



OISC

O'AHU INVASIVE SPECIES COMMITTEE



2006 STRATEGIC ACTION PLAN

O'ahu Invasive Species Committee

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The O‘ahu Invasive Species Committee (OISC) is a partnership of public and private organizations and individuals united to eradicate incipient invasive species, stop established species from spreading and prevent new invasive species infestations. The group is concerned with all non-native invasive species threatening agriculture, watersheds, native ecosystems, tourism, industry, human health and the quality of life on O‘ahu.

OISC evolved out of the Fountain Grass Working Group—a group of individuals from state agencies and conservation organizations who volunteered their time to control the spread of fountain grass on O‘ahu. In 2000, the group expanded its activities to address the gaps in existing management of invasive species on the island and form an entity that could attract funding for the work. This entity became OISC. OISC currently focuses its efforts on 10 of the most deleterious invasive species on the island, of which 2 have been functionally eradicated from O‘ahu.

Partners and Funding

OISC receives funding from several sources; the Hawai‘i Invasive Species Committee, the Department of Land and Natural Resources—Division of Forestry and Wildlife, the U.S. Fish and Wildlife Service, the City and County of Honolulu, the U.S. Forest Service and the Honolulu Board of Water Supply.

In addition to our funders, our many partners assist with our success. Our partners help us manage target species, support our administrative tasks and provide taxonomic assistance. OISC is a project of the Pacific Cooperative Studies Unit, a conservation and research-based organization that operates under the University of Hawai‘i Department of Botany. The Bishop Museum helps us identify unknown plants that may be invasive species new to the island. In addition to providing funding, the Division of Forestry and Wildlife provides logistical support with surveys and control work and provides OISC a baseyard and office space. The Hawai‘i Department of Agriculture, the Ko‘olau Mountain Watershed Partnership, U.S. Army Department of Public Works, Environmental Division and the Nature Conservancy all assist us to survey sites where target species may be. Several dedicated individuals give their time to sit on the OISC committee and help steer the organization.

OISC Activity Areas

Control, containment or eradication of target invasive species

In order to best utilize resources in the daunting battle against invasive species, OISC focuses its efforts on protecting the island from notorious invaders before they become established where there is the greatest return for the effort invested. OISC’s current target species and subsequent management of them have been chosen and ratified through an annual priority meeting. OISC committee members and staff choose the target species according to the danger they present to the environment, economy or quality of life on O‘ahu and the feasibility of eradication or containment.

Once all populations of a target species have been removed, they are considered functionally eradicated and moved to monitor status. The goal for some species is a localized eradication—for example, eradication in the Ko‘olau range only. Further information can be found in the individual species profiles below. OISC revisits previous control sites to ensure no recruitment has taken place.

Current OISC target species are:

Miconia (<i>Miconia calvescens</i>)	Smoke bush (<i>Buddleia madagascariensis</i>)
Coqui frog (<i>Eleutherodactylus coqui</i>)	Fountain grass (<i>Pennisetum setaceum</i>)
Himalayan blackberry (<i>Rubus discolor</i>)	Fireweed (<i>Senecio madagascariensis</i>)
Bush beardgrass (<i>Schizachyrium condensatum</i>)	Pampas grass (<i>Cortaderia ssp.</i>)

OISC target species to monitor are:

Fire tree (*Morella faya*)
Glory bush (*Tibouchina urvilleana*)

Early detection and rapid response:

As the current target species migrate from target species to species to monitor, OISC will integrate into our work early detection and rapid response to newly arrived potential invasives. This new focus will serve the greatest need in protecting the environment, economy and quality of life on O'ahu by stopping potential pests before they have a chance to infest an area. In 2006, OISC, in conjunction with the Bishop Museum, will begin to implement an early detection program in order to develop the capacity to continually monitor and assess the highest priority sites and commercial plant pathways on the island. Through this grant, OISC intends to develop a comprehensive early detection and rapid response program that will be an integral function of our organization.

OISC helps to protect a wide range of environments by targeting selected invasive species. We help to protect wet forest ecosystems and native species by controlling miconia and Himalayan blackberry. Preventing fountain grass from moving to the drier leeward part of the island will lessen the hazard of brush fires there. Residential areas benefit from the removal of coqui frogs.

Seven of OISC's 11 full-time staff work in the field surveying and controlling OISC target species. OISC field staff do the actual digging up and pulling out of pests. They hike the back country rainforest of the southern Ko'olau looking for miconia, control bush beardgrass in residential areas of Kāne'ohe and survey gulches in Wahiawā for smoke bush. Because the goal for most species is eradication, OISC surveys both public and private land. Field staff take GPS points when they find target species and enter the data into OISC's database.

Data collection and mapping of target species and control efforts

The OISC field crew uses GPS units and traditional navigation techniques to map all survey areas and target species locations. All field work is meticulously tracked via field forms. This information is in turn digitized in ArcMap to analyze and map target species distribution. An Access database tracks the number of species found and removed. OISC utilizes these tools to determine survey areas and calculate the time needed to do the work. Additionally, OISC works with the other ISCs to standardize data and evaluate management efficacy across the state.

Assisting other agencies to respond to invasive pests

OISC field crew are trained to be brown tree snake rapid responders. Along with other state agencies, OISC assists the state Department of Health with its West Nile Virus detection efforts by picking up dead birds for testing. OISC helps the Department of Agriculture survey for false kava and fireweed.

Educating the community about the threat of invasive species and preventing their spread

In the past year, OISC has given presentations at the Landscape Industry of Hawaii (LICH) conference, the University of Hawaii weed science class and the Kanu i Kalo festival at Ma'ema'e elementary school. OISC also staffed booths at several public events including Earth Day at UH, the 'Awa festival, the 2nd Annual Wahiawā Pineapple Festival and Pālolo Pride.

