



IN REPLY REFER TO:

# United States Department of the Interior

NATIONAL PARK SERVICE

HALEAKALA NATIONAL PARK

P.O. BOX 369

MAKAWAO, MAUI, HAWAII 96768

Sept  
Copy

November 14, 1989

To: Regional Director, Western Region

From: Superintendent, Haleakalā

Subject: Response to your memorandum of October 11 on Threatened and Endangered Species

We at HALE welcome any renewed interest in Threatened and Endangered Species within USDI and NPS. HALE attempts to protect many species near the brink of extinction, including six Federally Endangered birds. Since progress in listing Hawaiian plants has proceeded very slowly, none of HALE's plants are on the USFWS Threatened or Endangered list. However, the Park has already lost seven vascular plant species to extinction and 17 more have been extirpated within Park boundaries (see Attachment 1). HALE's research staff estimates that 14 additional vascular plant species of the Park could become extinct or extirpated from the Park within the next ten years (Attachment 2). Many other local endemics warrant special concern (Attachment 3). Our researchers are in touch with the Center for Plant Conservation regarding the status of rare plants of Maui (Attachment 4). We are also concerned over loss of endemic invertebrates (Attachment 5). Erosion of biological diversity is proceeding more rapidly in Hawai'i than in any other state. At this Park, we take our responsibility to slow and reverse biological losses very seriously.

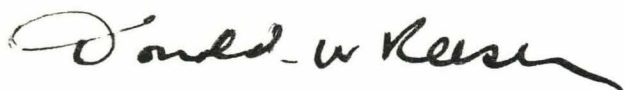
Regarding the three plant taxa listed as near extinction and occurring in HALE by the Center for Plant Conservation and the NPS WASO-Denver GIS Division:

*Argyroxiphium sandwicense* var. *sandwicense* -- (Note: G. Carr's authoritative 1985 monograph considers this taxon distinct at the subspecies level.) This taxon is restricted to Mauna Kea volcano on the island of Hawaii and is not present at HALE. HALE's silversword, *Argyroxiphium sandwicense* subsp. *macrocephalum*, numbers about 50,000 plants and is in good shape for the immediate future. Its long-term survival may be threatened, however, by vulnerability of its essential pollinators to invasive alien ants. Another silversword, *Argyroxiphium virescens*, endemic to Haleakalā volcano and last seen in the Park in 1945, is known from a single population of 3-4 individuals near the Park's northern boundary.

*Cyanea grimesiana* var. *grimesiana* -- This taxon was collected twice in Kipahulu Valley of HALE in 1919 by C.N. Forbes of the B.P. Bishop Museum (Forbes 1636M & 1680aM). It has not since been collected within the Park. Since much of Kipahulu Valley has not been explored thoroughly, it could still survive in low numbers. If still extant in the Park, the greatest threats to its continued survival would be feral pigs and alien plant invasion.

*Thelypteris (Christella) boydiae* -- After 86 years without a collection from Maui (and 59 years for the Hawaiian Islands), it was collected by the 1967 Kipahulu Valley expedition. Lost again for several years, it was relocated in 1987 by HALE researcher Art Medeiros and identified by Warren H. Wagner. An inventory in Kipahulu Valley in 1988 located 146 plants in three populations along watercourses at 4100-4800 ft elevation. Although once known from O'ahu, Hawaii, and elsewhere on Maui, the 146 plants in HALE are the only known surviving individuals of this species. Feral pig removal and alien plant control will help assure the survival of this rare fern.

HALE has included preliminary management of rare species within the crucial overall ecosystem protection strategy of fencing, elimination of feral ungulates, and weed control. Fencing has been completed, feral animal control is progressing, and alien plant control is being scarcely addressed. Realizing that all parks are striving for more funding in this time of budgetary austerity, we will continue to attempt to maximize protection of the Park's resources within our budgetary limitations, and try to further sharpen our requests for an urgently needed base increase for resources management. In our 1990 update of HALE's Resources Management Plan, we will use material developed in cooperation with the Center for Plant Conservation to strengthen project statements for projects involving feral animal control, alien plant control, inventory and monitoring, and other attempts to slow and reverse the chronic erosion of biological diversity at HALE. Given the long overdue need to address ecological degradation caused by alien species, we favor (at least in the first stage) a balanced approach which attempts to address the common threats to all our rare species rather than focusing on the relatively few species which make it to national lists.



