

CONTROLLING WEEDS IN NATURAL AREAS IN HAWAII: A MANAGER'S PERSPECTIVE

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ABSTRACT

Managers of most natural areas in Hawaii have a simple mandate: to know, restore, protect, and maintain native ecological communities and natural processes. Applying this to management of nonnative plants requires skillful evaluation of ecological principles and consideration of manpower and financial limits. Professional opinions, lay public demands, and even administrative preference must be considered. Hawaii Volcanoes National Park integrates most of these considerations in order to delineate priority categories for alien plant control work. The Park prioritization guide is a useful model for other lands, even those with more complicated land use mandates. Nonnative species that are disruptive (because they replace native species and communities) and those that are benign (because they do not dominate) are distinguished, and disruptive species are categorized according to distribution. Localized species are prioritized and placed on a control schedule, whereas widely distributed species are targeted for control only in designated areas, called Special Ecological Areas. Funding and staffing levels are inadequate for parkwide control of widely distributed disruptive plant species.

MANDATES AND OBJECTIVES

In Hawaii, the National Park Service manages Haleakala and Hawaii Volcanoes National Parks, as well as smaller historical parks and sites on Hawai'i Island, Maui, Moloka'i, and O'ahu. The Service operates under a land management mandate to maintain native plant and animal communities and the natural processes that shape them, and to minimize unnatural disturbances. "Native" is defined as endemic or indigenous. Species introduced by Polynesian settlers prior to the arrival of Europeans in the late 1770s are usually not disruptive of native communities or have cultural values. "Natural" is defined as unaffected to a great degree by humans, in the past or present, including subsequent restoration (removal of aliens and/or replacement or some encouragement of natives.) The

Service mandate may be contrasted with that of ranching or agriculture, which have the objective of producing food or money. It also contrasts with mandates of multiple use agencies such as the U.S. Forest Service or the Hawaii Department of Land and Natural Resources, which include resource conservation, commercial resource exploitation, and recreation. The mandates of the U.S. Fish and Wildlife Service, the Hawaii Natural Area Reserves System, and the privately endowed Nature Conservancy most nearly resemble that of the National Park Service, in that these three entities manage lands primarily to conserve natural resources. The mandates of all the interests listed are valid and serve the collective needs of Hawai'i's people.

The intent of National Park Service management is to restore and maintain the ecological diversity of plant and animal communities, to maintain native ecosystems, and to promote natural dynamics with minimal human interference. Native plant and animal communities in the areas we manage have been disrupted by ungulates, predators, alien plants, and other disturbances. Managers, therefore, must remove introduced species in order to restore natural communities and processes. We recognize that ecosystems will change, in community composition, structure, and distribution. We know that some species will naturally disappear, that some will evolve, and that these changes will occur over a very long period of time, as they did prior to the arrival of technological human societies in Hawai'i in the 18th century. We also realize that some changes brought about by humans are irreversible. National Park Service management objectives might be viewed as attempting to neutralize, where practical, some of the changes imposed on native Hawaiian ecosystems after the arrival of James Cook's expedition in 1778. The National Park Service is implementing a Congressional mandate that presumes inherent value in preserving for human society remnants of wild, natural America. In attempting to manage toward this end, we acknowledge our rudimentary understanding of Hawaiian ecological processes.

The magnitude of disruption of Hawaiian ecosystems sometimes seems overwhelming. Many of the animals and plants brought to the Islands during the past two centuries have become established, especially in lowland areas, and have thoroughly changed the landscape. In some instances the changes have been deliberate (e.g., conversion of native forests to plantation agricultural systems and ranchland pastures, introduction of wild ungulates to forests for recreational hunting, and conversion of lowland beach strands for tourist recreation). In other instances, changes have not been deliberate, for example, conversion of native dry forest to flammable fountain grass (*Pennisetum setaceum*) lands in western Hawai'i, statewide degradation of rain forests and montane forests by feral ungulates, and the early degradation of forest bird habitat caused by mosquitoes. As a consequence of both deliberate and accidental changes, however, only remnants of native plant and animal communities remain in Hawai'i, some in Hawaii Volcanoes and Haleakala National Parks. Even native plant and animal communities in these protected areas are deteriorating because of aggressive species of introduced plants and animals. In the remainder of the paper, I will consider how the National Park Service makes difficult choices in selecting target weeds for control.

SELECTING TARGET SPECIES FOR MANAGEMENT

The plant checklist for Hawaii Volcanoes National Park includes approximately 725 vascular species (Higashino *et al.* 1988). Approximately 475 (66%) of these are introduced or alien. The list of approximately 250 natives is missing some species that have become extinct or are no longer able to survive in the Park. The nonnative species in the checklist include a variety of life forms and threats. However, because many introduced species are not invasive, it is clearly unnecessary to control all of them, even if it were possible to do so. The manager's job is to identify which nonnative plants are relatively harmless and which are disruptive; then a decision must be made about which disruptive species should first be targeted for control.

