CONTROLLING EXOTIC PLANTS IN HAWAII VOLCANOES NATIONAL PARK

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INTRODUCTION

The Johnny Appleseed Syndrome is supremely manifest in Hawai'i. There are more introduced plant species growing here than there are endemics--a tragic affront to a natural system which is distinguished by plant endemism of 96%. In Hawaii Volcanoes National Park (HAVO) there are twice as many exotic species as natives. It is the mission of resource managers to attempt to neutralize the impact of foreign plants on the natural environment.

People began bringing plants to the Hawaiian Islands 1500 years ago. The early human-carried plant arrivals probably did not cause serious disruptions of native plant communities, at least beyond the immediate confines of cultivated fields and house sites. Species such as coconut, taro, ti, kukui, etc., are, in fact, regarded by National Park Service managers as innocuous and are protected as if they were native plants. However, non-native plant arrivals since the colonization of Hawai'i by Europeans, North Americans, and Asians during the past 200 years have been massive and in some instances ecologically disastrous (as have been most animal introductions). Plant pests of concern to modern land managers are escapees from commercial plantations of one sort or another, ornamentals gone wild, accidental introductions, or introductions made by specific land management interests. For the most part, these exotics have arrived without their natural inhibitors, and have freely exploited the Hawaiian environment.

THE PROBLEM

In Hawaii Volcanoes National Park, over 400 exotic plant species are included in our flora. Thirty-seven of these are the subject of special concern because they cause significant disruption of native plant and/or animal communities or they seriously detract from the natural landscape. These species are listed in Table 1.

Some of the exotic species which concern National Park Service managers do so because of our unique and distinctly non-commercial mandate: to preserve natural systems and to promote natural processes. Other Hawai'i land managers, because of their obligations to promote economic interests, would not compose a listing identical to that in Table 1.

Broomsedge (Andropogon virginicus L.) and beardgrass (A. glomeratus (Walt.) BSP.) are probably the most widely distributed exotic plants in the Park. Natives of the southeastern United States, these insidious grasses have invaded native 'ōhi'a (Metrosideros collina (J. R. & G. Forst.) Gray) forests from the margins of the rain forest to the drier and cooler margins of the 'ōhi'a woodlands and beyond into shrub and grassland communities. Not only do broomsedge and beardgrass occupy space which would be partly utilized by native herbs and shrubs, such as pili (Heteropogon contortus (L.) Beauv. ex R. & S.); 'a'ali'i (Dodonaea eriocarpa Sm.); and 'ōhelo (Vaccinium reticulatum Sm.), but these aggressive grasses have a notorious association with fire. They are highly flammable throughout most of the year, their tiny seeds are able to disperse widely, and they readily colonize burnt areas. These qualities confound management attempts to protect resources from unplanned fires, to utilize prescribed fire to combat exotic plants, and to reintroduce natural fire to our fire-type vegetation communities.

Firetree (Myrica faya Ait.) is rapidly invading 'ōhi'a woodlands. This aggressive native of the Azores, Canary, and Madeira Islands (where it receives government protection!) is an escapee from long-abandoned reforestation and fuel wood plantations. Its close association with 'ōhi'a trees and its small berry-like fruits, suggest dispersal by birds. We have noticed that in some areas where the native 'ōhi'a stand has been burnt, firetree occupies space more rapidly than 'ōhi'a, which usually sprouts vigorously after fires. We believe that without our intervention firetree is capable of replacing the native 'ōhi'a and its associates, at least during the early stages of invasion.

Banana poka (Passiflora mollissima (HBK.) Bailey) is a relative newcomer to the Park. In its native high elevation Central and South American forest habitat, this plant occupies a restricted niche. It has gained a foothold in parts of our 'Ōla'a Tract rain forest and surely is destined to spread to other parts of the rain forest inside and outside of the Park, thanks partly to the ubiquitous feral pig (Sus scrofa L.). This plant's behavior in other parts of Hawai'i Island has shown that it is impossible to control by mechanical or chemical methods, and that it relentlessly suppresses entire stands of native koa (Acacia koa Gray) and 'ōhi'a forest. Since banana poka is closely related to passion fruit (P. edulis Sims), a commercially grown Passiflora, State agricultural interests have steadfastly refused to support introductions of biological control organisms, the only practical means of controlling this serious plant pest, and ultimately most others.

Fountaingrass (Pennisetum setaceum (Forsk.) Chiov.) is a native of northern Africa. An escaped ornamental, it has become well-established on parts of the western and northern slopes of Mauna Kea, Hualālai, Mauna Loa, and in pastures of the Kohala Mountains. It has been found recently in parts of the Park, and has been eradicated, but perhaps not in time to contain the millions of light, easily-carried seeds produced here. Fountaingrass would quickly cover lava flows, new ash soils, and sands if not checked. Our eradication efforts now may merely forestall the inevitable invasion of this menace.

Each of the 33 remaining species in Table 1 has its peculiar history and poses its unique threat. Some species we may be able to control, others we surely will not. The function of management is to recognize what is possible, and then do it by the most efficient and ecologically correct method(s) known. It is within this realm that scientists and managers must work together closely. It is indeed the primary theme of this Conference.

