

PROTECTION STATUS OF THE NATIVE HAWAIIAN BIOTA

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ABSTRACT

For purposes of assessing the level of protection currently enjoyed by the native Hawaiian biota, a definition for "protected natural areas" is presented. A "protected natural area" is an area where affirmative legal action is required to allow serious disturbance by man thereon, and where active management to control non-native processes, species, and ecosystems is under way. Using this definition, public and private lands designated for management to conserve the native biota are listed and their protected status assessed. Of the 23% of the State's lands so listed, most fail to fully meet the definition of "protected natural areas." Any assessment of how well the present natural area system represents the range of native habitat types and endangered species, is seriously impaired by 1) lack of a definitive classification of Hawaiian ecosystems, and 2) lack of a single, comprehensive repository of rare species information. It is clear, however, that several important habitat types are not included in any currently protected natural area, and that most endangered plant species are also excluded. Recommendations for an improved system of protected natural areas include 1) establishment of an ongoing data base to determine protection needs; 2) support of effective management of existing protected areas; 3) provision for legal protection of naturally protected (by isolation or rugged terrain) areas; 4) protection of additional properly designed areas; 5) improvement of credibility of native species conservation.

INTRODUCTION

Over 415,000 ha in Hawai'i (23% of the State) are included in lands legally dedicated to the conservation of native species and ecosystems. All of these lands--National Park Service lands, U.S. Fish and Wildlife Service National Wildlife Refuges, State of Hawaii

Nature Conservancy preserves, and State of Hawai'i Protected Conservation Subzones--have been set aside by people with the idea that they will form a legacy, an ark to carry the important functions, products, and aesthetics of native Hawaiian species and ecosystems into the future for the benefit of our descendants. In this paper we try to answer 2 questions related to the goal of perpetuating the native biota. First, how well does our present system of protected natural areas protect the Hawaiian biota? Second, what should we do next?

DEFINING "PROTECTION"

What do we expect from a so-called "protected natural area"? We establish it with the intent that it will carry functioning native ecosystems or populations of unique plants and animals into the future. To protect a natural area for this purpose we must make 2 kinds of commitments.

First, we must commit ourselves and others not to do certain things on these lands. We must agree not to clear forests for residential or agricultural development, not to build an industrial facility there, not to allow any human activity that will adversely change the natural conditions that exist. This is largely a legal or political commitment.

Second, and perhaps less obvious, we must commit ourselves to actively do certain things. This is a commitment of funds and manpower to mitigate those threats to the native ecosystem that have already been or may in the future be introduced, and which, if left untended, will seriously degrade the natural values which the area was established to protect. Before we can expect an area to maintain its diversity and stability by its own natural processes, we must commit ourselves to actively protect those processes from radical disruption by introduced organisms such as feral pigs (Sus scrofa), goats (Capra hircus), and weeds, and from destabilizing abiotic processes such as fire and rapid erosion (often promoted by introduced organisms). With the exception of a very few isolated mountain tops, offshore islets, and lava tubes, the typical Hawaiian natural area today would suffer dramatically from disruption by alien species if we simply put a fence around it and left it alone.

For the purposes of this paper, a "protected natural area" may be defined as an area of land where 1) an affirmative legal action would be required to allow human activities to occur which would seriously disturb the native ecosystem, processes, or species thereon;

and 2) where an active management program is under way to control non-native biotic and resultant abiotic disruption of the native ecosystem, processes, and species thereon.

PROTECTED AREAS IN HAWAII

How the conservation of "protected" lands in Hawaii meets this definition of a protected natural area is shown in table 1. Not included are small privately protected areas. Also excluded are State and county parks, portions of forest reserves not in Subzone "P", and National Historic Parks where the chief management mandate is for recreation, forest products development, or anything other than native biota conservation; the important contributions of these areas to species and ecosystem protection are discussed later in this paper.

Of the 48 areas listed, 20 presently have both legal protection and active threat control programs. Five of these are large ecosystem preserves. Fifteen are areas dedicated to a relatively few rare species, generally birds or rare plants.

