Island-based Partnerships & Statewide Coordination to Protect Hawaii from Invasive Species

Report for the 2006 Calendar Year
# Table of Contents

- Safeguarding Hawai'i from Invasive Pest Species  
  - Page 2
- Background: Hawai'i’s Invasive Species Partnerships  
  - Page 2
- Hawai'i Invasive Species Council  
  - Page 3
- Coordinating Group on Alien Pest Species (CGAPS)  
  - Page 5
- Aquatic Invasive Species Team (AIS)  
  - Page 8
- Big Island Invasive Species Committee (BIISC)  
  - Page 15
- Maui Invasive Species Committee (MISC)  
  - Page 25
- Moloka‘i/Maui Invasive Species Committee (MoMISC)  
  - Page 34
- O‘ahu Invasive Species Committee (OISC)  
  - Page 39
- Kaua‘i Invasive Species Committee (KISC)  
  - Page 47
- Funding  
  - Page 55
- Contact Information  
  - Page 56
- Target Species  
  - Page 57
Safeguarding Hawai‘i from Invasive Pest Species

The accelerating invasion of non-native organisms into the State of Hawai‘i over the past two and a half centuries continues to devastate native ecosystems, depress sectors of the state’s economy and harm human health. Over the years, state and federal programs have arisen piecemeal to address specific pest concerns, resulting in an array of programs with limited scope and lacking in comprehensive coordination. Two separate reports found that Hawai‘i’s alien pest problem was the worst in the nation due to the lack of a coordinated and comprehensive program to address the issue (1992 report by The Nature Conservancy (TNC) and National Resources Defense Council (NRDC); 1994 report by the U.S. Office of Technology Assessment (OTA)).

The development of a comprehensive program requires acknowledging the existence of numerous gaps in agency authorities and policies, the commitment of leaders to fix the system, and secure funding that will allow these programs to succeed. A comprehensive protection program should consist of the following measures:

Prevention: The most economical and effective measure for protecting Hawai‘i. Adequate prevention should include laws preventing importation of plant and animal pests, enforceable penalties; thorough inspection at all ports of entry, interisland quarantine measures to prevent intrastate spread and clear, non-conflicting agency mandates and jurisdictions.

Early Detection and Rapid Response: Even with the best prevention systems, pests will get through. Clear mandates and set protocols are needed for monitoring and for early detection and rapid response, both for new pests around ports of entry and for incipient pests on public and private lands.

Ongoing control of existing pests: Some pests are considered too widespread to eradicate but require ongoing control to protect natural resources. Needed action includes research into biocontrol for some species, and active, on-the-ground control of others.

Background: Hawai‘i’s Invasive Species Partnerships

In the past decade, partnerships and groups have arisen to address significant gaps in Hawai‘i’s biosecurity system. They include the recently formed Hawai‘i Invasive Species Council (HISC) to provide cabinet-level leadership; the Coordinating Group on Alien Pest Species (CGAPS) for interagency and NGO communications and collaborative projects; and the Invasive Species Committees (ISCs) for island-based rapid response.
Hawai'i Invasive Species Council

A 2002 State Legislative Reference Bureau study identified the need for cabinet-level leadership and coordination to address the impact of invasive species on the State. The study called for the involvement of all state agencies responsible for regulating the pathways by which invasive species can gain access into Hawai'i, agencies responsible for controlling invasive species on the ground, and agencies that use and promote the pathways or natural resources.

In 2003, the Hawai'i State Legislature agreed that, "the silent invasion of Hawai'i by alien invasive species is the single greatest threat to Hawai'i’s economy, natural environment, and the health and lifestyle of Hawai'i’s people and visitors." That same year, the legislature and Governor Linda Lingle approved legislation that established the Hawai‘i Invasive Species Council and directed state agency chairs and department heads to address gaps in Hawai'i’s invasive species prevention and response measures.

The HISC, under the co-leadership of the chairpersons of the Hawai'i Departments of Land and Natural Resources and Agriculture, is comprised of leaders of the following agencies:

- Hawai'i Department of Agriculture
- Hawai'i Department of Land and Natural Resources
- Hawai'i Department of Health
- Hawai'i Department of Business, Economic Development and Tourism
- Hawai'i Department of Transportation
- University of Hawai'i

The first official meeting of the HISC convened on October 29, 2003. HISC members adopted a working committee structure to look at laws, policies, procedures, and needs in the areas of prevention, early detection and rapid response, control of widespread pests, and public awareness.

Tasked with a need to look at each agency’s organizational and resource shortfalls, HISC recognized the critical need for sustainable funding sources for adequate inspections of incoming goods, the need for early detection and rapid response for priority invasive species, and the need for ongoing control of existing pests. The HISC developed a statewide strategic plan and budget to implement a pilot multi-agency statewide invasive species program that was funded at $4 million for Fiscal Years 2005-2006 by the Legislature via the Hawai'i Department of Land and Natural Resources’ budget. In Fiscal Year 2007 the budget was reduced to $2 million. These funds are matched 1:1 with non-state dollars. Portions of these funds are used to support the efforts of the ISCs, the AIS Team and CGAPS in the areas of early detection, rapid response and public awareness.

2006 Actions

- Supported the Governor’s Economic Momentum Commission recommendations to fund invasive species prevention efforts via a service fee and create an approved importation list for plants.
• Approved a resolution to prevent the transport of coqui frogs to uninfested sites/islands.
• Supported the federal Hawaii Invasive Species Prevention Act that would provide increased federal quarantine resources to protect Hawaii from new pests.
• New legislative members were assigned and invited to join HISC:
  | House         | Senate         |
  | Kauai:        | Hermina Morita |
  | Oahu:         | Tommy Waters   |
  | Maui:         | Mele Carroll   |
  | Hawaii:       | Clift Tsuji    |
  |               | Gary Hooser    |
  |               | Carol Fukunaga |
  |               | Kalani English |
  |               | Russell Kokubun|
• Reviewed reports on spending related to the Interim State of Hawaii Strategic Plan for Invasive Species Prevention, Control, Research and Public Outreach.
• Approved a $2,000,000 spending plan for Fiscal Year (FY) 2007. The new budget is half of HISC Program’s budget in its first two years. It addresses the four interrelated plan components:
  o Prevention $410,000
  o Response and Control $1,115,000
  o Research and Technology $0
  o Public Outreach $230,000
  o HISC Support (includes Central Services fees) $245,000

The complete report on HISC activities to the Legislature may be found at:
http://www.hawaii.gov/dlnr/reports/FW07-InvasiveSpecies.pdf

A nursery owner who previously received a HISC Research and Technology Grant loads plants for a demonstration of the coqui treatment “shower box” he built.
Coordinating Group on Alien Pest Species (CGAPS)

The Coordinating Group on Alien Pest Species was formed in 1995 in direct response to the 1992 TNC/NRDC and 1994 OTA reports, which called for communication and coordination between agencies to better protect Hawai‘i from invasive species. Operating as a voluntary partnership, CGAPS is comprised primarily of management-level participants from every major agency and organization involved in invasive species work including federal, state, county and private entities. Members participate in both quarterly meetings and ad hoc steering committee meetings in an effort to influence invasive species policy and funding decisions, improve communications, increase collaborations, and promote public awareness statewide.

Progress includes:
- Launched the 1997-1998 “Silent Invasion” media campaign, which included television commercials and specials, printed materials and ads, and community weed-pulling trips for Operation Miconia.
- Facilitated the formation of the ISCs—grassroots partnerships on each island with paid staff that functions as early detection and rapid response teams.
- Working with legislators to develop new legislation.
- Providing policymakers with information for decision making.
- Continuing to facilitate communication and cooperation among agencies, the ISCs, and participation in HISC Working Groups and programs.
- Working statewide with industry groups such as the landscape and nursery industries to stem the introduction and spread of invasive plants.
- Working with the pesticide service industry to promote recognition and reporting of new pests.
- Preparing and launching the second phase of the Silent Invasion media campaign in 2006, which will run through 2007.
- Conducting public awareness surveys on invasive species issues.

In 2006, CGAPS public outreach staff launched the second phase of the Silent Invasion campaign with five television public service announcements (PSAs) and print media. This major media campaign aims to educate the public about how they can help protect Hawai‘i from invasive species. To ensure maximum viewership statewide, the PSAs aired nearly 600 times between January and July, 2006, in paid and free advertising slots on all local network affiliate stations and selected Oceanic Cable channels. The messages also have print components to help reach different audiences within the state. The campaign includes the following four messages: “Protect Hawai‘i—Don’t Pack a Pest,” which emphasizes the importance of filling out declaration forms upon arrival; “Protect Hawai‘i—Don’t Plant a Pest,” which explains to consumers that some ornamental plants are invasive and that they should ask
for native plants or non-invasive plants; “Protect Hawai‘i—Report a Pest,” which promotes a new state pest hotline; and Protect Hawai‘i’s Reefs—Because a Living Reef Gives Our Islands Life,” which reminds people to not dump their aquariums and to wash their gear to prevent spreading invasive seaweeds. Preparation for the campaign included exploring concepts with focus groups and conducting statewide awareness surveys before and during the campaign with the help of Ward Research. Complete Public Awareness Survey results are available at www.cgaps.org.

Surveys were conducted in 2004 before airing PSAs and again in 2006 after just three months of broadcast. Messages included images of snakes, fire ants, invasive seaweed, miconia and snowflake coral (the only featured species in which public recognition did not rise).

Public awareness studies also showed that the vast majority of people did not know whom to call when they see a snake or other invasive pest, or that there was a pest hotline number (808-586-PEST). Additionally, participants were reluctant to call the existing pest hotline number because it is an O‘ahu number, and therefore a toll call for neighbor island residents. CGAPS worked to gain consensus for the need for a better pest hotline system and in 2005 a new, toll-free pest hotline system and reporting database was instituted. HISC funds support the cost of the new number, 643-PEST (643-7378), which automatically routes calls to the nearest HDOA office during normal work hours, and to the HDOA office at Honolulu International Airport after hours and on weekends.

Funds from HISC also supported part of the cost of airing the PSAs, two of which advertised the number and the importance of calling to report invasive pests. The Report a Pest messages continue to be the focus of the campaign into 2007, with new outreach products and two
new websites, one aimed at 18-34 year olds, one of the important target demographics identified in awareness surveys.

The issue of invasive plants in the nursery and landscaping industry has been a central issue for CGAPS. Outreach staff from CGAPS and the ISCs worked to promote the Codes of Conduct project to gain voluntary help from the industry. Objectives included: 1) Have all plant species new to the state evaluated using the Hawai'i-Pacific Weed Risk Assessment to see if they might become invasive if grown in the Hawai'i; 2) reduce the amount of invasive ornamental plants being sold by agreeing on a short list of invasive plants which are current targets for control or eradication and which the plant industry would no longer grow, sell or specify for landscaping projects; and 3) identify and promote native or non-invasive ornamental plants in place of common invasive ornamental plants. The Codes of Conduct have been endorsed by the Landscape Industry Council of Hawai'i and have been signed by the O'ahu Nursery Growers Association, and the Kaua'i Landscape Industry Council. Wal-Mart stores and other industry associations are reviewing the Codes for possible adoption.

CGAPS continued to assist partner agencies in exploring public sentiment about potentially controversial issues. Topics included the possibility of adding a service fee to incoming cargo to give HDOA the capacity it needs to conduct inspections and quarantine services to prevent new invasive pests from entering the state. This question will be asked again in the 2007 survey.