On July 26, 2005, OISC's efforts against bush beardgrass made the front page of the Honolulu Advertiser. Also in July, the Associated Press wrote an article that mentioned OISC's work controlling coqui frogs. The article was picked up by both the Advertiser and the Star-Bulletin.

OISC field staff were featured on a documentary on invasive species in Hawai'i airing on public television. OISC also aired PSAs to increase public awareness and detection of coqui frog. The PSAs aired on KSSK and other Clearwater Communication channels during the coqui calling season (May-September) when coqui are most likely to be heard.

Finally, OISC runs a monthly Saturday volunteer work trip that is open to the public. This has proven to be an effective way to utilize volunteer resources for our program in addition to an effective outreach tool.

A new full-time outreach specialist has been hired who serves as an outreach extension of our field crew focusing on accessing private property, increasing detection of our target species, and garnering public support for OISC invasive species efforts.

Supporting statewide efforts by the Coordinating Group of Alien Pest Species and other invasive species committees to affect policies relating to invasive species such as imported plant screening, and revision of the state Noxious Weed List. OISC representatives attend CGAPS meetings, present at legislative briefings, and give public testimony when needed. OISC works with partner agencies to enact and implement changes in order to more effectively combat invasive species. OISC is working collectively with invasive species committees on other islands to revise the Hawai'i State Noxious Weed List and add target species that are not currently listed.

The Invasive Species Problem in Hawai'i

Alien species (also termed exotic or non-native species) are species that have been moved deliberately or inadvertently beyond their natural range as a result of human activities. Invasive alien species are those that spread from the point of introduction and become abundant threatening the environment, economy and human health.

Alien species threaten biological diversity and human welfare worldwide. Fire-adapted grasses can increase the frequency and intensity of brush fires. Plants with shallow root systems can overtake forests and increase landslides. Weeds poisonous to livestock can ruin pastures. Mammals, safe from the natural predators that keep their numbers down, prey on native birds and their young, driving them to the brink of extinction.

Islands are especially vulnerable to the deleterious effects of invasive species. Island organisms evolve in isolation from the many forces that shape continental ecosystems, such as herbivorous mammals, eusocial insects, diseases, and frequent fires. Hawai'i's environment and economy are

especially vulnerable to invasion by alien species because of its role as a transportation hub and tourist destination.

Due to its extreme isolation, hundreds of plants and animals that are found nowhere else on earth have evolved in the Hawaiian Islands. Ninety-five percent of all native insects, 91 percent of all native flowering plants, and 100 percent of the remaining native forest birds are unique to Hawai'i. It is our goal to protect these remaining species from invasive species that will crowd out their habitat and deplete the resources they need to survive.

Hawai'i also has the highest number of endangered and threatened species in the nation. More native species have been extirpated in Hawai'i than anywhere else in the United States. There are 349 endangered species and 14 threatened species in the State of Hawaii, 282 of which are plants. O'ahu alone has 101 federally listed and candidate endangered plant species, 56 of which are endemic to this island only. These species are primarily found on large tracts of intact native ecosystems that still exist at high elevations in the Ko'olau and the Wai'anae mountain ranges. Although habitat destruction has been an important cause of extinction and endangerment, the introduction of alien species has exacerbated biodiversity loss in Hawai'i over the past two centuries. The O'ahu Invasive Species Committee, in conjunction with its partners, is committed to preventing O'ahu's most serious threats from encroaching on these and other sensitive areas.

In addition to the threat to native plants and animals, invasive species pose huge threats to Hawai'i's tourism-based economy, agriculture, health, and general quality of life. The introduction of snakes, or red imported fire ants will make Hawai'i a less favorable tourist destination and will adversely affect the quality of life for Hawai'i's residents. Coqui frogs have already caused sleepless nights for those in infested areas, including hotel guests. Preliminary work by Kaiser Burnett and Pitt (2006) suggests that the piercing coqui call has lowered housing prices in infested areas. Coqui frogs have already resulted in a quarantine of Hawai'i nursery exports to Guam.

In a study published by the Nature Conservancy estimated that the economic impact from just miconia, the red imported fire ant and the brown tree snake alone could cost Hawai'i \$180 million dollars annually (Huffman 2002). The state recognizes the threat posed by invasive plants and has placed 79 species on a Noxious Weed List. DLNR has an "injurious wildlife" list that makes it illegal to transport certain vertebrate species.

Hawai'i's island-level Invasive Species Committees (ISCs) became active in the 1990's with the goal of responding to threats from alien pest infestations and controlling established pest populations. The Maui Invasive Species Committee (MISC), the Moloka'i subcommittee of MISC (MoMISC), the Big Island Invasive Species Committee (BIISC), the Kaua'i Invasive Species Committee (KISC), and the O'ahu Invasive Species Committee (OISC) all battle against invasive species. Each ISC is a voluntary partnership of county, state, and federal agencies, private businesses, nonprofit organizations, and individuals united in cooperative efforts to control the alien pest species that pose the greatest threats to each island's ecosystems, watersheds, economy, public health, and quality of life.

In 2005, through a series of species strategy meetings, OISC re-assessed management of all its target species, analyzing the species locations, buffering survey areas and re-evaluating treatment methods. Through this process we have applied a management model similar to what we use for miconia to all

our species. This model systematically buffers areas around all historical species locations to determine which areas to survey and establish the frequency of control and maintenance. This methodology provides us a roadmap to follow for the coming year and a tangible gauge of success. The results of this process were incorporated into the species profiles below. The species profiles present the goals and strategies for each of our targets.

MICONIA

(*Miconia calvescens*)

Goal: Island-wide eradication

Habitat: Disturbed rainforest of the lower Ko'olau mountains.

Hawai'i State Noxious Weed list: Yes



Threat: Introduced to Tahiti in the 1930's, miconia has proved to be destructively invasive there.