Enclosures

cc: PAAR



Attachment 1

Extinct Vascular Plant Taxa Formerly Occurring in Haleakala National Park  
(with date of last collection):

Tetramolopium lepidotum subsp. arbusculum (1841)

Silene cryptopetala (1870s)

Cyanea pohaku (1910)

Schiedea implexa (1910)

Cyanea longissima (1927)

Silene degeneri (1927)

Stenogyne haliakalae (1937)

Vascular Plant Taxa Extirpated within Haleakala National Park (with date of  
last collection), but surviving outside the Park:

Huperzia haleakalae (1841)

Phyllostegia bracteata (1918)

Asplenium kaulfussii (1919)

Clermontia lindseyana (1919)

Clermontia peleana (1919)

Cyanea grimesiana (1919)

Lindsaea repens var. macraeana (1919)

Platanthera holochila (1919)

Solanum incompletum (1919)

Trichomanes (Vandenboschia) draytoniana (1919)

Panicum tenuifolium (1937)

Argyroxiphium virescens (1945)

Ranunculus hawaiiensis (1945)

Ranunculus mauiensis (1945)

Cyanea elliptica (1967)

Asplenium leucostegioides (1978)

Gardenia remyi (1980)

Attachment 2

Vascular Plants of Haleakala National Park Which Could Become Extinct Within 10 Years:

Clermontia samuelii

Cyanea aculeatiflora

Cyanea copelandii subsp. haleakalaensis

Cyanea glabra

Cyanea hamatiflora

Cyanea horrida

Dubautia reticulata (only 1 plant survives in Park)

Pelea balloui

Schiedea haleakalensis

Vascular Plants Which Could Become Extirpated Within Haleakala National Park Within 10 Years:

Claoxylon sandwicense (single population)

Geranium arboreum (fewer than 6 individuals)

Hillebrandia sandwicensis

Huperzia somae

Joinvillea ascendens

Lagenifera maviensis

Myoporum sandwicense (4 surviving individuals) (but common on Mauna Kea)

Nestegis sandwicensis (6 trees survive)

Nothocestrum latifolium (1 tree)

Panicum pellitum

Pelea hawaiiensis (2 trees survive)

Plantago princeps var. laxiflora (3 plants survive in Park)

Platydesma spathulata

Pleomele auwahiensis (12-24 surviving trees)

Attachment 2

Vascular Plants Which Could Become Extirpated Within Haleakala National Park  
Within 10 Years (continued):

Pouteria sandwicensis (10-15 trees in single population)

Psychotria mauiensis (2 individuals)

Schiedea diffusa (approx. 10 known individuals or small populations)

Selaginella deflexa

Stenogyne rotundifolia

Strongylodon ruber (single population)

Viola chamissoniana (fewer than 24 plants known)

Viola maviensis

Zanthoxylum kauaense (1 surviving individual)

Attachment 3

Other Vulnerable Plant Species of Haleakala National Park

(Includes those taxa that appear to warrant special concern for local or total extinction within the next century if disruptive alien plants and animals are not controlled.)

\* = endemic to East Maui

FLOWERING PLANTS

Agrostis sandwicensis

Anoectochilus sandwicensis

Argyroxiphium grayanum - endemic to Maui

\*Argyroxiphium sandwicense subsp. macrocephalum

\*Artemisia mauiensis

\*Bidens campylotheca subsp. pentamera

Bidens hillebrandiana subsp. polycephala

\*Bidens micraantha subsp. haleakalae

\*Calamagrostis expansa

Carex montis-eeka

Chamaesyce celastroides var. lorifolia - endemic to Maui and Lanai

Chenopodium oahuense (var. discospermum)

Clermontia grandiflora - endemic to Maui, Molokai, and Lanai

\*Clermontia tuberculata

Cyanea elliptica - endemic to Maui and Lanai

Cyanea kunthiana - endemic to Maui

Cyanea macrostegia - endemic to Maui and Lanai

Cyrtandra grayi - endemic to Maui and Molokai

Cyrtandra paludosa

Cyrtandra platyphylla

Cyrtandra spathulata - endemic to Maui

Dichanthelium cynodon

\*Dubautia dolosa



\*Dubautia platyphylla

\*Dubautia reticulata

various Dubautia hybrids

Embelia pacifica

\*Geranium hanaense

\*Geranium multiflorum

Gnaphalium sandwicense var. hawaiiense

Gnaphalium sandwicense var. sandwicense

Gunnera petaloidea

Labordia hedyosmifolia

Labordia hirtella

Labordia venosa - endemic to Maui and Molokai

Lepechinia hastata

Liparis hawaiiensis

Lobelia gloria-montis - endemic to Maui and Molokai

\*Lobelia grayana

\*Lobelia hillebrandii

Lobelia hypoleuca

Lysimachia hillebrandii

Lysimachia remyi - endemic to Maui and Molokai

Lysimachia sp. #1 (St. John)

