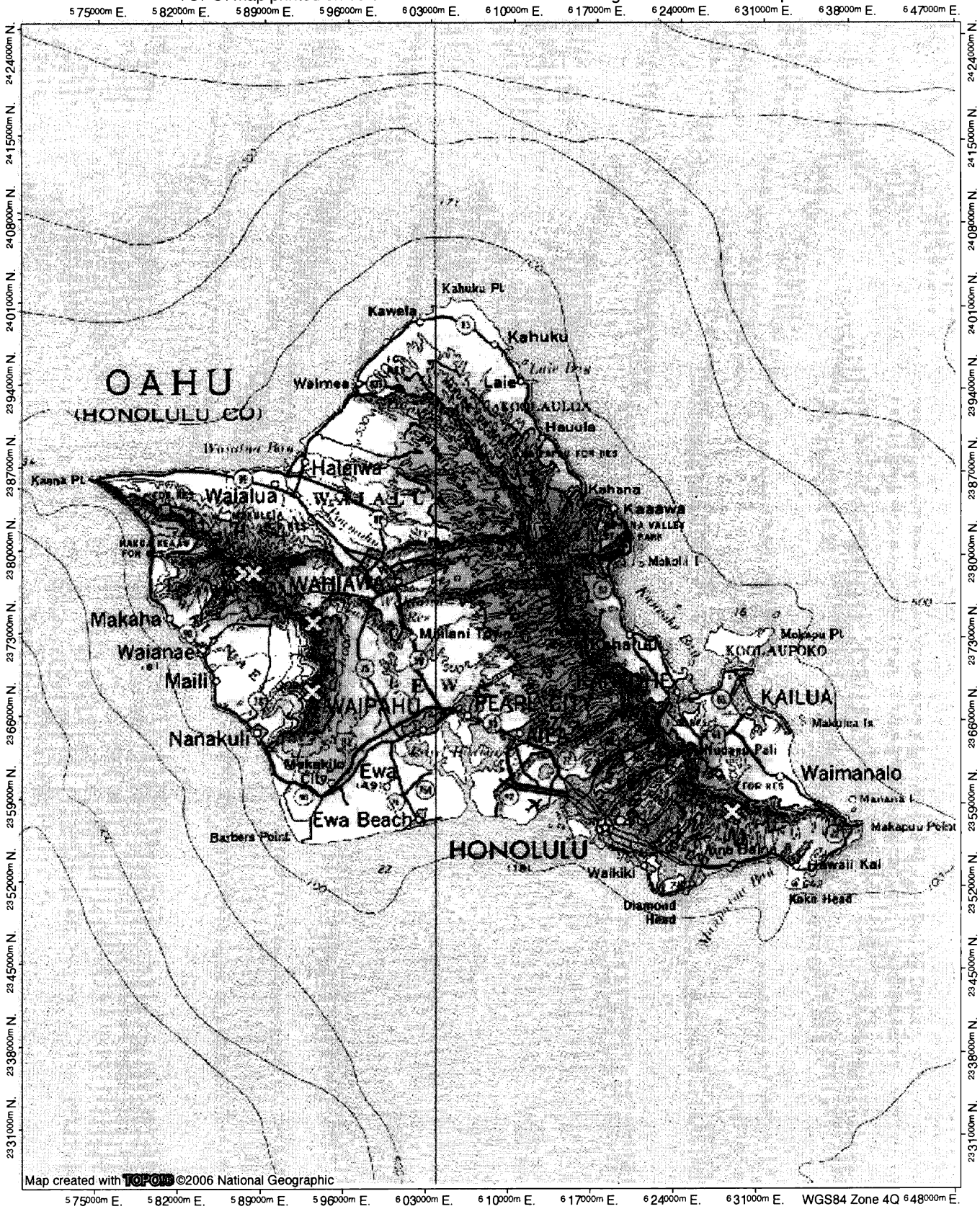

Map ES-4. Moloka'i (Mo)

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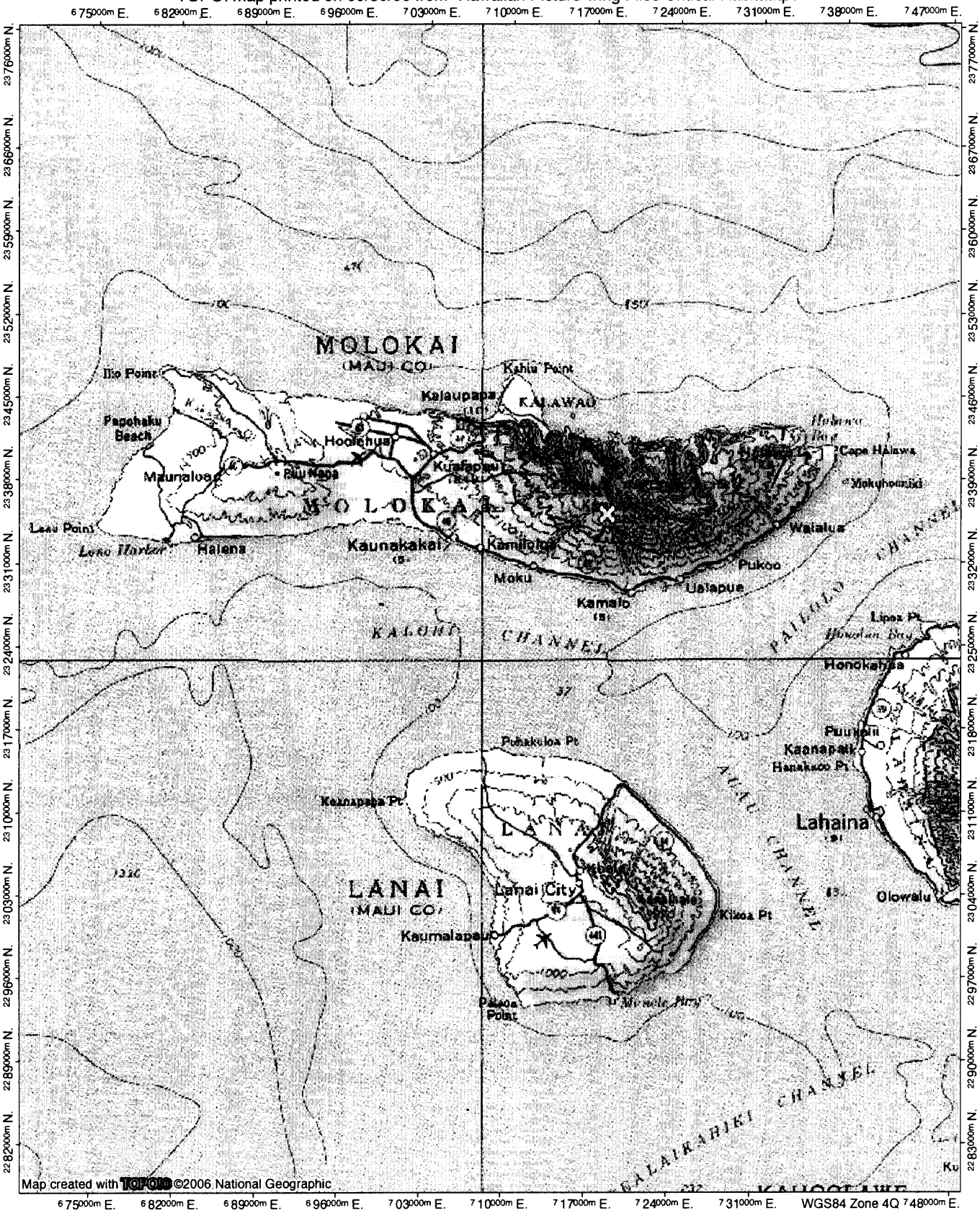

NATIONAL GEOGRAPHIC

0 5 10 miles

0 5 10 15 km

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Map ES-5. Hawai'i Island (Big Island, BI)

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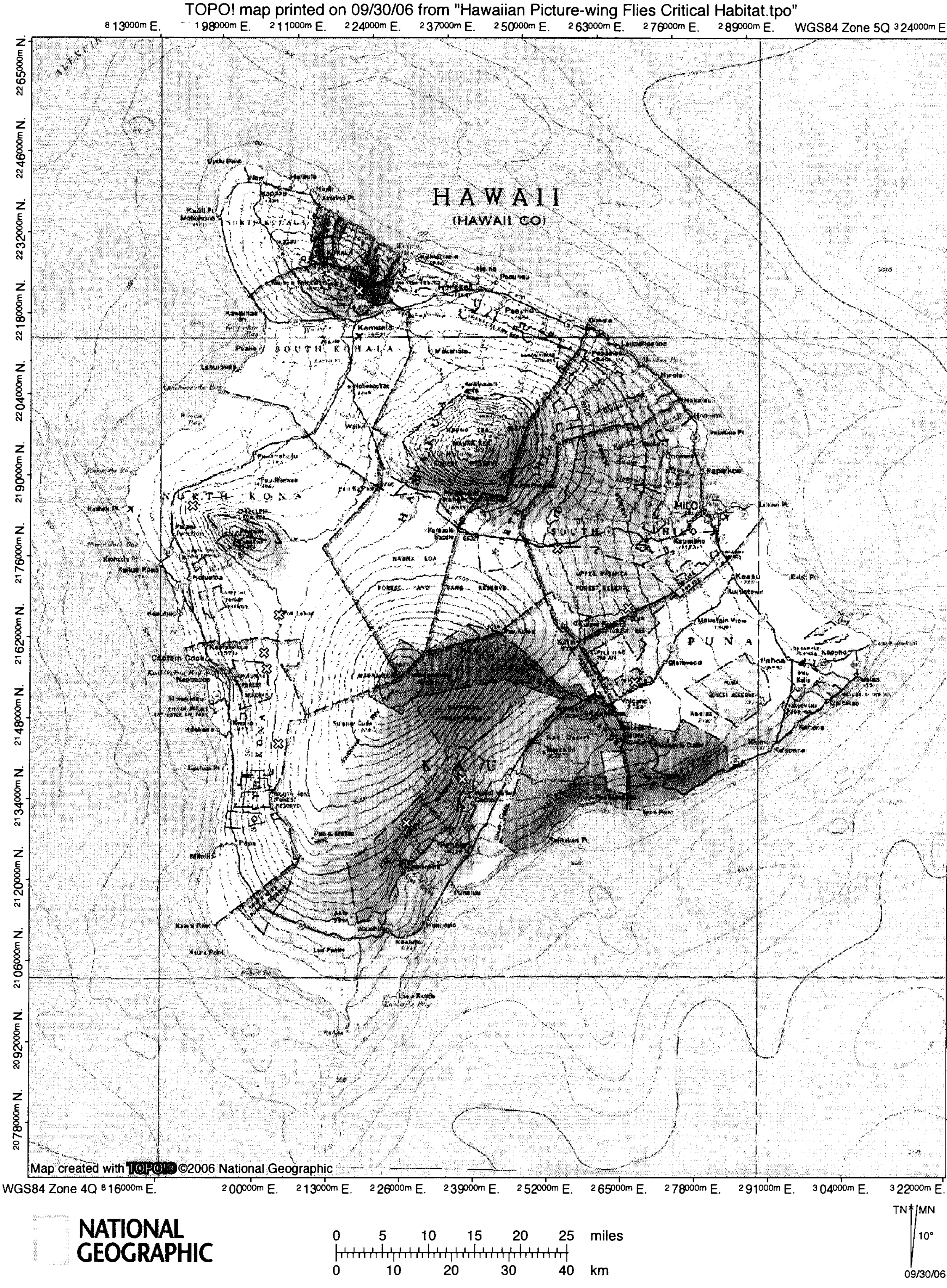


Table ES-1. Proposed Critical Habitat for Hawaiian Picture-wing Flies

Island Map	Species	Unit		Landowner	State District	Land Management Area	Existing CH	Land Use	Proposed Exclusion*
		No.	Name						
Kaua'i									
Ka-1	*D. musaphilia*	1	Waimea Canyon Rd at 2,600 ft	State DLNR	Consv.	Waimea Canyon State Park		Wilderness rec.	
O'ahu									
Oa-1	*D. aglaia*	1	Palikea	Campbell Estate	Consv.	TNCH - Honouliuli Preserve/FR	yes	Preservation	
Oa-2	*D. hemipeza*	1	Makaha Valley East	C&C Board of Water Supply	Consv.	Waianae Kai FR	yes	Forest watershed	
Oa-3	*D. hemipeza*	2	Palikea	Campbell Estate	Consv.	TNCH - Honouliuli Preserve/FR	yes	Preservation	
Oa-4	*D. montgomeryi*	1	Kaluaa Gulch	Campbell Estate	Consv.	TNCH - Honouliuli Preserve/FR	yes	Preservation	
Oa-5	*D. montgomeryi*	2	Palikea	Campbell Estate	Consv.	TNCH - Honouliuli Preserve/FR	yes	Preservation	
Oa-6	*D. obatai*	1	Wailupe	State DLNR	Consv.	Honolulu Watershed FR	yes	Forest watershed	
Oa-7	*D. subsenoptera*	1	Mt. Kaala	State DLNR	Consv.	NARS/Waianae Kai FR	yes	Preservation	
Oa-8	*D. tarphytrichia*	1	Kaluaa Gulch	Campbell Estate	Consv.	TNCH - Honouliuli Preserve/FR	yes	Preservation	
Oa-9	*D. tarphytrichia*	2	Palikea	Campbell Estate	Consv.	TNCH - Honouliuli Preserve/FR	yes	Preservation	
Moloka'i									
Mo-1	*D. differens*	1	Puu Kolekole*	Molokai Ranch	Consv.	TNCH - Kamoku Preserve		Preservation	yes
Hawai'i									
BI-1	*D. heteroneura*	1	Kau Forest Reserve	State DLNR	Consv.	Kau FR		Forest	
BI-2	*D. heteroneura*	2	Pauahi	Kealakekua Heritage R	Ag			Grazing, Koa	
BI-3	*D. heteroneura*	3	Waiea	State DLNR	Ag			Access	
BI-4	*D. heteroneura*	4	Waihaka Gulch	State DLNR	Consv.	Kau FR	yes	Forest	
BI-5	*D. heteroneura*	5	Gaspar's Dairy*	Kamehameha Schools	Ag	Honaunau FR, KS Malama Aina Area		Grazing, Koa	yes
BI-6	*D. heteroneura*	6	Kipuka at 4,900 ft*	Kamehameha Schools	Ag			Grazing	yes
BI-7	*D. heteroneura*	7	Pit Crater*	Kamehameha Schools	Consv.	KS Malama Aina Area		Grazing	yes
BI-8	*D. mulli*	1	Olaa Forest	State DLNR	Consv.	Olaa FR, Olaa - Kilauea Mngt Area		Preservation	
BI-9	*D. mulli*	2	Waiakea Forest	State DLNR	Consv.	Upper Waiakea FR		Forest	
BI-10	*D. ochrobasis*	1	Kipuka 14	State DLNR	Consv.	Upper Waiakea FR		Forest	
BI-11	*D. ochrobasis*	2	Kohala Mountains	State DLNR	Consv.	Kohala FR/Kahala Mtn Watershed		Forest ws, irr. ditch	

* = Proposed 4(b)(2) exclusion for non-economic reasons.

Abbreviations: D. = Drosophila; Rd = road; ft = feet; DLNR = Department of Land and Natural Resources; C&C= City & County; R= Ranch; TNCH = The Nature Conservancy of Hawaii; FR= Forest Reserve; NARS = Natural Area Reserves System; KS = Kamehameha Schools; Mngt = Management; Mtn = Mountain; rec. = recreation; ws = watershed; irr = irrigation.

Table ES-2. Threats to Hawaiian Picture-wing Flies, by Unit

Island Map	Species	Unit		Threats				
		No.	Name	Nonnative Plants	Ungulates	Wasps	Ants	Fire
Kaua'i								
Ka-1	*D. musaphilia*	1	Waimea Canyon Rd at 2,600 ft	yes	yes	yes	yes	yes
O'ahu								
Oa-1	*D. aglaia*	1	Palikea	yes	yes	yes	yes	yes
Oa-2	*D. hemipeza*	1	Makaha Valley East	yes	yes	yes	yes	yes
Oa-3	*D. hemipeza*	2	Palikea	yes	yes	yes	yes	yes
Oa-4	*D. montgomeryi*	1	Kaluaa Gulch	yes	yes	yes	yes	yes
Oa-5	*D. montgomeryi*	2	Palikea	yes	yes	yes	yes	yes
Oa-6	*D. obatai*	1	Wailupe	yes	yes	yes	yes	yes
Oa-7	*D. subsenoptera*	1	Mt. Kaala	yes	yes	yes	no	no
Oa-8	*D. tarphytrichia*	1	Kaluaa Gulch	yes	yes	yes	yes	yes
Oa-9	*D. tarphytrichia*	2	Palikea	yes	yes	yes	yes	yes
Moloka'i								
Mo-1	*D. differens*	1	Puu Kolekole*	yes	yes	yes	no	no
Hawai'i								
BI-1	*D. heteroneura*	1	Kau Forest Reserve	yes	yes	yes	yes	yes
BI-2	*D. heteroneura*	2	Pauahi	yes	yes	yes	yes	yes
BI-3	*D. heteroneura*	3	Waiea	yes	yes	yes	yes	yes
BI-4	*D. heteroneura*	4	Waihaka Gulch	yes	yes	yes	yes	yes
BI-5	*D. heteroneura*	5	Gaspar's Dairy*	yes	yes	yes	yes	yes
BI-6	*D. heteroneura*	6	Kipuka at 4,900 ft*	yes	yes	yes	yes	yes
BI-7	*D. heteroneura*	7	Pit Crater*	yes	yes	yes	yes	yes
BI-8	*D. mulli*	1	Olaa Forest	yes	yes	yes	no	no
BI-9	*D. mulli*	2	Waiakea Forest	yes	yes	yes	no	no
BI-10	*D. ochrobasis*	1	Kipuka 14	yes	yes	yes	no	no
BI-11	*D. ochrobasis*	2	Kohala Mountains	yes	yes	yes	no	no

* = Proposed 4(b)(2) exclusion for non-economic reasons.

Table ES-3. Cost of Proposed Critical Habitat for Hawaiian Picture-wing Flies, by Unit

(2006 dollars, 1/1/2007 valuation date)

Island Map	Species	Unit		Undiscounted		Discounted at 3%		Discounted at 7%	
		No.	Name	Low	High	Low	High	Low	High
Kaua'i									
Ka-1	*D. musaphilia*	1	Waimea Canyon Rd at 2,600 ft	$ 62,100	$ 500,590	$ 50,610	$ 381,260	$ 40,980	$ 281,430
O'ahu									
Oa-1	*D. aglaia*	1	Palikea	$ 17,025	$ 129,598	$ 13,920	$ 99,043	$ 11,325	$ 73,451
Oa-2	*D. hemipeza*	1	Makaha Valley East	$ 74,100	$ 535,590	$ 59,990	$ 409,280	$ 48,200	$ 303,320
Oa-3	*D. hemipeza*	2	Palikea	$ 17,025	$ 129,598	$ 13,920	$ 99,043	$ 11,325	$ 73,451
Oa-4	*D. montgomeryi*	1	Kaluaa Gulch	$ 34,050	$ 259,195	$ 27,840	$ 198,085	$ 22,650	$ 146,903
Oa-5	*D. montgomeryi*	2	Palikea	$ 17,025	$ 129,598	$ 13,920	$ 99,043	$ 11,325	$ 73,451
Oa-6	*D. obatai*	1	Wailupe	$ 74,100	$ 535,590	$ 59,990	$ 409,280	$ 48,200	$ 303,320
Oa-7	*D. subsenoptera*	1	Mt. Kaala	$ 73,900	$ 481,900	$ 59,840	$ 369,210	$ 48,090	$ 274,650
Oa-8	*D. tarphytrichia*	1	Kaluaa Gulch	$ 34,050	$ 259,195	$ 27,840	$ 198,085	$ 22,650	$ 146,903
Oa-9	*D. tarphytrichia*	2	Palikea	$ 17,025	$ 129,598	$ 13,920	$ 99,043	$ 11,325	$ 73,451
Moloka'i									
Mo-1	*D. differens*	1	Puu Kolekole*	$ 71,900	$ 478,700	$ 58,220	$ 366,610	$ 46,800	$ 272,580
Hawai'i									
BI-1	*D. heteroneura*	1	Kau Forest Reserve	$ 62,100	$ 500,590	$ 50,610	$ 381,260	$ 40,980	$ 281,430
BI-2	*D. heteroneura*	2	Pauahi	$ 73,020	$ 413,910	$ 51,210	$ 308,310	$ 34,960	$ 220,470
BI-3	*D. heteroneura*	3	Waiea	$ 44,050	$ 379,380	$ 34,780	$ 286,460	$ 27,030	$ 205,750
BI-4	*D. heteroneura*	4	Waihaka Gulch	$ 62,100	$ 500,590	$ 50,610	$ 381,260	$ 40,980	$ 281,430
BI-5	*D. heteroneura*	5	Gaspar's Dairy*	$ 45,550	$ 398,480	$ 36,280	$ 292,720	$ 28,530	$ 208,450
BI-6	*D. heteroneura*	6	Kipuka at 4,900 ft*	$ 44,050	$ 379,700	$ 34,780	$ 286,700	$ 27,030	$ 205,920
BI-7	*D. heteroneura*	7	Pit Crater*	$ 60,100	$ 497,710	$ 48,990	$ 378,900	$ 39,690	$ 279,530
BI-8	*D. mulli*	1	Olaa Forest	$ 73,900	$ 481,900	$ 59,840	$ 369,210	$ 48,090	$ 274,650
BI-9	*D. mulli*	2	Waiakea Forest	$ 61,900	$ 446,900	$ 50,460	$ 341,190	$ 40,870	$ 252,760
BI-10	*D. ochrobasis*	1	Kipuka 14	$ 61,900	$ 446,900	$ 50,460	$ 341,190	$ 40,870	$ 252,760
BI-11	*D. ochrobasis*	2	Kohala Mountains	$ 73,900	$ 481,900	$ 59,840	$ 369,210	$ 48,090	$ 274,650
TOTAL PV COST, INCLUDED UNITS				$ 933,270	$ 6,742,520	$ 749,600	$ 5,139,460	$ 597,940	$ 3,794,230
ANNUALIZED COST				$ 46,664	$ 337,126	$ 50,385	$ 345,454	$ 56,441	$ 358,149
TOTAL PV COST, EXCLUDED UNITS*				$ 221,600	$ 1,754,590	$ 178,270	$ 1,324,930	$ 142,050	$ 966,480
ANNUALIZED COST				$ 11,080	$ 87,730	$ 11,983	$ 89,056	$ 13,409	$ 91,229

* = Proposed 4(b)(2) exclusions for non-economic reasons.