Uniform stands of miconia can be found on Maui and the Big Island. Native to South and Central America, it is shade tolerant and grows quickly in sunlight. It produces fruits with millions of tiny seeds and shades out surrounding vegetation once it matures. Single-species stands of miconia threaten the health of O'ahu's watershed in two ways: the broad leaves shade out native vegetation,

eliminating the filtering and percolating function that these plants provide. The shallow root systems cannot hold the soil on the steep cliffs typical of eroded volcanic Pacific Islands. Landslides could therefore become more frequent and more destructive in areas dominated by miconia (Loope and Kraftsow 2001). Miconia was introduced to an O'ahu botanical garden in 1961 (Medeiros and Loope 1996).

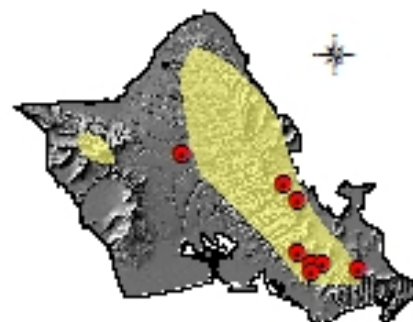
Management:

Miconia continues to be OISC's top priority target demanding over 56 percent of OISC's time and resources. Using data from three years of survey and control work, OISC has treated and mapped all known populations of miconia. With one exception, all these populations can be traced back to abandoned nursery sites or a single ornamental plant.

OISC places a one mile buffer around all seed-bearing trees: the inner 800-meters are surveyed by ground and the remaining area is surveyed by air. In addition, OISC surveys one mile downstream from all mature trees and obvious flyways. All areas within the ground survey buffer are re-surveyed every three years in order to exhaust the seed bank before recruitment reaches maturity. Currently there is no re-survey strategy for the aerial surveys. Recent OISC data analysis has proved the efficacy of the buffer system. In the three years that OISC has been surveying by air and ground for miconia, 99 percent of seedlings have been found within 800 meters of a mature tree.

Since July 2001, OISC has surveyed and cleared over 12,000 acres for miconia eliminating 8,268 plants of which 63 were mature. In 2005, with the largest field crew to date, OISC was able to survey 4,524 acres (2,247 ground / 2,275 aerial), controlling 2,873 plants of which only 9 were mature.

OISC's strategy in 2006 and 2007 is to continue surveying the rest of the land inside the buffer zone, prioritize re-survey areas with available resources and prioritize survey areas outside the buffer zone. Priority search areas outside the buffer will include abandoned nurseries and wild land areas that are



optimal habitat for miconia but do not receive conservation attention. Barring the discovery of any mature trees, OISC estimates that there are 3,000 acres of public land left to survey and approximately 5,600 acres of private land. However, discovery of a mature tree will extend the buffer.

Young miconia trees can usually be pulled out of the ground. Trees are hung upside down in the surrounding vegetation to die. Older trees are cut and their stumps covered with plastic. Field crew revisit the stump once every 6 months. Miconia begins to produce seeds in approximately five years. Therefore it is necessary to revisit the high-priority buffer areas every three years to catch seedlings before they mature.

Community Outreach:

Finding mature trees is the key to OISC’s eradication strategy. Therefore, OISC intends to increase its efforts to find mature trees by surveying all abandoned nursery sites located in miconia habitat. OISC will also work with hunter groups, Board of Water Supply workers and other conservation and forest users to increase the number of people looking for the plant.

Because the goal is island-wide eradication, it is necessary to survey and control miconia on private land. OISC has hired an outreach specialist who will work with large and small landowners to acquire right-of-entry for the OISC field crew. In 2002, the Hawai’i State Legislature passed a law that limits liability of landowners for workers surveying for or controlling invasive species on their land. The passage of this law has made property owners more willing to allow OISC field crew on their land. Many people have consented to allowing OISC on their property only after receiving a copy of the law (Hawai’i Revised Statutes 520A).

OISC survey areas:

Location	Source
Mānoa	Lyon Arboretum
Tantalus/Makiki	Brash Estate
Nu‘uanu	Marx Estate
Kalihi	Abandoned nursery
Maunawili	UNKNOWN. Closest mature tree is in Waimanālo (1.5 miles).
Waimānalo	Likely an abandoned nursery at the site where 4 mature trees have been found
Ka‘alaea	Hart and Tagami Art Gallery
Wahiawā	Wahiawā Botanical Garden
Waimea	Waimea Botanical Gardens*
Ha‘ikū	Probably from an abandoned nursery where a large cluster of trees, some showing evidence of cut stumps, was found

*The tree at the Waimea Botanical Gardens, now the Waimea Valley Audubon Society, never matured. OISC has surveyed the area, but found nothing.

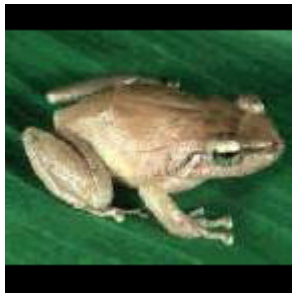
COQUI FROG

(*Eleutherodactylus coqui*)

Goal: Island-wide eradication, prevent further introductions, rapid response to reports of calls.

Habitat: Low to mid elevation rainforest, wet to mesic residential areas.

Injurious Wildlife: Coqui frogs are listed as “injurious wildlife” by the Hawai‘i Department of Land and Natural Resources.



Threat: The coqui frog is one of the most well-known of OISC’s target species. The male frog’s mating call has been measured at over 90 decibels, equal to that of a lawnmower garnering the species a lot of press. In their natural habitat in the Caribbean, natural predators keep coqui frog populations down, but on the Big Island, the frog densities can reach up to 23,076 an acre (Beard and Pitt 2005). A single coqui is loud enough to disturb sleep and on the Big Island, choruses of frogs keep tourists and residents awake. The presence of coqui frogs has



been included on disclosure statements in real estate transactions (Wu 2005). Preliminary research by Kaiser, Burnett and Pitt (2006) shows that the presence of the frog may impose localized damages to real estate values on the Big Island. Nurseries may have trouble exporting plants to the mainland and elsewhere if coqui becomes uncontrollable. Guam already requires nursery shipments to be treated for coqui before importation. Infested bromeliads from Florida that originated in Puerto Rico and were transported to residential areas in landscaping or nursery materials are the presumed source for coqui in Hawai‘i.