Areas where no affirmative legal action would be required to remove their protected status are those under short-term leases, cooperative agreements or permits. In each of these cases, the administering authority has decided that the benefits to ecosystems or important components thereof justify less-than-binding legal protection, often because more binding legal protection is simply not available or affordable. These areas are either small or are sites for limited management of a relatively few rare species (e.g., Hawaiian goose (*Nesochen sandvicensis*) sanctuaries, waterbird refuges, seabird nesting sites). The single area with neither legal nor active threat protection (Paradise Pacifica waterbird habitat) is similar in nature.

Sixteen of the natural areas in table 1 have legal protection but no active program for control of non-native threats. These include all 13 State NAR's (totalling 32,830 ha), all "Protected" Conservation Subzone lands (236,340 ha), the State Alaka'i Wilderness Preserve (4,020 ha) and The Nature Conservancy's Hakalau Preserve (1,330 ha). All are large ecosystem preserves, together accounting for 237,700 ha or 57% of all protected land in the State.

ECOSYSTEM PROTECTION

In addition to creating adequately protected natural areas, our goal must be to develop a system of areas which protects the fullest possible array of the

Table 1. Protected status of Hawaiian natural areas, by agency.

Natural Areas	Area (ha)	Legal Protection*	Active Threat Control Program*
<u>Federal</u>			
National Park Service			
HALE NP (Maui)	11,678	Yes	Yes
HAVO NP (Hawai'i)	92,784	Yes	Yes

	104,425		
U.S. Fish and Wildlife Service Refuges			
Pearl Harbor NWR (O'ahu)	25	No	Yes
James Campbell NWR (O'ahu)	57	No	Yes
Kakahai'a NWR (Moloka'i)	17	Yes	Yes
Hanalei NWR (Kaua'i)	371	Yes	Yes
Hule'ia NWR (Kaua'i)	96	Yes	Yes
Kilauea Pt. WAS (Kaua'i)	13	No	Yes
Hawaiian Islands NWR	708	Yes	Yes

	1,287		
U.S. Department of Defense			
Nu'upia Ponds (O'ahu)	205	No	Yes
Ulupa'u Head (O'ahu)	13	No	Yes
Naval Ammunition Depot (O'ahu)	36	No	Yes

	254		

Subtotal for Federal Natural Areas	105,966		

Natural Areas	Area (ha)	Legal Protection*	Active Threat Control Program*
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State

NAR's (13 areas)	32,826	Yes	No
"P" Subzone	236,345	Yes	No
Alaka'i Wilderness Preserve (Kaua'i)	4,022	Yes	No
	273,193		

Sanctuaries (Animal or Aquatic)

Hawai'i State Seabird Sanctuary (Offshore Islets)	121	Yes	Yes
Paiko Lagoon (O'ahu)	13	Yes	Yes
Kanaha Pond (Maui)	58	Yes	Yes
Kipuka 'Ainahou (Hawai'i)	15,540	Yes	Yes
Kahuku (Hawai'i)	8,094	No	Yes
Keauhou I (Hawai'i)	3,278	No	Yes
Keauhou II (Hawai'i)	4,047	No	Yes
Paradise Pacifica (Kaua'i)	4	No	No
Mana Ponds (Kaua'i)	3	No	Yes
	31,158		

Sanctuaries (Primarily Plant)

<u>Gardenia</u> (O'ahu)	< 0.1	Yes	Yes**
<u>Manawainui</u> Gulch (Maui)	23	Yes	Yes**
<u>Polipoli</u> <u>Geranium</u> (Maui)	0.6	Yes	Yes**
<u>Koai'a</u> (Hawai'i)	5	Yes	Yes**
<u>Pu'uwa'awa'a</u> <u>Hibiscadelphus</u> (Hawai'i)	< 0.1	Yes	Yes**
<u>Mauna Kea</u> <u>Silversword</u> (Hawai'i)	20	Yes	Yes**
<u>Powerline Road</u> <u>Silversword</u> (Hawai'i)	0.3	Yes	Yes**
<u>Sesbania arborea</u> (Moloka'i)	4	Yes	Yes**

Table 1. Continued.