Table ES-4. Cost of Proposed Critical Habitat for Hawaiian Picture-wing Flies, by Unit and Item

(2006 dollars, 1/1/2007 valuation date)

Island Map	Species	Unit		Item	Undiscounted		Discounted at 3%		Discounted at 7%	
		No.	Name		Low	High	Low	High	Low	High
Kaua'i										
Ka-1	*D. musaphilia*	1	Waimea Canyon Rd at 2,600 ft	Fencing, ungulate control	$ 16,700	$ 29,300	$ 16,700	$ 29,300	$ 16,700	$ 29,300
				Control of nonnative plants	$ 43,200	$ 86,400	$ 32,140	$ 64,270	$ 22,880	$ 45,770
				Wasp control	$ -	$ 328,000	$ -	$ 245,020	$ -	$ 175,620
				Ant control	$ -	$ 53,290	$ -	$ 39,770	$ -	$ 28,460
				Fire control	$ 200	$ 400	$ 150	$ 300	$ 110	$ 210
				Consultations, hunting	$ 2,000	$ 3,200	$ 1,620	$ 2,600	$ 1,290	$ 2,070
O'ahu										
Oa-1	*D. aglaia*	1	Palikea	Fencing, ungulate control	$ 4,175	$ 7,325	$ 4,175	$ 7,325	$ 4,175	$ 7,325
				Control of nonnative plants	$ 10,800	$ 21,600	$ 8,035	$ 16,068	$ 5,720	$ 11,443
				Wasp control	$ -	$ 82,000	$ -	$ 61,255	$ -	$ 43,905
				Ant control	$ -	$ 13,323	$ -	$ 9,943	$ -	$ 7,115
				Fire control	$ 50	$ 100	$ 38	$ 75	$ 28	$ 53
				Consultation, purchase	$ 500	$ 875	$ 500	$ 875	$ 500	$ 875
				Consultation, preservation	$ 1,500	$ 4,375	$ 1,173	$ 3,503	$ 903	$ 2,736
Oa-2	*D. hemipeza*	1	Makaha Valley East	Fencing, ungulate control	$ 16,700	$ 29,300	$ 16,700	$ 29,300	$ 16,700	$ 29,300
				Control of nonnative plants	$ 43,200	$ 86,400	$ 32,140	$ 64,270	$ 22,880	$ 45,770
				Wasp control	$ -	$ 328,000	$ -	$ 245,020	$ -	$ 175,620
				Ant control	$ -	$ 53,290	$ -	$ 39,770	$ -	$ 28,460
				Fire control	$ 200	$ 400	$ 150	$ 300	$ 110	$ 210
				Consultations, hunting	$ 2,000	$ 3,200	$ 1,620	$ 2,600	$ 1,290	$ 2,070
				Consultation, preservation	$ 12,000	$ 35,000	$ 9,380	$ 28,020	$ 7,220	$ 21,890
Oa-3	*D. hemipeza*	2	Palikea	Fencing, ungulate control	$ 4,175	$ 7,325	$ 4,175	$ 7,325	$ 4,175	$ 7,325
				Control of nonnative plants	$ 10,800	$ 21,600	$ 8,035	$ 16,068	$ 5,720	$ 11,443
				Wasp control	$ -	$ 82,000	$ -	$ 61,255	$ -	$ 43,905
				Ant control	$ -	$ 13,323	$ -	$ 9,943	$ -	$ 7,115
				Fire control	$ 50	$ 100	$ 38	$ 75	$ 28	$ 53
				Consultation, purchase	$ 500	$ 875	$ 500	$ 875	$ 500	$ 875
				Consultation, preservation	$ 1,500	$ 4,375	$ 1,173	$ 3,503	$ 903	$ 2,736
Oa-4	*D. montgomeryi*	1	Kaluaa Gulch	Fencing, ungulate control	$ 8,350	$ 14,650	$ 8,350	$ 14,650	$ 8,350	$ 14,650
				Control of nonnative plants	$ 21,600	$ 43,200	$ 16,070	$ 32,135	$ 11,440	$ 22,885
				Wasp control	$ -	$ 164,000	$ -	$ 122,510	$ -	$ 87,810
				Ant control	$ -	$ 26,645	$ -	$ 19,885	$ -	$ 14,230
				Fire control	$ 100	$ 200	$ 75	$ 150	$ 55	$ 105
				Consultation, purchase	$ 1,000	$ 1,750	$ 1,000	$ 1,750	$ 1,000	$ 1,750
				Consultation, Preservation	$ 3,000	$ 8,750	$ 2,345	$ 7,005	$ 1,805	$ 5,473
Oa-5	*D. montgomeryi*	2	Palikea	Fencing, ungulate control	$ 4,175	$ 7,325	$ 4,175	$ 7,325	$ 4,175	$ 7,325
				Control of nonnative plants	$ 10,800	$ 21,600	$ 8,035	$ 16,068	$ 5,720	$ 11,443
				Wasp control	$ -	$ 82,000	$ -	$ 61,255	$ -	$ 43,905
				Ant control	$ -	$ 13,323	$ -	$ 9,943	$ -	$ 7,115
				Fire control	$ 50	$ 100	$ 38	$ 75	$ 28	$ 53
				Consultation, purchase	$ 500	$ 875	$ 500	$ 875	$ 500	$ 875
				Consultation, preservation	$ 1,500	$ 4,375	$ 1,173	$ 3,503	$ 903	$ 2,736
Oa-6	*D. obatai*	1	Wailupe	Fencing, ungulate control	$ 16,700	$ 29,300	$ 16,700	$ 29,300	$ 16,700	$ 29,300
				Control of nonnative plants	$ 43,200	$ 86,400	$ 32,140	$ 64,270	$ 22,880	$ 45,770
				Wasp control	$ -	$ 328,000	$ -	$ 245,020	$ -	$ 175,620
				Ant control	$ -	$ 53,290	$ -	$ 39,770	$ -	$ 28,460
				Fire control	$ 200	$ 400	$ 150	$ 300	$ 110	$ 210
				Consultations, hunting	$ 2,000	$ 3,200	$ 1,620	$ 2,600	$ 1,290	$ 2,070
				Consultation, preservation	$ 12,000	$ 35,000	$ 9,380	$ 28,020	$ 7,220	$ 21,890
Oa-7	*D. subsenoptera*	1	Mt. Kaala	Fencing, ungulate control	$ 16,700	$ 29,300	$ 16,700	$ 29,300	$ 16,700	$ 29,300
				Control of nonnative plants	$ 43,200	$ 86,400	$ 32,140	$ 64,270	$ 22,880	$ 45,770
				Wasp control	$ -	$ 328,000	$ -	$ 245,020	$ -	$ 175,620
				Consultations, hunting	$ 2,000	$ 3,200	$ 1,620	$ 2,600	$ 1,290	$ 2,070
				Consultation, preservation	$ 12,000	$ 35,000	$ 9,380	$ 28,020	$ 7,220	$ 21,890

Table ES-4. Cost of Proposed Critical Habitat for Hawaiian Picture-wing Flies, by Unit and Item

(2006 dollars, 1/1/2007 valuation date)

Island Map	Species	Unit		Item	Undiscounted		Discounted at 3%		Discounted at 7%	
		No.	Name		Low	High	Low	High	Low	High
Oa-8	*D. tarphytrichia*	1	Kaluaa Gulch	Fencing, ungulate control	$ 8,350	$ 14,650	$ 8,350	$ 14,650	$ 8,350	$ 14,650
				Control of nonnative plants	$ 21,600	$ 43,200	$ 16,070	$ 32,135	$ 11,440	$ 22,885
				Wasp control	$ -	$ 164,000	$ -	$ 122,510	$ -	$ 87,810
				Ant control	$ -	$ 26,645	$ -	$ 19,885	$ -	$ 14,230
				Fire control	$ 100	$ 200	$ 75	$ 150	$ 55	$ 105
				Consultation, purchase	$ 1,000	$ 1,750	$ 1,000	$ 1,750	$ 1,000	$ 1,750
				Consultation, preservation	$ 3,000	$ 8,750	$ 2,345	$ 7,005	$ 1,805	$ 5,473
Oa-9	*D. tarphytrichia*	2	Palikea	Fencing, ungulate control	$ 4,175	$ 7,325	$ 4,175	$ 7,325	$ 4,175	$ 7,325
				Control of nonnative plants	$ 10,800	$ 21,600	$ 8,035	$ 16,068	$ 5,720	$ 11,443
				Wasp control	$ -	$ 82,000	$ -	$ 61,255	$ -	$ 43,905
				Ant control	$ -	$ 13,323	$ -	$ 9,943	$ -	$ 7,115
				Fire control	$ 50	$ 100	$ 38	$ 75	$ 28	$ 53
				Consultation, purchase	$ 500	$ 875	$ 500	$ 875	$ 500	$ 875
				Consultation, preservation	$ 1,500	$ 4,375	$ 1,173	$ 3,503	$ 903	$ 2,736
Moloka'i										
Mo-1	*D. differens*	1	Puu Kolekole*	Fencing, ungulate control	$ 16,700	$ 29,300	$ 16,700	$ 29,300	$ 16,700	$ 29,300
				Control of nonnative plants	$ 43,200	$ 86,400	$ 32,140	$ 64,270	$ 22,880	$ 45,770
				Wasp control	$ -	$ 328,000	$ -	$ 245,020	$ -	$ 175,620
				Consultation, preservation	$ 12,000	$ 35,000	$ 9,380	$ 28,020	$ 7,220	$ 21,890
Hawai'i										
BI-1	*D. heteroneura*	1	Kau Forest Reserve	Fencing, ungulate control	$ 16,700	$ 29,300	$ 16,700	$ 29,300	$ 16,700	$ 29,300
				Control of nonnative plants	$ 43,200	$ 86,400	$ 32,140	$ 64,270	$ 22,880	$ 45,770
				Wasp control	$ -	$ 328,000	$ -	$ 245,020	$ -	$ 175,620
				Ant control	$ -	$ 53,290	$ -	$ 39,770	$ -	$ 28,460
				Fire control	$ 200	$ 400	$ 150	$ 300	$ 110	$ 210
				Consultations, hunting	$ 2,000	$ 3,200	$ 1,620	$ 2,600	$ 1,290	$ 2,070
BI-2	*D. heteroneura*	2	Pauahi	Fencing, ungulate control	$ 5,850	$ 8,350	$ 5,850	$ 8,350	$ 5,850	$ 8,350
				Control of nonnative plants	$ 36,000	$ 72,000	$ 26,780	$ 53,560	$ 19,070	$ 38,140
				Wasp control	$ -	$ 254,800	$ -	$ 190,260	$ -	$ 136,280
				Ant control	$ -	$ 38,830	$ -	$ 28,990	$ -	$ 20,770
				Fire control	$ 200	$ 400	$ 150	$ 300	$ 110	$ 210
				Consultations, koa	$ -	$ 6,000	$ -	$ 6,000	$ -	$ 6,000
				Koa	$ 27,470	$ 27,930	$ 14,930	$ 15,400	$ 6,430	$ 6,900
				Grazing	$ -	$ 600	$ -	$ 450	$ -	$ 320
				Property value (development)	$ 3,500	$ 5,000	$ 3,500	$ 5,000	$ 3,500	$ 3,500
BI-3	*D. heteroneura*	3	Waiea	Fencing, ungulate control	$ 5,850	$ 8,350	$ 5,850	$ 8,350	$ 5,850	$ 8,350
				Control of nonnative plants	$ 36,000	$ 72,000	$ 26,780	$ 53,560	$ 19,070	$ 38,140
				Wasp control	$ -	$ 254,800	$ -	$ 190,260	$ -	$ 136,280
				Ant control	$ -	$ 38,830	$ -	$ 28,990	$ -	$ 20,770
				Fire control	$ 200	$ 400	$ 150	$ 300	$ 110	$ 210
				Property value (development)	$ 2,000	$ 5,000	$ 2,000	$ 5,000	$ 2,000	$ 2,000
BI-4	*D. heteroneura*	4	Waihaka Gulch	Fencing, ungulate control	$ 16,700	$ 29,300	$ 16,700	$ 29,300	$ 16,700	$ 29,300
				Control of nonnative plants	$ 43,200	$ 86,400	$ 32,140	$ 64,270	$ 22,880	$ 45,770
				Wasp control	$ -	$ 328,000	$ -	$ 245,020	$ -	$ 175,620
				Ant control	$ -	$ 53,290	$ -	$ 39,770	$ -	$ 28,460
				Fire control	$ 200	$ 400	$ 150	$ 300	$ 110	$ 210
				Consultations, hunting	$ 2,000	$ 3,200	$ 1,620	$ 2,600	$ 1,290	$ 2,070
BI-5	*D. heteroneura*	5	Gaspar's Dairy*	Fencing, ungulate control	$ 5,850	$ 8,350	$ 5,850	$ 8,350	$ 5,850	$ 8,350
				Control of nonnative plants	$ 36,000	$ 72,000	$ 26,780	$ 53,560	$ 19,070	$ 38,140
				Wasp control	$ -	$ 254,800	$ -	$ 190,260	$ -	$ 136,280
				Ant control	$ -	$ 38,830	$ -	$ 28,990	$ -	$ 20,770
				Fire control	$ 200	$ 400	$ 150	$ 300	$ 110	$ 210
				Koa	$ -	$ 18,940	$ -	$ 6,120	$ -	$ 1,090
				Grazing	$ -	$ 160	$ -	$ 140	$ -	$ 110
				Property value (development)	$ 3,500	$ 5,000	$ 3,500	$ 5,000	$ 3,500	$ 3,500

Table ES-4. Cost of Proposed Critical Habitat for Hawaiian Picture-wing Flies, by Unit and Item

(2006 dollars, 1/1/2007 valuation date)

Island Map	Species	Unit		Item	Undiscounted		Discounted at 3%		Discounted at 7%	
		No.	Name		Low	High	Low	High	Low	High
BI-6	*D. heteroneura*	6	Kipuka at 4,900 ft*	Fencing, ungulate control	$ 5,850	$ 8,350	$ 5,850	$ 8,350	$ 5,850	$ 8,350
				Control of nonnative plants	$ 36,000	$ 72,000	$ 26,780	$ 53,560	$ 19,070	$ 38,140
				Wasp control	$ -	$ 254,800	$ -	$ 190,260	$ -	$ 136,280
				Ant control	$ -	$ 38,830	$ -	$ 28,990	$ -	$ 20,770
				Fire control	$ 200	$ 400	$ 150	$ 300	$ 110	$ 210
				Grazing	$ -	$ 320	$ -	$ 240	$ -	$ 170
				Property value (development)	$ 2,000	$ 5,000	$ 2,000	$ 5,000	$ 2,000	$ 2,000
BI-7	*D. heteroneura*	7	Pit Crater*	Fencing, ungulate control	$ 16,700	$ 29,300	$ 16,700	$ 29,300	$ 16,700	$ 29,300
				Control of nonnative plants	$ 43,200	$ 86,400	$ 32,140	$ 64,270	$ 22,880	$ 45,770
				Wasp control	$ -	$ 328,000	$ -	$ 245,020	$ -	$ 175,620
				Ant control	$ -	$ 53,290	$ -	$ 39,770	$ -	$ 28,460
				Fire control	$ 200	$ 400	$ 150	$ 300	$ 110	$ 210
				Grazing	$ -	$ 320	$ -	$ 240	$ -	$ 170
BI-8	*D. mulli*	1	Olaa Forest	Fencing, ungulate control	$ 16,700	$ 29,300	$ 16,700	$ 29,300	$ 16,700	$ 29,300
				Control of nonnative plants	$ 43,200	$ 86,400	$ 32,140	$ 64,270	$ 22,880	$ 45,770
				Wasp control	$ -	$ 328,000	$ -	$ 245,020	$ -	$ 175,620
				Consultations, hunting	$ 2,000	$ 3,200	$ 1,620	$ 2,600	$ 1,290	$ 2,070
				Consultation, preservation	$ 12,000	$ 35,000	$ 9,380	$ 28,020	$ 7,220	$ 21,890
BI-9	*D. mulli*	2	Waiakea Forest	Fencing, ungulate control	$ 16,700	$ 29,300	$ 16,700	$ 29,300	$ 16,700	$ 29,300
				Control of nonnative plants	$ 43,200	$ 86,400	$ 32,140	$ 64,270	$ 22,880	$ 45,770
				Wasp control	$ -	$ 328,000	$ -	$ 245,020	$ -	$ 175,620
				Consultations, hunting	$ 2,000	$ 3,200	$ 1,620	$ 2,600	$ 1,290	$ 2,070
BI-10	*D. ochrobasis*	1	Kipuka 14	Fencing, ungulate control	$ 16,700	$ 29,300	$ 16,700	$ 29,300	$ 16,700	$ 29,300
				Control of nonnative plants	$ 43,200	$ 86,400	$ 32,140	$ 64,270	$ 22,880	$ 45,770
				Wasp control	$ -	$ 328,000	$ -	$ 245,020	$ -	$ 175,620
				Consultations, hunting	$ 2,000	$ 3,200	$ 1,620	$ 2,600	$ 1,290	$ 2,070
BI-11	*D. ochrobasis*	2	Kohala Mountains	Fencing, ungulate control	$ 16,700	$ 29,300	$ 16,700	$ 29,300	$ 16,700	$ 29,300
				Control of nonnative plants	$ 43,200	$ 86,400	$ 32,140	$ 64,270	$ 22,880	$ 45,770
				Wasp control	$ -	$ 328,000	$ -	$ 245,020	$ -	$ 175,620
				Consultations, hunting	$ 2,000	$ 3,200	$ 1,620	$ 2,600	$ 1,290	$ 2,070
				Consultation, preservation	$ 12,000	$ 35,000	$ 9,380	$ 28,020	$ 7,220	$ 21,890
TOTAL PV COST, INCLUDED UNITS					$ 933,270	$ 6,742,520	$ 749,600	$ 5,139,460	$ 597,940	$ 3,794,230
ANNUALIZED COST					$ 46,664	$ 337,126	$ 50,385	$ 345,454	$ 56,441	$ 358,149
TOTAL PV COST, EXCLUDED UNITS*					$ 221,600	$ 1,754,590	$ 178,270	$ 1,324,930	$ 142,050	$ 966,480
ANNUALIZED COST					$ 11,080	$ 87,730	$ 11,983	$ 89,056	$ 13,409	$ 91,229

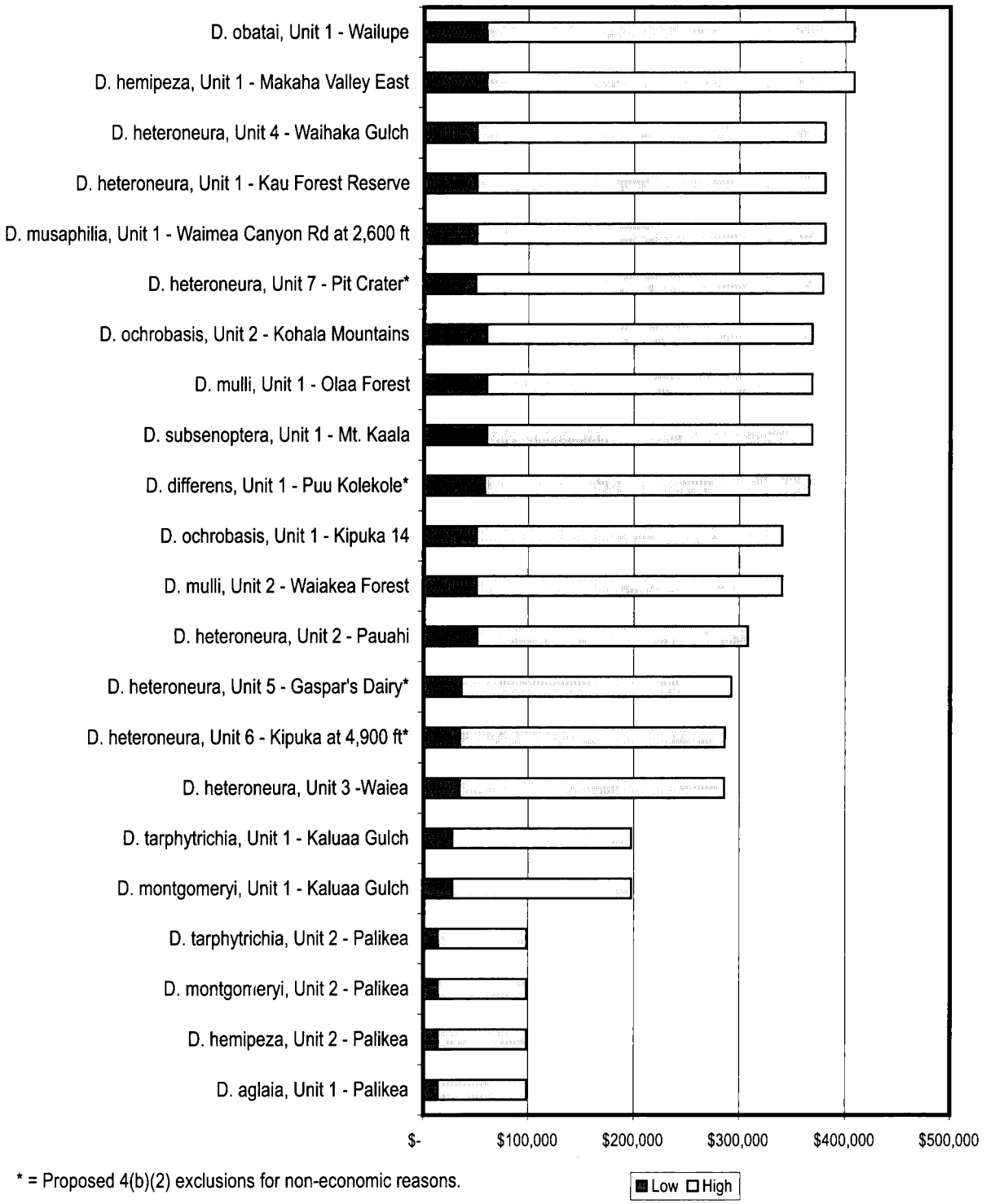
* = Proposed 4(b)(2) exclusions for non-economic reasons.

Table ES-5. Ranking of Proposed Critical Habitat Units, by PV Cost

Island Map	Species	Unit		Undiscounted		Discounted at 3%		Discounted at 7%	
		No.	Name	Low	High	Low	High	Low	High
Kaua'i									
Ka-1	*D. musaphilia*	1	Waimea Canyon Rd at 2,600 ft	5	2	5	2	4	2
O'ahu									
Oa-1	*D. aglaia*	1	Palikea	11	12	11	12	11	12
Oa-2	*D. hemipeza*	1	Makaha Valley East	1	1	1	1	1	1
Oa-3	*D. hemipeza*	2	Palikea	11	12	11	12	11	12
Oa-4	*D. montgomeryi*	1	Kaluaa Gulch	10	11	10	11	10	11
Oa-5	*D. montgomeryi*	2	Palikea	11	12	11	12	11	12
Oa-6	*D. obatai*	1	Wailupe	1	1	1	1	1	1
Oa-7	*D. subsenoptera*	1	Mt. Kaala	2	4	2	4	2	4
Oa-8	*D. tarphytrichia*	1	Kaluaa Gulch	10	11	10	11	10	11
Oa-9	*D. tarphytrichia*	2	Palikea	11	12	11	12	11	12
Moloka'i									
Mo-1	*D. differens*	1	Puu Kolekole*	4	5	3	5	3	5
Hawai'i									
BI-1	*D. heteroneura*	1	Kau Forest Reserve	5	2	5	2	4	2
BI-2	*D. heteroneura*	2	Pauahi	3	7	4	7	7	7
BI-3	*D. heteroneura*	3	Waiea	9	10	9	10	9	10
BI-4	*D. heteroneura*	4	Waihaka Gulch	5	2	5	2	4	2
BI-5	*D. heteroneura*	5	Gaspar's Dairy*	8	8	8	8	8	8
BI-6	*D. heteroneura*	6	Kipuka at 4,900 ft*	9	9	9	9	9	9
BI-7	*D. heteroneura*	7	Pit Crater*	7	3	7	3	6	3
BI-8	*D. mulli*	1	Olaa Forest	2	4	2	4	2	4
BI-9	*D. mulli*	2	Waiakea Forest	6	6	6	6	5	6
BI-10	*D. ochrobasis*	1	Kipuka 14	6	6	6	6	5	6
BI-11	*D. ochrobasis*	2	Kohala Mountains	2	4	2	4	2	4

* = Proposed 4(b)(2) exclusions for non-economic reasons.

Figure ES-1. Ranking of Critical Habitat Units by PV Cost (3%)



* = Proposed 4(b)(2) exclusions for non-economic reasons.

1. FRAMEWORK FOR THE ANALYSIS

1.a. Purpose of the Economic Analysis

The purpose of this report is to identify and analyze the potential economic impacts associated with the proposed critical habitat designation for 11 species of Hawaiian picture-wing flies. It attempts to quantify the economic impacts to activities occurring in the proposed critical habitat area and areas proposed for exclusion by taking into account the cost of conservation efforts associated with economic activities within the boundaries of these areas. The analysis looks retrospectively at costs incurred since the species was listed in 2006, and forecasts impacts after the proposed critical habitat is finalized.