Through the HISC Working Group on Education and Outreach, positions focused on outreach were filled on Kaua'i, the Island of Hawai'i, and O'ahu, with partial funding for existing staff for Maui County. The positions have statewide mandates, although there is an emphasis on island-specific issues. The accomplishments of these staff are highlighted in each island ISC section.

The CGAPS marine outreach coordinator continued with support from the Department of Land and Natural Resources/Division of Aquatic Resources, TNC, and the Hawai'i Tourism Authority’s Natural Resources Program. The marine outreach coordinator organized volunteer alien algae clean-ups, staffed displays at community events, and gave presentations on aquatic invasive species. These actions are detailed in the Aquatic Invasive Species Response Team section.

In the statewide phone survey, 88% of Hawaii residents supported a service fee on incoming cargo to help pay for invasive species inspection and prevention services.
Aquatic Invasive Species Team (AIS)

Project Strategy
In 2006, the Aquatic Invasive Species (AIS) Team entered its second year of working on key projects dealing with the eradication and control of target aquatic species. These projects included the eradication of mushroom anemones and upside-down jellyfish as well as large-scale control efforts for alien algae. Other activities also included a large effort to map alien algae statewide as well as continued work on developing techniques and tools for eradication and control.

Highlights
- Mapped significant inshore reef areas for alien algae on O'ahu, Maui, Moloka'i and the Big Island.
- Completed the construction of a new “Supersucker” barge that will allow removal of alien algae in new geographic regions.
- Completed the eradication of the mushroom anemone, *Actinodiscus nummiformis*.
- Completed the eradication of the upside down jellyfish, *Cassiopea sp.*, in the Waiopae Marine Life Conservation District.
- Finished the treatment phase of Port Allen commercial pier in order to eradicate snowflake coral (*Carijoa riisei*) on Kaua‘i.
Target Species
Prickly seaweed (*Acanthophora spicifera*)
Mushroom anemone (*Actinodiscus nummiformis*)
Leather mudweed (*Avrainvillea amadelpha*)
Snowflake Coral (*Carijoa riisei*)
Upside-down jellyfish (*Cassiopea andromeda*)
Gorilla ogo (*Gracilaria salicornia*)
Hookweed (*Hypnea musciformis*)
Smothering seaweed (*Kappaphycus spp/ Euchuma complex*)
Orange key hole sponge (*Mycale armata*)

Staff
The AIS Team was formed in 2005 and is comprised of one AIS Research Supervisor, 6 AIS Research Technicians and an Americorps Intern. Two technician positions are located in Hilo, Hawai‘i, while other staff is located at the Hawai‘i Institute of Marine Biology (HIMB). The collaboration with HIMB is vital to the operations of the AIS Team. Available facilities allow staff to work on the bay and be associated with a prime research community which facilitates increased exchange of information.
Field Work

Algae Removal

In 2006, the AIS Team initiated an effort to create baseline alien algae distribution maps. To date, significant areas in the State have been mapped. These areas include the Hilo coast, parts of south Moloka'i, windward O'ahu, Maunalua Bay, Waikiki, and parts of Ewa Beach, O'ahu.

Presence and absence data and relative abundance for Gorilla Ogo

Based on the alien algae distribution maps generated, key areas in Maunalua Bay were targeted as areas of interest. One of the areas chosen was Wailupe Beach Park. The Wailupe area has shown an increase of alien algae abundance over the last five years and may serve as a source population for continued spread. In order to work towards longer-term management of alien algae in Maunalua Bay, a removal and regeneration experiment was conducted. This basic experiment consisted of two large plots estimated to be 2700 m² each.

One plot was an experimental removal plot while the other was a control plot. An alien algae removal/regeneration experiment has not previously been attempted over this large of an area. Large-scale mechanical equipment was not available for this area, so the AIS Team worked with Youth Conservation Corps interns to clear approximately 5,000 pounds of gorilla ogo from the removal plot.
Invasive algae removal resulted in a temporary increase in native algae.

More than a dozen individuals worked five full days to hand pull algae from the reef flat of Wailupe Beach Park. The plot was monitored for six months during which time alien species coverage returned to the original state prior to removal. These data indicated that other forms of management need to be implemented in order to keep algal abundance at low levels.

The AIS Team also worked on testing the algae vacuum known as the “Supersucker.” This project is a joint venture between the Hawai‘i Department of Land & Natural Resources, the University of Hawai‘i at Mānoa, and The Nature Conservancy. The Supersucker operates with a 5-person crew in Kaneohe Bay, O‘ahu, and is capable of sucking up hundreds of pounds of algae per hour of dive time. In 2006, the Supersucker was tested on the invasive alga, smothering seaweed, and the results were quite promising. The continued development of this technology will allow increased removal of biomass from the reefs and allow managers to explore other management options to maintain the algal biomass at low levels.

To further expand the ability to remove algae, a new barge was designed and built for deployment to new geographic locations. The original barge is limited use in Kaneohe Bay, whereas the new smaller barge can be launched from any boat ramp in the State and can be deployed in most habitats. Early testing of this barge suggests it will be as efficient as the original barge despite its smaller size.

As the results of the experimental removal plot in Wailupe showed, the manual removal of alien algae is not the sole or most cost-effective solution to alien algae issues. The AIS Team is beginning to look at the role of fishes as a biocontrol tool. Native fishes naturally graze on algae; however, when the abundance of some species reaches a critical mass, fish grazing pressure is unable to keep the algal biomass at sufficiently low levels. By examining the role of fish grazing pressure on algal abundance, new approaches may begin to emerge in the long-term management of alien algae. Research on fish grazing complements on-going efforts to raise and plant native sea urchins on reefs to help maintain low levels of alien algae.
Eradications
The AIS Team has begun some key projects to eradicate invasive or potentially invasive aquatic species. In 2006, three species were targeted for eradication (mushroom anemone, upside down jellyfish, and snowflake coral). Significant progress has been made on all three species with two species believed to be eradicated.

*Mushroom anemone*

The mushroom anemone was intentionally introduced sometime prior to 1996. Although the AIS Team worked on this species throughout 2005, eradication remained elusive. In early 2006, few polyps existed, but they proved to be difficult to find and remove. Through a series of repeated surveys and the implementation of two separate methods, it appears that all polyps have been removed. Since July 2006, monthly surveys have revealed no new polyps. Surveys will continue in 2007 to ensure that no new polyps have been overlooked.

Research at the Hawai‘i Institute of Marine Biology suggests that the up-side down jellyfish may play a role in the transmission of coral disease. Although much research needs to be conducted on this topic to verify the significance of this connection, it was decided to respond to a situation that appeared to be containable. The up-side down jellyfish was targeted for eradication in the Waiopae Marine Life Conservation District (MLCD). This jellyfish population inhabited an isolated tide pool in the MLCD. The discovery of this organism in the Waiopae MLCD was a new distribution record. In an attempt to eradicate this local population, more than 200 individuals were manually removed from the tide pools. Since removal in early 2006, no jellyfish has been detected at this site, and this species is thought to be locally eradicated. The site will continue to be monitored in 2007 to assess the long-term success of the eradication effort.

Efforts to eradicate snowflake coral continued in 2006. In May, all pier pilings under the commercial pier at Port Allen were treated with commercial plastic. Since then, repeated surveys were conducted to detect colonies not killed by the wrapping. Soon after completing the treatment, many small colonies were discovered at the bottom of the pilings (in between the plastic and silt). With continued wrapping, most
colonies were killed. However, approximately 3-16 colonies have been found every month under different areas of the pier. It is uncertain where the source of these is located, but continued monitoring in 2007 will provide critical insight into the future success of the project. Additional work planned for 2007 includes the removal of all plastic, side-scan sonar mapping of the harbor, and extensive reef surveys. This project has proven to be the most challenging project undertaken by the AIS Team.

Another project the AIS Team worked on during 2006 was research on the invasiveness of the orange keyhole sponge. This project concluded a 2-year monitoring project led by the Bishop Museum as well as the testing of a new control technique. Over the last two years, the sponge has increased in density and the limits to its spread are unclear. The experimental control technique involved injecting air into the sponge cavity. The results of the research suggest this tool may be useful under some circumstances, but is not practical on a large scale. This technique needs to be refined and may be appropriate for small-scale projects and may be an applicable tool for eradication under the right circumstances.

Outreach & Education

This past year marked the 4th year of the A‘ohe Limu‘e, or “No Alien Algae” events. These invasive algae volunteer cleanup events continued to be a success with the general public and served as an excellent venue for public awareness for aquatic invasive species issues. They were held in Waikiki at the Hilton Hawai‘i Village Resort and the Waikiki Marine Life Conservation District. Volunteers from the local community actively participated in a large-scale removal effort. Participants included individual community members, local school groups, extra-curricular activity groups, and other local service groups. The events informed the public about the threat of introduced species in an experiential manner by having them participate in removing mats of algae from the reefs in Waikiki. The volunteers saw first-hand the destruction the algae is creating on the coral reef ecosystem in Hawai‘i.

Results of alien algae community clean-up events.

<table>
<thead>
<tr>
<th>2006</th>
<th>Location</th>
<th>Number of Volunteers</th>
<th>Tons Removed</th>
</tr>
</thead>
<tbody>
<tr>
<td>28-Jan-06</td>
<td>Hilton Hawai‘i Village</td>
<td>79</td>
<td>2</td>
</tr>
<tr>
<td>11-Mar-06</td>
<td>Hilton Hawai‘i Village</td>
<td>97</td>
<td>2</td>
</tr>
<tr>
<td>10-Jun-06</td>
<td>Hilton Hawai‘i Village</td>
<td>60</td>
<td>1</td>
</tr>
<tr>
<td>12-Aug-08</td>
<td>Waikiki MLCD</td>
<td>61</td>
<td>1</td>
</tr>
<tr>
<td>23-Sep-06</td>
<td>Waikiki MLCD</td>
<td>106</td>
<td>1</td>
</tr>
<tr>
<td>18-Nov-06</td>
<td>Waikiki MLCD</td>
<td>88</td>
<td>0.5</td>
</tr>
</tbody>
</table>
These events have received considerable media coverage, including a story in the Honolulu Star-Bulletin Mid-Week publication, a feature in a BBC documentary about various environmental problems in the Hawaiian Islands, and a segment on the television show, “Outside Hawai‘i.”

**Comparison of different methods of algae removal**

<table>
<thead>
<tr>
<th>Method</th>
<th>Total # algae Removed (lbs.)</th>
<th>Total # of manpower hrs.*</th>
<th>Avg. # lbs./person/hr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supersucker</td>
<td>10,460</td>
<td>480</td>
<td>21.8</td>
</tr>
<tr>
<td>Community Cleanups</td>
<td>15,000</td>
<td>1964</td>
<td>7.6</td>
</tr>
</tbody>
</table>

* based on 8 hrs. per 5 Supersucker crewmember per outing and 4 hrs. per event per volunteer for Community Cleanups.

**AIS Team Participants**

Hawai‘i Department of Agriculture, Hawai‘i Department of Land & Natural Resources - Division of Aquatic Resources, Hawai‘i Department of Transportation, Hawai‘i Institute of Marine Biology, Hawai‘i Tourism Authority, University of Hawai‘i - Manoa, University of Hawai‘i – Hilo, Windward Community College, City and County of Honolulu, Kaua‘i Invasive Species Committee, National Fish and Wildlife Foundation, National Oceanic & Atmospheric Administration, U.S. Fish & Wildlife Service, and e Bishop Museum, Hilton Hawaiian Village, Ho'omaluhia Botanical Gardens, and The Nature Conservancy.
Big Island Invasive Species Committee (BIISC)

Project Strategy
The Big Island Invasive Species Committee was established to coordinate efforts to prevent new invasive pest infestations on the Island of Hawai‘i, to stop newly established pests from spreading, and to provide local control of established pests. The Big Island contains the largest infestations of miconia, coqui frogs, and little fire ants. It is not possible to eradicate these species on the Big Island with the tools and resources currently available. The project’s objective for these priority species is to assist local communities and agencies in mitigating their spread as well as assisting planning for the most effective management possible. To protect the Big Island from new invasive species, and Early Detection project has been initiated to refocus on this critical strategy. During 2006, BIISC concentrated on control activities, building community partnerships, and data analysis.