Natural Areas	Area (ha)	Legal Protection*	Active Threat Control Program*
Subtotal for State Natural Areas	337,371		
<u>Private</u>			
The Nature Conservancy			
Hakalau (Hawai'i)	1,335	Yes	No
Kipahulu (Maui)	397	Yes	Yes
Kamakou (Moloka'i)	1,123	Yes	Yes
Waikamoi (Maui)	2,117	Yes	Yes
Kaluahonu (Kaua'i)	88	No	Yes

Subtotal for Private Areas	5,060		
Total	415,430		

* As defined in text.

** Fencing only.

remaining Hawaiian biota. We should try to include in our natural areas the best remaining examples of all native ecosystems and species. In Hawai'i, with highly localized endemism, we must include natural areas from all the islands in order to capture a full representation of the flora and fauna.

Assessing our progress thus far in ecosystem protection is difficult because many protected areas have not been inventoried even at the ecosystem level. This is especially true of State lands. A major obstacle to completing such a basic inventory is that we do not have a definitive classification of terrestrial Hawaiian ecosystems. That is, we lack a standard vocabulary for concisely describing what one person may call "mixed mesophytic forest" and what someone else may call "dryland forest" from the exact same site. This lack of standard language makes it difficult to get the ecosystem information that does exist into an interpretable form.

still
true?

Wayne Gagne and James Jacobi are both working on classification systems for Hawaiian ecosystems. In the meantime, we can use the vegetation zones developed by Ripperton and Hosaka (1942) and modified by Gagne and Mueller-Dombois (n.d.) to chart the general vegetation types included in protected natural areas (table 2). The numbers in the table are the numbers of protected areas on a given island of a given vegetation type. The number to the left of the slash is the number of fully (legally and biologically) protected areas, and the number to the right of the slash is the number of partially (legally or biologically) protected areas. State plant sanctuaries and "P" Subzone lands are not included. Most of Ripperton and Hosaka's vegetation types actually include several major ecosystem types. For example, #7 Aquatic Zone includes wetlands, streams, anchialine pools, marine pools, and lakes.

Listing the protected natural areas in this way reveals several important shortcomings in coverage of geographical and ecological areas for protection. All of the vegetation zones are included in the system, but the islands of Ni'ihau, Lana'i, and Kaho'olawe are totally excluded. The only natural areas on O'ahu with active threat control programs are waterbird wetlands. On Kaua'i and O'ahu, the wetland is the only vegetation zone that has both legal protection and active threat control. There is no actively managed example of the habitat types richest in rare plant species--mixed mesophytic forest on Kaua'i and O'ahu and lowland rain forest on O'ahu (Wagner, Herbst, and Yee, this volume). Except for coastal wetlands, no vegetation zone is fully protected in more than 2 locations on any

Table 2. Vegetation zones* included in Hawaiian protected natural areas, by island or island group.

Island or Group	Vegetation Zone												
	4	A	B	C	D1	D2	D3	E1	E2	E3	5	6	7
Ni'ihau	--	--	--	--									
Kaua'i	0/1	0/2	0/2	0/3	--	0/3	0/1				0/1	--	2/3
O'ahu	0/1	--	--	0/2	--	0/1	0/1				0/1	--	1/5
Moloka'i	--	--	1/0	1/0	--	1/0	1/0				1/0	1/0	1/0
Lana'i	--	--	--	--	--	--	--					--	--
Kaho'olawe	--	--	--	--									
Maui	2/0	--	--	1/0	1/0	2/0	2/0	2/0	2/0	2/0	1/0	2/1	2/1
Hawai'i	1/0	1/0	1/2	1/2	0/2	1/5	1/2	2/4	2/3	1/2	--	1/1	1/1
Offshore Islets	35/0												
Lee Hawaiian Islands	7/0	--	1/0										
	----	----	----	----	----	----	----	----	----	----	----	----	----
Total	45/2	1/2	3/4	3/7	1/2	4/9	4/4	4/4	4/3	3/2	2/2	4/2	7/10

* See Appendix.