This information is intended to assist the Secretary in determining whether the benefits of excluding particular areas from the designation outweigh the benefits of including those areas in the designation.[1] In addition, this information allows the Service to address the requirements of Executive Orders 12866 and 13211, and the Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA).[2-5] This report also complies with direction from the U.S. Court of Appeals for the 10th Circuit that "coextensive" effects should be included in the economic analysis to inform decision-makers regarding which areas to designate as critical habitat.[1]

This section of the report describes the framework for the analysis. First, it clarifies that the final economic analysis is for the proposed rule and not the final rule, and that no substantive changes were required between the draft and final economic analyses. Second, it describes the general analytic approach to estimating economic effects, including a discussion of both efficiency and distributional effects. Next, it discusses the scope of the analysis, including the link between existing and critical habitat-related protection efforts and economic impacts. It then presents the analytic time frame used in the report, followed by a discussion of present value and annualized value. Finally, this section lists the information sources relied upon in the analysis.

1. In 2001, the U.S. Court of Appeals for the 10th Circuit instructed the Service to conduct a full analysis of all of the economic impacts of proposed critical habitat, regardless of whether those impacts are attributable coextensively to other causes.[6]

1.b. Final Economic Analysis of Proposed Rule

This final report analyzes the proposed designation as described in the proposed rule. The analysis does not reflect changes to the proposed critical habitat designation made in the final rule. Consequently, the description of the habitat designation in the final rule may differ from maps and figures presented in the analysis. And since no public comments were received on the draft economic analysis, there are no substantive changes between this final economic analysis and the draft analysis.

1.c. Approach to Estimating the Economic Effects

1.c.(1) Overview

This economic analysis considers both the economic efficiency and distributional effects that may result from efforts to protect the Hawaiian picture-wing flies and their habitat (hereinafter referred to collectively as "Hawaiian picture-wing conservation efforts"). Economic efficiency effects generally reflect "opportunity costs" associated with the commitment of resources required to accomplish species and habitat conservation. For example, if activities that can take place on a parcel of land are limited as a result of the designation or the presence of the species, thereby reducing the market value of the land, this reduction in value represents one measure of opportunity cost or change in economic efficiency. Similarly, the costs incurred by a Federal action agency to consult with the Service under section 7 represent opportunity costs of Hawaiian picture-wing conservation efforts.

This analysis also addresses the distribution of impacts associated with the designation, including an assessment of any local or regional impacts of habitat conservation and the potential effects of conservation efforts on small entities and the energy industry. This information may be used by decision-makers to assess whether the effects of Hawaiian picture-wing flies conservation efforts unduly burden a particular group or economic sector. For example, while conservation efforts may have a relatively small impact relative to the national economy, individuals employed in a particular sector of the regional economy may experience relatively greater impacts. The difference between economic efficiency effects and distributional effects, as well as their application in this analysis, are discussed in greater detail below.

1.c.(2) Efficiency Effects

At the guidance of the Office of Management and Budget (OMB) and in compliance with Executive Order 12866 "Regulatory Planning and Review," Federal agencies measure changes in economic efficiency in order to understand how society, as a whole, will be affected by a regulatory action. In the context

of regulations that protect Hawaiian picture-wing flies habitat, these efficiency effects represent the opportunity cost of resources used or benefits foregone by society as a result of the regulations. Economists generally characterize opportunity costs in terms of changes in producer and consumer surpluses in affected markets.[2]

In some instances, compliance costs may provide a reasonable approximation for the efficiency effects associated with a regulatory action. For example, a Federal land manager may enter into a consultation with the Service to ensure that a particular activity will not adversely modify critical habitat. The effort required for the consultation is an economic opportunity cost because the landowner or manager's time and effort would have been spent in an alternative activity had the parcel not been included in the designation. When compliance activity is not expected to significantly affect markets—that is, not result in a shift in the quantity of a good or service provided at a given price, or in the quantity of a good or service demanded given a change in price—the measurement of compliance costs can provide a reasonable estimate of the change in economic efficiency.

Where habitat protection measures are expected to significantly impact a market, it may be necessary to estimate changes in producer and consumer surpluses. For example, a designation that precludes the development of large areas of land may shift the price and quantity of housing supplied in a region. In this case, changes in economic efficiency (i.e., social welfare) can be measured by considering changes in producer and consumer surplus in the market.

This analysis begins by measuring costs associated with efforts undertaken to protect 11 species of Hawaiian picture-wing flies and their habitat. As noted above, in some cases, compliance costs can provide a reasonable estimate of changes in economic efficiency. However, if the cost of conservation efforts is expected to significantly impact markets, the analysis will consider potential changes in consumer and/or producer surplus in affected markets.

1.c.(3) Distributional and Regional Economic Effects

Measurements of changes in economic efficiency focus on the net impact of conservation efforts, without consideration of how certain economic sectors or groups of people are affected. Thus, a discussion of efficiency effects alone may miss important distributional considerations. OMB encourages Federal agencies to consider distributional effects separately from efficiency effects.[9] This analysis considers several types of distributional effects, including impacts

2. For additional information on the definition of "surplus" and an explanation of consumer and producer surplus in the context of regulatory analysis, see: Gramlich, Edward M., A Guide to Benefit-Cost Analysis; and U.S. Environmental Protection Agency, *Guidelines for Preparing Economic Analyses.*[7,8]

on small entities; impacts on energy supply, distribution, and use; and regional economic impacts. It is important to note that these are fundamentally different measures of economic impact than efficiency effects, and thus cannot be added to or compared with estimates of changes in economic efficiency.

1.c.(3)(a) Impacts on Small Entities and Energy Supply, Distribution and Use

This analysis considers how small entities—including small businesses, organizations, and governments, as defined by the RFA—might be affected by future Hawaiian picture-wing flies conservation efforts.[4] In addition, in response to Executive Order 13211 "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use," this analysis considers the future impacts of conservation efforts on the energy industry and its customers.[3]

1.c.(3)(b) Regional Economic Effects

Regional economic impact analysis can provide an assessment of the potential localized effects of conservation efforts. Specifically, regional economic impact analysis produces a quantitative estimate of the potential magnitude of the initial change in the regional economy resulting from a regulatory action. Regional economic impacts are commonly measured using regional input/output models. These models rely on multipliers that represent the relationship between a change in one sector of the economy (e.g., expenditures by recreationists) and the effect of that change on economic output, income, or employment in other local industries (e.g., suppliers of goods and services to recreationists). These economic data provide a quantitative estimate of the magnitude of shifts of jobs and revenues in the local economy.

The use of regional input/output models in an analysis of the impacts of species and habitat conservation efforts can overstate the long-term impacts of a regulatory change. Most importantly, these models provide a static view of the economy of a region. That is, they measure the initial impact of a regulatory change on an economy but do not consider long-term adjustments that the economy will make in response to this change. For example, these models provide estimates of the number of jobs lost as a result of a regulatory change, but do not consider re-employment of these individuals over time or other adaptive responses by impacted businesses. In addition, the flow of goods and services across the regional boundaries defined in the model may change as a result of the regulation, compensating for a potential decrease in economic activity in the region.

Despite these and other limitations, in certain circumstances regional economic impact analysis may provide useful information about the scale and

scope of localized impacts. It is important to remember that measures of regional economic effects generally reflect shifts in resource use rather than efficiency losses. Thus, these types of distributional effects are reported separately from efficiency effects (i.e., they are not summed). In addition, measures of regional economic impact cannot be compared with estimates of efficiency effects, but should be considered as distinct measures of impact.

1.d. Scope of the Analysis

1.d.(1) Coextensive Impacts

This analysis identifies those economic activities most likely to threaten the listed species and its habitat and, where possible, quantifies the economic impact to avoid, mitigate, or compensate for such threats within the boundaries of the study area. Due to the difficulty in making a credible distinction between listing and critical habitat effects within critical habitat boundaries, this analysis considers all future conservation-related impacts to be coextensive with the designation.[1,3]

Coextensive effects may also include impacts associated with overlapping protective measures of other Federal, state, and local laws that aid habitat conservation in the areas proposed for designation. In past instances, some of these measures have been precipitated by the species listing and/or impending designation of critical habitat. Because conservation efforts affording protection to a listed species likely contribute to the efficacy of critical habitat designation, the impacts of these actions are considered relevant for understanding the full effect of critical habitat designation. However, enforcement actions taken in response to violations of the Act are not included.

1.d.(2) Sections of the Act Relevant to the Analysis

This analysis focuses on activities that are influenced by the Service through sections 4, 7, 9 and 10 of the Act. Section 4 of the Act focuses on the listing and recovery of endangered and threatened species, as well as the designation of critical habitat. In this section, the Secretary is required to list species as endangered or threatened "solely on the basis of the best available scientific and commercial data."[1] Section 4 also requires the Secretary to designate critical habitat "on the basis of the best scientific data available and after taking into consideration the economic impact and any other relevant impact of specifying any particular area as critical habitat."[1]

3. In 2004, the U.S. Ninth Circuit invalidated the Service's regulation defining destruction or adverse modification of critical habitat (Gifford Pinchot Task Force v. United States Fish and Wildlife Service). The Service is currently reviewing the decision to determine what effect it (and to a limited extent Center for Biological Diversity v. Bureau of Land Management) may have on the outcome of consultations pursuant to section 7 of the Act.[10]

The protections afforded to threatened and endangered species and their habitat are described in sections 7, 9, and 10 of the Act, and economic impacts resulting from these protections are the focus of this analysis:

— Section 7 of the Act requires Federal agencies to consult with the Service to ensure that any action authorized, funded, or carried out will not likely jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat. The administrative costs of these consultations, along with the costs of project modifications resulting from these consultations, represent compliance costs associated with the species listing and the proposed critical habitat.[3]

— Section 9 defines the actions that are prohibited by the Act. In particular, it prohibits the "take" of endangered wildlife, where "take" means to "harass, harm, pursue, or collect, or to attempt to engage in any such conduct."[1] The economic impacts associated with this section manifest themselves in sections 7 and 10.

— Under section 10(a)(1)(B) of the Act, an entity (e.g., a landowner or local government) may develop a Habitat Conservation Plan (HCP) for an endangered animal species in order to meet the conditions for issuance of an incidental take permit in connection with the development and management of a property.[11] The requirements posed by the HCP may have economic impacts associated with the goal of ensuring that the effects of incidental take are adequately minimized and mitigated. The designation of critical habitat does not require completion of an HCP; however, the designation may influence conservation measures provided under HCPs.

1.d.(3) Other Relevant Protection Efforts

The protection of listed species and habitat is not limited to the Act. Other Federal agencies, as well as state and local governments, may also seek to protect the natural resources under their jurisdiction. For the purpose of this analysis, such protective efforts are considered to be coextensive with the protection offered by critical habitat, and costs associated with these efforts are included in this report. In addition, under certain circumstances, critical habitat may provide new information to a community about the sensitive ecological nature of a geographic region, potentially triggering additional economic impacts under other state or local laws. In cases where these costs would not have been triggered absent the designation of critical habitat, they are included in this economic analysis.

1.d.(4) Additional Analytic Considerations

This analysis also considers the potential for other types of economic impacts that can be related to section 7 consultations in general and critical habitat in particular, including time delay, regulatory uncertainty, and stigma impacts.

1.d.(4)(a) Time Delay and Regulatory Uncertainty Impacts

Time delays are costs due to project delays associated with the consultation process or compliance with other regulations. Regulatory uncertainty costs occur in anticipation of having to modify project parameters (e.g., retaining outside experts or legal counsel to better understand their responsibilities with regard to critical habitat).

1.d.(4)(b) Stigma Impacts

Stigma refers to the change in economic value of a particular project or activity due to negative (or positive) perceptions of the role critical habitat will play in developing, implementing, or conducting that policy. For example, changes to private property values associated with public attitudes about the limits and costs of implementing a project in critical habitat are known as "stigma" impacts. This analysis does not quantify any stigma impacts associated with the proposed critical habitat designation for the Hawaiian picture-wing flies

1.d.(5) Benefits

Under Executive Order 12866, OMB directs Federal agencies to provide an assessment of both the social costs and benefits of proposed regulatory actions.[2] OMB's Circular A-4 distinguishes two types of economic benefits: direct benefits and ancillary benefits. Ancillary benefits are defined as favorable impacts of a rulemaking that are typically unrelated, or secondary, to the statutory purpose of the rulemaking.[9]

In the context of critical habitat, the primary purpose of the rulemaking (i.e., the direct benefit) is the potential to enhance conservation of the species. The published economics literature has documented that social welfare benefits can result from the conservation and recovery of endangered and threatened species. In its guidance for implementing Executive Order 12866, OMB acknowledges that it may not be feasible to monetize, or even quantify, the benefits of environmental regulations due to either an absence of defensible, relevant studies or a lack of resources on the implementing agency's part to conduct new research.[9] *Rather than rely on economic measures, the Service believes*

that the direct benefits of the proposed rule are best expressed in biological terms that can be weighed against the expected cost impacts of the rulemaking.

Critical habitat designation may also generate ancillary benefits. Critical habitat aids in the conservation of species specifically by protecting the primary constituent elements on which the species depends. To this end, critical habitat designation can result in maintenance of particular environmental conditions that may generate other social benefits aside from the preservation of the species. That is, management actions undertaken to conserve a species or habitat may have coincident, positive social welfare implications, such as increased recreational opportunities in a region. While they are not the primary purpose of critical habitat, these ancillary benefits may result in gains in employment, output, or income that may offset the direct, negative impacts to a region's economy resulting from actions to conserve a species or its habitat.

It is often difficult to evaluate the ancillary benefits of critical habitat designation. To the extent that the ancillary benefits of the rulemaking may be captured by the market through an identifiable shift in resource allocation, they are factored into the overall economic impact assessment in this report. For example, if habitat preserves are created to protect a species, the value of existing residential property adjacent to those preserves may increase, resulting in a measurable positive impact. Where data are available, this analysis attempts to capture the net economic impact (i.e., the increased regulatory burden less any discernible offsetting market gains) of species conservation efforts imposed on regulated entities and the regional economy.

1.d.(6) Geographic Scope

The geographic scope of the analysis includes areas intended to be proposed for critical habitat designation as well as areas proposed for exclusion from critical habitat. The economic impacts of the critical habitat designation are estimated for each of these two categories of land in the proposed rule. The analysis focuses on activities within or affecting these areas.[1,3]

1.e. Analytic Time Frame

The analysis estimates economic impacts based on activities that are "reasonably foreseeable," including, but not limited to, activities that are currently authorized, permitted, or funded, or for which proposed plans are currently available to the public. The analysis estimates economic impacts to activities from 2006 (year of the species' final listing) to 2026 (20 years from the expected year of final critical habitat designation which is expected to occur in early 2007).

1.f. Present Value and Annualized Value

For each land-use activity, this analysis presents economic impacts incurred in different time periods in present-value terms. The present value represents the value of a payment or stream of payments in common-dollar terms. That is, it is the sum of a series of past or future cash flows expressed in today's dollars. Translation of the economic impacts of past or future costs to present-value terms requires the following: (1) past or projected future costs of conservation efforts; and (2) the specific years in which these impacts have been incurred or are expected to be incurred. With these data, the present value of the past or future stream of impacts *(PVc)* of conservation efforts from year t to T is measured in 2006 dollars according to the following standard formula:[4]

$$PV_c = \sum_{t=t_o}^{t=T} \frac{C_t}{(1+r)^{t-2006}}$$

C_t = cost of conservation efforts in year t

r = discount rate[5]

Impacts of conservation efforts for each activity in each unit are also expressed as annualized values (i.e., the series of equal annual costs over some defined time period that have the same present value as estimated total impacts). Annualized values are calculated to compare impacts across activities with varying forecast periods *(T)*. For this analysis, all activities employ a forecast period of 20 years, 2007 through 2026. Annualized impacts of future conservation efforts *(APVc)* are calculated by the following standard formula:

$$APV_c = PV_c\left[\frac{r}{1-(1+r)^{-(N)}}\right]$$

N = number of years in the forecast period

1.g. Information Sources

The primary sources of information for this report are communications with and data provided by personnel from the Service, Federal, state, and local governments and other stakeholders.

4. To derive the present value of future conservation efforts in this analysis, t is 2007 and T is 2026.
5. To discount and annualize costs, guidance provided by the OMB specifies the use of a real rate of 7%. In addition, OMB recommends sensitivity analysis using other discount rates such as 3%, which some economists believe better reflects the social rate of time preference.[9,12]

2. SPECIES AND HABITAT DESCRIPTIONS

2.a. Regulatory History[13]

A final listing rule for 12 species of Hawaiian picture-wing flies was published in the *Federal Register* on May 9, 2006, and the "Proposed Designation of Critical Habitat for 11 Species of Picture-wing Flies from the Hawaiian Islands; Proposed Rule" was published in the *Federal Register* on August 15, 2006.

2.b. Locations of Proposed Critical Habitat Units

As indicated Maps ES-1, 2, 3, 4 and 5 and as summarized in Table ES-1, proposed critical habitat units for the Hawaiian picture-wing flies are located on four of the major islands of Hawai'i: Kaua'i (Kaua'i County), O'ahu (City & County of Honolulu), Moloka'i (part of Maui County), and Hawai'i (Hawai'i County). Hawai'i Island is often referred to as the "Big Island" to distinguish it from the State of Hawai'i as a whole. On Maps ES-2, 3, 4 and 5, yellow Xs show the locations of the units. Detailed maps of the units are shown in Appendix B.

2.c. Threats to the Species and Host Habitat, by Unit[13]

Threats to the picture-wing flies and to the plants they depend upon include:

— Nonnative Plants

The invasion of nonnative plants contributes to the degradation of native forests and to host plants for the picture-wing flies. Some nonnative plants form dense stands, thickets, or mats that shade or out-compete native plants. Nonnative vines cause damage or death to native trees by overloading branches, causing breakage, or by forming dense canopies that intercept sunlight and shade out native plants below. Nonnative grasses burn readily, often grow at the borders of forests, and carry fire into areas having woody native plants. Also, nonnative grasses are more fire-adapted and can spread prolifically after a fire, ultimately creating a stand of nonnative grasses where native forests once stood. Some nonnative plant species produce chemicals that inhibit the growth of other plant species.

— Feral Ungulates (pigs, goats and cattle)

Feral ungulates consume native vegetation, trample roots and seedlings, accelerate erosion, and promote the invasion of nonnative plants.

— Nonnative Insects (western yellow-jacket wasp and several species of ants)

Nonnative insects pose a serious threat to Hawaii's picture-wing flies through direct predation or parasitism, and through competition for food or space.

— Fire

Fire threatens the habitat of the Hawaiian picture-wing flies in dry to mesic grassland, shrubland and forests. Also, habitat that has been damaged or destroyed by fire is more likely to be revegetated by nonnative plants that cannot be used by picture-wing flies as host plants.

Table ES-2 summarizes the various threats specific to each proposed critical habitat unit.

2.d. Acreage of Proposed Critical Habitat Units

Each unit is 1 acre square in size and shape. However, the combined area of the 22 units totals only 18 acres because some of the O'ahu units overlap.

2.e. Land Ownership and Leases

Landowners of the 22 critical habitat units are shown in Table ES-1, and are summarized as follows:[13]

Landowner	Acres
U.S. Government	0
State of Hawai'i, Dept. of Land & Natural Resources (DLNR)	10
City & County of Honolulu, Board of Water Supply	1
Private	7

Recent and anticipated changes in land ownership and long-term leases to the land are as follows:

— Kalua'a Gulch and Palikea Units (O'ahu)[14-17]

As indicted in Table ES-l, the landowner for these two units is the Estate of James Campbell (JCE). However, by January 2007, this trust will terminate and the assets will be transferred to James Campbell Company LLC. Also, these two units are within the

Honouliuli Preserve which is under long-term lease to The Nature Conservancy of Hawai'i (TNCH). The northern part of the Preserve borders the U.S. Army's (Army) Schofield Barracks which is located to the northeast, and borders the U.S. Navy's (Navy) Lualualei Naval Magazine which is located to the west.

In 2002, the Army planned to purchase the northern part of the Preserve, which includes the Kalua'a Gulch unit, as part of its planned expansion of Schofield Barracks. A mountainous portion of this land would have continued to be managed by TNCH as part of the Preserve, but it also would have served as a safety zone for rifle and pistol ranges.

The Army's acquisition of land to expand Schofield Barracks has proceeded, but the acquisition does not include the Honouliuli Preserve. Instead, landowner JCE is seeking another buyer of the Preserve land who would continue to manage it as a Preserve. Also, the Army may help fund the land purchase through its Army Compatible Use Buffer (ACUB) program. This program allows the Army to partner with another branch of government or a non-profit organization to purchase land for a compatible land use. The compatible land use can be a physical buffer for training areas or a conservation buffer. However, the Army does not intend to assume management responsibilities or title to the land.

— Pu'u Kolekole Unit (Moloka'i)[13]

This unit is owned by Moloka'i Ranch Ltd., but is under long-term lease to TNCH which manages it as part of the Kamoku Preserve.

— Pauahi Unit (Big Island)[13,18,19]

Service records indicate that the Pauahi lands are owned by Koa Road LLC. However, according to State records, this entity was terminated in August 2005. Hawai'i County records indicate that the land is owned by Kealakekua Heritage Ranch, LLC.

— Waiea Unit (Big Island)[20]

The Waiea lands are owned by the State of Hawai'i, which leases the land to the owners of McCandless Ranch. The lease provides access to McCandless Ranch.

— Gaspar's Dairy, Kipuka at 4,900 ft and Pit Crater Units (Big Island)[21]

These units are owned by Kamehameha Schools, but are part of lands that are leased to ranches for grazing cattle.

2.f. Terrain

Most of the units are located in mountainous areas having rugged terrain (Maps ES-2, 3, 4 and 5). The exceptions are four units in West Hawai'i: Kipuka at 4900 ft, Gaspar's Dairy, Pauahi and Waiea.

2.g. Land Management Areas

As indicated in Table ES-1, 18 of the 22 units are in the State Conservation District which limits economic use of the land as well as development potential. Subject to approvals, permits, and approved management plans, the less restrictive subzones of State Conservation Districts allow one home per parcel, the growing and harvesting of commercial timber, cattle grazing, and farming.

Four of the units are in the State Agricultural District which limits use to crop farming, grazing, support facilities, and homes for the operators and employees. Regardless of the restrictions on use, large-lot agricultural subdivisions for luxury homes have occasionally been approved and developed on land that is in the State Agricultural District.

None of the units is in the State Urban District or Rural District.

As further indicated in Table ES-1, 19 of the units are in land management areas that emphasize preservation and/or land stewardship, and generally limit other uses of the land.

All of the O'ahu units are within existing critical habitat for the 'elepaio and for threatened and endangered plants. On the Big Island, the Waihaka Gulch unit is within the critical habitat for the plant *Phyllostegia velutina.*

2.h. Land Uses

Consistent with the above, 17 of the units are included in lands managed as nature preserves, forest reserves, watersheds, or for wilderness recreation (Table ES-1).

On the Big Island, landowners report that four units are used for grazing cattle: Pauahi, Gaspar's Dairy, Kipuka at 4900 ft, and Pit Crater.[21,22] In addition, the Pauahi unit is in an area that was planted in *koa* (*Acacia koa,* a hardwood) as part of a commercial timber operation, and *koa* is planned for the Gaspar's Dairy unit.

Also on the Big Island, the Upper Hamakua Ditch passes through or near the Kohala Mountains unit.[23] This ditch provides irrigation water to farms on the Hamakua coast.

Many of the units are also used for recreation. Specifically, recreational hunting is allowed in all of the government-owned units that are within the Conservation District.[24,25] Also, hiking trails are known to exist in or near the following units:

— O'ahu: Palikea and Wailupe units
— Moloka'i: Pu'u Kolekole unit
— Big Island: Waiakea Forest and Kohala Mountains units

None of the units is in the path of urban development as indicated by the State Conservation Districting (Table ES-1) and, for the Big Island, the County General Plan.[26]

2.i. Proposed Exclusions[13]

Four of the units are proposed for 4(b)(2) exclusion from critical habitat designation for non-economic reasons: Pu'u Kolekole on Moloka'i and Gaspar's Dairy, Kipuka at 4900 ft, and Pit Crater on the Big Island.

3. ECONOMIC IMPACTS

3.a. Introduction

Economic impacts of Hawaiian picture-wing conservation efforts are addressed below. For future impacts, the material is organized by activities that could be affected by conservation efforts.