Lysimachia sp. #2 (St. John)

Nothocestrum longifolium

Pelea molokaiensis - endemic to Maui and Molokai

Pelea orbicularis - endemic to Maui

\*Pelea ovalis

\*Peperomia subpetiolata

Phyllostegia ambigua

Phyllostegia macrophylla

Phytolacca sandwicensis

\*Pipturus forbesii

Pittosporum confertiflorum

Plantago pachyphylla

Pritchardia cf. arecina

Rubus macraei

Rumex giganteus

Sanicula sandwicensis

\*Santalum haleakalae

Schiedea pubescens

Sicyos cucumerinus

Silene struthioloides

Sisyrinchium acre

Stenogyne kamehamehae - endemic to Maui and Molokai

Stenogyne microphylla

\*Tetramolopium humile subsp. haleakalae

Tetraplasandra kawaiensis

Trematolobelia macrostachys

Wikstroemia oahuensis ("W. haleakalesis" population)

#### FERNS AND FERN ALLIES

Adenophorus hymenophylloides (rare?)

Ctenitis honoluluensis

Dryopteris unidentata var. unidentata

\*Dryopteris unidentata var. ukulelensis

Huperzia erubescens

Huperzia mannii



Huperzia polytrichoides

Marattia douglasii

Polystichum bonseyi - endemic to Maui

Polystichum haleakalense

Polystichum hillebrandii

Pteris irregularis

#### Attachment 4

EAST MAUI NOTES FOR CENTER FOR PLANT CONSERVATION  
A.C. Medeiros/L.L. Loope  
Haleakala National Park -- 11/13/89

#### Argyroxiphium virescens

CPC# 8054

-Long believed extinct, the single "possible" population of this monocarpic species was confirmed as "probable" A. virescens (either pure or hybridized with Haleakala silversword) by Dr. G.D. Carr of Univ. of Hawaii in 1989 based on flower heads from a single plant which flowered in June. Unfortunately, seeds obtained from this plant were unfilled (and self-compatibility of the species is unlikely). 3-4 more plants exist in the area. Prospects for its survival are dim, but this attractive species could possibly be saved through a sophisticated recovery plan.

#### Bonamia menziesii

CPC# 606 (category C)

-Our survey of leeward East Maui found only 8 individuals of this species in 6 populations at 1100-2400 ft elevation.

#### Canavalia pubescens

CPC# 744

Canavalia forbesii St. John (CPC# 733) and Canavalia haleakalaensis St. John of leeward East Maui have been merged by Wagner et al. in press into the more wide ranging C. pubescens, which is extremely rare on East Maui. Our survey of leeward East Maui found no more than six plants (Art?) at 50-2750 ft elevation.

#### Christella (Thelypteris) boydiae

good species -- yes, according to W.H. Wagner of Univ. Michigan

CPC# 7601, category B (information given in list 2 of 27 Sept. 1989 is correct)

-In 1988, an inventory in Kipahulu Valley in Haleakala National Park located 146 plants in three populations along watercourses at 4100-4800 ft elevation. It was collected at one other site on Maui (Waiho'i Valley) in 1972, but has not been collected elsewhere since 1908. Species is threatened by feral pigs and alien plant invasion.

#### Clermontia samuelii

-good species (recognized as species by Lammers in Wagner et al. in press)

CPC# (none)

An East Maui endemic with very restricted distribution (NE rift of Haleakala volcano), this species is not common. We doubt that more than several hundred plants exist and young plants are never seen. As far as we know, it could become extinct within 10 years as a result of feral pig damage within its restricted habitat.