Highlights
- Initiated the Early Detection and Rapid Response project for new invasive plants including plans for island-wide roadside surveys.
- Conducted the first aerial spray operation for miconia on the Big Island with the assistance of the Division of Forestry and Wildlife and completed work on the 1996-2006 “miconia net change analysis”.

2006 Statewide Report  CGAPS, AIS & ISCs  15
Highlights continued

- Worked with partner agencies to control coqui infestations in priority areas including Kalōpā State Park and Manukā Natural Area Reserve.
- Worked with Hawaii Department of Agriculture to conduct monitoring for little fire ant
- Developed the “What’s in your backyard” outreach program for island residents.

Target Plant Species

- Bocconia (*Bocconia frutescens*)
- Miconia (*Miconia calvescens*)
- Fountain grass (*Pennisetum setaceum*)

Target Animal Species

- Coqui frog (*Eleutherodactylus coqui*)

Staff

Staffing levels fluctuated during 2006 as BIISC sought to fill vacant field and supervisory positions. By the end of the year, five field positions had been filled creating one fully operational field crew. A GIS specialist, two administrative positions, an outreach specialist and the project manager for a total of ten staff support this crew and the BIISC partners. Despite lack of field staff in the first half of the year, survey and control work continued by partnering with other field workers from across the State.

Field Work

**Early Detection:** In late 2006, BIISC has completed its scoping sessions for creating an “Early Detection and Rapid Response” program focusing on roadside surveys for new invasive plants. Given the enormity of this project, BIISC has decided to break roadside surveys by districts. BIISC will be creating three separate contracts for conducting roadside, nursery and botanical garden beginning with roadside surveys in South Kona and North Hilo (882 miles total). Surveys will concentrate on major, secondary and tertiary roads only. The with nursery and botanical garden surveys contract will begin with a subset of all facilities to develop a target list based on plantings.

**Priority Target Plant Species:** Miconia continued to be a top priority species for BIISC field operations, with control operations being the primary focus during this reporting period.

A major accomplishment during 2006 included a comparison of historical miconia data, dating from 1996, and more recent data from surveys conducted in established plots. Historical data was converted to a grid format using ArcGIS, based on density of miconia trees (adults & sapling). All new ground data (2005-2006) was aggregated and interpolated using the Inverse Distance Weighted method and based on the same grid size as the historic dataset for comparability. After some additional screening to better reflect the known miconia distribution, the data were used to calculate net change in population.
From Hilo to Nīnole, many of the areas showed either no change or a slight increase (0.01 – 50 trees) in the number of miconia trees per acre, but the data also indicated a slight decrease in some areas. Areas showing the greatest increase included Mountain View and Hā'ena.

BIISC completed surveys outlined in 2005 and identified the following five key areas for control and containment efforts: Pi'ihonua/Onomea/ Nīnole containment perimeter; Leilani Estates and Malama-kī; Maku'u Forest Reserve populations in the lower Puna region; KahauaLe'a and Ihope Road populations in the upper Puna region and Hōnaunau and Honalo populations in the Kona region.

The OISC crew finds miconia on a cooperative operation with BIISC
In the Hāmākua area, control operations are concentrated in previously controlled blocks along a 10-mile containment perimeter from Pi‘ihonua in S. Hilo to Nīnole in the N. Hilo district, along the Hāmākua coastline. This containment perimeter continues to be given the highest priority to keep the largest core population of miconia in East Hawai‘i from spreading to elevations above 1500’ and beyond east Hawai‘i. However, one population in Onomea is located at the 1,660 ft elevation and is the highest known population along the containment corridor for East Hawai‘i. A total of 25 plants were controlled from this area during 2006. By chance, field personnel found two miconia plants outside the control block, yet within a half mile of this area, which resulted in an expansion of the search area. No other plants were found.
Leilani Estates, Malama-kī and Maku'u Forest Reserve make up the control and containment perimeter for the lower Puna region of the Big Island. Much of the work in the Puna district focused on the Leilani Estates area. The community in the lower Puna district has been very supportive, with some landowners assisting with control on their properties. Many new homes have been developed on lots with known miconia populations in the development. The movement of bulldozers and the potential for infestations away from known centers remains a serious concern. There was an increase in the number of permissions given to access vacant lots to conduct control actions during 2006. BIISC crews conducted control on 27 one-acre sized lots within the core area of Leilani Estates and removed a total 7,886 individual miconia plants of which 228 plants were considered mature adults. Seedling recruitment remains high at this site.

Malama-kī, located on the southern boundary of Leilani Estates, has been one of the more challenging sites for ground control, with miconia located in deep volcanic craters. Much of the area is inaccessible by foot, requiring use of a helicopter. Aerial control operations took place in the Malama-kī Forest Reserve and on two large private parcels directly adjacent to the forest reserve. A total of 83 plants were controlled, of which 76 were mature. Seed recruitment is expected to be a challenge, particularly within crater sites where miconia plants reached tree heights exceeding 20 feet.

The Maku'u Forest Reserve is another challenging control site, with tall uluhe (*Dicranopteris linearis*) and numerous earth cracks. This year was the first time that aerial control operations were conducted at this location. Ground crews were only able to cover a total of 98 observed acres and found a total of 2 immature miconia plants, utilizing a total of 528 personnel hours (0.19 acres per hour). Compared to 159 plants controlled, with 991 total observed acres, and 25.50 personnel hours (39 acres per hour). A combined total of 52.13 acres were treated.

Staff also worked on one additional site in the lower Puna region within the Halepu'a area of the Nānāwale Forest Reserve as part of a community led volunteer miconia control campaign. A small group of volunteers from the Wa'a Wa'a subdivision, which borders the reserve, has been conducting miconia control in the area for a number of years. Previous BIISC control activities have also taken place in this area. In addition to BIISC staff, a team from the O'ahu Invasive Species Committee, and students from the Hawai'i Community College-Forest Team program participated in a two-day weekend miconia control effort. A total of 24 people participated in this activity, controlling a total of 931 plants. BIISC provided all of the field equipment to maintain decontamination protocols and prevent the spread of miconia seeds from the work site.

In the upper Puna area, aerial surveys of known populations within KahauaLe'a and Ihope Road locations did not yield any miconia plants. The known population at the KahauaLe'a homestead location was not found. This site will continue to be monitored as it is an isolated location. Much of the area has recently been cleared for new home sites, again raising concerns of potential seed dispersal from bulldozers.
In the South Kona district, BIISC was assisted by personnel from the East Maui Watershed Partnership program to work on miconia control in the Honaunau area. Aerial surveys and ground operations took place simultaneously. The goal for this area is total eradication of miconia. Combined aerial and ground activities for total observed acres equaled 1,909 acres. Field crews controlled a total of 16 individuals of which 4 were mature plants.

No plants were found during aerial surveys of the Honalo site. BIISC did not feel it necessary to send a ground team into the control block, since the majority of the Honalo control block is open with very little tree cover.

A new and large population of miconia was discovered in the upper Puna region within the Wao Kele O Puna forest. The nearest known population was in the Fern Forest subdivision, approximately 1,200 meters south of the current containment line in upper Puna. The population is estimated to cover at least 2 acres with hundreds of mature plants. Additional aerial surveys are planned to determine the extent of this population.

Bocconia control efforts focused on the Ka’u district in the Wood Valley area. The total observed acres for aerial, ground and roadside activities totaled 6,278 acres. Staff controlled 101 plants, of which 93 were mature.

**Woodvalley bocconia populations**

---

*Bocconia*
Work on fountain grass was conducted by staff from BIISC, Hawai‘i Volcanoes National Park (HAVO), the Division of Forestry and Wildlife -Natural Area Reserve (NARS) and community volunteers.

During 2006, fountain grass control efforts were expanded to include an additional subdivision currently outside of the control areas currently targeted. BIISC conducted roadside surveys and control in the Ranchos Subdivision in the Ka‘u district. Control efforts focused on easements along main arterial roads that lead out of the subdivision to the main highway. No control was conducted on private lots. The intent is to limit seed dispersal into areas currently controlled by HAVO and NARS. A total of 1,592 individual plants were controlled, of which 811 were mature.

Oceanview Estates fountain grass survey

![Image of fountain grass survey map]

Fountain grass
Action Summary for BIISC Priority Plant Species – 2006

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Acres Surveyed</th>
<th>Plants Controlled (mature)</th>
<th>Acres Treated¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bocconia</td>
<td>Bocconia frutescens</td>
<td>6,861</td>
<td>101 (93)</td>
<td>0.16</td>
</tr>
<tr>
<td>Miconia</td>
<td>Miconia calvescens</td>
<td>12,177</td>
<td>13,500 (1,348)</td>
<td>172</td>
</tr>
<tr>
<td>Fountain grass</td>
<td>Pennisetum setaceum</td>
<td>826</td>
<td>1592 (811)</td>
<td>135</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>18,864</td>
<td>15,193 (2,252)</td>
<td>307.16</td>
</tr>
</tbody>
</table>

¹ Acres treated is derived using the Forest Service calculation of 1/10,000 acre x number of individuals or actual area sprayed depending on the target.

Priority Target Vertebrate Species:

**Coqui Frog Survey & Treated Areas**

Providing public assistance and data management for the control efforts of the massive invasion of the coqui frog on the Big Island demanded significant BIISC resources. BIISC objectives for coqui frog control operations are to provide public assistance, planning and management support, prevent coqui from spreading into high-value resource areas such as critical habitat for endangered species, natural area reserves and watersheds. BIISC strategy also includes controlling isolated populations to prevent spread into regions currently free from the coqui frog.
Control sites during 2006 included State-owned lands in the Waiākea Forest Reserve, Manukā Natural Area Reserve, and Kalōpā State Park. Additional control sites include Waipi'o lookout, Steinback Highway, and Volcano (excluding HAVO). Observed acres for these locations total 145 with a total of 78 acres controlled.

During the last quarter of 2006, BIISC’s coqui control activities were limited to supporting partner agency’s activities, primarily working with personnel from the County of Hawaiʻi. BIISC provide one field assistant to Hawaiʻi County for control activities. The total surveyed acres during operations with Hawaiʻi County, were 22 acres with treated acres totaling 0.06 acres.

A popular community program is the BIISC citric acid matching program. During 2006, BIISC provided 20 tons, or 802 50-lb. bags of citric acid in a 1:1 match to community participants who had purchased citric acid. This program serves community members who do not qualify for a Hawaiʻi County grant, but who have been actively treating frogs on their property or working with neighbors to control frogs in their immediate surroundings.

Coqui calls to the BIISC hotline totaled 298 calls, the majority of which inquired about control techniques, chemical assistance or requesting help. Staff responded to directly to reports of coqui frogs on two occasions, including a new outbreak in the Kaʻu district. A survey conducted two weeks after treatment in the Kaʻu district found no calling coqui.

With funding assistance from the Hawaiʻi Island Economic Development Board “Women in Technology” grant, BIISC hired a temporary data assistant to help organize coqui files into a coherent database. Working in conjunction with USDA Wildlife Services personnel, data were converted into digital files using the Geographical Information System (GIS) to create map overlays. BIISC will continue to provide technical support and one full time data assistant through fiscal 2007 to assist with this project. HISC provided additional funding to support expansion of the coqui database by the USGS Pacific Basin Information Node staff. This joint data project will be initiated in January 2007.