3.b. Past Costs[13,27]

No conservation efforts have been undertaken in the past (i.e., before December 2006) for the 11 species because the picture-wing flies were not listed until May 9, 2006. There has been no section 7 consultations; no project modifications; and no expenditures on land management, protections, or restoration. Therefore, no past economic impacts are estimated.

3.c. Conservation Activities for Picture-wing Flies

In order to alleviate and reverse the ongoing degradation and loss of habitat for the picture-wing flies, all of the proposed critical habitat units may require active management to control feral ungulates, invasive nonnative plants, yellow-jacket wasps, ants and fire. The nature and cost of this management is discussed below.

3.c.(1) Affected Units[28]

Table ES-2 summarizes the threats specific to each proposed critical habitat unit, and indicates the related threat-management that may be needed.

3.c.(2) Baseline Management

As indicated in Table ES-1, a number of the units are located in larger areas that are managed for preservation or watershed. Management activities generally include (1) strategic fencing to limit the travel of feral ungulates into large protected areas, and (2) hunting and trapping to reduce the population of ungulates in these protected areas. Also, preservation management may include efforts to control nonnative plants.

In the event of a major fire in a mountainous area, firefighters may be marshalled from (1) the State DLNR using staff from the affected island and nearby islands, (2) County fire departments, and (3) the U.S. Army. The objective is to extinguish fires as quickly as possible.

To a limited extent, the proposed critical habit units benefit from these existing approaches to managing threats.

3.c.(3) Potential Management Activities[16,17,29,30]

Active management to control threats to picture-wing flies and their host plants may include the following:

— Ungulates

For relatively small areas, exclosure fencing is the preferred method of protecting habitat from ungulates. Gates are normally provided to allow human travel along established trails

— Nonnative plants

Nonnative plants are generally controlled by (1) using a chain saw to remove thick growth; (2) weeding, and (3) targeted applications of herbicides. Controlling nonnative plants is difficult and must be planned carefully and monitored to insure that the native plants ultimately flourish in the areas that are cleared.

To increase the probability that native plants replace nonnative ones, the effort may include restoration that involves growing native plants in a greenhouse, then planting them in the cleared areas.

— Wasps and ants

Wasps and ants are difficult to control in mountainous areas, particularly if an infestation is well-established and widespread. Also, effective methods are yet to be developed and, once developed, must be approved by State and Federal environmental agencies to insure that they do not cause risks to native species or cause other environmental damage. If colonies of wasps or ants within or near a habitat unit are few in number and small in size, then eradication might be possible. But if they are numerous or large, then a localized reduction in their populations might be a more realistic objective. Such a stopgap containment strategy would buy time until more effective methods are developed.

For wasps, the anticipated method of control would involve a grid of outdoor bait traps using a protein to attract the wasps. The bait would be laced with a poison that would (1) kill the queen if captured, thereby preventing the growth of a new col-

ony, or (2) reduce the population of a colony by killing workers. Since wasps forage out as far as 500 meters (1,640 feet), the grid would have to cover about 200 acres to protect a 1-acre picture-wing critical habitat. The anticipated density is about one trap per hectare (about 2.47 acres) for a total of about 80 traps. In late spring and early summer when new colonies are first being established, the traps would be replenished about every three days over a period of about 1-1/2 months. Of particular concern, the bait would have to attract wasps but not picture-wing flies or other native insects.

For ants, the anticipated method of control would involve a grid of outdoor bait traps using a liquid poison that would kill nests in the immediate area. However, if a colony consists of several scattered nests, the colony would probably survive. About 1 acre would be covered with about 50 traps that would have to be replenished about once a month.

— Fire

To reduce the probability of fire threatening critical habit, the Service could work with the State DLNR and County fire departments to request that a high priority be assigned to protecting critical habitat and surrounding areas. This could be accomplished by writing an annual letter to the responsible agencies regarding the Service's desired priorities.

3.c.(4) Data Sources and Methodology

Primary sources of information about methods and costs of managing threats to picture-wing flies and their habitat was provided by biologists with The Nature Conservancy of Hawai'i; the U. S. Army, Environmental Division; and the U.S. Geological Survey, Pacific Island Ecosystem Research Center.

For each type of control, low and high costs were estimated for the initial year and for annual operations, as appropriate. PV costs were then calculated assuming three discount rates.

3.c.(5) Future Costs

Estimated costs to control threats to picture-wing flies and their habitat are as follows:

— Exclosure fencing to exclude feral ungulates[16,17,22]

For the four critical habit units located on agricultural land, the cost of exclosure fencing will reflect the fact that four-wheel drive vehicles can be used to carry materials and workers to the

site. For these units, the low cost of fencing is estimated at about $5,850 (based on a perimeter of 835 feet x $7 per foot of fencing). The high cost is estimated at $8,350 (based on $10 per foot of fencing).

For critical habit units located in the mountains, the cost of exclosure fencing will be higher because of the more difficult access and terrain. Some sites can be approached by vehicle, followed by a hike to the site. Other sites may require helicopters to deliver materials and possibly workers. For these mountainous units, the low cost is estimated at $16,700 (based on $20 per foot for fencing), while the high cost is estimated at $29,300 (based on $35 per foot).

For all units, it is assumed that the fencing would be installed in 2007, with the cost paid by the landowner.

In Table ES-4, the corresponding costs of each of the four overlapping Palikea units are one-quarter of the above estimates, and the costs of each of the two overlapping Kalua'a Gulch units are half of the above estimates.

— Control of nonnative plants[16,17]

For the four critical habit units located on agricultural land, the cost of controlling nonnative plants is estimated at $1,800 to $3,600 per year, based on about 2-1/2 to 5 days of effort every other month, and a labor rate of about $15 per hour. Over a 20-year period, the low PV cost per unit is about $36,000 at a 0% discount rate, about $26,780 at a 3% discount rate, and about $19,070 at a 7% discount rate. The high PV cost per unit is about $72,000 at a 0% discount rate, about $53,560 at a 3% discount rate, and about $38,140 at a 7% discount rate.

For critical habit units located in the mountains, costs to control nonnative plants are estimated at about $2,160 to $4,320 per year, based on about 3 to 6 days of effort every other month, and a labor rate of about $15 per hour. Over a 20-year period, the low PV cost per unit is about $43,200 at a 0% discount rate, about $32,140 at a 3% discount rate, and about $22,880 at a 7% discount rate. The high PV cost per unit is about $86,400 at a 0% discount rate, about $64,270 at a 3% discount rate, and about $45,770 at a 7% discount rate.

These estimates do not include the cost of restoration—i.e., growing native plants in a greenhouse then planting them in cleared areas.

It is assumed that the cost of controlling nonnative plants would be paid by the individual landowner. In Table ES-4, the corresponding costs of each of the four overlapping Palikea units are one-quarter of the above estimates, and the costs of each of the two overlapping Kalua'a Gulch units are half of the above estimates.

— Wasp control[29,30]

The low estimate for wasp control is $0 based on the assumption that there might not be an effective and approved approach for controlling wasps within the critical habitat units.

For the four units located on agricultural land, the high estimate for controlling wasps includes an initial cost of $2,800, based on covering 200 acres with 80 outdoor bait traps at about $5 each, and 20 days of effort at about $15 per hour to set up the grid of bait stations. Annual costs are estimated at $12,600 based on refilling the bait traps about 15 times per year at a cost of about $1.50 per refill, and about 6 days of effort per refill trip at about $15 per hour. Over a 20-year period, the high PV cost per unit is about $254,800 at a 0% discount rate, about $190,260 at a 3% discount rate, and about $136,280 at a 7% discount rate.

For critical habit units located in the mountains, the high estimate for the initial cost increases to about $4,000 based on 10 additional days of effort to set up the grid, and the annual cost increases to about $16,200 based on an additional 2 days per visit to refill the bait stations. Over a 20-year period, the PV high cost per unit is about $328,000 at a 0% discount rate, about $245,020 at a 3% discount rate, and about $175,620 at a 7% discount rate.

It is assumed that the cost of controlling wasps would be paid by the individual landowners. In Table ES-4, the corresponding costs of each of the four overlapping Palikea units are one-quarter of the above estimates, and the costs of each of the two overlapping Kalua'a Gulch units are half of the above estimates.

— Ant control[17,29]

The low estimate for ant control is $0 based on the assumption that there might not be an effective and approved approach for controlling ants within the critical habitat units.

For the four critical habit units located on agricultural land, the high estimate for controlling ants includes an initial cost of $430, based on 50 outdoor bait traps at about $5 each, and about 1-1/2 days of effort at about $15 per hour to set up the grid of bait

stations. Annual costs are estimated at $1,920 based on refilling the bait traps monthly at a cost of about $2 per refill and about a half day of labor at about $15 per hour. Over a 20-year period, the high PV cost per unit is about $38,830 at a 0% discount rate, about $28,990 at a 3% discount rate, and about $20,770 at a 7% discount rate.

For critical habit units located in the mountains, the high estimate for the initial cost increases to about $490 based on an additional half day of effort to set up the grid, and annual costs increased to about $2,640 based on an additional half day per visit to refill the bait stations. Over a 20-year period, the high PV cost per unit is about $53,290 at a 0% discount rate, about $39,770 at a 3% discount rate, and about $28,460 at a 7% discount rate.

It is assumed that the cost of controlling ants would be paid by the individual landowner. In Table ES-4, the corresponding costs for each of the four overlapping Palikea units are one-quarter of the above estimates, and the costs for each of the two overlapping Kalua'a Gulch units are half of the above estimates.

— Fire Control

The cost to communicate desired priorities for fire managements, and to adjust these priorities, is estimated to be about $10 to $20 per year per critical-habitat unit (based on 2 to 4 hours per year of effort, about $60 per hour for labor, and averaged over 12 separate units in dry to mesic areas). Over a 20-year period, the low PV cost per unit is about $200 at a 0% discount rate, about $150 at a 3% discount rate, and about $110 at a 7% discount rate. The high PV cost per unit is about $400 at a 0% discount rate, about $300 at a 3% discount rate, and about $210 at a 7% discount rate.

In Table ES-4, the corresponding costs for each of the four overlapping Palikea units are one-quarter of the above estimates, and the costs for each of the two overlapping Kalua'a Gulch units are half of the above estimates.

3.c.(6) Sources of Uncertainty

Primary sources of uncertainty associated with the above analysis include (1) whether active management of the threats would actually occur given the lack of legal obligations, high costs, and the lack of proven and approved methods for wasp and ant control; (2) the amount of effort that would be required to manage the threats; and (3) which organization would actually pay the costs of managing the threats.

3.d. Commercial *Koa* Forest[21]

3.d.(1) Affected Units

The Gaspar's Dairy unit is within an area that Kamehameha Schools plans to plant in *koa* as part of a commercial forest, and the Pauahi unit is in an area that is already planted in *koa*.

3.d.(2) Baseline Economic Activity[28]

A commercial *koa* forest is a long-term crop that can span a period of 50 years or more. The cash-flow of a 500-acre commercial *koa* forest is as follows:

- Per-acre expenditures of about $700 in the first year to establish the forest, or about $260 after State and Federal subsidies.
- Per-acre expenditures of about $14 to $15 per year for about 39 years to maintain the forest, or net revenues of about $38 to $39 per year for 29 years after subsidies.
- Per-acre revenues from harvesting that increase from about $4,420 in Year 40 to about $5,730 in Year 49. This reflects harvesting about 10% of the land each year for 10 years, a harvest that grows from about 8,500 board feet per acre year in Year 40 to about 10,100 board feet in Year 49, and a *koa* price of $3.50 per board foot plus real price appreciation of about 1% per year.

State subsidies are available from the Hawai'i Forest Stewardship Program, a government cost-share program administered by the Hawai'i Department of Land and Natural Resources (DLNR). Federal subsidies are available from the Conservation Reserve Enhancement Program administered by the U.S. Department of Agriculture. This program provides rental payments and cost-share assistance covering initial forest establishment and ongoing major maintenance costs. However, the land would be removed from the program before harvesting begins.

The present value (PV) of this 50-year cash flow is about $51,470 per acre using a 0% discount rate (i.e., undiscounted), about $13,880 using a 3% discount rate, and about $2,580 using a 7% discount rate.

Planting of *koa* is planned in about 10 years for lands that include the Gaspar's Dairy unit. For the 3% and 7% discount rates, the delay in planting reduces the PVs. However, *koa* at the Pauahi unit is already planted with about 20 years before first harvest of mature trees. Thus, past expenditures are sunk costs, and the harvest of mature trees is closer in time. For this situation, the PVs of the remaining cash flow will be higher than for newly planted *koa*.

3.d.(3) Industry Overview[31]

Koa is a tree endemic to Hawai'i that is predominantly found at elevations ranging from about 2,000 feet to 6,000 feet. The *koa* holds great cultural importance to Hawai'i, partly because the very large tree trunks were ideal for building canoes of all sizes. Today, Hawaii's commercial forest industry is based largely on harvesting *koa* for the woodcrafts industry. *Koa* is considered a very attractive wood and is used primarily to make high-quality furniture, cabinetry, wood panelling, bowls, and other woodcrafts; it is the predominant wood of choice among many Hawaiian artists and crafters.

To supply this market, approximately 1 million board feet of *koa* are harvested annually, of which about 25% is wastage. Gross revenues of the forestry component of the *koa* industry amount to about $3 million per year. The value of *koa* woodcrafts, however, is far higher.

Koa is a high-value wood commanding a price of about $3.50 per board foot for standing timber; premium-quality *koa* can sell for considerably more. The price reflects the limited supply because much of the original forests have been lost.

Kamehameha Schools has about 5,000 acres of mature *koa* in the Honaunau area of West Hawai'i. And Kealakekua Heritage Ranch has 65 acres of *koa* that were planted in the mid-1990s, as well as volunteer *koa* on portions of their remaining 11,400+ acres. In addition to growing *koa*, Kealakekua Heritage Ranch also mills the trees to produce lumber, dries the lumber in its own kiln, and uses the processed lumber to make furniture, cabinets, flooring, etc.

3.d.(4) Potential Changes in Koa Operations

In response to designating the Gaspar's Dairy unit, it is unlikely that Kamehameha Schools will plant the area in *koa* since preparing the land for planting, thinning the forest in the later years to foster better tree growth, and harvesting the trees at maturity all represent a threat to the species and habitat. For the benefit of the species, landowners may move the planting to another area and maintain the same planted acreage, or plant one less acre in *koa*. In both cases, it is expected that they would fence off the critical habitat unit.

For the Pauahi unit, Kealakekua Heritage Range has indicated that they would fence off the area for the benefit of the species. Although the trees would not be harvested from the unit, growing subsidies could continue even if the lands are not harvested.

3.d.(5) Data Sources and Methodology

Financial information about commercial *koa* forests is based on a recent study by Goldstein.[28] For the Gaspar's Dairy unit, the cash flow from this

study was adjusted to reflect planting that, absent conservation for the Hawaiian picture-wing flies, would start in about 10 years.

For the Pauahi unit, the cash flow was adjusted to reflect the fact that, absent species conservation, the first harvest of mature trees will start in about 20 years. For the low estimate, it was assumed that the 1 acre would be withdrawn from subsidy programs. For the high estimate, subsidies would continue. The PVs were then recalculated for three discount rates.

Also for the Pauahi unit, there would be the cost of a section 7 consultation related to Federal subsidies for *koa*.

3.d.(6) Future Costs, Low Estimate

For commercial *koa* operations at the Gaspar's Dairy unit, the low estimate of the economic impact of the flies conservation is zero. This estimate reflects the assumption that Kamehameha Schools would plant the same amount of land in *koa*, but the planting would be located in another area.

For the Pauahi unit, *koa* is already planted, with the first harvest of mature trees being about 20 years off. Thus, planting expenditures and past growing expenditures are sunk costs. For the low estimate, the 1 acre would be withdrawn from Federal subsidy programs, thereby decreasing net revenues and eliminating the cost of a section 7 consultation. For this case, the PV of the foregone cash flow associated with growing *koa* on 1 acre then harvesting the trees is about $41,210 using a 0% discount rate, about $19,670 using a 3% discount rate, and about $7,530 using a 7% discount rate. These PV costs were annualized over a 30-year period until tree harvesting would be completed then, for consistency with the rest of the report, modified PV costs were calculated over a 20-year period using the annualized costs. The resulting modified PV costs are $27,470 using a 0% discount rate, about $14,930 using a 3% discount rate, and about $6,430 using a 7% discount rate.

3.d.(7) Future Costs, High Estimate

For the Gaspar's Dairy unit, it is assumed for the high estimate of the economic impacts that Kamehameha Schools would reduce its *koa* plantings by one acre due to species conservation. Since the lands surrounding the unit will not be planted for about 10 years, the PV for the foregone cash flow associated with growing *koa* on 1 acre then harvesting the trees is about $56,820 using a 0% discount rate and a 60-year time horizon, about $11,390 using a 3% discount rate, and about $1,450 for a 7% discount rate. These PV costs were annualized over a 60-year period until tree harvesting would be completed, then modified PV costs were calculated over a 20-year period using the annualized costs. The resulting modified PV costs are $18,940 using a 0% discount rate, about $6,120 using a 3% discount rate, and about $1,090 using a 7% discount rate.

For the Paʻuahi unit, it is assumed for the high estimate of the economic impacts that the landowner would participate in Federal subsidies for growing *koa*, but mature trees would not be harvested. Also, the cost of a section 7 consultation associated with the Federal subsidy is estimated at about $6,000 (based on a relatively simple, informal consultation with no biological assessment).[32] The PV of the foregone cash flow associated with growing *koa* on 1 acre then harvesting the trees is about $41,900 using a 0% discount rate, about $20,290 using a 3% discount rate, and about $8,080 for a 7% discount rate. These PV costs were annualized over a 30-year period until tree harvesting would be completed, then modified PV costs were calculated over a 20-year period using the annualized costs. The resulting modified PV costs are $27,930 using a 0% discount rate, about $15,400 using a 3% discount rate, and about $6,900 using a 7% discount rate.

3.d.(8) Statewide Economic Impacts

Under the worst-case scenario, the critical habitat designation for the picture-wing flies could result in a 2-acre loss of *koa* forest. Given the large amount of low-value grazing land on the Big Island, this loss could be offset easily by planting *koa* on lands elsewhere, possibly including lands owned by Kamehameha Schools (the largest private landowner in Hawai'i) and/or by Kealakekua Heritage Ranch.

3.d.(9) Sources of Uncertainty

The major uncertainties for the above analysis include: (1) whether Kamehameha Schools would plant *koa* elsewhere or reduce their plantings by 1 acre, (2) future State and Federal subsidies (3) *koa* growth rates and yields, and (4) future *koa* prices.

3.e. Commercial Logging of Eucalyptus

The Waiakea Forest unit is about 1,000 feet from the edge of the Waiakea Timber Management Area. This is commercial forest of nearly 12,000 acres that the State planted in eucalyptus trees in the 1960s, and is now ready for harvesting.[33] In September 2005, the State gave approval to Tradewinds LLC of Oregon to begin harvesting the timber.

Service biologists believe that the logging operation will be sufficiently far away from the unit that it will not pose a threat to the picture-wing flies or their habitat.[34] Furthermore, no change in logging operations and no economic impacts are anticipated as a result of conservation efforts for the flies.

In view of these findings, further analysis of economic impacts was not conducted.

3.f. Cattle Grazing

3.f.(1) Affected Units

As mentioned above, commercial cattle grazing occurs on four of the proposed 1-acre units on the Big Island—Pauahi, Gaspar's Dairy, Kipuka at 4900 ft, and Pit Crater. These units are part of larger cattle grazing operations involving lands that have been grazed probably since the early 1800s or before.

Although the Pauahi unit is planted in commercial *koa*, cattle are allowed to graze among the trees because the stand is well established. Grazing at the Gaspar's Dairy unit will be discontinued in about 10 years when the surrounding lands are planted in *koa*.

The proposed rule does not identify cattle grazing as a threat to the picture-wing flies or the plants they depend upon (Section 2.b). Nevertheless, exclosure fencing to protect the habitat areas from ungulates would also prevent domestic cattle from grazing in these units.

3.f.(2) Baseline Economic Activity

The economic activity associated with cattle grazing on 1 acre of land at higher elevations in the Kona District is estimated as follows:

- Revenues of about $37 per year (based on a stocking density of about 7.5 acres per cow-and-calf unit, a calf yield of about 70% of the units, and a value of about $400 per calf)
- Net revenues of about $16 per year[28]
- Negligible employment and payroll (one ranch hand can manage a few thousand acres)

However, Kealakekua Heritage Ranch reports the Pauahi unit is located on high-quality pasture land that has a high carrying capacity: about 4 acres per cow-and-calf unit. The economic activity associated with cattle grazing on 1 acre of land of this quality is estimated as follows:

- Revenues of about $70 per year (based on a stocking density at the carrying capacity of the land, which is about 4 acres per cow-and-calf unit; a calf yield of about 70% of the units; and a value of about $400 per calf)
- Net revenues of about $30 per year (adjusted from Goldstein)[28]
- Negligible employment and payroll

Even though the financial returns are low, grazing provides a number of benefits to landowners, including the following: reduced risk of brush fires, keeping the land clear of rubbish, and low land assessments that reduce property taxes.

3.f.(3) Industry Overview

The total supply of grazing land in the State is about 1.15 million acres, most of which is located on the Big Island.[35,36] Furthermore, the supply of grazing land has increased statewide due to a major contraction of plantation agriculture. In contrast, the number of range cattle in Hawaii has remained at about 80,500 ± 3,300 beef cows since at least 1980.

In 2004, Hawai'i's cattle industry generated about $22.1 million in calf sales, of which about $16.6 million (75%) came from the Big Island.

3.f.(4) Potential Changes in Grazing Operations

When the four subject critical habitat units are surrounded by exclosure fencing to protect the habitat areas, cattle will no longer graze inside the units.

3.f.(5) Data Sources and Methodology

Information about the cattle industry is based on industry data from *Statistics of Hawai'i Agriculture*, personal communications with about a dozen ranch managers, a recent study that covers the net returns from grazing, and various news articles on Hawai'i ranching.

The estimate for lost economic activity is based on the information provided in Section 3.f.(2).

3.f.(6) Future Costs, Low Estimate

The low estimate of the economic impacts on cattle operations due to conservation efforts for the flies is zero. This assumes that the size of the herds would remain unchanged even though 4 acres of grazing land would be lost.

3.f.(7) Future Costs, High Estimate

The high estimate of the economic impact assumes a slight reduction in calf production associated with a 1-acre loss of grazing land for each of the four units that host grazing operations. For this scenario, the estimated impacts are as follows:

— Pauahi unit

- reduced gross revenues of about $70 per year
- reduced net revenues of about $30 per year
- over a 20-year period, a PV loss of about $600 using a 0% discount rate, about $450 for a 3% discount rate, and about $320 using a 7% discount rate.

— Kipuka at 4,900 ft unit
  - reduced gross revenues of about $37 per year
  - reduced net revenues of about $16 per year
  - over a 20-year period, a PV loss of about $320 using a 0% discount rate, about $240 for a 3% discount rate, and about $170 using a 7% discount rate.

— Pit Crater unit
  - same as for Kipuka at 4,900 ft

— Gaspar's Dairy unit
  - same gross and net revenues as for Kipuka at 4,900 ft
  - over a 10-year period (until *koa* is planted), a PV loss of about $160 using a 0% discount rate, about $140 for a 3% discount rate, and about $110 using a 7% discount rate.

3.f.(8) Statewide Economic Impacts

Under the worst-case scenario, reduced calf production associated with the loss of grazing land would be more than offset with the addition of just one cow-and-calf unit on some other land.

3.f.(9) Sources of Uncertainty

The uncertainty associated with the above analysis is whether the size of the herds would remain the same or be reduced.

3.g. Residential and Related Development

In the absence of the listed flies and the critical habitat designation, future residential developments, large-lot agricultural subdivisions, or other urban-type developments are very unlikely for most of the proposed units because of mountainous terrain, State Conservation Districting, and preservation land management (Section 1.b).