Although coqui are most widely known for their loud sleep-disturbing calls, they also present a threat to Hawai‘i’s native ecosystems. The frogs are voracious insect eaters, putting pressure on already threatened native insect populations, including native plant pollinators, and swallowing the prey base of the endangered ‘elepaio. The frogs may increase populations of already established invasives such as rats and mongoose, allowing the predators to reach even higher densities. They may also serve as a potential food source for snakes.

Management:

Coqui frog is the only vertebrate species that OISC targets. On Oahu coqui eradication is a collaborative of several committed partners that make up the coqui working group (CWG). The CWG includes: Hawai‘i Department of Agriculture (HDOA), Hawai‘i Department of Land and Natural Resources (DLNR), U.S. Army Department of Public Works, Environmental Division (DPW), the City and County of Honolulu, United States Fish and Wildlife Service and OISC. OISC serves as the coordinating entity of the CWG and subsequent clearing house of all coqui data on Oahu.

In December of 2005 OISC, with HISC money, hired a vertebrate supervisor to oversee all of OISC’s coqui operations. Coqui management on O’ahu has three distinct areas of focus: Single calls, nurseries and the Wahiawā population.

Nurseries:

In 2005 there were four active nurseries with varying population levels, ranging from a few frogs to hundreds. One of these, at a PXtra on a military base, has been eradicated. Of the other three, only one has consistently calling frogs. A protocol for controlling frogs and efforts to assist business owners in receiving National Resource Conservation Service support has been developed. The CWG has been working with nursery owners to systematically monitor and control all the coqui populations. This will continue until all the nursery populations have been eradicated.

Wahiaiwā

With increased HISC funding in 2005, OISC was able for the first time to begin to allocate the necessary resources towards coqui eradication. OISC hired a temporary crew of five technicians and a field supervisor to methodically treat the ten acre Wahiaiwā population. The systematic night sprays with citric acid seemed to be greatly effective in reducing the population from over 130 calling frogs in 2004 to zero calling frogs by the end of the calling season in 2005. OISC, in collaboration with the CWG and with continued funding from HISC and new City and County funding, is preparing to mount an even more intensive campaign for 2006. A temporary crew will systematically drench the soil and perform spot treatments as needed at the site of the Wahiaiwā population with the best available treatment.

Single calls:

Frog reports to the Hawai'i Department of Agriculture's pest hotline and other calls are forwarded to OISC to screen, track and determine the response. OISC aired PSAs in 2005 using a HISC outreach grant of approximately \$7,000 to publicize the coqui call and the importance of reporting calls. In 2005, there were approximately 91 reports of single calls. Fourteen turned out to be coqui and 54 were greenhouse frog. (The data on the 30 additional calls was not available at the time of this report).

In 2006, the vertebrate supervisor will continue to investigate call reports from the public. OISC plans to release PSAs on the radio at the beginning of the calling season to increase public awareness and call reports.

Community Outreach:

The two main outreach strategies for coqui frog have already been mentioned above—working with nurseries to eradicate frogs and increasing public awareness of the need to report coqui calls through radio PSAs.

Locations	Size	Status	Notes
Home Depot (Iwilei)	< 1 acre	Eradicated	In landscaped area from garden center. Worked with Home Depot to eradicate frog and alter habitat.
Kahalu'u nursery	Several frogs	Eradicated	No frogs confirmed since 5/01, monitored several times since then.
Wahiawā (Schofield E range and residences)	10. 7 acres	Active	Possibly naturalized from resident with plant rental business. Treated in 2005. Will continue to monitor in 2006.
Nursery on North shore	Unavailable	Active	HDOA has taken lead, call free for six months, still monitoring.
PX	2 nurseries	Eradicated	Source of coqui is possibly from plants of infested nursery on North shore. More than 30 frogs eradicated at one nursery. At other nursery, only one frog was heard. Site is being monitored. PX's, HDOA, DLNR, DPW, and OISC are working together.
Waimanalo nurseries	4 nurseries	Active	One nursery has almost 100 frogs, 12-30 at another. Frogs have been controlled at the other 2 nurseries. Inconsistent resources dedicated to nurseries moving to systematic treatment as in Wahiawa. OISC, HDOA, DLNR and nursery associations are working jointly with the nurseries to jointly eradicate.
Single frog reports throughout the island	14 frogs	Eradicated	Frog reports from the general public. To date, OISC has fielded 98 frog reports, 14 of which turned out to be coqui. These frogs were eradicated.

HIMALAYAN BLACKBERRY

(*Rubus discolor*)

Goal: Island-wide eradication

Hawai'i State Noxious Weed list: No, but other *Rubus* species are listed.



Threat: *Rubus discolor* poses a threat to natural areas in Hawai'i by forming dense impenetrable thickets that exclude other native plant species, and make access difficult for hunters, hikers, and other visitors to forests. Although *Rubus discolor* is not on the HDOA's noxious weed list, several



other *Rubus* species are on the list. The Division of Forestry and Wildlife of DLNR has designated all species of *Rubus* as some of Hawai'i's Most Invasive Horticultural Plants. Himalayan blackberry, native to Eurasia, is a perennial bramble with sturdy, 5-angled, thorny stems. It overtops native vegetation and forms impenetrable thickets in riparian areas, marshes, and oak woodlands on the West Coast from California to British Columbia. The California exotic Plant Pest Council considers this species a "most invasive wildland pest plant". *Rubus discolor* is a high priority for control because it poses a potentially serious threat to natural ecosystems and outdoor recreation. It was most likely introduced to O'ahu as a garden plant.