BIISC also supported two community organizations in the upper Puna area by providing cell phones with coqui activities. BIISC provides two cell phones to assist with the communities’ rapid response program. These community groups have been crucial in keeping coqui from exploding into high-value natural resource areas like Hawaiʻi Volcanoes National Park and State forest reserves. BIISC assisted in getting the Volcano group a grant from the Hawaiʻi Island Economic Development Board to purchase road signs as part of their coqui efforts and also provided personnel to help install the road signs. The groups have agreed to participate on early detection programs in their respective communities.
Reports of coqui along main arterial roads have increased, indicating movement of the coqui frog by vehicles. Inadvertent transportation of coqui is a major source for new infestations across the Big Island, making containment problematic.

<table>
<thead>
<tr>
<th>Species</th>
<th>Survey Acres</th>
<th>Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coqui</td>
<td>152</td>
<td>7</td>
</tr>
</tbody>
</table>

**Outreach & Education**

During 2006, BIISC staff worked with various community members, community organizations and associations, as well as students from the local community college to build community-based programs to assist with BIISC objectives. These groups have helped with access issues, volunteer control projects for miconia, fountain grass and strawberry guava, and early detection of target species. BIISC filled a critical outreach position during the last quarter of 2006. The Outreach Specialist has been charged with creating a program to highlight BIISC objectives, particularly with early detection of target species.

Staff participated in the Natural Resources Working Group of the County’s Puna Community Development Plan. BIISC is providing expertise related to controlling the spread of invasive species and preserving natural resources on private property.

A series of articles and press releases designed to highlight BIISC activities is under development. Also in progress is a program called “What’s in my backyard?” to assist with early detection, invasive species identification, and to highlight native species pertinent to their areas including options in selecting landscaping plants.

**BIISC Participants**

Maui Invasive Species Committee (MISC)

Project Strategy
The Maui Invasive Species Committee detects and controls invasive plants and animals that threaten the environment, economy, and quality of life. MISC seeks to limit biological invasions to allow parts of Maui County to serve as long-term refuges for the remaining endemic and vulnerable plants and animals. MISC focuses on early detection and rapid response, using an operational strategy that is science-based and data-driven. Strong partnerships, dedicated staff, and a supportive community form the basis for MISC’s status as a regional model for successfully combating invasive species.
Highlights

- Targeted 19 plant species for island-wide eradication or containment and another four species in defined geographic areas
- Successfully controlled coqui frogs at five population centers. Continued active work at eight other infestations.
- Reached 7,500 members of the public through outreach and education activities, and engaged students in survey and control activities for miconia, coqui frogs, fire ants, ivy gourd and other invasive targets.

Target Plant Species
Queensland silver wattle (Acacia podalyriifolia)†
Water wattle (Acacia retinodes)†
Giant reed (Arundo donax)
Ivy gourd (Coccinia grandis)
Pampas grass (Cortaderia spp.)
Rubber vine (Cryptostegia grandiflora)
Ruby saltbush (Enchylaena tomentosa)
Bingabing (Macaranga mappa)†
Parasol leaf tree (Macaranga tanarius)†*
Osage orange (Maclura pomifera)†
Malabar melastome (Melastoma candidum)
Red melastome (Melastoma sanguineum)†
Miconia (Miconia calvescens)
Wax myrtle (Morella cerifera)†
Firetree (Morella faya)†*
Jerusalem thorn (Parkinsonia aculeata)
Fountain grass (Pennisetum setaceum)
Cape pittosporum (Pittosporum viridiflorum)†
Downy rose myrtle (Rhodomyrtus tomentosa)
Himalayan raspberry (Rubus ellipticus)
Bully tree (Sideroxylon persimile)†*
Common mullein (Verbascum thapsus)†
†Early detection species
*Targets for localized control

Vertebrate Targets
Mitred conure (Aratinga mitrata)
Veiled chameleon (Chamaeleo calyptratus)
Coqui frog (Eleutherodactylus coqui)
Snakes and other new vertebrate introductions

Plant Diseases
Banana bunchy top virus
Staff
The Maui Invasive Species Committee formed in 1997 and hired its first staff in the fall of 1999. Maui-based staff now numbers 26, with two crews operating out of Makawao and one crew from Hāna. During 2006, MISC hired three temporary workers to focus on coqui frog control. Staff exhibits a high degree of flexibility in scheduling, which enhances MISC’s ability to operate as a rapid response team to new introductions and to cover all the islands of Maui County. MISC provides fiscal and administrative oversight for two additional staff members based on Moloka'i with the Maui/Moloka'i Invasive Species Committee (MoMISC).

Maui Invasive Species Committee field crew on a service trip to Kaho'olawe

Field Work
Priority target plant species: Miconia continued to be MISC’s top priority plant target. Using a combined aerial and ground approach, crews worked in established management areas, treating newly discovered infestations and areas with established seed banks. Over 44,000 acres were surveyed for miconia during 2006. Nearly 41,000 plants were controlled, of which 465 were mature. Progress over the last four years – measured by decreases in the number of mature miconia plants – has been significant. The downward trend is consistent even when data are adjusted for fluctuations in person hours and acres surveyed. Despite the encouraging trends, continued surveys are essential: large mature trees were discovered during ground sweeps in the western end of the miconia distribution and plants also were found at the 2,700’ elevation during aerial
reconnaissance. These discoveries and the many thousands of acres that harbor miconia seeds underscore the need to ensure continuity of effort. Funds from a three-year National Park Service grant expired in 2006. Replacement of those funds remains a pressing priority.

Changes in number of mature miconia plants on Maui: 2003-2006

![Bar chart showing number of mature miconia plants on Maui: 2003-2006](chart.png)

Similar to miconia, the strategy for controlling pampas grass involves both aerial and ground operations. During 2006, a new population of pampas grass was discovered in West Maui. Several outlier plants also were found at high elevations in East Maui.

**Pampas grass survey on West Maui**

Changes to operational strategy are enhancing our ability to interrupt the reproductive cycle of pampas grass by using helicopters to drop crews in for day and overnight surveys. Previously, control in remote areas was limited to aerial treatment performed after plants became detectable from the air by their showy plumes. In September, MISC crews were joined by multiple partners for annual pampas sweeps across the Haleakalā front country. Over 1,600 acres were covered with only two plants found.

Control of fountain grass on Maui occurred at four known sites. A new multi-year population was discovered in South Maui (Mākena) on an excavation mound associated with a local golf course, suggesting transport of seeds via construction equipment from the...
heavily-infested Island of Hawai’i. Fountain grass work continued on Lāna‘i. Crews surveyed 9,212 acres and controlled 610 mature plants. Funding from the U.S. Forest Service supported aerial surveys for fountain grass on Lāna‘i.

Ivy gourd remains challenging as new sites in South Maui continue to be discovered, although crews are achieving good results at existing sites. The number of mature plants has decreased from a high of 1,822 mature plants in the year 2003 to 230 this last year. Control of giant reed continued to focus high-value natural areas, particularly at low elevation wetlands.

Previous roadside surveys conducted on Maui by personnel from the U.S. Geological Survey helped identify invasive species with a high potential for eradication. During 2006, MISC staff continued to work on twelve invasive plant species targeted for eradication. Of the eight species targeted for island-wide eradication, all known locations for six of the species have been controlled (Water wattle, bingabing, Osage orange, red melastome, wax myrtle, and common mullein). Staff discovered and controlled a new location for bingabing, with the landowner reporting that the plant had been brought in from the Island of Hawai’i, where this species is widespread. Three species targeted for local containment have been controlled (cat’s claw, parasol leaf tree, and firetree) although additional work was required for cat’s claw during 2006. Crews surveyed 99 acres and controlled 408 plants during 2006 for early detection species. MISC began promoting public awareness of these and other MISC targets through an Early Detection workshop, creation of an “Eyes & Ears” early detection field guide, and initiation of a monthly column in the Maui News.

**Action Summary for MISC Priority Plant Species – 2006 (Maui)**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Acres Surveyed</th>
<th>Plants Controlled (mature)</th>
<th>Acres treated&lt;sub&gt;1&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Giant reed</td>
<td><em>Arundo donax</em></td>
<td>61</td>
<td>72 (72)</td>
<td>0.01</td>
</tr>
<tr>
<td>Ivy gourd</td>
<td><em>Coccinia grandis</em></td>
<td>1,718</td>
<td>10076 (433)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.00</td>
</tr>
<tr>
<td>Pampas grass</td>
<td><em>Cortaderia spp.</em></td>
<td>29,807</td>
<td>2,678 (462)</td>
<td>0.20</td>
</tr>
<tr>
<td>Rubber vine</td>
<td><em>Cryptostegia grandiflora</em></td>
<td>6</td>
<td>1 (1)</td>
<td>0.01</td>
</tr>
<tr>
<td>Malabar melastome</td>
<td><em>Melastoma candidum</em></td>
<td>2</td>
<td>1 (1)</td>
<td>0.01</td>
</tr>
<tr>
<td>Miconia</td>
<td><em>Miconia calvescens</em></td>
<td>47,049</td>
<td>41,345 (465)</td>
<td>46.00</td>
</tr>
<tr>
<td>Jerusalem thorn</td>
<td><em>Parkinsonia aculeata</em></td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Fountain grass</td>
<td><em>Pennisetum setaceum</em></td>
<td>1,102</td>
<td>118 (27)</td>
<td></td>
</tr>
<tr>
<td>Downy rose myrtle</td>
<td><em>Rhodomyrtus tomentosa</em></td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>51,086 (1,256)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> Number of ivy gourd plants refers to root nodes. <sub>1</sub> Acres treated is derived using the Forest Service calculation of 1/10,000 acre x number of individuals or actual area sprayed depending on the target.
Action Summary for MISC Priority Plant Species – 2006 (Lāna‘i)

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Acres Surveyed</th>
<th>Plants Controlled</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Coccinia grandis</em></td>
<td>Ivy gourd</td>
<td>26.7</td>
<td>3,205 (205)</td>
</tr>
<tr>
<td><em>Pennisetum setaceum</em></td>
<td>Fountain grass</td>
<td>9,211.6</td>
<td>4,733 (560)</td>
</tr>
<tr>
<td><em>Prosopis juliflora</em></td>
<td>Long thorn kiawe</td>
<td>0.9</td>
<td>50 (50)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>9,239.2</td>
<td>7,988 (815)</td>
</tr>
</tbody>
</table>

**Plant Diseases:** Funding from the County of Maui supported work on banana bunchy top virus (BBTV). MISC surveyed 962 sites, covering 329 acres, primarily in Pukalani, Makawao, and Kihei, and detected and controlled 720 infected plants, of which 115 were at previously infested properties. Surveys in Kihei followed reports from the Hawai‘i Department of Agriculture of three infested sites in the area. Using information on the spread of BBTV obtained from research in Hawai‘i, MISC delineated suspect areas in Kihei and worked with a local high school student who performed the laboratory verification procedures. An additional 17 infested sites in the Kihei area were identified. Crews surveyed 496 sites in Lāna‘i City for BBTV in January and found no infected plants. Staff continued to participate in the Maui Banana Bunchy Top Committee, which met to prioritize actions and evaluate progress. A presentation on the status of BBTV on Maui was given at the annual Banana Industry Conference in Hilo. Informational flyers were distributed to the public a BBTV display was set up at public events.