However, in the distant future, such developments could occur on one or more of the four Big Island units that are in the Agricultural District: Pauahi, Waiea, Gaspar's Dairy, and Kipuka at 4900 ft. Nevertheless, any future development of these units would be very far off into the future (20+ years) as indicated by the following:

— The Pauahi unit is planted in high-value *koa* which will not reach maturity for another 20 years, and the Gaspar's Dairy unit is planned for *koa* with plantings beginning in about 10 years, followed by a 30- to 50-year period before the trees are harvested.

— None of these units is near existing urban areas or large-lot agricultural subdivisions, so none is in the path of urban expansion.
— The County General Plan indicates that these lands and nearby lands are to remain in agriculture, thereby making development approvals difficult.[26]
— Because of the distance of the units from existing urban areas, construction of access roads and other infrastructure would be expensive.
— Finally, the landowners are not actively planning to develop these lands.

With the presence of the listed flies and the critical habitat designation, it is unlikely that these lands would be developed even in the distant future because of (1) Federal restrictions on take, and (2) the difficulty in obtaining State and County development approvals for lands that are designated critical habitat and have listed species on them. Any loss of development or diversion of development to other areas is likely to occur well beyond the 20-year time horizon of this economic analysis. However, the loss of future development potential is likely to cause a near-term loss of property values which is addressed in the following subsection.

3.h. Property Values

3.h.(1) Potential for Economic Impacts

Closely related to the previous discussions, the presence of listed species and the critical habitat designation can cause a loss in property values if there is an actual or perceived (1) restriction on the actual or potential economic use of property (i.e., cattle grazing and commercial forest), (2) a restriction on future development potential, and/or (3) an increase in land-management or development costs. If there is an reduction in land value, it will generally occur soon after a species is listed and a critical habitat is designated, even if the restrictions may not come into play for many decades.

3.h.(2) Affected Units

A loss of property values generally is not an issue for land that: (1) has mountainous terrain, (2) is in the State Conservation District, and/or (3) is managed for preservation. Such land generally has a low economic value because of limited economic use and limited development potential.

However, the four Big Island units that are in the Agricultural District—Pauahi, Waiea, Gaspar's Dairy, and Kipuka at 4900 ft—carry higher land values because of the existing and potential economic uses of the land, and the potential for future development.

3.h.(3) Data Sources[19,22,37,38]

Agricultural land values in West Hawai'i are based on a pending sale as reported by Kealakekua Ranch, recent sales recorded with the Hawai'i County Real Property Tax Office, discussions with one of the County's property-tax assessors for West Hawai'i, discussions with Baird Appraisals (a firm specializing in property appraisals on the Big Island), and on various appraisals and land sales.

3.h.(4) Land Values

The market value of a property reflects the future time-stream of economic and other benefits anticipated by potential buyers and sellers of land. For agricultural land, this includes the time-stream of net returns from the agricultural use of the land (e.g., grazing and/or commercial forestry), followed by returns that will be generated by development in the distant future.

On the Big Island, the selling price for agricultural land that (1) hosts a low-value use (such as cattle grazing), (2) lacks infrastructure, and (3) has not been subdivided for home-lots, ranges from a low of about $1,000 per acre to a high that can exceed $20,000 per acre. The differences in price largely reflect when development might occur: land with near-term development potential carries a higher price than land where development might not occur for decades.

Grazing land in the vicinity of the Pauahi and Gaspar's Dairy units is valued at about $4,500 per acre. About $250 of this value reflects the agricultural use of the land based on the following: a net return of $16 per acre from grazing cattle, a period of about 30 years until development occurs, and a real discount rate of 5% which is the approximate discount rate that is consistent with agricultural land values in Hawai'i. Using 3% and 7% discount rates, the agricultural value of the land would be about $310 and $200 per acre, respectively. If all current economic use and future development potential of the land are lost then, from an economic perspective but not a biological one, the land would be categorized by the County as "wasteland" having an assessed market value of about $100 per acre. The remaining $4,150 ($4,500 total value – $250 agricultural value – $100 residual value) reflects the current value of the future development potential of the land. In practice, a realistic price range for this value is about $3,500 to $5,000 per acre. For agricultural land in a less favorable location, the development component of the land value could be as low as $2,000 per acre.

Land having a commercial *koa* forest would sell for a higher amount that reflects the value of the trees.

3.h.(5) Methodology for Estimating Lost Property Value

The loss of property value associated with conservation of the flies is split into two components: (1) a loss in value (if any) attributed to forgone agricultural use, and (2) a loss in value attributed to forgone development. The first component is estimated above in the sections on commercial *koa* forest and cattle grazing. To avoid double-counting, this component of lost property value is separated from the loss in value due to forgone development.

3.h.(6) Loss of Property Values, Development Component

Based on the land values discussed above, the loss in the development-component of property values due to the presence of the listed flies and the critical habitat designation are estimated as follows:

	Low	High
— Kealakekua Heritage Ranch		
• Pauahi unit	$ 3,500	$ 5,000
— State of Hawai'i, DLNR		
• Waiea unit	$ 2,000	$ 5,000
— Kamehameha Schools		
• Gaspar's Dairy unit	$ 3,500	$ 5,000
• Kipuka at 4900 ft unit	$ 2,000	$ 5,000
— Total	$11,000	$20,000

The loss of property value is generally a concern for private landowners, but not for the State.

3.h.(7) Sources of Uncertainty

Without in-depth land appraisals, sources of uncertainty in the above analysis are the market values of the subject properties, and the corresponding shares that are attributable to future development potential.

3.i. Maintenance of an Irrigation Ditch[34,39,40]

The Upper Hamakua Ditch runs through or near the Kohala Mountains unit. Completed in 1907, the ditch was built to provide water to irrigate sugarcane fields on the Hamakua Coast of the Big Island. Now owned and operated by the State Department of Agriculture (DOA), the ditch is part of the Honoka'a-Paauilo Irrigation System which provides water to irrigate about 4,775 acres in diversified crops.

Since the top of the ditch is open, DOA reports that their staff use an herbicide regularly to keep vegetation from growing in the ditch; otherwise, a growth of thick vegetation would restrict water flow. Maintenance is funded through user fees with no Federal participation.

The use of herbicides occurs near the listed flies and the plants they depend upon. The vegetation could be cleared manually over a distance of about 200+ feet (i.e., one side of a 1 acre square). The additional cost for manual clearing at this remote location is estimated by the DOA at about $45,000 per year. In turn, this would require a 2-year process to increase statewide water rates.

However, the proposed rule does not identify using herbicides to clear the ditch as a threat to the picture-wing flies or the plants they depend upon (Section 2.b). Thus, no changes in operations and no economic impacts are anticipated as a result of conservation efforts for the flies.

In view of these findings, further analysis of economic impacts was not conducted.

3.j. Recreation

As mentioned above, recreational hunting is allowed in all of the ten government-owned units within the Conservation District. Also, hiking trails are known to exist in or near the Palikea and Wailupe units on O'ahu, the Pu'u Kolekole unit on Moloka'i, and the Waiakea Forest and Kohala Mountains units on the Big Island.

The proposed Rule does not list hunting or hiking as threats to the picture-wing flies or the plants they depend upon. Furthermore, exclosure fencing is not expected to significantly affect recreation since gates could be installed to allow travel along established trails passing through a unit. Also, if any loss of hiking or hunting activities does occur in a critical habitat unit, the activity could easily be diverted to surrounding areas, resulting in no significant loss of recreational opportunities. This is indicated by the very small size of the critical-habitat acreage compared to (1) the Conservation District where most public hiking trails are located, and (2) public hunting areas:

Island	Critical Habitat Picture-wings (acres)	Conservation District[35] (acres)	Public Hunting[35] (acres)
Kaua'i	1	198,769	129,200
O'ahu	5	156,619	25,000
Moloka'i	1	49,768	16,000
Hawai'i Island	11	1,304,347	905,400
Other Islands	0	264,133	121,000
State of Hawai'i	18	1,973,636	1,196,600

For the hunting areas, the Service provides financial support to DLNR for game-management projects under the Pittman-Roberson Act. Internal Service section 7 consultations occur about every 5 years for Statewide game management. Therefore, about four consultations are likely to occur over the next 20 years. For the picture-wing flies, simple informal consultations with no biological assessments and no project modifications are expected. The estimated cost for four consultations covering ten units is about $20,000 to $32,000, based on $5,000 to $8,000 per consultation.[32] The corresponding PV cost is about $16,240 to $25,990 using a 3% discount rate, and about $12,920 to $20,670 using a 7% discount rate. These costs are allocated evenly among the ten critical habitat units in game-management areas.

Since no significant economic impacts related to recreation are expected other than the cost of the consultations, further analysis was not conducted.

3.k. Native Hawaiian Rights

Native Hawaiians have traditional and cultural gathering and access rights to nearly all undeveloped property in Hawai'i, including most and possibly all of the areas proposed for critical habitat designation.

The Service is not aware of any cases where critical habitat for terrestrial plants or animals have restricted these rights.[34] And similar to the situation with recreation, exclosure fencing is not expected to significantly affect gathering and access rights, since gates could be installed to allow access to and through the units. In the unlikely event that a loss of traditional or cultural rights does occur in a critical habitat unit, and the activity is not site-specific, the activity could easily be diverted to surrounding areas, resulting in no significant loss of the activity. Again, this is indicated by the very small size of the critical-habitat acreage compared to the Conservation District where traditional and cultural activities generally occur—at least for inland activities as opposed to ones along the shoreline (see previous subsection for acreages).

In view of the above, the critical habitat designation for the Hawaiian picture-wing flies is not expected to significantly restrict Native Hawaiian rights and, as a result, is not expected to have any related economic impacts. Therefore, further analysis of economic impacts was not conducted.

3.l. Purchase of Honouliuli Preserve

As discussed in Section 2.d, the Army may provide funds to an organization to help with the purchase of Honouliuli Preserve. The funds would be provided through the ACUB program (Section 2.e) in order to ensure compatible use of land near new firing ranges at Schofield Barracks. The new organization

would continue to manage the land as a Preserve. The Army does not intend to assume management responsibilities or title to the land.

Since the Palikea and Kalua'a Gulch units are located within the Preserve and Federal funds would be used to help with the purchase, a section 7 consultation would be required. The cost is estimated at $4,000 to $7,000 for a simple informal consultation requiring no biological survey and no project modifications. It is assumed that this cost would be distributed proportionately among the units within the Preserve.

3.m. Watershed and Preservation Management

The Service is involved as a partner in a number of watershed and preservation management areas, and/or provides funding for programs and projects located in managed areas. These areas and the affected picture-wing units include:

Island and Management Area	Units
O'ahu	
•Honouliuli Preserve	Palikea and Kalua'a Gulch
•Ka'ala NARS	Mt. Ka'ala
•Board of Water Supply, Watershed	Makaha Valley East
•Ko'olau Watershed Partnership	Wailupe
Moloka'i	
•Kamoku Preserve	Pu'u Kolekole
Hawai'i	
•Ola'a - Kilauea Partnership	Ola'a Forest
• Kohala Forest Management Group	Kohala Mountains

Because of the Federal involvement, section 7 consultations will be required. For each of the seven areas listed above, it is assumed that plan updates and budgeting will occur four to five times over a 20-year period, each of which will require a consultation. The cost per consultation, including the cost of additional effort in the case of an overlap with an existing critical habitat, is estimated at $3,000 to $7,000, based on simple informal consultation requiring no biological survey and no project modifications.[32] Thus, the estimated cost for each management area is about $12,000 to $35,000. The corresponding PV cost is about $9,380 to $28,020 using a 3% discount rate, and about $7,220 to $21,890 using a 7% discount rate. For the Honouliuli Preserve, the costs are allocated proportionately among the critical habitat units.

3.n. Public Observing of Picture-wing Flies

Critical habitat designation can increase public interest in certain endangered species. However, in the case of the picture-wing flies, the flies are not charismatic, and they are extremely difficult to find.[34] Also, no activity or improvements are anticipated to feature the flies as an attraction, to assist in finding them, or to improve access to their locations. Therefore it is highly unlikely that there will be increased public observation of the listed flies or related welfare benefits.

4. ECONOMIC IMPACT ON SMALL BUSINESSES AND ENERGY PRODUCTION

4.a. Small Entities

4.a.(1) Regulatory Flexibility Act

This section considers the extent to which the analytic results presented in the previous sections reflect potential future impacts to small businesses and the energy industry. The small business analysis presented here is conducted pursuant to the RFA, as amended by SBREFA of 1996. The energy analysis in Section 4.b is conducted pursuant to Executive Order No. 13211.

In accordance with SBREFA, when a Federal agency publishes a notice of rulemaking for any proposed or final rule, it must make available for public comments a regulatory flexibility analysis that describes the effect of the rule on small entities (i.e., small businesses, small organizations, and small government jurisdictions). No regulatory flexibility analysis is required, however, if the head of an agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. SBREFA amended the RFA to require Federal agencies to provide a statement of the factual basis for certifying that a rule will not have significant economic impact on a substantial number of small entities.

To assist in this process, the following represents a screening-level analysis of the possible impacts of Hawaiian picture-wing conservation activities on small entities. This analysis is based on the estimated impacts associated with the proposed rulemaking as described in Section 3 of this analysis.

4.a.(2) Entities Potentially Impacted

The analysis is based on a review of all previously discussed projects, activities, land uses and entities that may be directly regulated as a result of the proposed critical habitat designation. Based on this review, the following entities will be directly regulated due to a Federal nexus. The projects, activities, land uses are noted in parentheses.

— Federal

Army (funding to assist in purchase of land)

DOA (forestry subsidies)

Service (all projects, activities, and land uses listed in the subsection)

— State

Hawai'i DLNR (game management)

— County

Board of Water Supply (conservation projects)

— Non-Profit

Ko'olau Watershed Partnership (conservation projects)

Kohala Forest Management Group (conservation projects)

Ola'a - Kilauea Partnership (conservation projects)

The Nature Conservancy of Hawai'i (conservation projects)

— Private

Kealakekua Heritage Ranch (forestry subsidies)

4.a.(3) Potential Impacts on Small Entities

The RFA/SBREFA considers "small entities" to include small governments, small organizations, and small businesses.[4] The following discussion examines each entity potentially impacted from the list above to determine whether it would be considered "small" under the RFA/SBREFA.

4.a.(3)(a) Federal Agencies

For the purposes of the RFA/SBREFA, Federal agencies are not considered small governments. As such, the Federal agencies listed above are not considered further in this portion of the economic analysis.

4.a.(3)(b) State Agencies

For the purposes of the RFA/SBREFA, State governments are not considered small government jurisdictions. As such, the State agency listed above is not considered further in this portion of the economic analysis.

4.a.(3)(c) County Agencies

The RFA/SBREFA defines "small governmental jurisdiction" as the government of a city, county, town, school district, or special district with a population of less than 50,000. Oahu has a population greater than 50,000. As such, the county agency listed above is not considered further in this portion of the economic analysis.

4.a.(3)(d) Non-Profit

The Ko'olau Watershed Partnership, Kohala Forest Management Group, and the Ola'a - Kilauea Partnership are not independently owned organizations,

but they are public-private partnerships among Federal agencies, State agencies, and private landowners that are forums for setting policy for watershed protection. Based on the above factors, this analysis does not consider these organizations to be "small organizations."

TNCH is a 501(c)(3) non-profit organization dedicated to protecting Hawai'i's native forests and wildlife, and is responsible for managing more than ten private preserves in Hawai'i. While the definition of "small organization" leaves room for interpretation, TNCH can be considered dominant in its field Statewide. Based on the above factors, this analysis does not consider TNCH to be a "small organization."

4.a.(3)(e) Private

The RFA/SBREFA defines "small business" as one that is independently owned and operated, organized for profit, and not dominant in its field. Depending on the industry, eligibility is based on the average number of employees for the preceding 12 months, or on sales volume averaged over a 3-year period.

Kealakekua Heritage Ranch is a relatively large ranch of about 11,470 acres. In addition to its cattle operation, the Ranch is among the largest producers of *koa* and *koa* products in Hawai'i. The SBA defines a farming operation as "small" if its annual sales are less than $750,000. As sales exceed this amount, the Ranch cannot be considered a small business for purposes of this analysis.

4.a.(4) Summary

As none of the impacted entities is small, the proposed critical habitat designation will not have a significant economic impact on a substantial number of small entities in Hawai'i.

4.b. Energy Market

Pursuant to Executive Order No. 13211, "Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use," issued May 18, 2001, Federal agencies must prepare and submit a "Statement of Energy Effects" for all "significant energy actions."[3] The purpose of this requirement is to ensure that all Federal agencies "appropriately weigh and consider the effects of the Federal Government's regulations on the supply, distribution, and use of energy."[41] The Office of Management and Budget has provided guidance for implementing this Executive Order that outlines nine outcomes that may constitute "a significant adverse effect" of a regulatory action under consideration:

- Reductions in crude oil supply in excess of 10,000 barrels per day.
- Reductions in fuel production in excess of 4,000 barrels per day.
- Reductions in coal production in excess of 5 million tons per year.
- Reductions in natural gas production in excess of 25 million Mcf (thousand cubic feet) per year.
- Reductions in electricity production in excess of 1 billion kilowatts-hours per year or in excess of 500 megawatts of installed capacity.
- Increases in energy use required by the regulatory action that exceed the thresholds above.
- Increases in the cost of energy production in excess of 1%
- Increases in the cost of energy distribution in excess of 1%
- Other similarly adverse outcomes.

Conservation activities for the Hawaiian picture-wing flies are expected to have no significant impact on the supply, distribution, use or price of energy in any form.

5. REFERENCES

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[4] 5 U.S.C. 601 et seq.

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APPENDIX A

ORGANIZATIONS CONTACTED

Federal Agencies
— Department of the Interior, U.S. Fish and Wildlife Service
— U. S. Army, Environmental Division
— U.S. Geological Survey, Pacific Island Ecosystem Research Center

State Agencies
— Department of Agriculture
— Department of Land and Natural Resources

University of Hawai'i
— Department of Plant and Environmental Protection Science

County Government
— County of Hawai'i, Real Property Tax Office

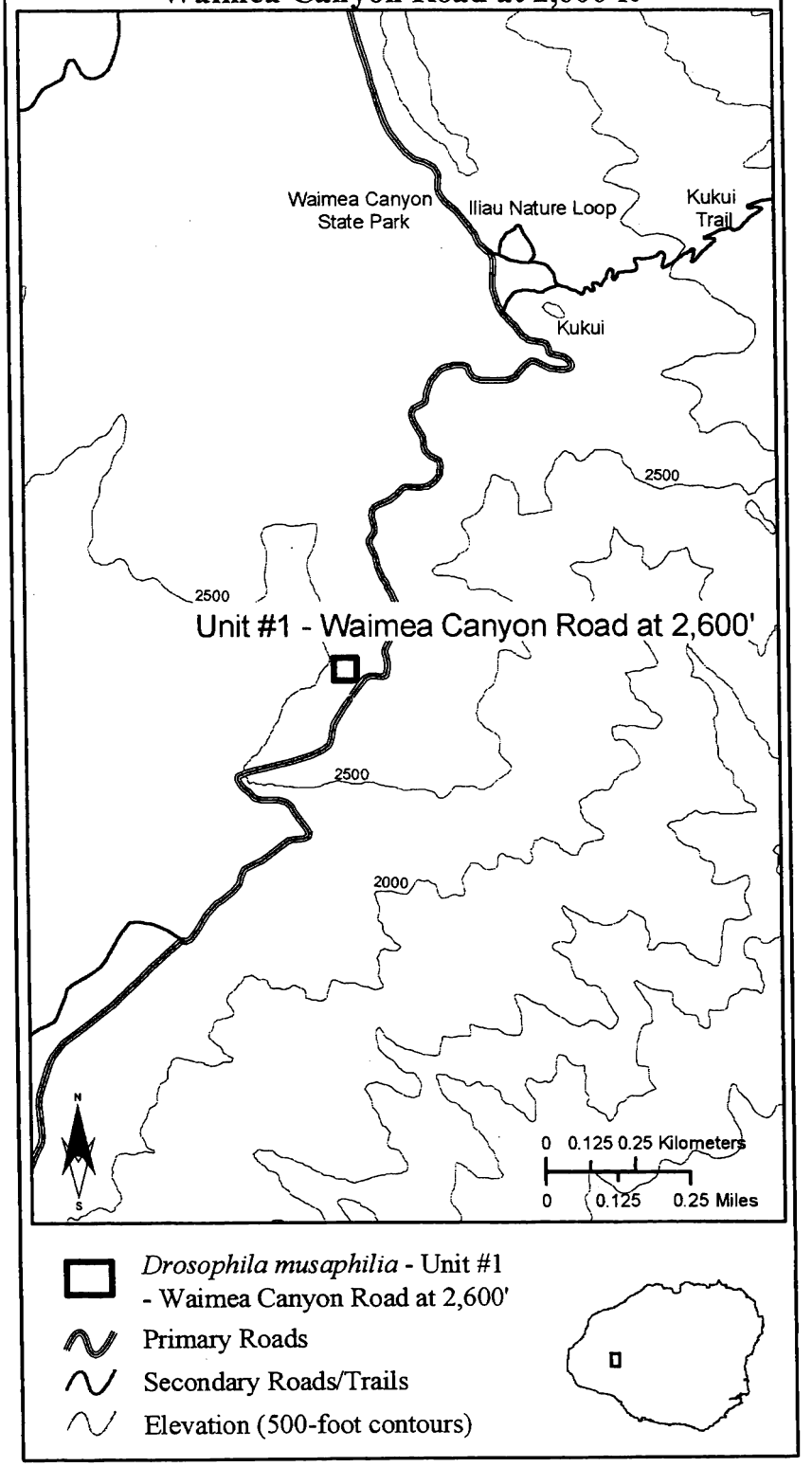
Private Entities
— Baird Appraisals
— Kealakekua Heritage Ranch
— McCandless Ranch
— The Estate of James Campbell

Non-Profit
— Hawai'i Cattlemen's Association
— Kamehameha Schools
— The Nature Conservancy, Hawaii