Clermontia lindseyana

-good species (recognized as species by Lammers in Wagner et al. in press)  
CPC# 1014 (category A) — 2 historical collections from East Maui are known to us, one by J.F. Rock in Kaupo, possibly from Haleakala National Park. We have no knowledge of its collection since 1919 and its habitat on Maui is essentially obliterated. Unless it survives on Hawai'i, it is probably extinct.

Clermontia peleana

-good species (recognized as species by Lammers in Wagner et al. in press)  
CPC# 1017 (annotated possibly extinct) — 2 historical collections from East Maui are known to us (the type, Lydgate 56, BISH, & a 1919 C.N. Forbes collection from Ko'olau Gap, probably within present day Waikamoi Preserve). We have no further knowledge.

Cyanea copelandii var. haleakalaensis

-good subspecies, endemic to E. Maui (recognized at subsp. by Lammers in Wagner et al. in press)

CPC# (C. copelandii subsp. copelandii is #9491.)

-This shrub with yellow-salmon flowers is rare (< 50 plants) on the central pali and lower level of Kipahulu Valley of Haleakala National Park at 3390-3580 ft elevation. It is also found in low numbers (ca. 20-30 plants — check with R. Hobdy) along the lower Waikamoi flume. It could become extinct within 10 years.

Cyanea grimesiana subsp. grimesiana

-good subspecies (recognized at subsp. by Lammers in Wagner et al. in press)  
CPC# 1176 (same as subsp. obatae, a category A species; 3rd subsp. is extinct)  
-A Maui endemic, it has not been collected or observed since 1919 in Haleakala National Park and, so far as we know, survives on Maui only in a single population found by R. Hobdy in Iao Valley of West Maui.

Cyanea hamatiflora subsp. hamatiflora

-good subspecies, endemic to E. Maui (recognized at subsp. by Lammers in Wagner et al. in press)

CPC# (Cyanea hamatiflora subsp. carlsoni, a category A taxon, is CPC# 9493.)

-These large (to 8m tall) palm-like plants, with large, arched, dark purple flowers, grow on sides of watercourses in Kipahulu Valley of Haleakala National Park and in perhaps a few other places on East Maui. The plant is very conspicuous, but quite uncommon. Young plants are never seen. This species could easily be extinct within 10 years. The species thus consists of two subspecies, one category A and one category B.

Cyanea longissima

-good species (recognized as species by Lammers in Wagner et al. in press)

CPC# 9495

-An East Maui endemic, it has not been collected or observed since 1919 in Haleakala National Park and may be extinct, so far as we know.



Cyanea mceldowneyi

-good species (recognized by Lammers in Wagner et al. in press)

CPC# 1186

-An East Maui endemic of windward forest at 925-1280 m, it has never to our knowledge been collected or observed in Haleakala National Park. Art: Where is it? (Waikamoi distribution)

Geranium arboreum

CPC# 2011 (category C)

-This East Maui endemic is undergoing review for Federal Endangered status. Category C is probably an appropriate classification since it probably won't go extinct within the next ten years. This species should probably be strongly considered by CPC for promotion in botanical gardens because of its extremely unusual and attractive flowers, however.

Huperzia (Lycopodium) mannii

CPC# 9341

This rare, epiphytic, endemic Hawaiian species has only been collected on East and West Maui, Kaua'i, and Hawai'i. Extant populations are known only from East Maui and Hawai'i. On East Maui we know of 1) a population with 6 individuals (as of 1982) on koa in Manawainui (Kahikinui) drainage at 5500 ft, and 2) 3 populations on koa on the Manawainui (Kaupo) plateau at 4000-5000 ft reported by Higashino and Mizuno in 1976. In neither of these locations is the koa forest reproducing due to feral ungulates. We don't really know about the Hawai'i situation.

Joinvillea ascendens ssp. ascendens

CPC# 2364

This species is present but definitely in danger of extirpation at any time in Kipahulu Valley of Haleakala National Park, where 5 very small populations have been located. It is very rare elsewhere on Maui. Wagner et al. cite Hobdy's observation that seedlings have rarely been observed in Hawai'i; mature seeds germinate readily in cultivation but seedlings do not live beyond the seedling stage.

Pelea adscendens

-good species (recognized by Wagner et al. in press)

CPC# 9694

Definitely merits Category A.

-This species differs strikingly from all other Pelea species in being a sprawling vine-like shrub instead of a tree. An East Maui endemic, it is known (since 1919) as only a single plant (last confirmed in 1989) at 4000 ft elevation near Pu'u O'ili in 'Auwahi on southern East Maui.