**Priority target vertebrate species:** Maui’s top vertebrate priority is the coqui frog. This year, MISC fielded 75 coqui reports and visited 259 sites to search for and control coqui. Activities included habitat modification and hand capture or spray operations at more than 50 active sites, including three infested nurseries. MISC worked to develop a voluntary coqui-free certification program for local nurseries and plant providers to help prevent the spread of this pest. After a year and a half of stepped-up efforts, one population center (5 or more calling males) is now considered coqui-free. Four more are in a monitor phase, meaning at least six months has passed since a coqui has been heard. Seven other population centers are showing promising results with decreases in numbers of vocalizing males and infested acreage. With additional funding from the County of Maui, a temporary crew was hired to begin working on properties near the heavily infested Maliko Gulch. Crews were able...
to conduct two complete spray operations and removed a significant amount of coqui-friendly habitat in this 51-acre zone. Before beginning work in the area, MISC organized a community workshop to inform local residents about the operation and to secure their support. Despite these successes, nearly 76 steep-sided acres in Maliko Gulch will remain a coqui stronghold until adequate funds become available to tackle this area.

![Status of Coqui Frog Populations on Maui](image)

Work continued on a population of veiled chameleons in a residential area of upcountry Maui, with searches occurring on 27 nights. Since the chameleons were first discovered in 2002, over 194 individuals have been removed. During 2006, a total of ten individuals were captured, with most of the animals being found just outside the initial core population. The greatest distance between any two animals discovered during 2006 was approximately 0.3 miles. The search area has been expanded to address the apparent dispersal of the species. Supported by HISC funding, research continued on the feasibility of eradicating this species, with efforts focused on tracking animals via radio transmitters and developing potential traps.

A population of cliff-dwelling parrots (mitred conures) in the Huelo area of East Maui has been a source of concern for many years. The recent discovery of mature miconia plants in the area where the conures congregate suggests that the birds are likely vectors of miconia seeds into adjacent mauka forests, where anomalous locations of miconia have been discovered. Surveys conducted by MISC staff provided baseline information for control efforts. Personnel from the U.S. Department of Agriculture - Wildlife Services
and Hawai‘i Department of Land and Natural Resources conducted control activities. MISC staff provided support activities. Subsequent surveys indicated that the population has been reduced by approximately one-third, with current flock numbers estimated to be approximately 75 birds.

Initiating a rapid response to reports of snakes and other alien vertebrates is critical to a successful capture. Staff cooperated with HDOA and DLNR by responding to two reports of snakes on West Maui. A MISC Field Supervisor attended the three-week training course on brown tree snakes held in Guam. Staff also responded to several reports of unusual lizards but no captures occurred.

Outreach & Education
Many outreach and education activities occurred during 2006, thanks in part to HISC funding for specific projects. Outreach activities included local press releases, production and distribution of printed pest alerts, presentations to schools and professional groups, display booths at the County Fair and participation in other public events across the island. Creation of a giant papier mache snake and coqui frog was responsible for MISC receiving the “Most Unusual Entry” award at the Makawao 4th of July parade.

**Most Unusual Entry in the 4th of July parade**

Siginificant new publications included posting MISC’s quarterly reports on the website, launching a newsletter, “Kia ‘i Nā Moku o Maui Nui,” for the public, and initiating a monthly column in the Maui News about target species. In coordination with the Maui Association of Landscape Professionals and the County of Maui, MISC sponsored the fourth annual award program designed to recognize industry professionals who work to protect Maui County from invasive species. The award was presented to a community college agriculture specialist, who also is a fourth-generation farmer with an organic cattle business and nursery. The HISC-supported workshops for teachers which use the Maui-based science curriculum, “Hoike o Haleakalā,” continued to be popular, as was another HISC-funded program, “Weed Warriors,” which involved high school students in efforts to control invasive species.
<table>
<thead>
<tr>
<th>Type of Outreach / Education Activity</th>
<th>Number of Events</th>
<th>Audience Reached (#s)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print Media / Articles</td>
<td>20</td>
<td>&gt;30,000</td>
<td>Based on Maui News circulation</td>
</tr>
<tr>
<td>Broadcast Media</td>
<td>3</td>
<td>Unk.</td>
<td>2 TV broadcasts, 3 radio PSAs</td>
</tr>
<tr>
<td>Presentations / Workshops</td>
<td>9</td>
<td>656</td>
<td></td>
</tr>
<tr>
<td>Public Events</td>
<td>15</td>
<td>4,827</td>
<td></td>
</tr>
<tr>
<td>School / Classroom Visits</td>
<td>24</td>
<td>1,852</td>
<td></td>
</tr>
<tr>
<td>Teacher Training</td>
<td>9</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Volunteer Trips</td>
<td>7</td>
<td>96</td>
<td>High school students</td>
</tr>
</tbody>
</table>

Moloka‘i/Maui Invasive Species Committee (MoMISC)

Project Strategy
The Moloka‘i Invasive Species Committee works to detect and control invasive plants and animals that threaten the environment, economy, agriculture, and quality of life on Moloka‘i. To date, Moloka‘i has managed to avoid or halt the introduction of major pest species that plague the other Hawaiian Islands, including miconia, coqui frogs, ivy gourd, fountain grass, and banana bunchy top virus. MoMISC focuses on early detection and rapid response, and maintains an effective education and outreach program to prevent future introductions of pest species. MoMISC’s on-island partner agencies and committee members provide assistance in the field, essential in-kind services, and expertise in operational planning.

Highlights
• Targeted 12 plant species for island-wide eradication or containment and another two species in defined geographic areas.
• Worked cooperatively with the agriculture industry to prevent establishment of agricultural pests.
• Conducted outreach and education activities with increased emphasis on the harbor to help prevent the introduction of new invasive species to Moloka‘i.
Target Plant Species
Mexican poppy (*Argemone mexicana*)
Giant reed (*Arundo donax*)
Cat’s claw (*Caesalpinia decapetala*)*
Pampas grass (*Cortaderia spp.*)
Rubber vine (*Cryptostegia madagascariensis*)
Australian tree fern (*Cyathea cooperi*)
Woodrose (*Merremia tuberosa*)*
Fountain grass (*Pennisetum setaceum*)
Barbados gooseberry (*Pereskia aculeata*)
New Zealand flax (*Phormium tenax*)
False awa (*Piper auritum*)**
Long thorn kiawe (*Prosopis juliflora*)
Tumbleweed (*Salsola kali*)**
Gorse (*Ulex europaeus*)

Banana showing signs of BBTV

Target Animal Species
Gold Dust Day Gecko (*Phelsuma lauticauda*)**
Red vented bulbul (*Pycnonotus cafer*)

Plant Diseases
Banana bunchy top virus (BBTV)

*target for localized control, as surveys revealed that populations were too widespread to eradicate island-wide.

**target for control while distribution is being determined.

Staff
The Moloka‘i/Maui Invasive Species Committee (MoMISC) formed in 2001 as a subcommittee of the Maui Invasive Species Committee, which provides administrative and fiduciary oversight. The Nature Conservancy on Moloka‘i continues to provide management assistance to MoMISC through in-kind labor, as well as the use of vehicles, tools, office space, and supervision by the Program Director. MoMISC has two staff. Two temporary workers were hired during 2006 to assist with weed removal and to update outreach and presentation materials.

Field Work
Where feasible, MoMISC seeks to eradicate target species on an island-wide basis. Some species, such as cat’s claw, are too widespread and are targeted for control in limited geographic areas due to the close proximity of native forest.

During 2006, MoMISC initiated suppression of a large infestation of rubber vine, with the assistance of other partner agencies. To date, 12 of the 13 known rubber vine populations have been controlled. Another round of aerial surveys for miconia and other target plants was completed with funding from the U.S. Forest Service. MoMISC staff also assisted The Nature Conservancy with aerial weed assessment of TNC and East Moloka‘i Watershed areas. No miconia was detected during any of these surveys. A survey of 150 residences in the Kalae-Palaau (upper) districts turned up more Australian tree fern plants. The faster growing Australian tree fern threatens to displace the native tree fern where they co-occur. Stopping the spread of this ornamental is essential to keeping it out of Moloka‘i’s native forests. During 2006, MoMISC controlled 29 Australian tree fern plants.

Much of MoMISC’s work focused on surveying areas where target species have been removed to ensure that the seed bank has been exhausted. Surveys for giant reed, pampas grass, and fountain grass detected no new growth or re-growth during 2006. Only two gorse seedlings were detected. MoMISC conducted survey and control work on woodrose and tumbleweed to assess whether these species should be included as priority targets for control.

In cooperation with other partners, over 100 acres were surveyed for banana bunchy top virus (BBTV) with no evidence of the virus found on Moloka‘i in 2006. BBTV, papaya ring spot virus and other agriculture-related issues are components of MoMISC’s outreach workshops, often conducted in collaboration with the Hawai‘i Department of Agriculture.

Rapid response activities involving alien vertebrates included checking out a snake report (blind snake), participating in surveys for alien birds, and working to control the gold dust day gecko population at the airport.

**Action Summary for MoMISC Priority Plant Species – 2006**

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Acres Surveyed</th>
<th>Plants Controlled (mature)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Arundo donax</em></td>
<td>giant reed</td>
<td>0.6</td>
<td>0</td>
</tr>
<tr>
<td><em>Caesalpinia decapetala</em></td>
<td>cat’s claw</td>
<td>18.6</td>
<td>572 (182)</td>
</tr>
<tr>
<td><em>Cortaderia spp.</em></td>
<td>pampas grass</td>
<td>71.5</td>
<td>0</td>
</tr>
<tr>
<td><em>Cryptostegia madagascariensis</em></td>
<td>rubber vine</td>
<td>100.8</td>
<td>3,616 (1,422)</td>
</tr>
<tr>
<td><em>Cyathea cooperi</em></td>
<td>Australian tree fern</td>
<td>404.9</td>
<td>29 (25)</td>
</tr>
<tr>
<td><em>Mierremia tuberosa</em></td>
<td>woodrose</td>
<td>2.9</td>
<td>110 (12)</td>
</tr>
<tr>
<td><em>Merremia calvescens</em></td>
<td>miconia</td>
<td>2,819.5</td>
<td>0</td>
</tr>
<tr>
<td><em>Pennisetum setaceum</em></td>
<td>fountain grass</td>
<td>34.2</td>
<td>0</td>
</tr>
<tr>
<td><em>Pereskia aculeata</em></td>
<td>Barbados gooseberry</td>
<td>27.5</td>
<td>307 (22)</td>
</tr>
<tr>
<td>Species</td>
<td>Common Name</td>
<td>Abundance</td>
<td>Count</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------------</td>
<td>-----------</td>
<td>-------</td>
</tr>
<tr>
<td>Phormium tenax</td>
<td>New Zealand flax</td>
<td>53.5</td>
<td>78</td>
</tr>
<tr>
<td>Piper auritum</td>
<td>false awa</td>
<td>0.4</td>
<td>482</td>
</tr>
<tr>
<td>Prosopis juliflora</td>
<td>long thorn kiawe</td>
<td>1.6</td>
<td>6</td>
</tr>
<tr>
<td>Salsola kali</td>
<td>tumbleweed</td>
<td>13.2</td>
<td>412</td>
</tr>
<tr>
<td>Ulex europaeus</td>
<td>gorse</td>
<td>0.6</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>3,549.8</strong></td>
<td><strong>5,614 (1,925)</strong></td>
</tr>
</tbody>
</table>

**Outreach & Education**

Moloka’i does not have an agriculture inspector or inter-island inspection of incoming agricultural goods. The absence of inspection complicates MoMISC’s efforts to address critical control points for incipient species and to stop the re-introduction of previously eradicated pests, such as fountain grass or banana bunchy top virus. Cooperation with partner agencies and effective public education and outreach become even more important, with a gap in prevention resources.