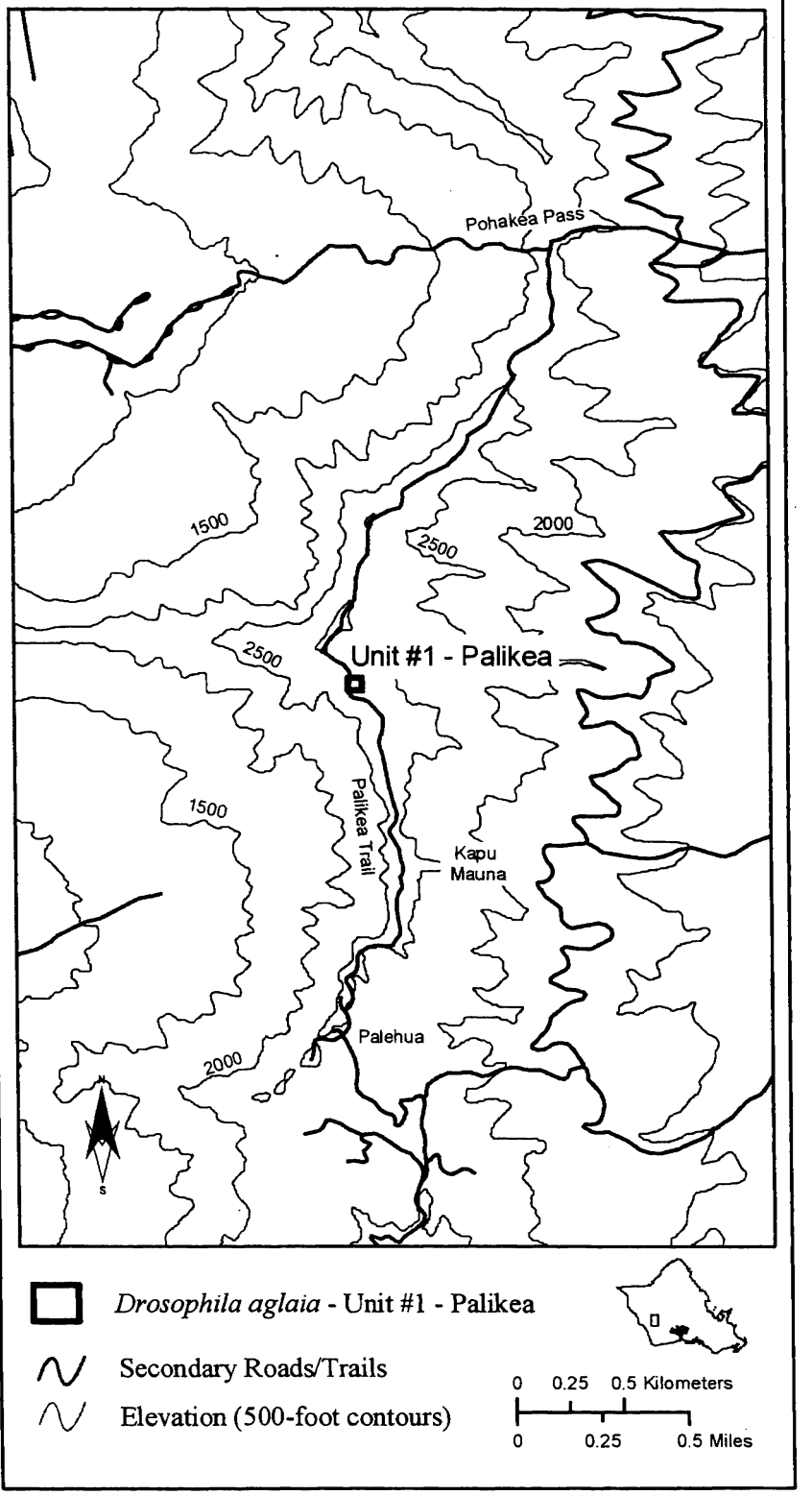
APPENDIX B

MAPS OF CRITICAL HABITAT UNITS

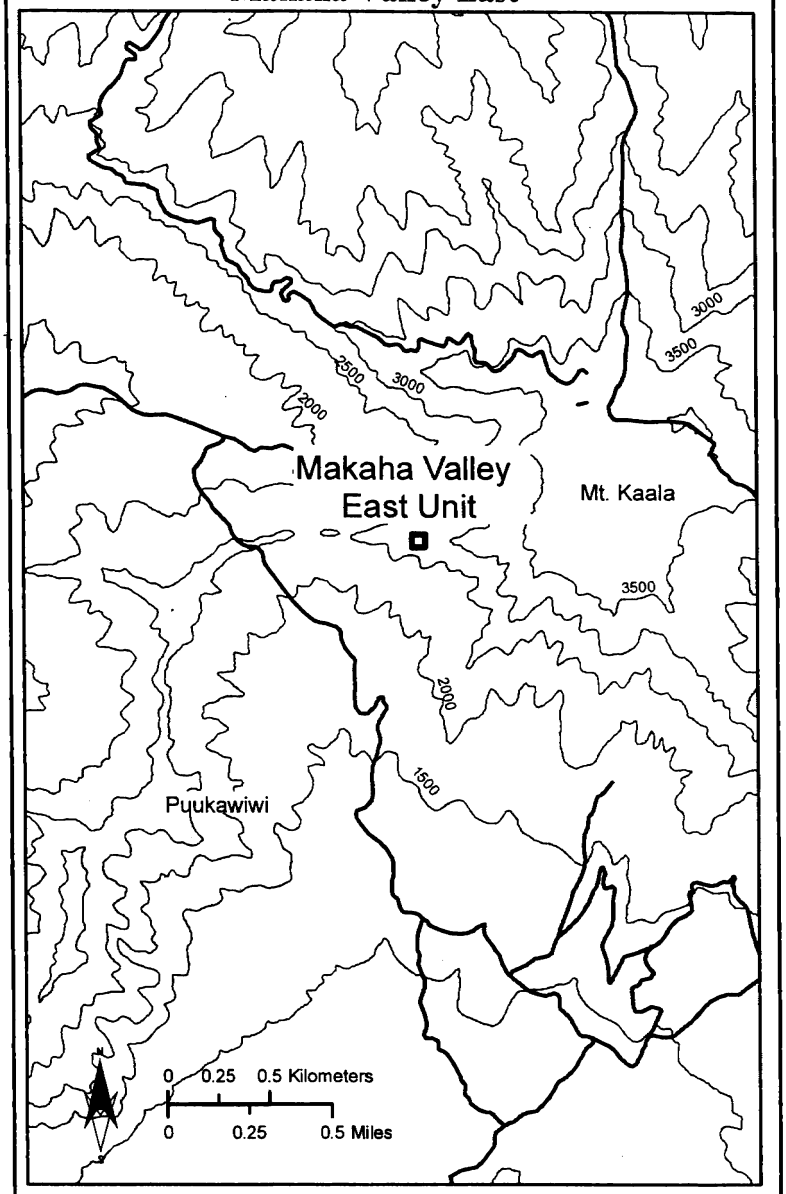
Map Ka-1. *Drosophila musaphilia* - Unit 1
Waimea Canyon Road at 2,600 ft



Map Oa-1. *Drosophila aglaia* - Unit 1 - Palikea



Map Oa-2. *Drosophila hemipeza* - Unit 1
Makaha Valley East

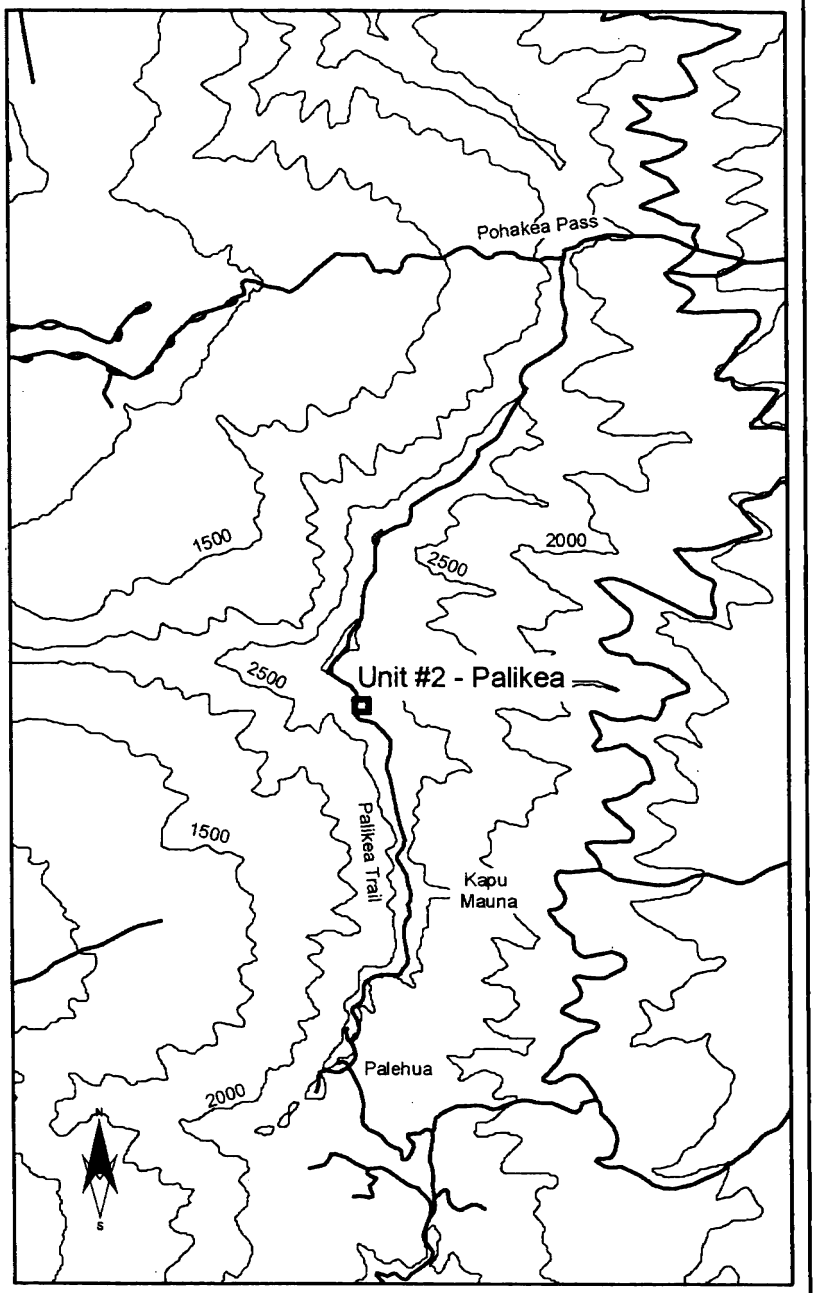


Drosophila hemipeza - Unit #1 - Makaha Valley East Unit

Secondary Roads/Trails

Elevation (500-foot contours)

Map Oa-3. *Drosophila hemipeza* - Unit 2 - Palikea



Drosophila hemipeza - Unit #2 - Palikea

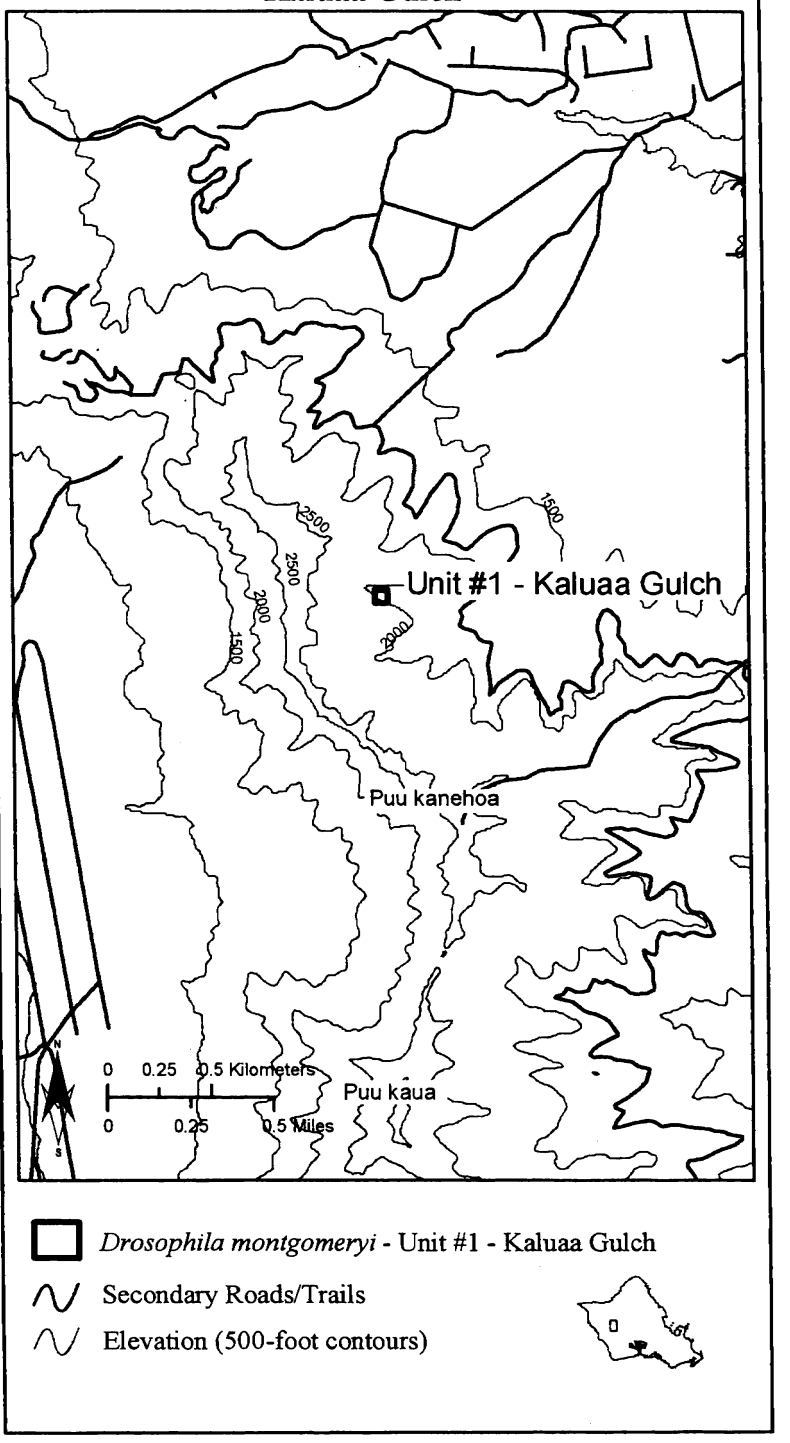
Secondary Roads/Trails

Elevation (500-foot contours)

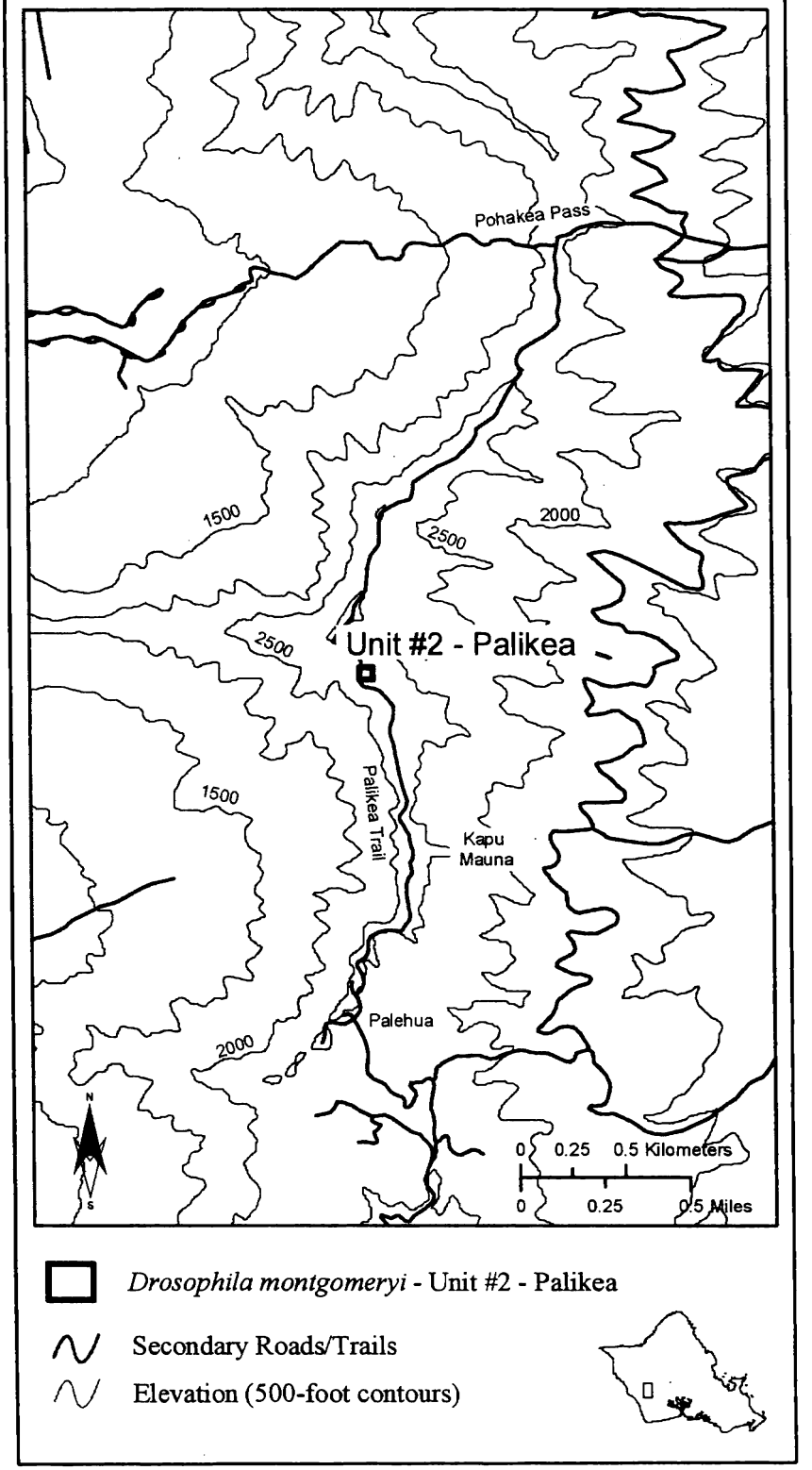
0 0.25 0.5 Kilometers

0 0.25 0.5 Miles

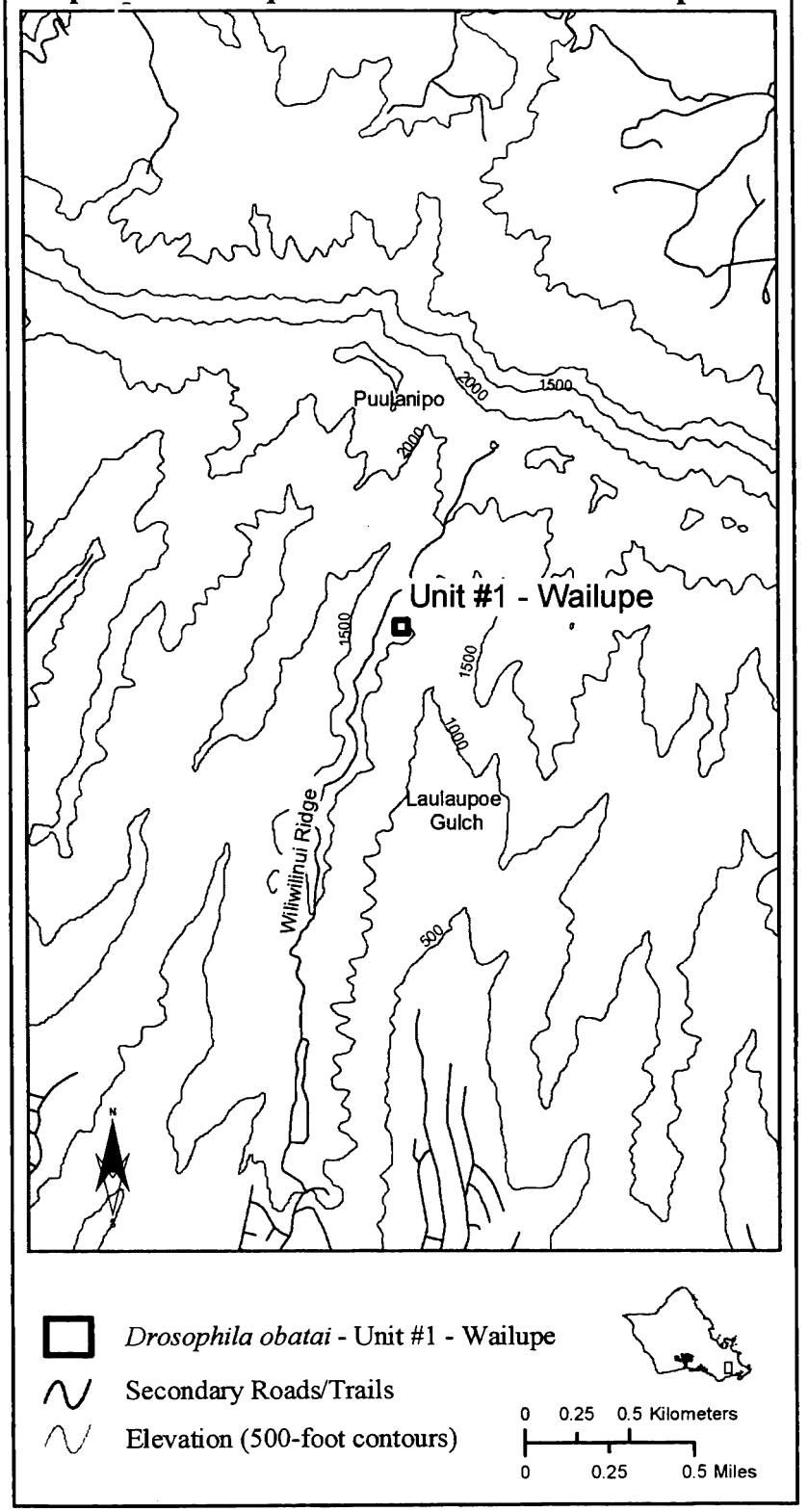
Map Oa-4. *Drosophila montgomeryi* - Unit 1
Kaluaa Gulch



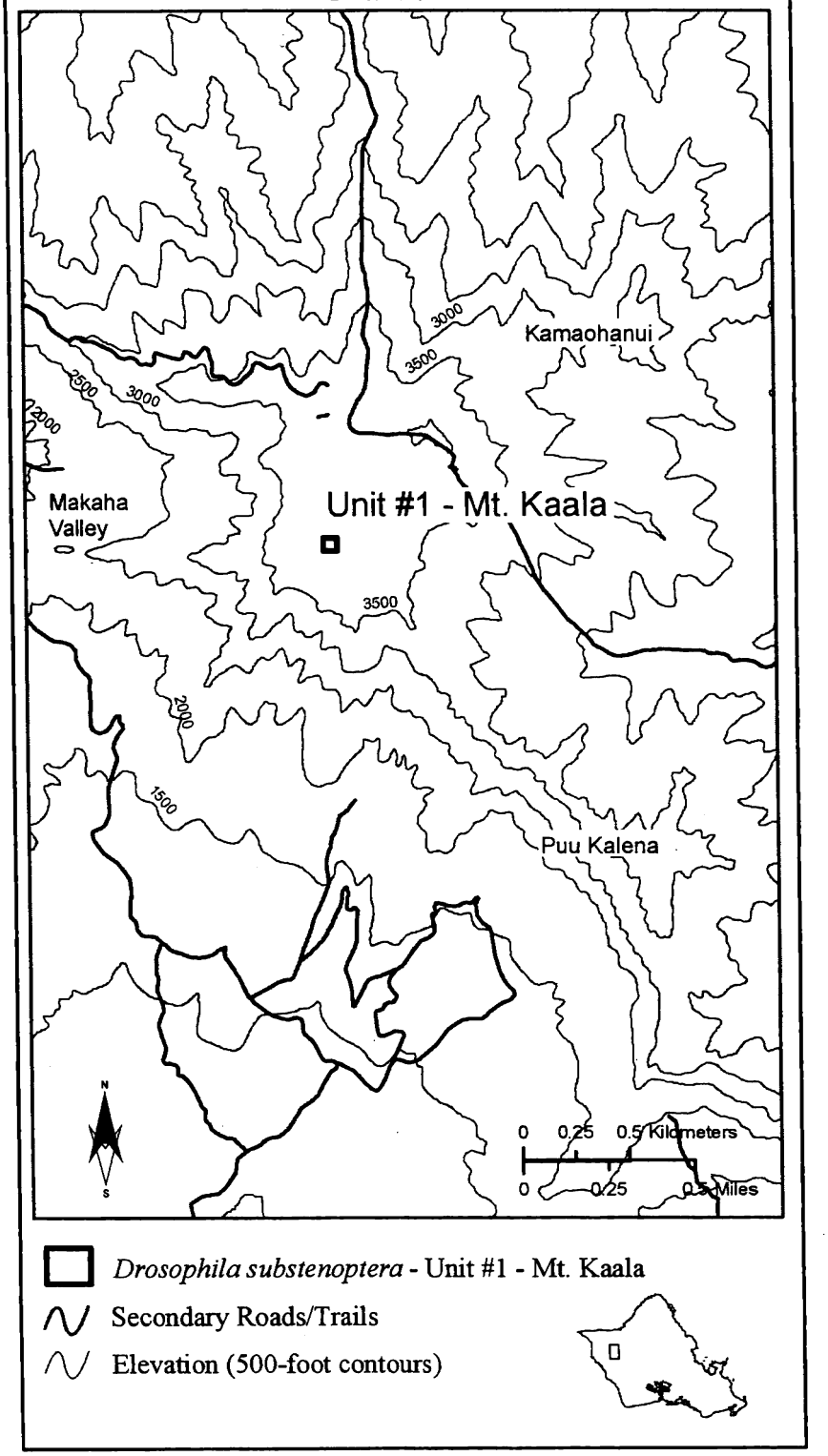
Map Oa-5.*Drosophila montgomeryi* - Unit 2 - Palikea