Pelea balloui

CPC# 3143

-good species, recognized by Wagner et al. in press, who state: "possibly extinct"

-This East Maui endemic had not been collected since 1927 when it was "rediscovered" at 2500 ft elevation in Haleakala National Park's Kipahulu

Valley by L. Cuddihy in 1987. The identification by Cuddihy and Medeiros is tentative and must be checked with Dr. B.C. Stone (the monographer of the genus, who resides in Singapore). The number of surviving individuals is very low. The collection site is in an area severely degraded by feral pig digging and alien plant invasion.

Recommend category B, though category A may be warranted.

Pelea hawaiiensis

CPC# 3157

-good species, recognized by Wagner et al. in press.

-In a survey by us in 1981-85, we encountered 2 trees at 4850 ft in Haleakala National Park, and 4 trees in western 'Auwahi at 3000-4000 ft elevation. We believe that these 6 trees are the only ones on Maui. Fruits with plump seeds were found, but no seedlings.

Pelea knudsenii

CPC# 3162

-good species, recognized by Wagner et al. in press., who merged Pelea multiflora of Maui with P. knudsenii of Kaua'i. The Kaua'i form is presumed extinct (1\*). The Maui form is very rare and we support the category A designation already given by CPC in list 2 of 27 Sept. 1989.

-In a survey by us in 1981-85, we encountered about a dozen trees of Pelea knudsenii, all senescent individuals at 2500-4000 ft elevation in the 'Auwahi-Kanaio area of leeward East Maui. No seedlings or saplings were seen, and several individuals have since died. There is a healthy tree 6m tall (as of 1983) in an arboretum at Pu'u Mahoe, near Ulupalakua, Maui. The trees mentioned here are probably the only surviving individuals of this species.

Pelea ovalis

CPC# 3178

-good species, recognized by Wagner et al. in press, who state: "known only from the type...collected in 1920 from the mountains above Hana, Maui."

-Like Pelea balloui, this East Maui endemic with large fragrant leaves was "rediscovered" in middle elevation forests of Haleakala National Park's Kipahulu Valley by L. Cuddihy in 1987. At this time it is impossible to estimate the number of surviving individuals, but this species seems to be in less danger of imminent extinction than P. balloui. Both species are threatened by feral pig destruction of reproduction and prevention of reproduction by alien plant invasion of the forest understory.

Recommend category C.

Plantago princeps var. laxiflora

-Only 3 plants survive in Haleakala National Park. We are aware of no other populations on Maui

Ranunculus hawaiiensis

CPC# 8994

-The species is endemic to East Maui and Hawai'i. It formerly occurred in Haleakala National Park but has not been collected or seen there since 1927. The only population extant on Maui is very insecure, in degraded koa forest in



Kahikinui at 5200 ft. R. hawaiiensis may rate category A or B unless secure populations exist on Hawai'i.

Ranunculus mauiensis

CPC# 9673

-The species is said by Wagner et al. to occur on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i. It is extirpated from O'ahu. It formerly occurred in Haleakala National Park, but has not been collected or seen there since 1945. Only two very small populations are extant on Maui: 1) at 5200 in Ko'olau Gap (Waikamoi Preserve, and 2) at 5650 ft in Manawainui (Kahikinui) drainage on southern East Maui. It may rate category A or B unless secure populations exist on other islands.

Santalum freycinetianum vae. lanaiense

CPC# ?

-Wagner et al. in press sunk Stemmermann's var. auwahiense into var. lanaiense, which now has a range of Lanai and Maui. Var. lanaiense is Federally Endangered, based on the Lanai population.

-Status of East Maui population: Total number of surviving trees may be 100 or more, but no reproduction occurs. Population will probably last more than ten years, but the taxon is clearly doomed without reproduction.

-Also occurs on leeward West Maui.

Schiedea diffusa

CPC# 9508

This species is very rare, as indicated by Weller in Wagner et al. in press. It is, however, sparsely present in several populations in Haleakala National Park, at 2500-6470 ft. It is undoubtedly threatened by feral pigs and alien plants.

Schiedea haleakalensis

CPC# 3845 (C)

Endemic to Haleakala Crater. This very rare species survives only on cliffs in western Kaupo Gap and near Holua. The number of individuals is not known (because of perpendicular terrain), but may not exceed 50. There is some chance that the species may spread now that feral goats have been removed from its habitat.