Since its establishment in 2001, MoMISC has increased its outreach efforts yearly. With the short term hire of an outreach/administrative assistant during 2006, time spent on outreach more than tripled (approximately 725 hours). Informational flyers were updated and new Powerpoint presentations were created. Information was provided to the public during door-to-door canvassing, via educational flyers, through The Nature Conservancy’s Moloka’i newsletter, and at public events. A display booth was staffed at the annual Earth Day event. Training and information on invasive species was provided to a Youth Conservation Corps group and to two interns (AmeriCorps and The Nature Conservancy). MoMISC gave presentations on invasive species at Moloka’i’s “Goat Fest” for the Moloka’i Watershed Partnership and also to a Maui Community College botany class.

*Efforts to enhance early detection of priority species included a workshop for Young Brothers Ltd. employees, installation of an invasive species bulletin board at the Kauanakakai Pier, and a holiday display at the Moloka’i Airport, entitled “Don’t Bring These Presents to Moloka’i.” Staff maintained the airport kiosk throughout the year.*
MoMISC Participants:
This year, the Committee invited Monsanto’s Hawaiian Research company, and Dow Chemical's Mycogen Seeds company to join the committee. Their participation will help MoMISC better understand agricultural-related invasive species issues, such as the Erythrina gall wasp which decimated windbreaks used by seed producers on Moloka’i.


MoMISC’s partners from across the island
O‘ahu Invasive Species Committee (OISC)

Project Strategy
The O‘ahu Invasive Species Committee (OISC) is an informal partnership of agencies and individuals interested or involved in dealing with all issues related to invasive alien species on O‘ahu.

Highlights
- Initiated Early Detection program with the Bishop Museum
- Discovered and eradicated two noxious weeds not previously known to be on O‘ahu: yellow Himalayan raspberry (Rubus ellipticus) and tibouchina (Tibouchina herbacea)
- Treated the entire 12 acres of what was once a coqui infestation of approximately 125 calling frogs. This was O‘ahu’s only wildland population and eradication at this site is in the final stages.
- Ran monthly volunteer trips to control invasive species and educated the public about invasive species through community events and presentations.

Target Plant Species
Miconia (Miconia calvescens)
Himalayan blackberry (Rubus discolor)
Beardgrass (Schizachyrium condensatum)
Fountain grass (Pennisetum setaceum)
Pampas grass (*Cortaderia spp.*)
*Tetragastrigma pubinerve+
Hiptage (*Hiptage benghalensis*) (In the Waianae Range)+
Yellow Himalayan raspberry (*Rubus ellipticus*)+
Tibouchina (*Tibouchina herbacea*)+
Butterfly bush (*Buddleia madagascariensis*)*
Fire tree (*Morella faya*)*
Glory bush (*Tibouchina urvilleana*)*
Fireweed (*Senecio madagascariensis*)*
+Rapid response target, few known individuals
*Monitoring, population eradicated

**New vertebrate:**
Giant day gecko

**Target Animal Species**
Coqui frog (*Eleutherodactylus coqui*)
New vertebrate introductions

**Other**
West Nile Virus (WNV)

**Staff**
OISC started in 1999 as the Fountain Grass Working Group, a volunteer partnership of individuals and agency staff who shared a common interest in controlling fountain grass (*Pennisetum setaceum*) on O‘ahu and who volunteered their time to survey and control this single species. The transition to the O‘ahu Invasive Species Committee occurred in the year 2000 and staff was hired to control multiple incipient species. By 2006, OISC had grown to a staff of 15 employees (including seasonal hires) through increased funding from critical sources, including the Hawai‘i Invasive Species Council. OISC also relies on staff from partner agencies and a cadre of dedicated volunteers to accomplish its work.

*OED botanist Alex Lau works with Richard Criley from CTAHR to survey the CTAHR experimental agriculture site.*

**Field Work**
Invasive species are easier and cheaper to eradicate if they are caught early, before they spread or set seed. One of the most significant accomplishments of 2006 was the creation and implementation of an early detection program within OISC. Initiated in July through a grant from HISC and in partnership with the Bishop Museum, the O‘ahu Early Detection (OED) program aims to find invasive plants that are new to O‘ahu before they become a problem.
OED botanists began surveying areas with high potential for new introduced plants that may be invasive. These “hotspots” encompass a myriad of sites that were categorized and prioritized to provide the best sampling possible. The hotspots included areas such as experimental agriculture sites, botanical gardens, and nurseries. From over 22 hotspot surveys, the OED team identified and documented over 1,200 species. Of these, 175 were not vouchered in the Bishop Museum’s Herbarium Pacificum, meaning they are possibly very recent arrivals to O’ahu. Seventeen of these 175 species have been documented as weeds elsewhere in the world and may become targets for OISC eradication. Subsequent work will focus on prioritized road side surveys throughout the island.

Once a species is identified, it is screened for potential invasiveness and prioritized for potential eradication. Species are screened using a matrix incorporating the Weed Risk Assessment system developed by Dr. Curt Daehler at the University of Hawai‘i. Plants that have a high level of threat to the island and a low level of establishment represent the highest priority for control and become OISC rapid response species. Once a species is included as a rapid response target, OISC begins to systematically survey and control all known populations to eradicate it from O’ahu. This past year, OISC discovered and began control of three rapid response species, two of which have been eradicated from the island: yellow Himalayan raspberry and tibouchina. An additional three other species are well on their way to being completely controlled.

Action Summary for OISC Priority Plant Species – 2006

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Acres Surveyed</th>
<th>Plants Controlled (mature)</th>
<th>Acres Treated¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miconia</td>
<td>Miconia calvescens</td>
<td>5,432</td>
<td>527 (6)</td>
<td>0.0527</td>
</tr>
<tr>
<td>Himalayan blackberry</td>
<td>Rubus discolor</td>
<td>41</td>
<td>480 (2)</td>
<td>0.0480</td>
</tr>
<tr>
<td>Beardgrass</td>
<td>Schizachyrium condensatum</td>
<td>2,863</td>
<td>6,945 (766)</td>
<td>0.6945</td>
</tr>
<tr>
<td>Fountain grass</td>
<td>Pennisetum setaceum</td>
<td>2,084</td>
<td>383 (195)</td>
<td>0.0383</td>
</tr>
<tr>
<td>Pampas grass</td>
<td>Cortaderia spp.</td>
<td>30</td>
<td>15 (15)</td>
<td>0.0015</td>
</tr>
<tr>
<td>Tetrastigma</td>
<td>Tetrastigma pubinerve</td>
<td>4</td>
<td>124 (35)</td>
<td>0.0124</td>
</tr>
<tr>
<td>Hiptage</td>
<td>Hiptage benghalensis</td>
<td>35</td>
<td>26</td>
<td>0.0026</td>
</tr>
<tr>
<td>Yellow Himalayan Raspberry</td>
<td>Rubus ellipticus</td>
<td>107</td>
<td>10 (1)</td>
<td>0.0010</td>
</tr>
<tr>
<td>Tibouchina</td>
<td>Tibouchina herbacea</td>
<td>14</td>
<td>1</td>
<td>0.0001</td>
</tr>
<tr>
<td>Butterfly bush</td>
<td>Buddleia madagascariensis</td>
<td>1,669</td>
<td>2</td>
<td>0.0002</td>
</tr>
<tr>
<td>Fire tree</td>
<td>Morella faya</td>
<td>18</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Glory bush
Tibouchina urvilleana
0.2 1 (1) 0.0001

Miscellaneous species
472 1,553 (199) 0.1553

Total 12,769.2 10,067 (1220) 1.0067

1 Acres treated is derived using the Forest Service calculation of 1/10,000 acre x number of individuals or actual area sprayed depending on the target.

Miconia remains OISC’s top priority target, demanding aerial and ground surveys. Since July 2001, OISC has surveyed and cleared over 16,000 acres for miconia eliminating 8,950 plants of which 66 were mature. In 2006, OISC committed over 60 percent of field time to eradicating this one target species and made substantial progress. In 2006, with the largest field crew to date, OISC was able to survey 5,429 acres and control 527 plants, of which only six were mature. There are currently no mature trees on the island. However, the seed bank left from the trees that have been removed require repeated survey and control work. By the end of 2007, OISC will have conducted initial surveys of all potential seed banks in wildland areas and nearly completed initial surveys in all suspect residential areas. Because miconia seeds can sprout after twelve years, re-visiting those areas in the future will still be necessary.

The year 2006 marked the first year of supplemental funding for miconia aerial operations with grants from the National Fish & Wildlife Foundation. Funding from NFWF covered all of OISC’s miconia operations and the significant increase in flights allowed OISC to close the gap on aerial surveys needed. In 26 flights covering over 1,900 acres, three mature trees and seven immature trees were detected.

Katy Metzler treats the last O‘ahu Tibouchina herbacea
OISC’s new full-time outreach specialist helped obtain permission from landowners, allowing OISC to focus on private lands within the miconia survey area. As with all of OISC’s work, public support plays a key role in the success of an eradication. Many plants, including all the original miconia, were intentionally bought and traded as ornamental plants. Future work will focus on prioritizing surveys outside the established buffer areas for miconia, including abandoned nurseries and wildland areas, which are optimal habitat for miconia but which do not receive any conservation attention.

Himalayan blackberry, a habitat altering bush which is also a problem elsewhere in the U.S., is now found in only two locations on the island. Growth is primarily from runners...
under the ground. The runners are so persistent that OISC field crew still finds new growth at the two locations. However, despite the need for continued maintenance, this weed is completely contained. In 2007, work will focus on refining treatments to increase efficacy and to treat areas before new sprouts have the potential to mature and spread.

*Steep ridge with light colored beardgrass infestation*

Previously thought to be in only two populations on the island, the fire-promoting beardgrass, has been found in a third location this past year. Increased detection and mapping surveys uncovered this population on the cliffs above the Ahuimanu residential site. It is probable that this sheer cliff-dwelling population is fed by plants on some of the remnant residences who continue to deny OISC access to control beardgrass on their property. Recalcitrant landowners underscore the need for improved regulation of invasive plants. The other two beardgrass populations have experienced a steady decrease in population size. During 2007, OISC will focus on developing and testing strategies for treating the inaccessible cliff areas, while continuing with systematic surveys and treatment to eradicate the other populations.

Fountain grass, another fire-promoting grass, is established in certain parts of O‘ahu, but OISC works to prevent its spread to the drier and more fire-prone Leeward Coast. Each year, OISC conducts extensive surveys throughout the Waianae range with the cooperative support from partner agencies and community groups, including the O‘ahu Army Natural Resources Program and the Ka‘ala Learning Center. So far, all known populations along the Leeward Coast have been eradicated and no new populations of fountain grass have been found. Outside of the Leeward Coast, the top priority is preventing its further spread which is accomplished by surveying and treating high traffic areas, including the airport and along the H-1 Highway. The Hawai‘i Department of Agriculture (HDOA), Marine Corps Base Hawai‘i and the Hawai‘i Army National Guard partner with OISC to contain large fountain grass populations and eradicate satellite populations.

The highly attractive pampas grass represents a unique challenge for OISC control efforts. Pampas grass is widely used in the landscape industry, but has proved extremely invasive in Maui, California, Australia, and New Zealand. It is a fire hazard, chokes out native plants, and alters habitat. Pampas grass has not yet “jumped the fenceline” into native habitat on O‘ahu but, given its increasing popularity, it is only a matter of time. It is now only found in areas where it was intentionally planted making eradication of this
species completely dependent on community support. Removal of pampas grass clumps from private property will avoid the need to spend millions of dollars cleaning it out of wildland areas. To date, pampas grass clumps have been removed from four locations. When requested, OISC has provided alternative landscaping at these sites.