Management:

Himalayan blackberry prefers riparian areas and disturbed, open habitat not covered by canopy. There are currently 2 known infestations; a 3-acre site at Lai ridge and Wai'oma'o stream and a 17-acre site along the Mau'umae trail. The entire population has been mapped and initially controlled.

OISC set an 800 meter buffer zone around this population and subsequently determined how much of this buffer is suitable for Himalayan blackberry. After surveying it, OISC determined there was no notable range extension. OISC field crew will revisit the established population and retreat on an annual basis. This species requires treatment with herbicide. The habitat determined to be suitable will be reassessed every three years. An aerial survey may be necessary in order to assess whether the areas surrounding these populations are suitable habitat.

Community outreach:

As with miconia, OISC will work with forest users such as natural resource workers and hunting clubs so OISC has more eyes looking for plants.

Known historical locations:

Locations	Size	Status	Notes
Lai ridge and Wai'oma'o stream (active)	3 acres	Controlled source plants, monitoring for recruitment	Exposed ridge behind residential area, & along stream trail: possibly spread from residence.
Mau'umae trail (active)	17 acres	Controlled source plants, monitoring for recruitment	Just off the trail approximately one mile in. Source unknown.

BUSH BEARDGRASS

(*Schizachyrium condensatum*)

Goal: Island-wide eradication

Hawai'i State Noxious Weed list: No



Threat: OISC targets bush beardgrass because it has aggressively invaded on the Big Island, especially at Hawai'i Volcanoes National Park. In just seven years, between 1959 and 1966, bush beardgrass became one of the dominant species in certain areas of the park.



Although the entire park is at risk to fires due to increased volcanic activity since the sixties, scientists have documented that fires ignite more frequently and burn longer in areas

dominated by bush beardgrass (Tunison et. al.). Bush beardgrass can grow in such a wide variety of climates and if it becomes widespread on O'ahu, brush fires here may become more frequent and burn longer—especially if the grass moves to the drier leeward parts of the island. It is native to subtropical America and it is believed that bush beardgrass arrived on O'ahu from infested construction equipment from the Big Island.

Management:

There are currently only 2 known populations of bush beardgrass—along H-3 and in the Temple Valley subdivision of 'Āhuimanu. The Temple Valley subdivision has not yet been completely surveyed but OISC expects it to be complete by the end of 2006. It is possible to hand pull individual seedlings from residential areas, but large infestations, such as the one along H-3, require herbicides. OISC is also experimenting with some habitat modification techniques, such as ground cloth covers in 'Āhuimanu.

In both cases we are beginning to see a change in population structure as large, mature plants are becoming increasingly rare. However these populations must be surveyed and removed every 6 weeks. The Temple Valley subdivision in 'Āhuimanu is somewhat problematic because the majority of plants are on private property. The majority of residents have given us permission to survey their property, but some have not. Gaining access to these properties is a priority for the new outreach specialist.

Known locations:

Location	Size	Status	Notes
Halawa valley H3 road cuts and access road (active)	16 acres	Eradicated initial infestation, monitoring and controlling seed bank	Worst infestation in staging area for H3 construction, presumed contaminated equipment from Big Island.
Temple Valley residences (active)	6 acres (54 / 247 TMKs have beardgrass)	Eradicated initial infestation, monitoring and controlling seed bank	Residential area infestation presumed to have come from contaminated equipment from Big Island

FOUNTAIN GRASS

(Pennisetum setaceum)

Goal: Eradication and prevention in the Wai‘anae range, containment in the Ko‘olau range.

Hawai‘i State Noxious Weed list: Yes



Threat: Fountain grass drops prolific leaves and seeds, creating high fuel loads and giving it the distinction of “promoting the spread of fires more than any other grass yet introduced to Hawai‘i”. (Loope et. al. 1992). It prefers dry areas and spreads rapidly after fire, crowding out the seedlings of native plants. It is native to Africa and first

arrived on O‘ahu as an ornamental.



Management:

OISC priority and management is centered around eradication and prevention of fountain grass in the Wai‘anae range. All historical populations in the Wai‘anae have been treated, and receive consistent oversight from local caretakers. OISC has been performing annual surveys of the priority buffers and has not identified any new fountain grass locations.

In the Ko‘olau range there are three well-established populations of fountain grass; Diamond Head crater, Lanikai, Pālolo valley, and several known satellite populations. OISC works with partner agencies to treat satellite populations and respond to any new ones in the Ko‘olau. U.S. Army DPW will stop any recruitment and ensure eradication at Kahuku and Dillingham military reservations. OISC, the Hawai‘i Army National Guard (HIARG) and the City and County Parks Department annually survey and remove fountain grass at Diamond Head. OISC, HIARG, the Air Force and MCBH monitor the population at Bellows Air Force Base. Additionally, HDOA, assists with the eradication of several satellite populations. The established populations are managed annually to minimize potential spread of seeds via the trails of Diamond Head and Lanikai. Fountain grass is treated with both herbicide and mechanical removal.

OISC defines its survey areas in the Wai‘anae range using buffers based on geographic boundaries. For example, the Mākaha high priority buffer would be the entire Mākaha Valley. The pathways by which fountain grass spreads are people and vehicles. Therefore, we include roads in the high priority buffer. Because fountain grass is so drought tolerant and prefers disturbed areas, buffers may have to be extended to include burned areas.

Community outreach:

Fountain grass has already established itself in several neighborhoods around Diamond Head. We plan to make a “do-it-yourself” fountain grass kit and distribute it to these neighborhoods. Larger landowners such as Chaminade University will also be encouraged to control fountain grass on their property. In addition, OISC will work with the military to control spread of seeds on military vehicles that are coming over from the Big Island.