Legend:

-- none protected.

blank indicates habitat type does not occur on that island.

1/2 number of legally protected areas with active threat control program/number of areas with legal protection or active threat control.

island. All of Moloka'i's upland habitat protection is concentrated in a single protected area.

RARE SPECIES PROTECTION

Our protected natural areas should also include the fullest possible representation of the Hawaiian flora and fauna. There are difficulties in making accurate assessments of the species coverage of our natural areas, again due in part to the lack of survey data from large State-owned lands. Most current field information on rare plant and invertebrate species is in the heads of field biologists. There is no single repository or standard format for these data; thus, they are not available for protection planning. Nevertheless, examples from the major groups of organisms give a fair indication of our progress in Hawaiian species protection.

Of the 820 Hawaiian taxa included in Federal Register 45(242) (U.S. Fish and Wildlife Service 1980), approximately 125 or 15% are believed to occur within actively managed, legally protected natural areas. This does not include those plant species protected in arboreta. The Nature Conservancy's Heritage Program has recently compiled all available population data on 75 of O'ahu's rarest native plants. Of these, none have populations within a fully protected natural area.

Current protected natural areas include significant habitat for 10 of the 19 endangered or threatened Hawaiian forest birds. This legally and biologically protected habitat is probably adequate for long-term survival of only 3 rare bird taxa (Hawaiian goose; palila, Loxioides bailleui; and crested honeycreeper, Palmeria dolei) (Scott et al., in press). A significant portion of the essential habitat for endangered passerine birds on the island of Hawai'i is included within legally protected natural areas. However, only about 8% of this habitat is included in an active threat control program.

Hawaiian waterbirds and seabirds have received more protection than any other endangered group in their very limited remaining habitat. However, pressures on this remnant habitat are exceptionally great, and the manpower and funds available for threat control on many sanctuaries are very limited.

It is especially difficult to assess how much of our invertebrate fauna is included in protected areas, or to assess priorities for protection of particular taxa or habitat locations. Of 19 species in the endemic and endangered land snail genus Achatinella, none is protected in an area with an active control program

for introduced predators, ungulates, or exotic plants. The only direct threat control program for Hawaiian land snails is at The Nature Conservancy's Kamakou Preserve on Moloka'i. This may be the only direct protection work under way for any terrestrial invertebrate in Hawai'i, and even this program must be described as "bare bones." Generally, invertebrates, more than other groups, must be indirectly protected by protecting their habitat.

Our native freshwater fauna owes any protection it currently enjoys primarily to the ruggedness or remoteness of remaining habitat. In the entire State, only one stream is legally protected and managed for the perpetuation of native species.

WHERE DO WE GO FROM HERE?

If it's an ark we're building as a legacy for the future, clearly we have a few missing passengers, and the boat is too small. The task before us now is to make the most of what we've already invested in natural areas protection, and of the limited resources available for the protection of additional areas. Here are a few suggestions.

1. We need to establish an ongoing data base to further determine which species and ecosystems are most in need of protection and where they can best be protected. This should be an objective source of standardized information accessible to all land use planners. At this point, we only have such data for Hawaiian birds. An essential part of this data base will be a definitive classification of Hawaiian ecosystems. Several agencies and organizations currently involved in collecting rare species data have met in order to coordinate their efforts into a product useful to all interested parties. This group includes the U.S. Fish and Wildlife Service, Bishop Museum Department of Botany, the State Division of Forestry and Wildlife, and The Nature Conservancy of Hawai'i. Once we have such a data base, we will be able to rewrite this paper and accurately represent just what and how much has been protected.

2. We need to support management (threat control) efforts for those priority ecosystems and species already included in legally protected natural areas. The commitment must be for long-term efforts. Specifically, we should:

(a) Plan and implement long-range threat control programs for all State NAR's. Priority natural areas presently in the conservation district but outside the NAR's should receive focused threat control

NAR.
118
new
NAR.
7
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through inclusion in the NAR system or through inclusion in a State Wildlife Sanctuary.