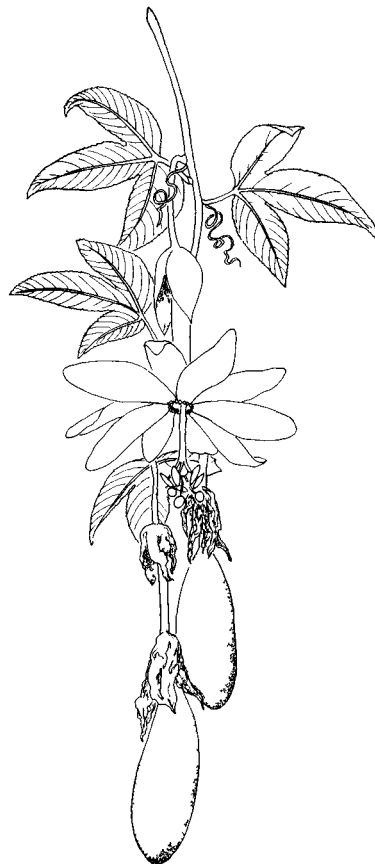
We have identified 53 species from the list of 475 aliens as actually or potentially disruptive. Disruptive species are defined as those threatening the integrity of native plant communities because they displace native species, hinder native plant reproduction and growth, or alter community dynamics (such as changing the fire regime, soil structure, nutrient cycling, or soil chemistry, etc.). Good examples of disruptive alien species include banana poka (*Passiflora mollissima*), which smothers native vegetation in 'Ōla'a Tract in the Park; fountain grass, which alters fire regimes in the Ka'ū Desert; firetree (*Myrica faya*), which alters nutrient cycling in submontane 'ōhi'a (*Metrosideros polymorpha*) forests; kähili ginger (*Hedychium gardnerianum*), which displaces native vegetation in 'ōhi'a rain forests; and strawberry guava (*Psidium cattleianum*), which changes forest composition by shading out native species in 'ōhi'a forests from 500 to 5,000 ft (150-1,525 m) elevation. These species are discussed by others in this volume. Aesthetic factors usually are not seriously considered in evaluating an alien plant's disruptive potential. For example, the aesthetically out-of-place eucalypts (*Eucalyptus* spp.) at Nāmakani Paio Campground, the pines at 'Ainahou Ranch, and the fuchsias (*Fuchsia magellanica*) at Thurston Lava Tube are relegated to low priority for control because they are localized, non-disruptive species.

The Division of Resources Management program at Hawaii Volcanoes is under strict funding and manpower constraints and therefore must prioritize the list of 53 target species to bring the workload into line with financial means, and the chances of success. Target species have been categorized into two general groups: widely distributed (16 species) and localized (37 species). Species within each category have been prioritized according to feasibility for control, with an intent to promote ecological resources management as well as demonstrate positive results. Widely distributed alien plant species cannot be controlled throughout their range because of funding and staffing limits, so they are controlled only in areas where native vegetation is relatively intact and where we are able to maximize success. Management of these Special Ecological Areas is described in Tunison and Stone (this volume). Localized alien plant species are confined to small enough areas to enable workers to control them and thus prevent their spread and possible attainment of

uncontrollable status. This aspect of the vegetation management program is described by Tunison and Zimmer (this volume).

APPLICATION

The selection and prioritization process practiced at Hawaii Volcanoes National Park has several applications. **First**, it gives an otherwise overwhelming alien plant control problem a systematic framework within which certain decisions about weed control work can be made. The framework also identifies needs for future work and funds, regardless of any probabilities we will ever receive adequate funds and manpower. **Second**, the selection and prioritization process also articulates procedures and objectives for others, namely administrators, other agencies, and the lay public. **Finally**, the selection and prioritization process presents an opportunity for regional cooperation. The system helps solve shared problems by fostering communication among State, Federal, and private land managers. The degree to which responsible authorities outside of the Park share concerns about fountain grass, banana poka, firetree, clidemia (*Clidemia hirta*), and Christmas berry (*Schinus terebinthifolius*) is affirmation of this. I anticipate that we will eventually conduct regional control programs for some alien plant species, as we have done already on a limited scale for firetree.



Literature Cited

- Higashino, P.K., L.W. Cuddihy, S.J. Anderson, and C.P. Stone. 1988. *Checklist of vascular plants of Hawaii Volcanoes National Park*. Tech. Rep. 64, Univ. Hawaii Coop. Natl. Park Resour. Stud. Unit. Honolulu.
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