Locations

Location	Status	Size
Diamond Head (established)	Established	200 acres
Lanikai (established)	Established	150 acres
Pālolo (established)	Established	18 acres
BWS Sierra Drive (satellite)	Eradicated	< 1 acre
Pali Highway (satellite)	Active	< 1 acre
Punchbowl (satellite)	Eradicated	25 acres
Airport area (satellite)	Eradicated	< 1 acre
Kalaniani'ole Highway (satellite)	Eradicated	< 1 acre
He'eia (satellite)	Eradicated	NA
Bellows AFB (satellite)	Active	30-50 plants w/in 500 acres
Schofield East Range (satellite)	Eradicated	1 plant
Kahuku Military (satellite)	Active but few plants remaining	<1 acre
Dillingham Military (satellite)	Eradicated	< 1acre
Mākaha Heiau	Initial population eradicated, some recruitment	Several hundred plants initially
Ka'ala Learning Center	Initial population eradicated, some recruitment	Several hundred plants
Lualualei	Eradicated	6-10 plants
Ko'olina (H-1)	Eradicated	Few plants

PAMPAS GRASS

(*Cortaderia jubata* and *C. selloana*)



Goal: Island-wide eradication

Hawai'i State Noxious Weed list: *C.*

jubata yes, *C. selloana*, no.

Threat: Although only one species of pampas grass is on the HSNW, both species of pampas grass has proven to be a problem on Maui and in California,

New Zealand and Australia. Pampas grass forms masses of large clumps, crowding out native species. Pampas grass can reach heights of up to 10 feet displacing vegetation and blocking access to recreational and agricultural areas. It also creates a significant fire hazard. Pampas grass is native to South America and has been brought to O'ahu as ornamental plantings.



Management:

Pampas grass is a new target species for OISC. It has not yet naturalized on O'ahu, but it exists in several locations as an ornamental. It is presumed, but not confirmed, that all species here are female *C. selloana*, and therefore incapable of reproducing. However, if a male plant is brought to O'ahu, the plant could become invasive. This happened on Maui only a few years ago and OISC therefore believes it is best to be proactive and aim for eradication of both species. Unfortunately, all of the plants are ornamental plantings on private land. Therefore the strategy for removal will depend heavily on community outreach.

Removing pampas grass may require herbicide. After removing the plant, OISC will send samples to the Bishop Museum to confirm the sex and species. If one of the plants turns out to be male, OISC will set buffers around the removed plants and survey these areas for recruitment.

Community outreach:

We assume that all pampas grass on the island is *C. selloana* and therefore removal of all plants will have to be voluntary. Cooperation with property owners will be vital to accomplishing this. As mentioned above, we hope that evidence from Maui and the offer of a replacement plant will be enough to convince property owners to let us remove the plant. An additional part of control of this species will be to place *C. selloana* on the noxious weed list. New Zealand and Australia have already set precedent for this by listing *C. selloana* on their noxious weed lists. CGAPS has greatly assisted our case for removal of pampas grass by coming to an agreement with the O'ahu Nursery Growers Association to no longer import or sell *C. selloana*.

Because we expect pampas grass to be mostly found in landscaped areas, we will depend heavily on public reports of the species. Through appearances at neighborhood festivals and other events, OISC will increase public awareness of this species.

Known locations

Location	Size	Status	Notes / Source
‘Aiea	Single clump	Active	Ornamental planting
‘Aiea State Park	Single clump	Active	Ornamental planting
Mānoa (residence)	Single clump	Active	Ornamental planting
Nu‘unanu (residence)	Single clump	Active	Ornamental planting
Pūpūkea (residence)	Single clump	Active	Ornamental planting
Schofield East Range (golf course)	Single clump	Active	Ornamental planting
Wilhelmina Rise (residence)	Single clump	Active	Ornamental planting
Mariner’s Ridge, Hawai‘i Kai (residence)	Single clump	Active	Ornamental planting
Wahiawā (residence)	Three plants	Active	Ornamental planting

SMOKE BUSH/BUTTERFLY BUSH

(Buddleia madagascariensis)

Goal: Island-wide eradication

Hawai'i State Noxious Weed list: No



Threat: Smoke bush is a vine native to Madagascar that invades disturbed areas and creates dense thickets that exclude other native plant species and make access difficult for hunters, hikers, and other visitors to forests. It grows rapidly and can smother the slower growing native species. It has

already become a problem in Koke'e State Park on Kaua'i and on Maui, the plant has already naturalized. It was introduced as an ornamental planting.



Management:

OISC has systematically treated all known plants and is nearing completion of surveying the high priority buffer in wildland areas. Known infestation sites will need to be retreated annually to eradicate the seed bank. Buffer zones will have to be surveyed every three years.

The high priority buffer is 800 meters around mature plants and one mile downstream and obvious flyways. The low priority buffer is one mile around all mature plants. Barring any new findings of mature plants or new infestations, OISC will consider this species functionally eradicated and move it from OISC target to OISC species to monitor. It is necessary to use herbicide to treat smoke bush because even a small piece of vine can take root.

Smoke bush infestations covered only 2 acres on O'ahu—1.75 acre in Tantalus, which has been removed and .75 acres in the Schofield East Range, which has been controlled. Barring any new findings or recruitment, OISC anticipates that smoke can be moved to monitor status next year.

Community outreach:

Some residential areas and some land owned by the Dole Food Co. fall within the high priority buffer area. OISC has worked with the landowners to acquire right-of entry to those properties.

Historical locations:

Location	Size	Status	Notes
Tantalus Dr.	1.75	Eradicated, still monitoring for recruitment	Naturalized population, presumably from an ornamental planting, removed.
Schofield East Range & Wahiawa	.75	Eradicated, still monitoring for recruitment	Small clump of plants that are possibly seedlings from an unknown ornamental source in the Wahiawā neighborhood, removed.