Target species believed to have been eradicated continue to be monitored. Periodic surveys of the seed bank area help ensure that new plants are not becoming established. Fewer resources are devoted to species presumed eradicated; however, the necessity of continual monitoring is a reality of invasive species management. Of particular note in 2006 was the assessment that fireweed and butterfly bush had been eradicated. All known populations on O‘ahu of these two species have been controlled and OISC is now monitoring to ensure there is no recruitment. OISC’s partner agencies, HDOA and O‘ahu Army Natural Resources Program provided essential assistance in both the eradication and monitoring of these species.

In 2006, OISC made several significant accomplishments towards ridding O‘ahu of coqui frog. This was the second year that a dedicated full-time crew treated the only wildland population of coqui on the island. The crew worked over 50 days spraying 34,000 pounds of citric acid on the 12-acre site. Remarkable success has resulted. The initial 2004 population estimate of several hundred frogs had been reduced to one calling frog by September 2006.

Several committed partners are working with OISC in the effort to eradicate coqui from O‘ahu. The coqui working group (CWG) includes HDOA, DLNR/DOFAW, O‘ahu Army Natural Resources Program, City and County of Honolulu, the U.S. Fish and Wildlife Service, and OISC. OISC serves as the coordinating entity and the clearinghouse for all coqui data on O‘ahu. This past year, OISC implemented a coqui database, which records all coqui reports and tracks all coqui population sites across the island. This database helps ensure that all reports have been followed up to completion and that all population sites receive adequate attention for achieving eradication. In 2006, the CWG fielded 144 calls for coqui frog, of which only 17 were confirmed to be coqui.
There are only three nurseries on O’ahu with coqui frogs and the CWG is actively monitoring and controlling for coqui frog at those sites. This past year, CWG participants caught 75 coqui frogs and removed one clutch of eggs in the nurseries.

Eradication of all coqui populations on O’ahu is feasible within two years, assuming continued landowner cooperation and sufficient resources, However, as long as there is no interisland quarantine system for plants from other islands with larger coqui problems, the threat of new infestations will always be present.

OISC has joined forces with the Hawai’i Department of Agriculture to keep O’ahu free from new vertebrate pests. This past year that cooperation resulted in capturing the only known standing day gecko in the State. Work continues on removing the only remaining tokay gecko as well. These large (12-15”) long lived (7-10 years) lizards are aggressive hunters whose naturalization could further jeopardize the already threatened forest birds of the island. Unfortunately, OISC and HDOA actions are limited by the landowner’s unwillingness to permit access to remove the last known individual. In 2007, OISC will focus on surveys in the surrounding areas and attempt to lure the tokay gecko to public land for capture. In addition, OISC will assist HDOA to rapidly respond to new vertebrate pests, including the brown tree snake.

**Action Summary for OISC Priority Animal Species – 2006**

<table>
<thead>
<tr>
<th>Species</th>
<th>Survey Acres</th>
<th>Treated Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coqui</td>
<td>866</td>
<td>29</td>
</tr>
<tr>
<td>Eleutherodactylus coqui</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tokay gecko</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Gekko gecko</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standing day gecko</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Phelsuma standingi</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Outreach & Education
The OISC outreach program aims to educate the public about the problem of invasive species and acquire access onto private land to remove invasive species. In 2006, OISC set up an educational booth at fifteen different community festivals in neighborhoods from Waimea to Kailua to Wahiawa. Over 1,000 people stopped by to talk about invasive plants, listen to the call of the coqui frog, and receive refrigerator magnets with the new HDOA pest hotline number (643-PEST). Staff also made presentations at eight schools and six community organizations about invasive species.

Media alerts also help to bring new stories to the public regarding invasive species. A press release announcing the beginning of the coqui calling season on O’ahu resulted in four newspaper articles in the Honolulu Advertiser, the Honolulu Star-Bulletin, Ka Nupepa and Hawai’i Landscape. Two television shows for the Trinity Broadcast Network and KITV featured OISC’s work.

Two new brochures were created in 2006 – one introduces OISC and describes why invasive species are a problem and one specifically asks landowners to remove pampas grass from their property. OISC also began publishing a quarterly newsletter called “Weed Wise.” A radio public service announcement (PSA) was recorded and broadcast with money from the Hawai’i Invasive Species Council to ask the public to report coqui frogs to the pest hotline.

OISC Participants
Kaua’i Invasive Species Committee (KISC)

Project Strategy
The Kaua’i Invasive Species Committee (KISC) is a voluntary partnership of government, private and non-profit organizations, and concerned individuals. The partnership works to prevent, eliminate or control the most threatening invasive plant and animal species in order to preserve Kaua’i’s native bio-diversity and minimize adverse ecological, economic and social impacts. KISC collaborates with other island invasive species committees to ensure that the most effective work methods and protocols are being used.

Highlights
- Initiated an Early Detection program to conduct in an island-wide roadside weed survey.
- Kaua’i’s one known fireweed population was monitored all year with no plants detected.
- Over 4,000 acres were aerially surveyed for miconia with no plants found outside the known buffer area.
- KISC completed an island-wide survey for the presence of little fire ant. No little fire ants were detected.
Target Plant Species
Miconia (*Miconia calvescens*)
Cattail (*Typha latifolia*)
Ivy gourd (*Coccinia grandis*)
Fountain grass (*Pennisetum setaceum*)
Long thorn kiawe (*Prosopis juliflora*)
False kava (*Piper auritum*)*
Giant reed (*Arundo donax*)*
Pampas grass (*Cortaderia spp.*)*
Fireweed (*Senecio madagascariensis*)*
*Monitoring, population eradicated

Target Animal Species
Mongoose (*Herpestes auropunctatus*)
Coqui frog (*Eleutherodactylus coqui*)
Little fire ant (*Wasmannia auropunctata*)

Other
West Nile Virus (WNV)

Bill Null surveys for ants

Staff
KISC formed in 2001 and hired its first staff in 2002. KISC moved to a new base yard at the beginning of 2005, at which time there were two office staff, and three field crew. With HISC funding during 2005, KISC was able to add the additional needed positions of Data Technician, Outreach Specialist and Field Crew Supervisor. By 2006, with dedicated funding, KISC was able to continue surveying for little fire ant and mongoose with two Pest Survey and Response Technicians. KISC also utilizes AmeriCorps interns and two interns helped perform field duties during 2006.

Field Work
Miconia continues to be KISC’s primary target species. With a matching grant received from the National Fish and Wildlife Foundation, KISC was able to aerial survey over 4,000 acres of Forest Reserve in the Wailua District. During these aerial surveys only three plants were detected; all of them immature and within the known buffer of infestation. There are currently no mature trees on Kaua‘i, with the last one discovered in the Forest Reserve in 2003 and one in the Wailua Homesteads in 2004. Due to persisting seed banks, continual monitoring and surveys need to be conducted for at least 12 years after the last seeding plant is removed.
Miconia On Kauai

To ensure the success of eradication of miconia from Kaua’i, KISC is employing the most current methods of detection and treatment for this pest species. Two search zone buffers around seed-bearing plants determine areas for aerial or ground surveys. These buffers are based on studies of bird as spread vectors as well as what is physically feasible to ground survey. Emphasis is also placed on surveying riparian corridors as a likely seed dispersal area. KISC has aerial or ground surveyed 40% of these buffers to date.

Several of KISC’s plant target species are in the monitoring stage, having previously treated all known populations. Sites are being monitored for re-growth or seedlings sprouting from lingering seed banks. These species include pampas grass, giant reed, and false kava. KISC also continues to monitor all known populations of cattail due to a potential seed dormancy of 100 years. All re-sprouts were treated with herbicide.

KISC has been working in partnership with the Hawai’i Department of Agriculture to eradicate Kaua’i’s one known population of fireweed. This pest species is currently listed on Hawai’i’s Noxious Weed List and is poisonous to horses, cattle, and other livestock, posing a serious threat to pasturelands. On Kaua’i, fireweed was accidentally introduced in a hydro-seed planting of the state highway near Halfway Bridge. During 2006, KISC crew monitored this infestation site weekly and found no plants. Since fireweed is capable of remaining dormant for up to 50 years in the soil, monitoring for this pest will continue to remain a priority for years to come.
Action Summary for KISC Priority Plant Species – 2006

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Acres Surveyed</th>
<th>Plants Controlled (mature)</th>
<th>Acres Treated¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miconia</td>
<td>Miconia calvescens</td>
<td>4,481</td>
<td>969 (0)</td>
<td>0.10</td>
</tr>
<tr>
<td>Giant Reed</td>
<td>Arundo donax</td>
<td>29</td>
<td>0 (2,950)</td>
<td>0.29</td>
</tr>
<tr>
<td>Ivy Gourd</td>
<td>Coccinia grandis</td>
<td>35</td>
<td>450 (3,163)</td>
<td>0.36</td>
</tr>
<tr>
<td>Pampas grass</td>
<td>Cortaderia selloana</td>
<td>2</td>
<td>1 (0)</td>
<td>0.01</td>
</tr>
<tr>
<td>Fountain grass</td>
<td>Pennisetum setaceum</td>
<td>.5</td>
<td>6 (0)</td>
<td>0.01</td>
</tr>
<tr>
<td>False kava</td>
<td>Piper auritum</td>
<td>1</td>
<td>5 (0)</td>
<td>0.01</td>
</tr>
<tr>
<td>Long thorn Kiawe</td>
<td>Prosopis juliflora</td>
<td>228</td>
<td>15,704 (2,472)</td>
<td>1.82</td>
</tr>
<tr>
<td>Fireweed</td>
<td>Senecio madagascariensis</td>
<td>6.3</td>
<td>0 (0)</td>
<td>0</td>
</tr>
<tr>
<td>Cattails</td>
<td>Typha latifolia</td>
<td>4.8</td>
<td>320 (51)</td>
<td>0.04</td>
</tr>
<tr>
<td>Miscellaneous species</td>
<td>Typha latifolia</td>
<td>16</td>
<td>0 (233)</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>4,803.6</strong></td>
<td><strong>17,455 (8,869)</strong></td>
<td><strong>2.67</strong></td>
</tr>
</tbody>
</table>

¹ Acres treated is derived using the Forest Service calculation of 1/10,000 acre x number of individuals or actual area sprayed depending on the target.

Ivy gourd is another plant species currently on Hawai‘i’s Noxious Weed List. Kaua‘i currently has only one core population in Anahola on the East side of the island. KISC continues to treat plants in this area and has reduced the population significantly by destroying over 3,000 plants in 2006. This plant is a vigorous grower which requires constant and continued treatment. This plant is also easily moved in green waste and has been discovered at smaller satellite spots around the island. KISC treats and monitors all of these populations routinely.

Fountain grass has not spread as quickly on Kaua‘i as it has on other islands, probably due to its location in a somewhat wet area. However, steep and difficult terrain makes this threat one of KISC’s greatest challenges. At the KISC annual strategy meeting, it was decided to form a Kaua‘i Fountain Grass Working Group to address some of the challenges that this species poses. Emphasis will be placed on collecting vouchers from possible North Shore locations as well as conducting further surveys to determine population boundaries. KISC is working in partnership with The Nature Conservancy to explore possible aerial treatment options.