A PLAN OF ACTION

In formulating a plan of action to control exotic plants in Hawaii Volcanoes National Park, we relied heavily upon scientists and concerned citizens for guidance. A selected group of interested people, mostly non-NPS employees, were asked to provide verbal or written comments on the initial draft of an exotic plant control action proposal for the coming year. Comments were extensive, particularly concerning work priorities, and did much to further our understanding of the immense problem at hand.

The draft was rewritten, incorporating suggestions which arose during the review. This revised document constitutes our plan of action for the year. It contains an outline of exotic plant problems in the Park, a brief history of management action to date, and a listing of research needs. The core of the plan lists exotic plant control projects, in priority order, which we intend to undertake. About one-third of these projects have been completed by Conference time.

A METHOD

Exotic plant control work is complicated. Some species are widely distributed, others are localized; some occur in dense stands, others are scattered; some must be poisoned, others can be cut or uprooted; some must be re-eradicated frequently and regularly, others require less attention. A method has been developed which, we expect, will enable us to locate and evaluate exotic plants prior to control work, carry out the work efficiently and sensitively, and evaluate our control efforts accurately.

Each target exotic plant has its own file. The file contains an outline map of the Park showing the Park-wide distribution of the species. In several instances larger scale maps show more precise distribution. These large-scale maps are used also by field workers who carry out survey or eradication assignments.

All data on exotic species are inserted into the appropriate file as they are gathered. In all cases, the file includes the results of initial and follow-up surveys, the results of all control work undertaken by current methods, and in some cases, meager information about control work done in years past. Survey and control work is documented on a data sheet which proves summaries of stand extent, density, age, and reproductive capacity. The amount of information required on data sheets is deliberately kept to a minimum in order to avoid the common hazard of allowing the process to dominate the product. Data we have been getting by this method is adequate to enable us to plan and evaluate work, which is the primary intent.

The method of surveying involves sampling an assigned area by simple measuring with pacing and by orientation with a good quality hand-held compass. These skills can be learned quickly (including metric distances) by most field people. The field person travels along a cardinal bearing, and searches a specified distance, usually 15 or 20 m, on either side. He or she calculates the distance along the bearing, usually in 10-meter increments, and at the same time makes note of the subject exotic species. At convenient points along the course, usually 100- or 500-meter intervals, the searcher will summarize observations on the data sheet. Intervals between compass courses are 100 m to 300 m, depending on the sample size needed.

The completed survey provides not only an accurate distribution of the subject plant species, plus some crude information about stand age and density, but it also provides an excellent baseline against which to measure the results of control work or other changes in stand structure if no work is done.

With only minor modification, the same method and same data sheet can be used to record control work. The advantages of this system are compelling, particularly the simplicity which allows field people to get on with the task of locating or destroying exotic plants without being confounded by an unnecessarily complex reporting procedure.

The method is adequate for the manager, who, after all must combine a sometimes bewildering mix of costs, science, ethics, personalities, priorities, and above all, ecological land management.

LITERATURE CITED

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TABLE 1. Exotic plant species of concern to Park managers.

Scientific Name	Action Planned	Common Name
	No Control Action Planned	
Andropogon glomeratus (Walt.) BSP.		Beardgrass
A. virginicus L.		Broomsedge
Buddleja asiatica Lour.		Buddleja
Melinis minutiflora Beauv.		Molassesgrass
Microlaena stipoides (Labill.) R. Br.		
Pennisetum clandestinum Hochst. ex Chiov.		Kikuyugrass
Setaria palmaefolia (Koen.) Stapf.		Palmgrass
Tricholaena rosea Nees		
	No Control Action Planned; Support Biological Control	
Passiflora mollissima (HBK.) Bailey		Banana poka
	Control through Protection of Insect Parasites	
Lantana camara L.		Lantana
	Control in Selected Areas	
Anemone hupehensis (Lem. & Lem. f.) Lem. & Lem. f.		Anemone
Crotalaria spectabilis Roth.		Rattle-pod
Hedychium sp.		Ginger
Myrica faya (Ait.)		Firetree

Passiflora edulis Sims	Liliko'i
Psidium cattleianum Sabine	Strawberry guava
P. guajava L.	Guava
Rubus penetrans Bailey	Blackberry
Schinus terebinthifolius Raddi	Christmas berry
Tritonia crocosmiflora Nichols.	Tritonia

Eradicate Where It Occurs in the Park

Casuarina equisetifolia Stickm.	Ironwood
Eucalyptus sp.	Eucalyptus
Fraxinus sp.	Ash
Fuchsia magellanica Lam.	Fuchsia
Grevillea robusta A. Cunn. in R. Br.	Silk oak
Leucaena leucocephala (Lam.) de Wit	Haole koa
Linociera ligustrina Sw.	Olive
Nasturtium sp.	Nasturtium
Opuntia sp.	Cactus
Pennisetum setaceum (Forsk.) Chiov.	Fountaingrass
Phyllostachys sp.	Bamboo
Ricinus communis L.	Castor bean
Rubus ellipticus Sm.	Raspberry
Tibouchina urvilleana (DC.) Cogn.	Tibouchina

Maintain Surveillance

Eupatorium riparium Regel	Hāmākua pamakani
Gomphocarpus physocarpus E. Mey.	Balloon plant
Passiflora ligularis Juss.	Passion fruit