FIREWEED

(Senecio madagascariensis)

Goal: Island-wide eradication

Hawaii State Noxious Weed List: Yes



Threat: Fireweed (also called Madagascar ragwort and variable groundsel) has become a serious pest in pastures on the Big Island and Maui. It is poisonous to livestock and can render pastureland unusable. Each plant can produce up to 30,000 seeds and are dispersed by wind, or by hitchhiking on



passing animals or vehicles. It prefers disturbed areas and is most abundant in high elevation pastures. In Australia, where the plant is also a problem, scientists estimate that it causes yearly losses of \$2 million (Holtkamp and Hosking).

Management: OISC has been collaborating with the Nature Conservancy, the Hawai'i Department of Agriculture (HDOA) and the U.S. Army DPW to ensure systematic treatment of all known populations on O'ahu. The Nature Conservancy monitors the site of a controlled infestation in Kunia. The high priority buffer zone is 800 meters around mature plants. Buffer areas will have to be surveyed annually. Once we have finished assessing and surveying the suitable habitat within the buffer, we plan to move fireweed to monitor status. It is necessary to use herbicide to control fireweed.

Community outreach:

Fireweed has not yet been seen on private property. However, it can travel in hydromulch and or contaminated nursery plantings and may make an appearance soon. OISC will need to work with HDOA, nurseries, landscapers and contractors to ensure that any new infestations are caught early.

Location	Size	Status	Notes
Schofield South Range (monitored site)	1	Active	Found along training area road. Presumably from Army transport from the Big Island. Army Dept. of Public Works performs quarterly surveys.
Kunia (no recruitment)	< 1 acre	Eradicated	15 mature plants found on Kalua'a trailhead: 15 mature plants in 2003, 1.5 miles from Schofield population.
Castle Junction (monitored site)	< 1 acre	Active	14 original plants from contaminated hydro mulch, seedlings continually found here.
Manana Trail (no recruitment)	< 1 acre	Eradicated	2 large mature plants found, but no seedlings have been observed. Plants may have come from contaminated koa plantings from a Kamuela nursery.
Pali Hwy (no recruitment)	< 1 acre	Eradicated	Possible from Kamuela nursery contaminated koa plantings.

FIRE TREE

(*Morella faya*)

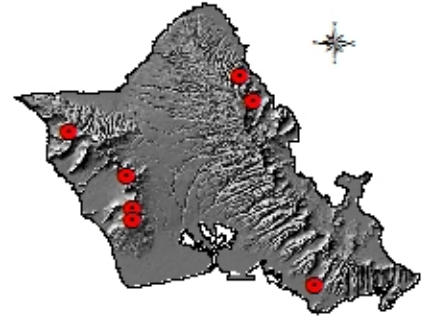
OISC TARGET SPECIES TO MONITOR

Functionally eradicated from the Ko‘olau.

Hawaii State Noxious Weed list: Yes



Threat: *Morella faya* is a fast growing, quick spreading tree that invades a variety of habitats. It is a nitrogen fixing tree and readily invades nutrient poor volcanic sites more quickly than native plants resulting in a disruption of natural succession. The seeds are spread by fruit eating birds and pigs. The leaf litter of *M. faya* produces toxins that prevent germination of native ‘ohia (Starr, Kim and Forrest). Fire tree was introduced to Hawai‘i in the 1800’s from Portugal and later used in forestry plantings.



Management:

OISC’s goal was to eradicate fire tree from the Ko‘olau, as the population in the Wai‘anae mountains is already established. We have left one tree standing on the Mau‘umae trail to see if it produces fruit to help determine if other trees are in the area. (Fire trees are dioecious.) Seedlings can be pulled, mature trees require herbicide.

Community outreach:

OISC will compile list of people and agencies that work within forest reserves to increase detection in these areas.

Known locations:

Locations	Size	Status	Notes
Hau‘ula Waipilopilo Ridge	5 trees	Eradicated	One large tree and several smaller recruitment.
Wa‘ahila Ridge	Single tree (eradicated)	Eradicated	One large tree killed in ’99 may have been <i>M. cerifera</i> as noted in the forestry records no recruitment: eradicated.
Mau‘umae Ridge	Single tree (monitoring)	Monitor	One large tree; monitoring phenology since 2003. Has not yet flowered.
Wai‘anae Range	Extensive population	Established	Extensive population, beyond scope of OISC.

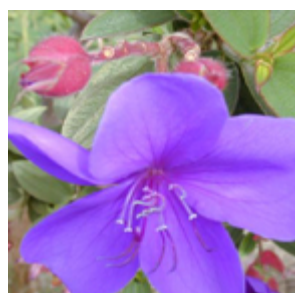
GLORY BUSH

(Tibouchina urvilleana)

OISC Target Species to Monitor

All known plants have been removed.

Hawaii State Noxious Weed list: Yes



Threat: Glory bush threatens native areas by forming monotypic thickets that out compete and displace native plants. Its showy flowers make it a popular ornamental, alluring gardeners unaware of its weedy behavior.

Inter-island dispersal may cause new infestations. Although a significant problem on the other islands, it is not

yet naturalized on O‘ahu. It is native to tropical America and was first introduced as an ornamental.



Management:

OISC will monitor sites of previously controlled infestations for seedlings annually. U.S. Army DPW will take the lead on suppressing recruitment on a controlled site on Navy Land in Whitmore Village.

Monitored locations (all plants have been removed)

Locations	Size	Status	Notes
Kahalu‘u residence	single plant	Eradicated, monitoring	Ornamental planting, no recruitment
Mililani Mauka	100+ plants	Eradicated, monitoring	Ornamental landscape on new housing development. Worked with HDOA to remove and address issue with contractor. No recruitment.
Tantalus residence	single plant	Eradicated, monitoring	Presumed ornamental planting
Navy land, Whitmore Village area	100+ plants	Eradicated, monitoring	Presumed from the abandoned nursery, only site on O‘ahu with recruitment and all vegetative to date. The Army’s environmental division is managing this site.

WEST NILE VIRUS

Goal: Island-wide prevention and rapid response

Threat: Spread by mosquito bites and can be fatal to humans. The virus is also fatal to birds and could decimate already endangered native bird populations.