Schiedea implexa

CPC# 3849

-Species is undoubtedly extinct.

Solanum incompletum

CPC# 4032 (A)

-Species is known from Haleakala National Park only from one or two 1919 collections. As far as we know, this species is apparently extirpated on Maui.



Trichomanes (Vandenboschia) draytoniana

CPC #4317

-collected once in Haleakala National Park (1919), but not recorded since; ACM knows it only from lower Hanawi Stream on Maui

Zanthoxylum kauaense

CPC# none

-We lack knowledge of the status of this species on other islands, but can confidently state that it might not survive another 5 years on Maui. There is only one surviving individual in Haleakala National Park. The only other location for this species on Maui is a group of 3 relictual individuals that R. Hobdy showed us above Makawao in 1983.

Attachment 5

N1621

March 24, 1989

Memorandum

To: Dr. Mietek Kolipinski, NPS Western Region T & E Specialist

From: Lloyd Loope and Arthur Medeiros, Research Division, Haleakala National Park

Subject: Review of Endangered and Threatened Invertebrates (your memo of February 22, 1989)

We received with interest a copy of the item regarding "Endangered and Threatened Wildlife and Plants; Animal Notice of Review" in the Federal Register, Vol. 54, No. 4, January 6, 1989, which solicits data concerning animal taxa in an extensive table. Since many of the species included in the table occur within the boundaries of Haleakala National Park, we feel it appropriate at this time to provide the information given below. Obviously, the information given is just the "tip of the iceberg," and only gives examples. The knowledge available to us suggests that many native invertebrate species are endangered; this knowledge is pathetically inadequate, but we have to start somewhere.

The following taxa in the published table occur (or at least have been recorded) within or near the boundaries of Haleakala National Park and their survival is believed by us to be jeopardized by the indicated threats:

Machiloides heteropus (Insects, bristletails) -- recorded in the Park in 1980 at an elevation of 480 m -- vulnerable to the recently established (1970s) alien ant Anoplolepis longipes

Megalagrion nigrohamatum (Insects, damselflies) -- recorded near the Park in 1980 at an elevation of 550 m (Pua'alu'u Stream) -- vulnerable to the recently established (1970s) alien ant Anoplolepis longipes

Megalagrion pacificum (Insects, damselflies) -- This species is said to have been the most widespread species of the endemic Hawaiian genus Megalagrion at the beginning of this century. It lives in mosses and algae in streams and on wet banks and preys on small invertebrates. Because of the introduction of mosquito fish (Gambusia) and habitat degradation, it is now known only from two isolated streams in Kipahulu Valley in and near the Park. It is vulnerable to the recently established (1970s) aggressive alien ant Anoplolepis longipes. No survey of this damselfly's status has been made since 1980.



Neseis haleakalae (Heteroptera: Lygaeidae - seed bugs) -- This species has never to our knowledge recorded within the Park, but endemic to Haleakala volcano below 2000 ft elevation -- described by Perkins in 1912 -- may well be extinct due to alien predators, but should be looked for in the few potential native habitats that still exist.

Nesosydne bridwellii (Homoptera: Delphacidae - planthoppers) -- an East Maui endemic -- The host plants of this species are Argyroxiphium (silversword) and its close relative Dubautia. This species has apparently not been collected in the past 10 years and should be looked for. The endemic Hawaiian planthopper species show great host specificity and are nearly all restricted to native plants. Entomologist E.C. Zimmerman in 1948 attributed the notable decline of many of the native leafhoppers to the intentional introduction of foreign parasites to control the alien sugarcane leafhopper.

Nesosydne cyrtandrae, N. longipes, and N. sulcata (Homoptera: Delphacidae - planthoppers) -- The host plant of each of these three species, all endemic to East Maui, is Cyrtandra, an increasingly rare endemic genus highly vulnerable to feral pig damage. These three species have not to our knowledge been collected in the Park, but should be looked for.

Nesothauma haleakalae (Neuroptera: Hemerobiidae - lacewings) -- This flightless lacewing was last collected above Makawao in the 1870s and may be extinct, but should be looked for in studies of forest invertebrates on East Maui.