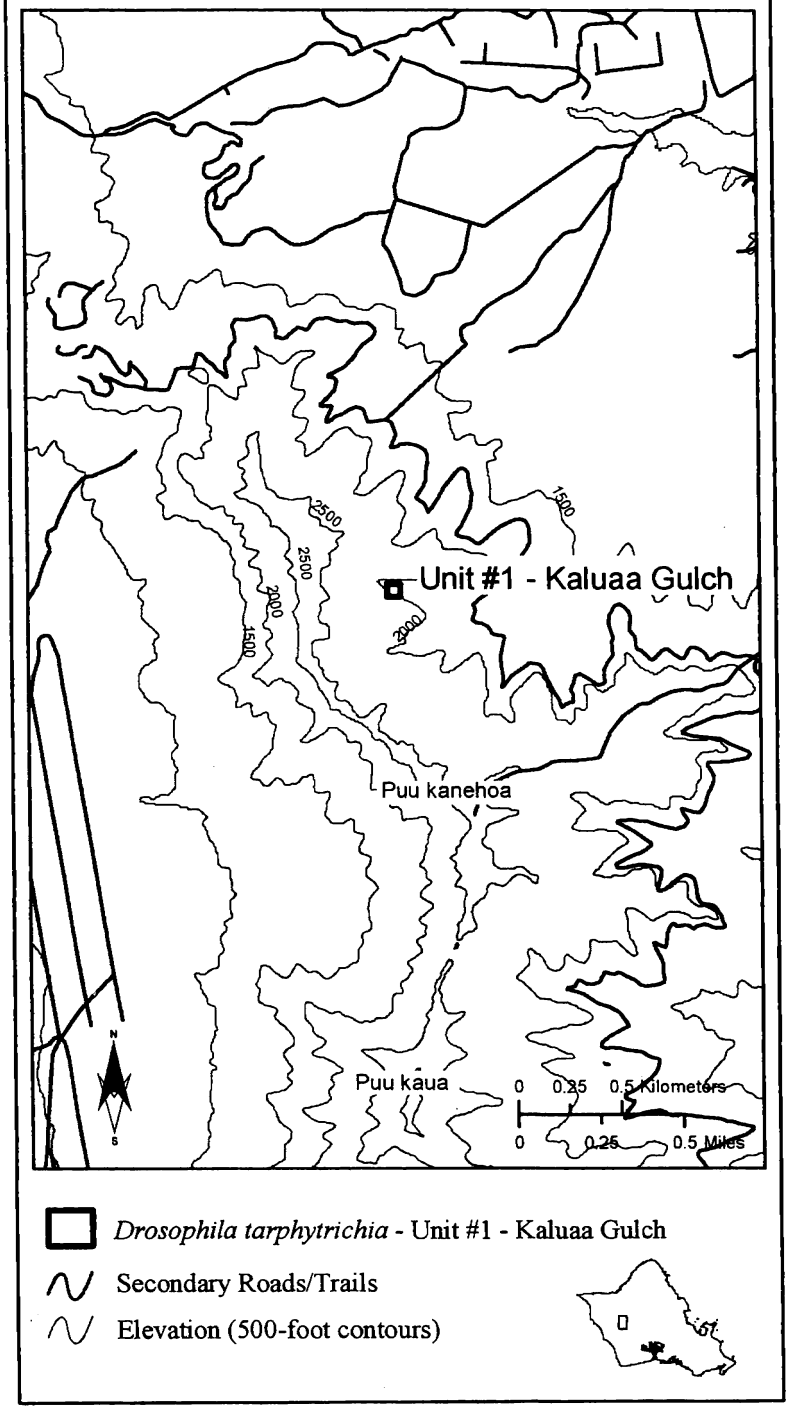
Map Oa-6. *Drosophila obatai* - Unit 1 - Wailupe



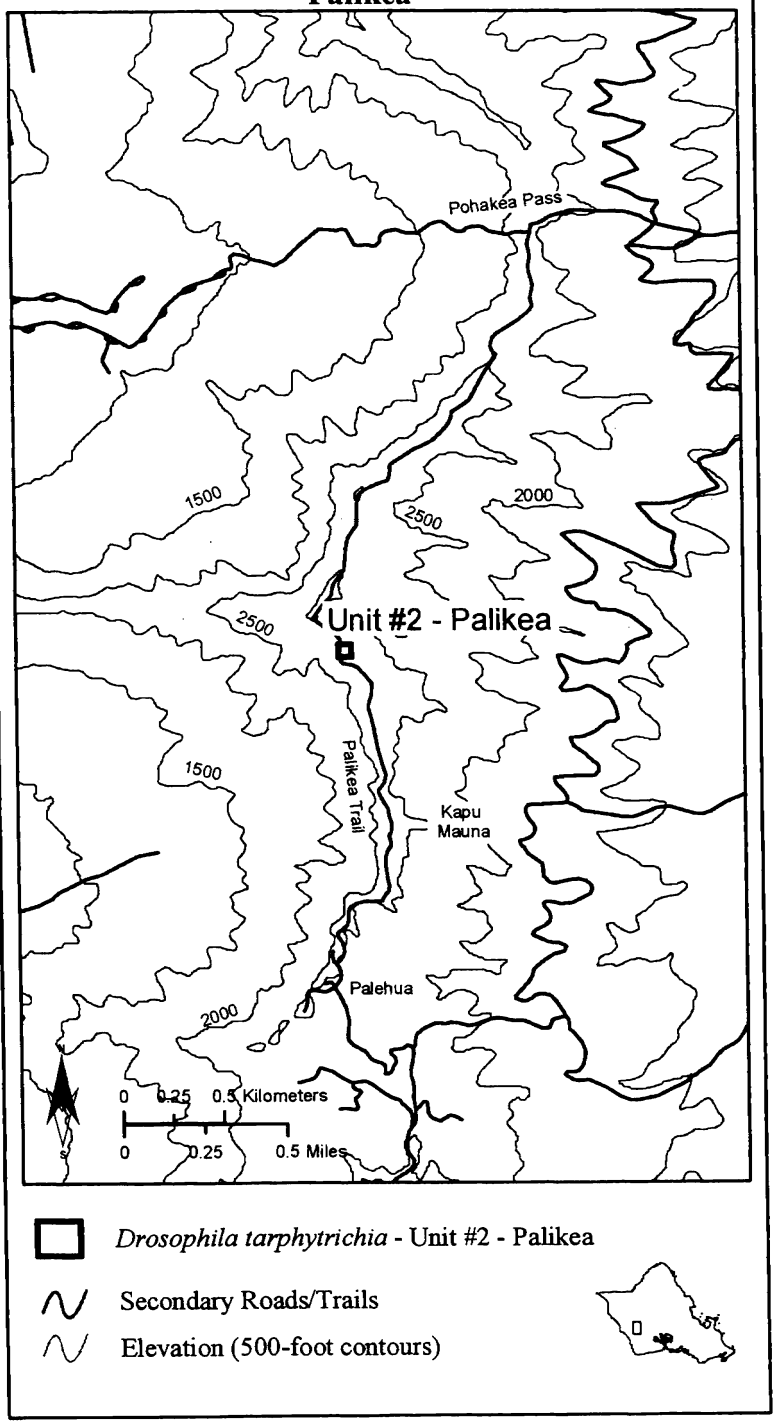
Map Oa-7. *Drosophila substenoptera* - Unit 1
Mt. Kaala



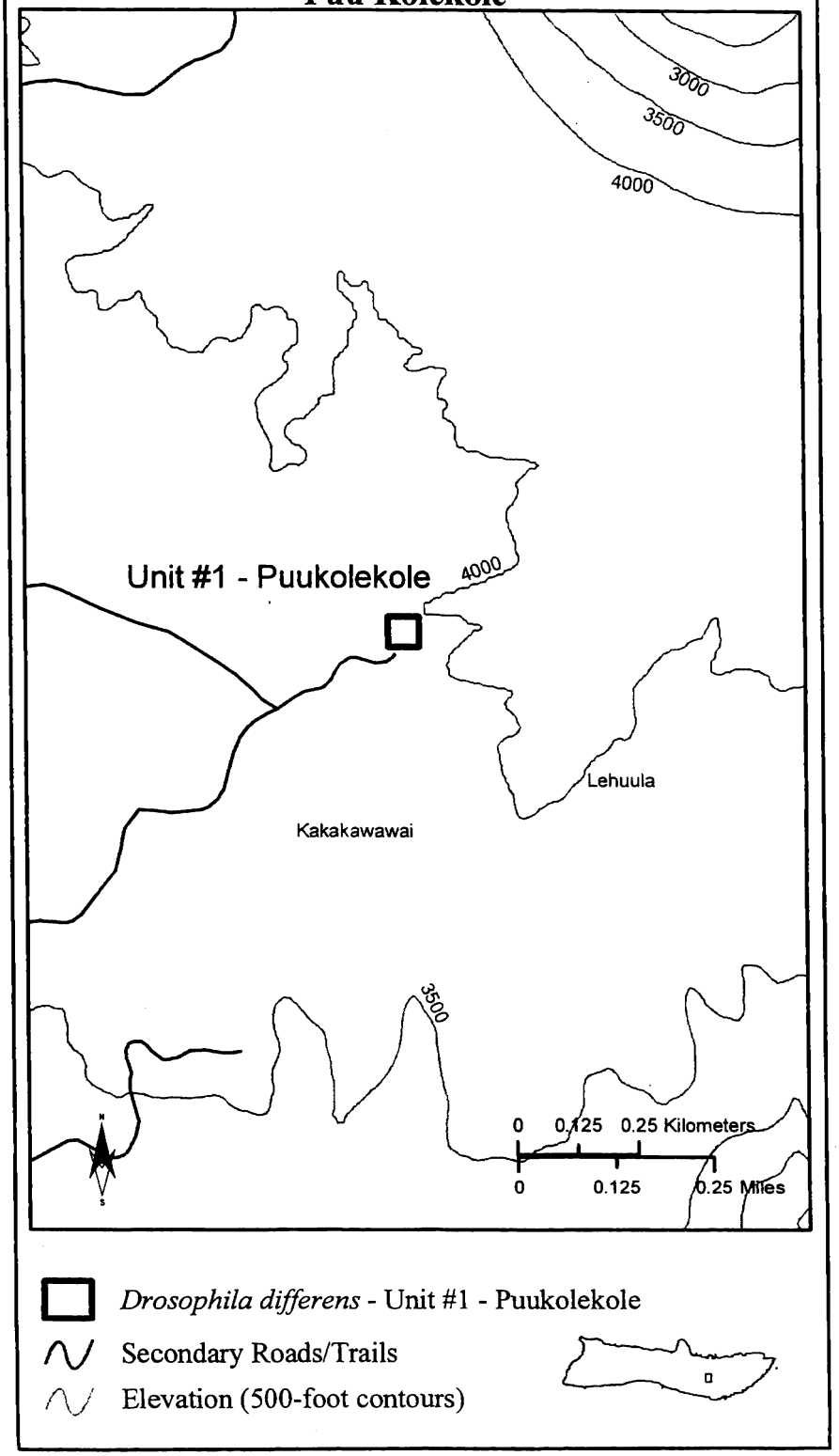
Map Oa-8. ***Drosophila tarphytrichia*** **- Unit 1**
Kaluaa Gulch



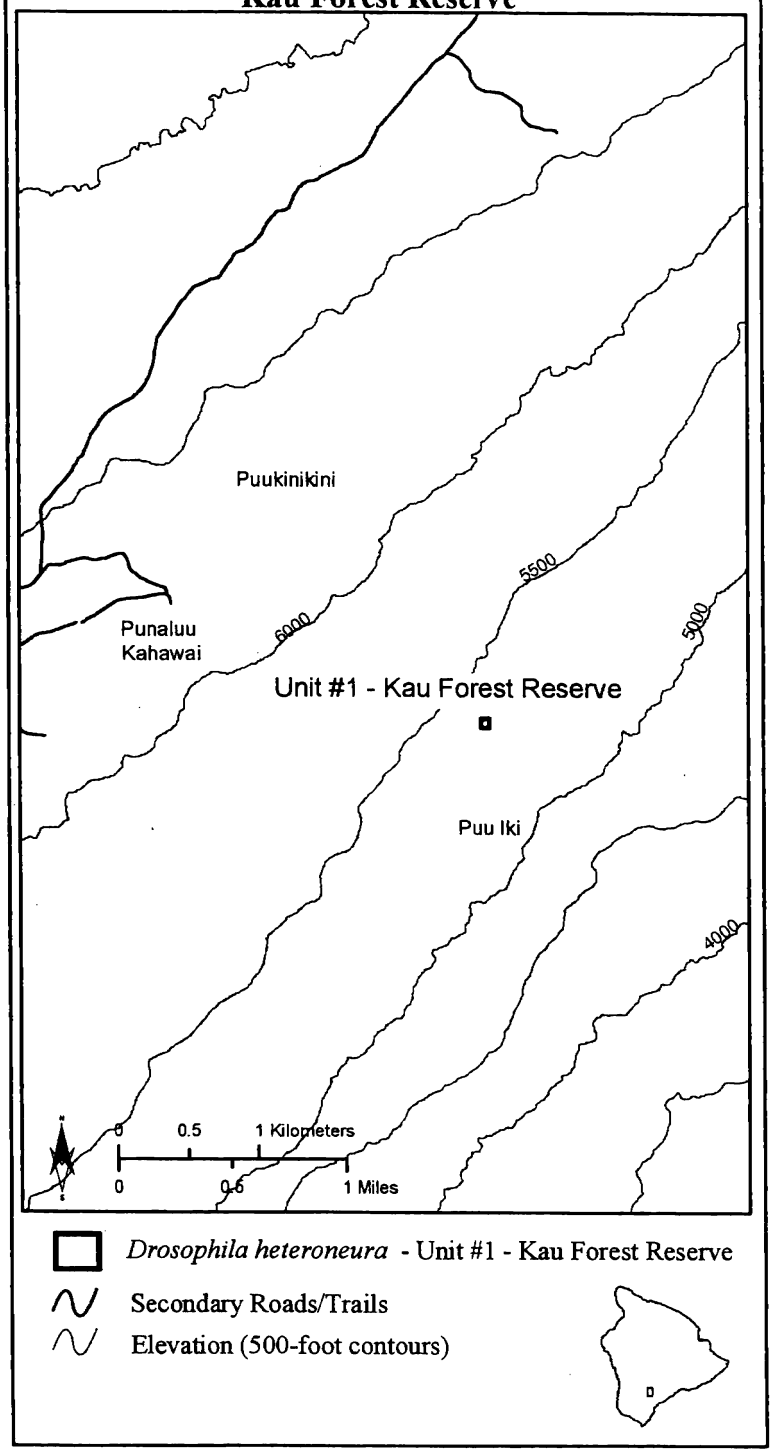
Map Oa-9. *Drosophila tarphytrichia* - Unit 2 Palikea



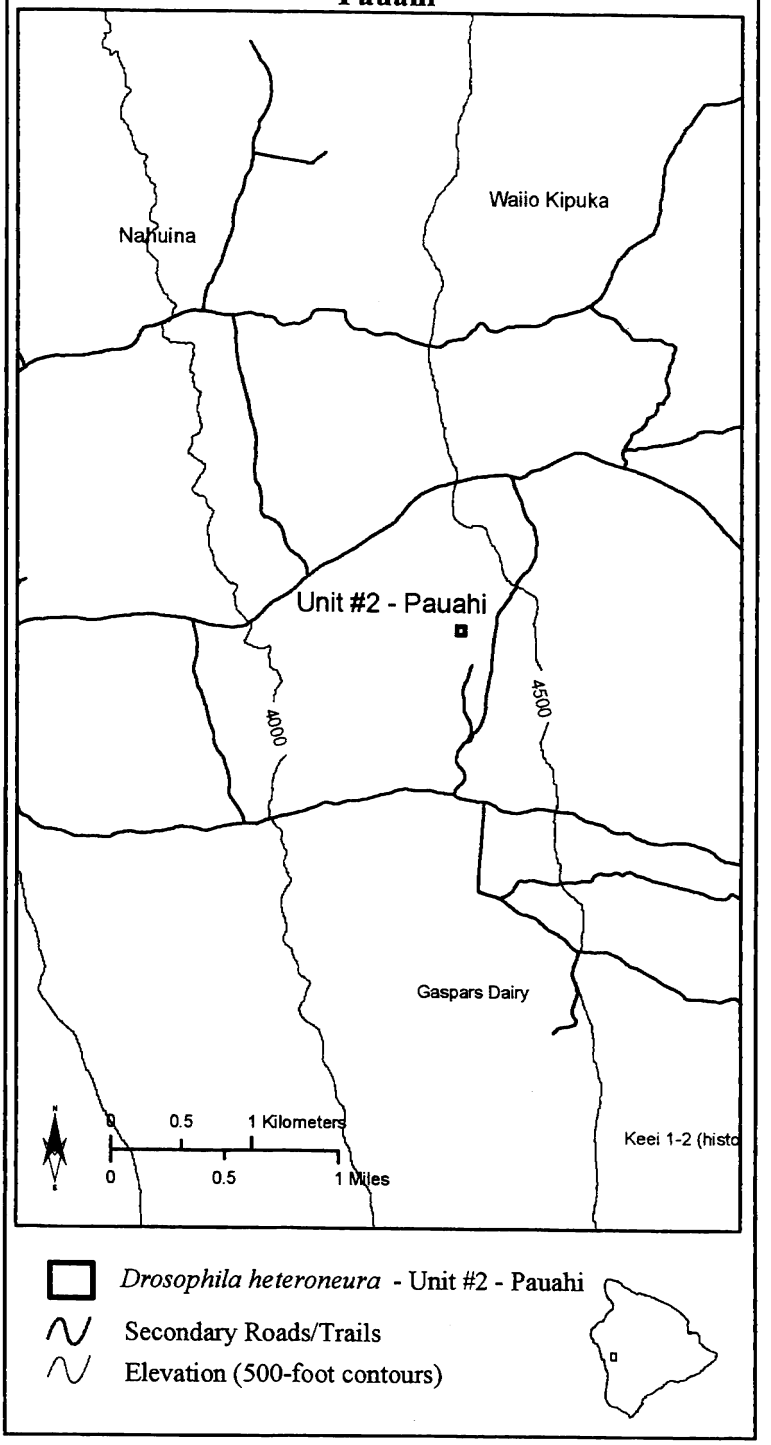
Map Mo-1. *Drosophila differens* - Unit 1
Puu Kolekole



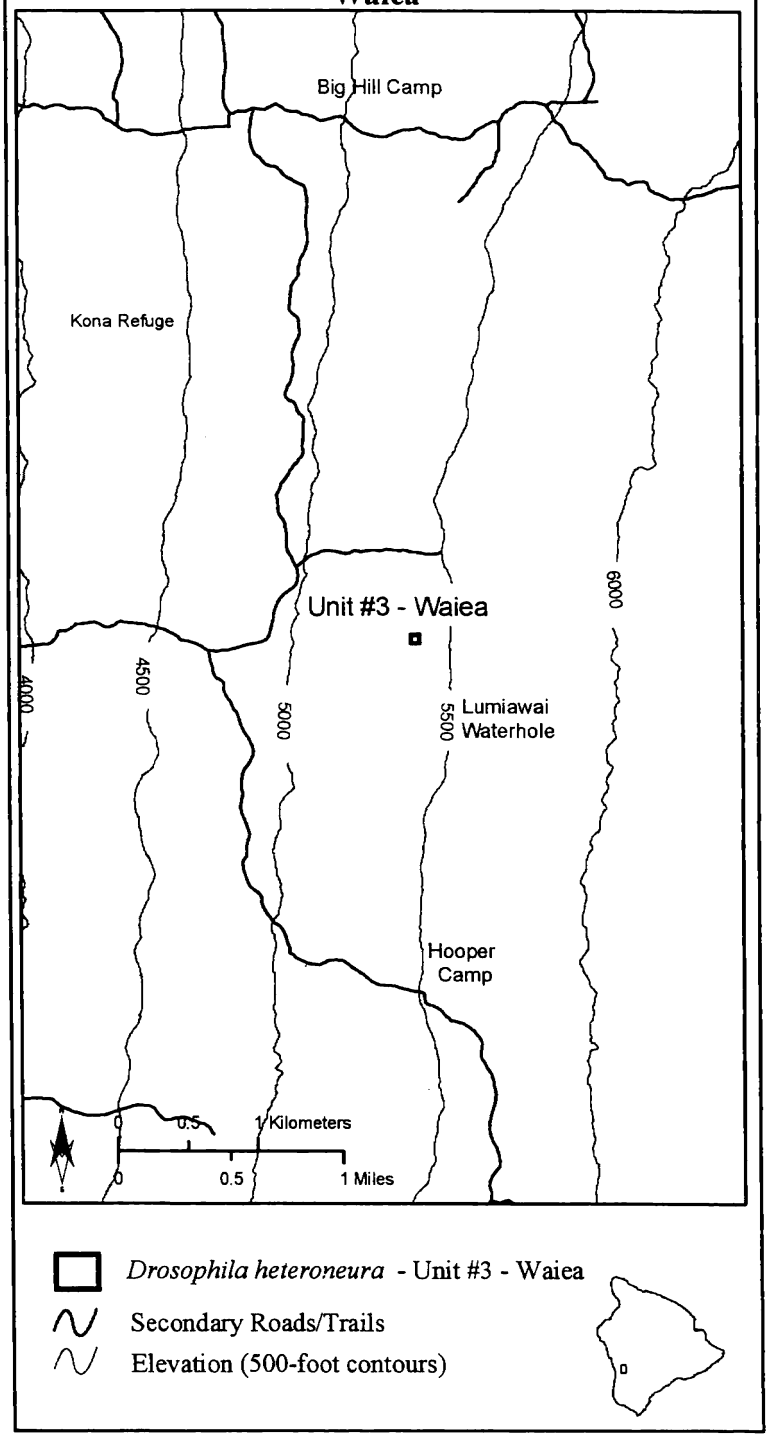
Map BI-1. *Drosophila heteroneura* - Unit 1
Kau Forest Reserve



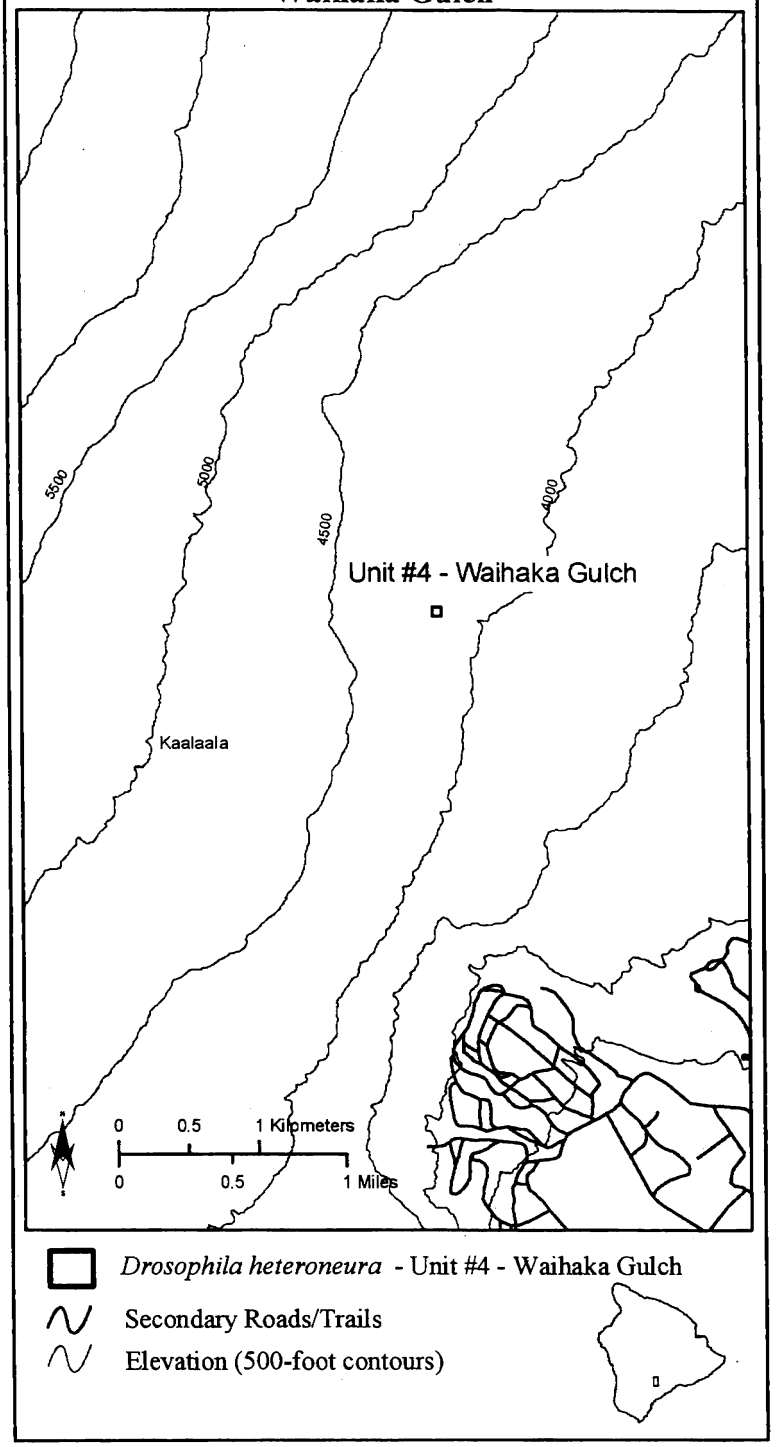
Map BI-2. *Drosophila heteroneura* - Unit 2
Pauahi