(b) Open selected NAR's and "Protected" Conservation Subzone lands to public hunters under liberal hunting seasons and bag limits as part of an ongoing program of ungulate reduction. (1000)

(c) Promote community volunteerism for active management of native elements in accessible areas such as State and county parks and some wildlife sanctuaries.

3. We need to provide perpetual legal protection for several areas well protected due to their natural isolation and ruggedness, before new disturbances greatly increase costs of long-term management. Examples are the Oloku'i Plateau on Moloka'i, Lihau Peak on West Maui, and several offshore islets. These are natural preserves requiring very little active management other than monitoring for alien species invasion. They also host some of our most intact native systems.

4. Clearly, additional areas need to be protected. In designing these, we need to include a commitment to perpetual management. This can be very costly, especially for an economy already stretched paper-thin over its present conservation programs.

5. To expect people to dedicate the resources necessary to fulfill this conservation commitment, we must improve the credibility of native species conservation. We must emphasize the importance of natural diversity to watershed quality, genetic resources, aesthetics, and local culture. And we must be prepared for the idea that we can't try to save every piece of land with Hawaiian species on it if we are to succeed in protecting the best remaining areas.

If a thousand years from today there are large areas of native landscape in Hawai'i, it will be because the people cared enough to save them, cared enough to keep natural areas protected even in the face of other potential uses for these lands. The long-term success that we all hope for depends on the people's appreciation of the land. The best prospect for making that future happen is to show today's people the value of our natural heritage and to show them how to care for it.

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APPENDIX

Overview of Ecological Zonation Scheme for the High Hawaiian Islands

Zonal Ecosystems [controlled dominantly through macroclimate]

1. Xerotropical (leeward lowland to submontane)
 - A. Savannah and dry grassland [Prosopis savannah and Heteropogon-Rhynchelytrum grassland]
 - B. Dryland sclerophyll forest (or scrub) [Metrosideros-Diospyros open forests; replacement vegetation: Leucaena scrub and forest]
 - C. Mixed mesophytic forest (woodland or scrub). C1 low phase, C2 high phase. [Acacia koa open forests; replacement vegetation: Psidium guajava, Eugenia cumini forests or woodland]
2. Pluviotropical (windward lowland to upper montane)
 - D1. Lowland rain forest [Metrosideros forests]
 - D2. Montane rain forest [Metrosideros-Cibotium and dominantly Cibotium forests]
 - D3. Upper montane rain or cloud forest [Cheirodendron or Acacia koa-Metrosideros mixed forests]
3. Cool tropical [upper montane to alpine; only on Maui and Hawai'i]
 - E1. Mountain parkland and savannah [Acacia koa-Sophora chrysophylla tree communities, Deschampsia tussock grassland]
 - E2. Subalpine forest and scrub [Sophora-Myoporum tree communities, Styphelia-Vaccinium-Dodonaea scrub communities]
 - E3. Sparse alpine scrub [Styphelia, Vaccinium] and moss desert [Rhacomitrium lanuginosum var. pruinatum]

Azonal Ecosystems [controlled largely through edaphic factors]

4. Coastline

- . windward (beach, dune and rock substrates) [Scaevola scrub, Pandanus and Hibiscus tiliaceus forests]
- . leeward (beach, dune and rock substrates) [Prosopis scrub and woodland]

5. Bogs

- . low- and mid-elevation bogs
- . montane bogs [dwarf Metrosideros]

6. Geologically recent

- . vegetation on new volcanic materials [e.g. Metrosideros-Sadleria, Gleichenia, and Lycopodium]
- . lava tubes and other recent geological features

7. Aquatic

- . fresh water lakes
- . streams
- . coastal brackish and marine ponds

8. Cliffs

Note: Information synthesized by Gagne and Mueller-Dombois (n.d.) from earlier works. Letter symbols adapted to map in Ripperton and Hosaka (1942).

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