Pseudopsectra cookeorum (Neuroptera: Hemerobiidae - lacewings) -- This bizarre spiny flightless species has only been collected once, in 1945, on Dubautia, at the type locality, at 9700 ft on the rim of Haleakala crater. It is undoubtedly inconspicuous, however, and may still survive in spite of probable rodent predation and increasing human encroachment in its habitat.

Pseudopsectra lobipennis (Neuroptera: Hemerobiidae - lacewings) -- This rare flightless hemerobiid, endemic to Maui, survives in rain forests of Kipahulu Valley in spite of predation by alien rodents.

Plagithmysus (Longhorn Beetles - Cerambycidae) (43 species, unspecified) -- The Hawaiian cerambycid fauna presents one of the more remarkable examples of great proliferation of species and form through adaptive radiation from a single ancestor. Species of the group feed in living trees and have remarkably specific host-tree food habits within a given species of beetle, but have adapted to a large number of families (27) of trees for the whole group. Body form has diverged greatly from the presumed ancestral type. About 140 species have been described, and 33 have been recorded in or near Haleakala National Park. The group forms an important food source for forest birds, most notably the Endangered Maui parrotbill (Pseudonestor xanthophrys), a honeycreeper endemic to East Maui. Hawaiian cerambycids are directly threatened by alien parasitoids and alien predatory insects such as ants and yellowjackets; they are indirectly threatened by feral ungulates and alien plant species that threaten their host plants. For example, in an as yet unpublished study on prey of the alien yellowjacket Vespula pensylvanica in high-elevation shrubland of Haleakala, 4 of 200 identified prey items were Plagithmysus funebris, host specific on the endemic Sophora tree. Plagithmysus terryi is an East Maui endemic which utilizes only the Haleakala



silversword (Argyroxiphium sandwicense var. macrocephalum) and greensword (A. grayanum) as host plants. Silversword habitat may be vulnerable to invasion by the Argentine ant (Iridomyrmex humilis), whereas the greensword is vulnerable to damage by feral pigs and invasion of alien grasses and sedges. Plagithmysus geranii depends on its host plants, Geranium arboreum (an East Maui endemic and a listed Endangered species) and Geranium cuneatum var. tridens (fairly restricted in distribution itself, with a range which coincides with or is located near that of the spreading Argentine ant).

Proterinid beetles (Coleoptera: Proterinidae) (72 species, unspecified, are given in the published table) -- 35+ species are recorded for Haleakala National Park and vicinity; many are local endemics; few have been collected in recent decades; almost nothing is known about them.

Nesoprosopis (Hymenoptera: Hylaeidae) -- yellow-faced bees -- about 50 Hawaiian species are included in the table -- 8 species have been recorded at Haleakala; all except N. volcanica are among those included in the table -- Nesoprosopis bees are among the most important pollinators of Hawaiian plants. Under-rock surveys within and outside the range of the Argentine ant in Haleakala high-elevation shrubland indicate that these ground-nesting bees are seriously impacted by the aggressive alien ant predators.

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The following taxa found in Haleakala National Park would seem to warrant inclusion in any list of invertebrates under consideration for Threatened and Endangered status. Their survival is believed by us to be jeopardized by the indicated threats:

Partulina -- an endemic genus of tree snails in the endemic Hawaiian family Achatinellidae (The entire genus Achatinella in the same family is Endangered.) Partulina dolei and Partulina fulvicans have been recorded along 'O'heo Stream. Partulina porcellana has been recorded as very rare in Kipahulu Valley; its primary "host" tree species, Antidesma platyphyllum, is threatened by invasion of its habitat by strawberry guava (Psidium cattleianum).

Lycosa spinipes (Spiders: Lycosidae) -- threatened by ants?

Syroloma minor (Spiders: Lycosidae) -- endemic Hawaiian genus -- threatened by ants?

Sephora creniger (Heteroptera: Lygeidae - seed bugs) -- the single species in an endemic Hawaiian genus has not been recorded within the Park, but the type collection was from similar habitats on Haleakala volcano at 5000 ft elevation, "under stones."

cfr. Trigonotylus sp. (Heteroptera: Miridae - leaf bugs) -- New flightless and undescribed genus, near Trigonotylus, collected repeatedly by W. Gagne in upper Kipahulu Valley and upper Hana rain forest. Its host plant, Astelia, has been greatly reduced by rooting and feeding of feral pigs.