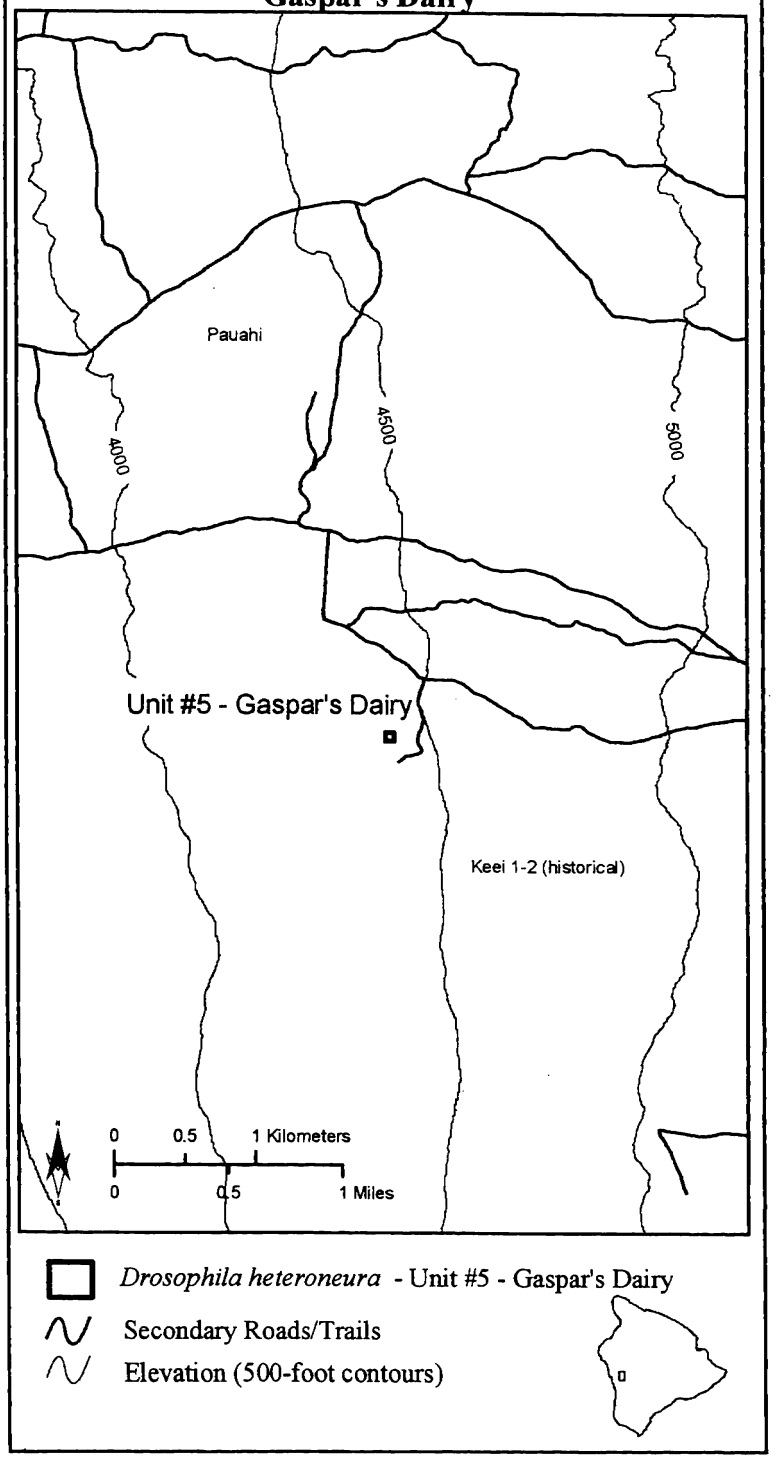
Map BI-3. *Drosophila heteroneura* - Unit 3
Waiea



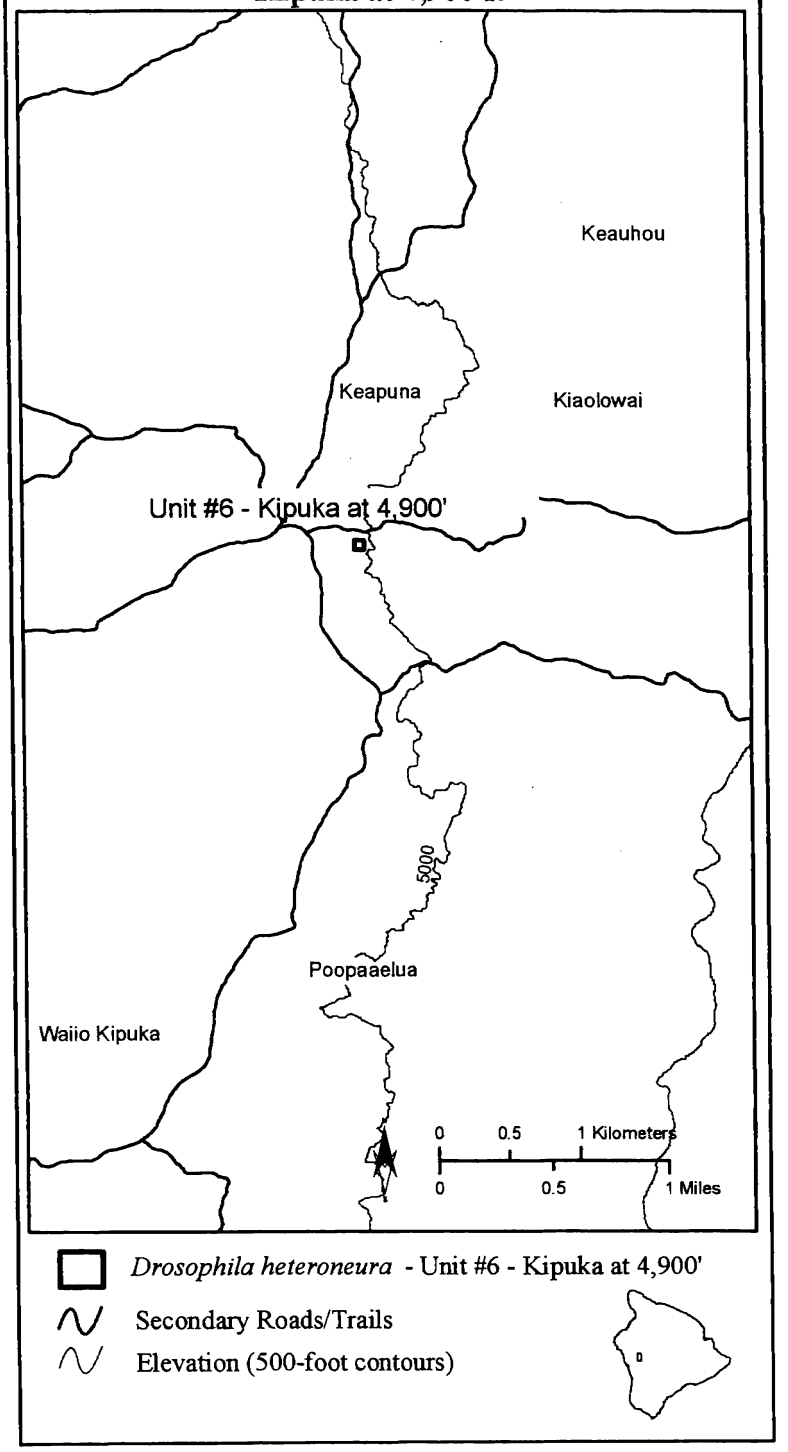
Map BI-4. ***Drosophila heteroneura*** **- Unit 4**
Waihaka Gulch



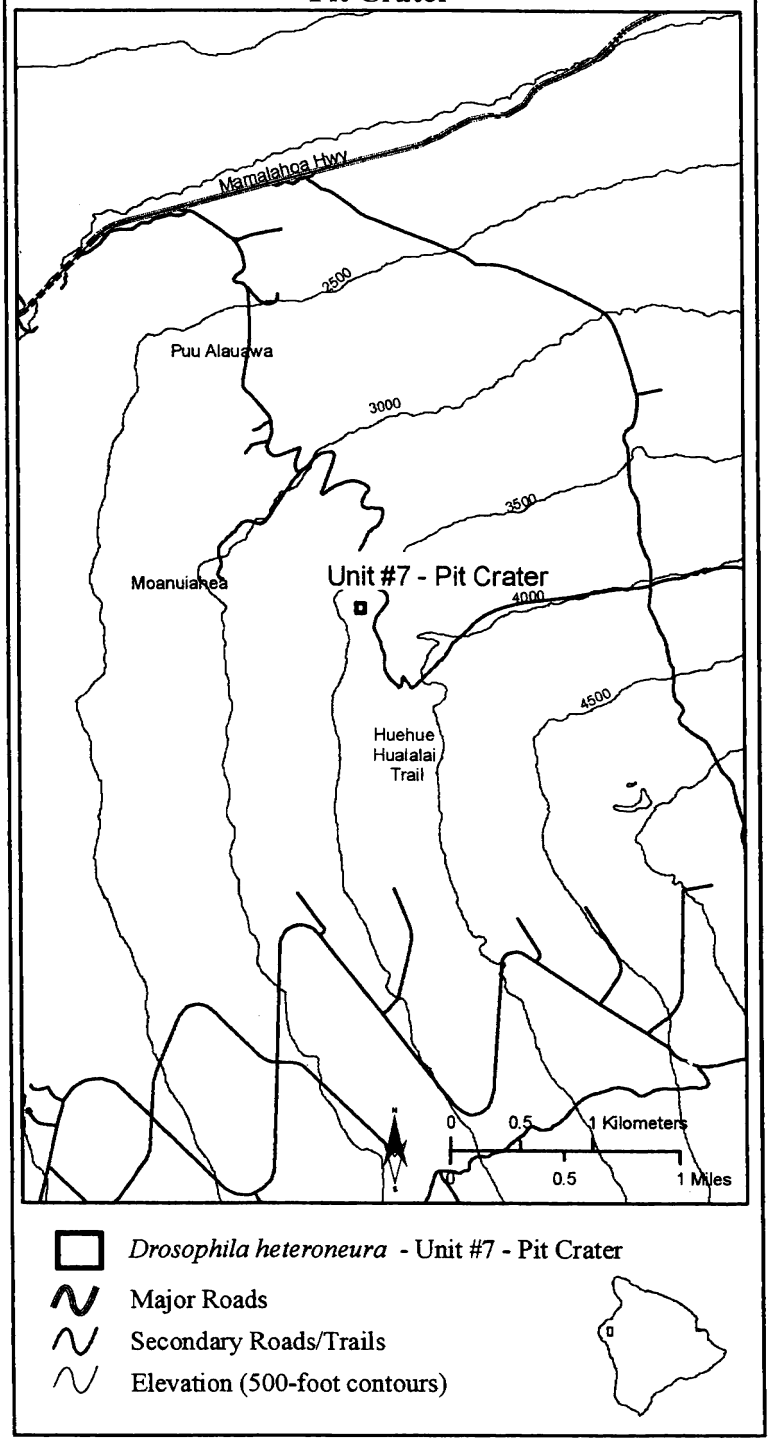
Map BI-5. *Drosophila heteroneura* - Unit 5
Gaspar's Dairy



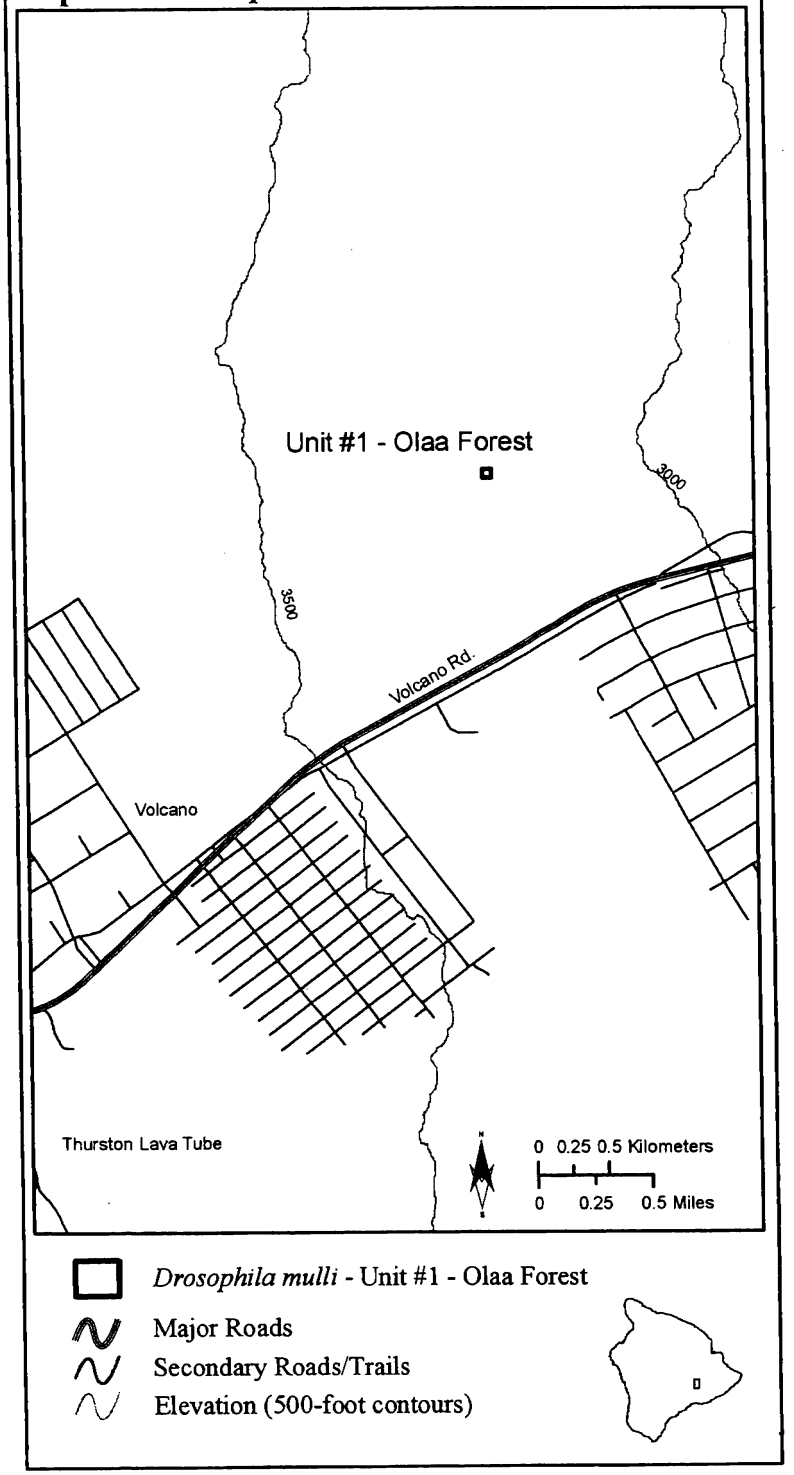
Map BI-6. *Drosophila heteroneura* - Unit 6
Kipuka at 4,900 ft



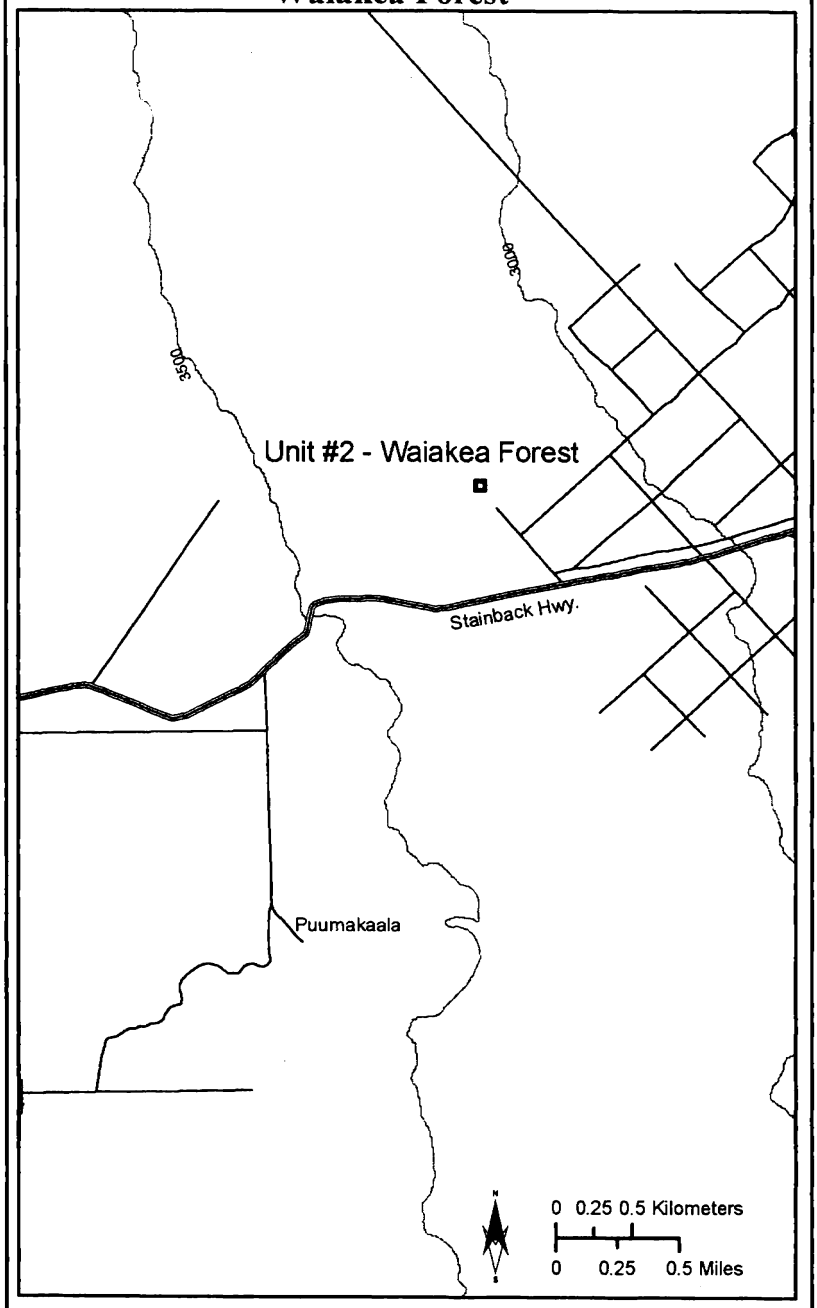
Map BI-7. *Drosophila heteroneura* - Unit 7
Pit Crater



Map BI-8. *Drosophila mulli* - Unit 1 - Olaa Forest



Map BI-9. *Drosophila mulli* - Unit 2
Waiakea Forest



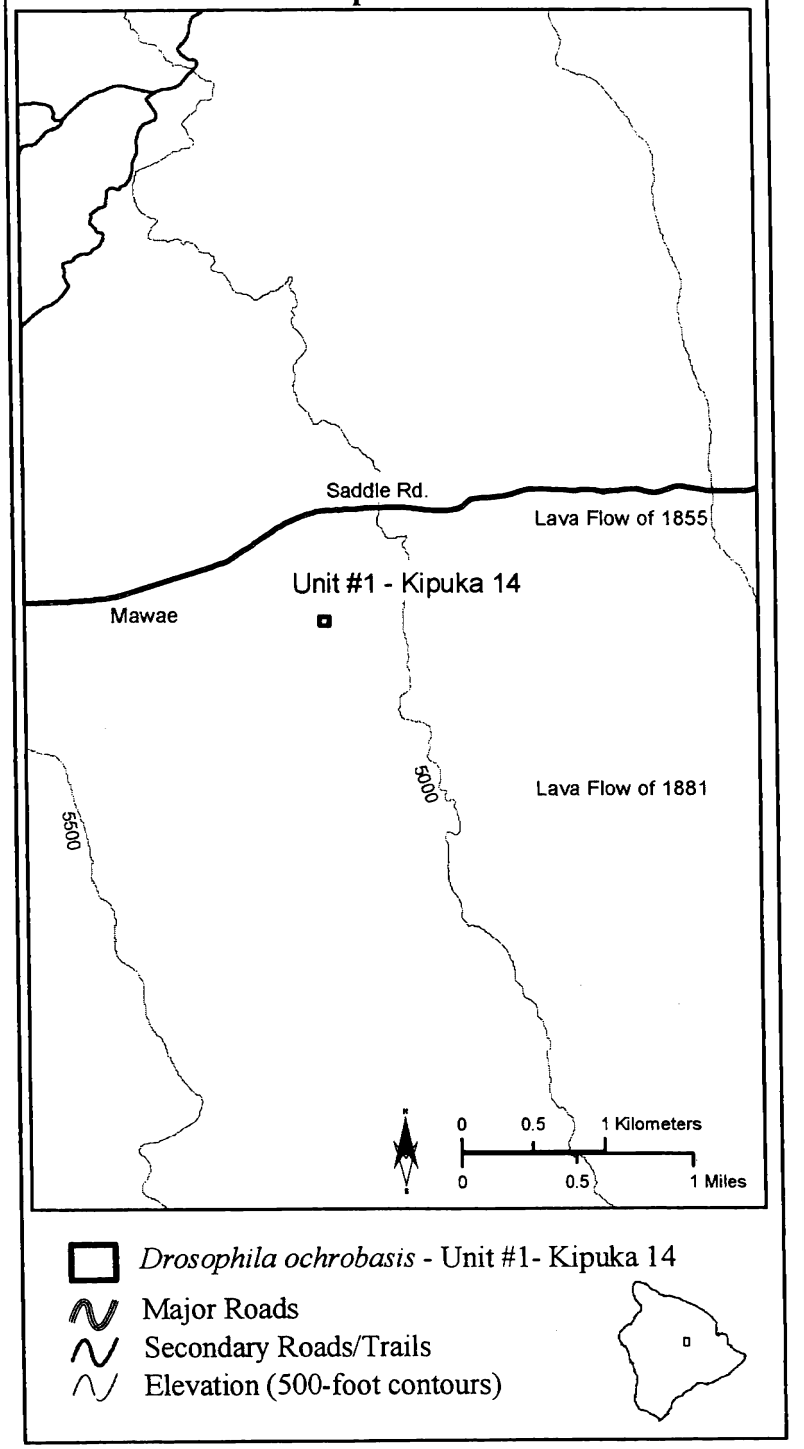
Drosophila mulli - Unit #2 - Waiakea Forest

Major Roads

Secondary Roads/Trails

Elevation (500-foot contours)

Map BI-10. ***Drosophila ochrobasis*** **- Unit 1**
Kipuka 14



Map BI-11. *Drosophila ochrobasis* - Unit 2
Kohala Mountains