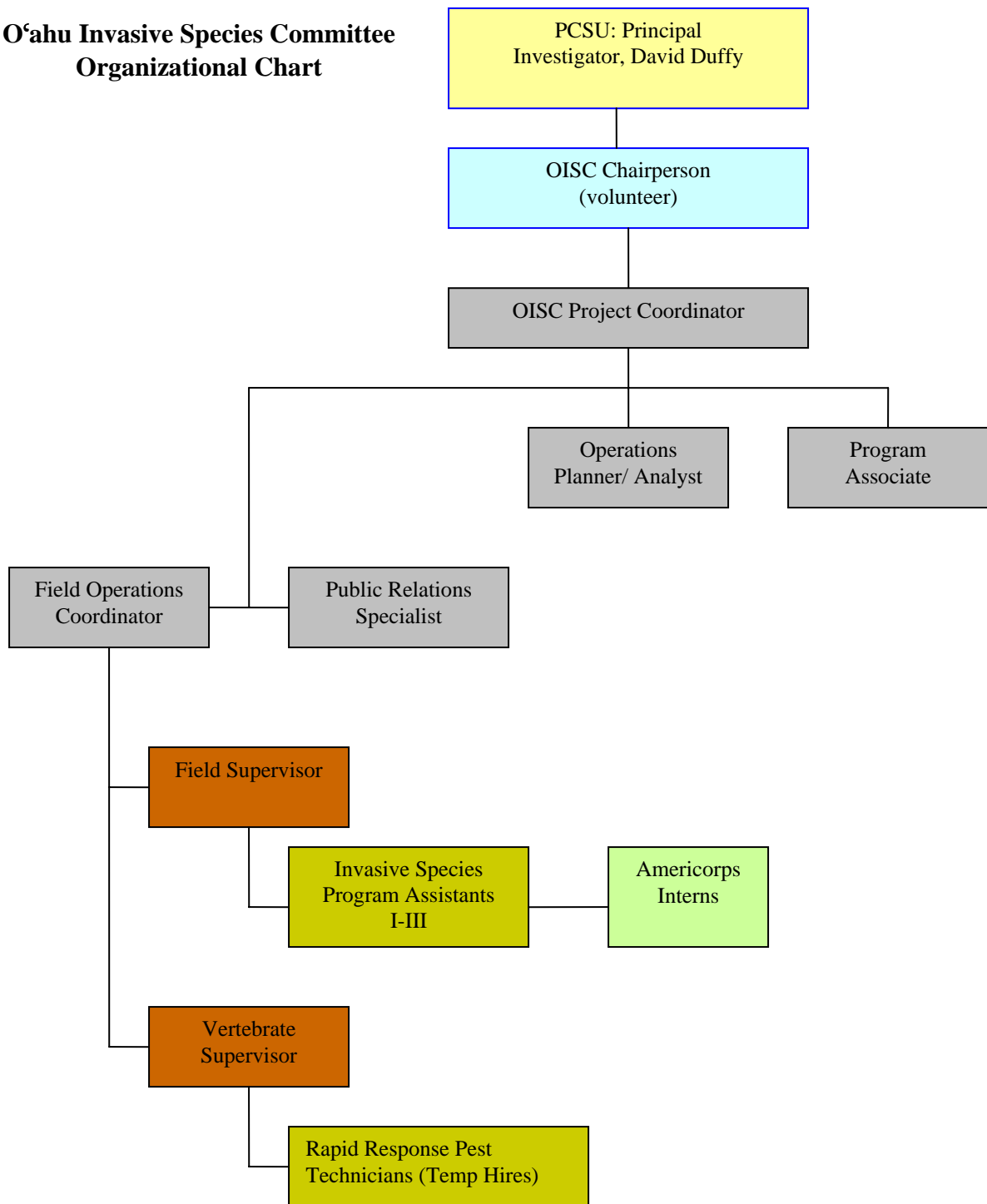
Summary:

Hawai'i has not yet had a case of West Nile Virus. The Hawai'i Department of Health is managing overall prevention and rapid response. OISC assists DLNR/DOFAW to pick up dead birds that will then be tested for West Nile Virus. OISC is on call one day a week to pick up dead birds.

Projected costs for 2006

Taxon Name:	Action Method	Projected Budget Cost 2006	Projected % of OISC field time	Projected Staff Hours	Total Need in Hours	Total Need in \$
Buddleia madagascariensis	Ground	\$6,846.35	1.41%	104	104	\$6,846.35
Miconia calvescens	Aerial	\$86,403.04	7.83%	576	887	\$121,051.08
Miconia calvescens	TMKs				5,294	\$68,696.00
Miconia calvescens	Ground	\$250,945.02	51.85%	3,812	0	\$300,389.52
Pennisetum setaceum	Binocular			N/A	N/A	
Pennisetum setaceum	Ground	\$30,281.93	6.26%	460	460	\$30,281.93
Rubus discolor	Ground	\$18,959.12	3.92%	288	288	\$18,959.12
Schizachyrium condensatum	Binocular					
Schizachyrium condensatum	Ground	\$88,475.89	18.28%	1,344	1,344	\$88,475.89
Senecio madagascariensis	Ground	\$4,213.14	0.87%	64	64	\$4,213.14
Coqui Frog - Wahiawa		\$2,106.57	0.44%	32	32	\$2,106.57
Coqui Frog - crew nurseries		\$31,598.53	6.53%	480	480	\$31,598.53
WNV		\$12,639.41	2.61%	192	192	\$12,639.41
Available field hours per year (1 staff for 1 hour)	7352	\$532,469.00	100.00%	7,352	9,145	
		Total 2006 need, excluding some coqui				\$685,257.54
		Miconia shortfall, not including indirect costs				\$152,788.54

**O'ahu Invasive Species Committee
Organizational Chart**



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