Nesosydne argyroxiphii (Homoptera: Delphacidae - planthoppers) Endemic to Haleakala Crater, its host plant is the Haleakala silversword -- Any of the species restricted to silversword would be highly vulnerable to invasion of



the crater by the Argentine ant (Iridomyrmex humilis), already present on the crater rim at 9300 ft elevation.

Nesosydne geranii (Homoptera: Delphacidae - planthoppers) -- a Maui endemic -- The host plant of this species recorded in the literature is Geranium arboreum, itself a Federally listed Endangered species. However, this species was collected in the Park in the 1970s on Geranium tridens. Its status should be investigated.

Nesosydne tetramolopii (Homoptera: Delphacidae - planthoppers) -- an East Maui endemic -- The host plant of this species is Tetramolopium humile, itself a species with a highly restricted distribution near the Haleakala summit. This species was collected in the Park in the 1970s. Its status should be investigated.

Carabid beetles (Coleoptera: Carabidae) -- Of the 215 endemic Hawaiian species of this inconspicuous, ground dwelling, predominantly flightless, predatory group of beetles, 68 (mostly local endemics, in some cases monotypic genera) have been recorded for East Maui. Although few collections have been made since Perkins' exploratory work nearly a century ago, three locally endemic species were present in pitfall traps we recently used to assess effects of the Argentine ant on native ground-dwelling biota. These three species, Mauna frigida, Barypristus rupicola, and Mecyclothorax robustus, were rare or lacking in areas where the Argentine ant has established and moderately common locally in areas not yet invaded by the ant. Predatory, ground-dwelling carabid beetles are obviously highly vulnerable to ant predation and the status of East Maui species should be explored further.

Weevils or snout beetles (Curculionidae) -- Many members of the genera Acalles (6 spp.), Heteramphus (3 spp.), and Oodemus (16 spp.) have been described for East Maui. Few specimens have been collected in recent decades. A survey is needed.

Hodegia (Thyrocopa) apatela (Lepidoptera: Gelechiidae) -- This flightless moth (an endemic genus and species), with narrow dagger-like wings too small for flight, is found only on upper Haleakala volcano above 8000 ft elevation. Collected once in the early 1900s, it was not found again until the 1970s. Though not common, Hodegia was found to be a prey item of yellowjackets in our as yet unpublished study of prey of the recently introduced (1978) Vespula pennsylvanica.

Other moths: Hawaii has a rich moth fauna, and Haleakala has many locally endemic species, including important pollinators, especially in the family Noctuidae. In larval stages, moths are subject to predation by alien rodents, pigs, ants, yellowjackets, etc. Moth larvae are particularly subject to parasitism by introduced parasitoids, many of which have been introduced either accidentally or intentionally (for biocontrol).

Vinegar flies: Drosophila (74 species at HALE) and Scaptomyza (44 species at HALE): Many of these are very localized endemics. They live in decaying plant material and are very specific in their substrate requirements. If a plant species is locally extirpated, its associated fauna is going to be extirpated, in many cases, made entirely extinct.

Tephritid flies -- HALE has 10 endemic species, many of them associated with

silversword and its relatives. For example, Neotephritis paludosae is known only from greensword (Argyroxiphium grayanum) plants in montane bogs within the upper Hana rain forest of Haleakala National Park. All endemic Hawaiian tephritid flies may be threatened by a program (sponsored by USDA-APHIS) to eradicate alien pest tephritid flies (medfly, oriental fruit fly, melon fly, etc.) which involves (among other things) massive introductions of alien parasitoids. Distribution of large numbers of malathion baits and tephritid-specific attractants may also be part of the program. The program is still in an experimental stage, but large numbers of parasitoids are already being introduced on Maui, with results considered highly favorable by APHIS. Since the alien pest tephritid flies occur on guava as well as on native hosts throughout much of the Park rain forest, potential threats to closely related native flies are obvious. To fully document this threat, the Park would need much more information on these native species, their ecology, and habitat.

In summary, Haleakala National Park has many invertebrate species that are clearly deserving of Threatened or Endangered Status. This is undoubtedly true of many areas in the state of Hawaii. Haleakala National Park is noteworthy in that its native biota is relatively intact and relatively well known. There is actually a chance for saving many of these species through acquisition of knowledge and application of fine-tuned management, rather than merely cataloguing their demise. A comprehensive inventory of the status of native organisms of the Park would appear to be a worthwhile project for the U.S. Fish and Wildlife Service and National Park Service to consider.