In 2006, KISC continued to make progress controlling the last large population of long thorn kiawe on Kaua‘i. The 65-acre infestation had been largely inaccessible before 2005, when a new partnership was formed with the landowner, the U.S. Department of Defense’s Pacific Missile Range Facility (PMRF). This year PMRF contributed...
additional funding to continue clearing long thorn kiawe with heavy machinery. KISC crewmembers then followed up by clean-cutting the stumps and treating with herbicide. Following last year’s successful clearing of eight acres, the machinery was able to clear an additional six acres of coast strand. Monitoring at this site is showing natural recruitment of ten native plant species, which had been excluded by the thickly infested population of long thorn kiawe. Follow-up treatment of seedlings and re-growth is underway. When KISC began working on this species, there were multiple infestations with a combined total of 152 acres.

Control of long thorn kiawe with heavy machinery

Kaua`i currently has one coqui frog population in a largely rural area, infesting approximately 15 acres, including a buffer zone, in Lāwa‘i. During 2005, efforts were stepped up dramatically with the formation of a Kaua‘i Coqui Frog Working Group, comprised of KISC members, county legislators, state agencies, affected landowners, and private stakeholders. The Working Group developed a plan to use known eradication methods, which was implemented in late November and has continued into 2006. Emphasis was placed on habitat modification by utilizing heavy machinery to mulch all foliage and remove all trees and shrubs under 14” in diameter. Access roads were also cut to delineate smaller management units.

Mixing citric acid for coqui control

KISC expended over 2,400 labor hours during 2006 and the results have been encouraging as calling frogs have been reduced dramatically. To follow up the vegetation clearing, crews have been spraying mixtures of citric acid as well as solutions of hydrated lime to control the frogs. Almost 15,000 gallons of citric acid as well as over 25,000 gallons of hydrated lime have been sprayed at this Lāwa‘i infestation. Eradication goals, backed by dedicated funding from both the legislature and the County of Kaua‘i will help KISC meet the objective to have no calling frogs by fall of 2007.

Coinciding with the efforts in Lāwa‘i, KISC also acts as a clearing house for all reports of coqui that are called in to HDOA or to KISC directly. One such call that was responded
to in Hanamā'ulu turned out to be seven male calling frogs that had been imported on purchased plants. This potential population was quickly exterminated and efforts to monitor importing nurseries are underway.

<table>
<thead>
<tr>
<th>Species</th>
<th>Survey Acres</th>
<th>Treated Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coqui</td>
<td>190</td>
<td>99</td>
</tr>
</tbody>
</table>

Control, survey and detection of little fire ant continued with funding received from the U.S. Fish and Wildlife Service. Since early detection is the key to eradication, KISC’s Survey and Response Technician worked to complete an island-wide survey of Kaua‘i. A total of 105 acres were surveyed across Kaua‘i, at nurseries, plant holding areas, green waste sites, and at the one known population in Kalīhi Wai. All of Kaua‘i’s 46 nurseries were contacted and interviewed regarding inter-island plant importations. If proven to be “high-risk,” inspections were conducted and information about little fire ant was distributed. No little fire ants were discovered during this island-wide survey. Continued surveys of key nurseries will continue to be a part of KISC’s Early Detection Program. The report of this survey can be viewed at [http://www.hear.org/kisc/index.html#2006wasmanniareport](http://www.hear.org/kisc/index.html#2006wasmanniareport). KISC and HDOA continue to treat and monitor the only known little fire ant infestation in an effort to eradicate this species from the island. Continued monitoring will ensure island-wide control of this pest.

Credible mongoose sightings continued to be reported on Kaua‘i and KISC worked to investigate reports by using tracking boards and traps. With HISC funding, KISC’s Pest Survey & Response Technician set 4,700 traps during the course of 2006 and responded to 15 credible sighting island-wide. Multiple methods of trapping and baiting have not resulted in clear evidence of a mongoose. Outreach efforts were also conducted to raise public awareness of this issue. After 2006, funding for this project will be directed to U.S. Department of Agriculture - Wildlife Services to respond to sightings. By tapping into USDA-WS’s existing workforce of experienced trappers, combined with additional alternative methods for vertebrate detection, confirmation of mongoose on Kaua‘i may be possible. Future eradication plans will then need to be formulated to protect Kaua‘i’s endangered ground nesting native bird population from this devastating pest species.

Early Detection
To ensure that limited resources are used in the most expedient manner, KISC has initiated implementation of an early detection program. By quickly detecting incipient populations of likely introductions, the cost of eradication can be minimized. With the formation of a Working Group composed of federal, state, private and non-profit entities, plans are now underway to conduct an island-wide roadside survey of weed species. This survey will not only serve as a baseline for existing targeted weeds on the island of Kaua‘i, but will also result in an “eradicable” list of species that KISC and other agencies can expediently address.
Kristin Hall, Field Supervisor has been working on an early detection guide for KISC partners

Combined with the island-wide survey will be a series of workshops to be conducted with partner agencies and private individuals. These workshops will heighten awareness of a list of likely weed introductions from neighboring islands. By involving a greater community of people, incipient invasive species may be quickly eradicated. Ideally, the workshops will provide the public with information that can be easily accessed or reported on the internet.

Staff has also been working collaboratively with other island ISCs to formulate a species matrix to assist in the accuracy of survey and detection of invasive species. To answer the question “Are we looking in the right places?” for targeted weed species, a Habitat Suitability Model has been formulated. This model is based on certain criteria derived for each species based on where the species is found in its native range as well as in Hawai‘i. The criteria include: maximum and minimum temperatures, precipitation levels, and elevation. Using Geographic Information Systems, the model will predict suitable habitat for target species for each island. Using this information, each ISC can more accurately plan where to conduct surveys based on infestation projections.

Another statewide target for early detection is West Nile Virus (WNV) and KISC has entered into an agreement with Hawai‘i Department of Health (HDOH) to assist with WNV detection efforts. KISC will respond to reports of dead birds and will pick up and deliver them to HDOH for further testing. Combined with this effort, KISC has also entered into an agreement with U.S. Fish and Wildlife Service to aid in early detection of Avian Influenza by responding to reports of dead chickens.

**Outreach & Education**

The addition of an Outreach Specialist this past year has greatly benefited KISC’s work. The intention of KISC’s outreach program was not only to build community awareness and connections, but also to promote state-wide invasive species concerns beyond KISC’s limited target species. This proved to be a banner year in accomplishing these goals.

In June of 2006, the Kaua‘i Landscaping Industry Council (KLIC) adopted a Voluntary Codes of Conduct for the Green Industry. These codes were adapted from The St. Louis Declaration on Invasive Plant Species and KLIC identified specific plants that were agreed upon for discontinued sales. This adoption was unanimously approved and continued to be promoted through other events such as Arbor Day, the Garden Fair, and
Throughout the year, KISC participated in many social and cultural events highlighting the impacts of invasive species. Press releases, neighborhood flyers, Public Service Announcements, as well as Rotary Club meetings, fairs, TV and radio shows were all part of KISC’s outreach efforts during the year. Development of state-wide flyers for miconia along with miconia tattoos added to the outreach products that help educate both children and adults.

Data Management
During 2006, staff from the U.S. Geological Survey’s Pacific Basin Information Node continued working with the Invasive Species Committees to unify portions of each ISC’s data management system. The result of this process was the establishment of a reliable and efficient statewide reporting system on invasive species. The new, integrated reporting system was operational by June of 2006 and will continue to be improved to provide current information about efficacy and status of control efforts.

Funding
Funding for the ISCs comes from a variety of state, federal and private sources. One steady source of funds has been through the DLNR line item, LNR 402, which has passed through to the ISCs each year since 2000. Other sources include the HISC, the U.S. Forest Service – Invasive Plants program, the U.S. Fish and Wildlife Service, the National Fish and Wildlife Foundation Pulling Together program and the Counties

In past years, the combined budgets for the island ISCs were approximately $1,600,000. With the addition of the AIS Team to the group and the HISC funding of $1,700,000 in 2005 there was an increase of 236% over past years. This increase allowed for further leveraging of dollars by providing a source of matching funds. The ISCs and the AIS Team also receive a tremendous amount of support from their partners through loans of equipment and other in-kind services.

When the HISC budget was reduced by $2,000,000 in fiscal year 2007, the ISCs and AIS team funding was reduced to $1,115,000. Staff were laid off on Kauai and the temporary coqui crew on Oahu was not continued. With the shift to early detection, progress on many priority targets that had been targeted for eradication will be lost with out securing additional funding.
## Contact Information

<table>
<thead>
<tr>
<th>Committee</th>
<th>Contact Information</th>
</tr>
</thead>
</table>
| Big Island Invasive Species Committee (BIISC) | 16 East Lanikauwila Street  
Hilo, Hawai`i  96720  
Office: (808) 974-4140  
Fax: (808) 974-4148  
e-mail: jakleialoha@Hawai`i.rr.com  
www.hear.org/biisc  
Julie Leialoha, Manager  
Anne Marie LaRosa, Chair |
| Kaua`i Invasive Species Committee (KISC)       |  
P.O. Box 1998  
Lihue, Hawai`i  96766  
Office: (808) 246-0684  
Fax: (808) 632-0841  
e-mail: kisc@lava.net  
www.hear.org/kisc  
Keren Gundersen, Manager  
Tim Flynn, Chair |
| Maui Invasive Species Committee (MISC)         |  
P.O. Box 983  
Makawao, Hawai`i  96768  
Public Relations: (808) 573-MISC (6472)  
e-mail: miscpr@Hawai`i.edu  
Manager: (808) 573-6471  
e-mail: misc@Hawai`i.edu  
Fax: (808) 573-6475  
www.hear.org/misc  
Teya Penniman, Manager  
Randy Bartlett, Chair |
| Moloka`i Subcommittee of MISC (MoMISC)         |  
P.O. Box 220  
Kualapuu, Hawai`i  96757  
Office: (808) 553-5236  
e-mail: lbuchanan@tnc.org  
www.hear.org/momisc  
Lori Buchanan, Field & Outreach Coordinator  
Ed Misaki, Chair |
| O`ahu Invasive Species Committee (OISC)        |  
2551 Waimano Home Road  
Pearl City, Hawai`i  96782  
Office: (808) 453-6112  
e-mail: oisc@Hawai`i.edu  
www.hear.org/oisc  
Ryan Smith, Coordinator  
Amy Tsunioshi, Chair |
| Aquatic Invasive Species Team (AIS Team)       |  
P.O. Box 1346  
Kaneohe, Hawai`i 96744  
(808) 236-7422  
Fax: (808) 236-7433  
e-mail: sarap@Hawai`i.edu  
Signe Opheim, Outreach Coordinator  
e-mail: opheim@Hawai`i.edu  
www.cgaps.org (for algae cleanup schedule) |
| Coordinating Group on Alien Pest Species (CGAPS) |  
P.O. Box 61441  
Honolulu, Hawai`i 96839  
Public Information: (808) 722-0995  
Fax: 808-956-4710  
e-mail: christym@rocketmail.com  
www.cgaps.org  
Christy Martin, Public Information Officer  
Randy Bartlett, Chair  
Tony Montgomery, Chair Emeritus  
Anne Marie LaRosa, Deputy Chair |
| Hawai`i Invasive Species Council (HISC)        |  
1151 Punchbowl Street, Room 325  
Honolulu, Hawai`i 96813  
Invasive Species Coordinator: (808) 587-0164  
Fax: (808) 587-0160  
e-mail: Mindy.M.Wilkinson@Hawaii.gov  
www.state.hi.us/dlnr/dofaw/HISC/  
Sandra Kunimoto, Co-Chair  
Peter Young, Co-Chair |
Target Species
All of the plant species targeted by the ISCs are able to outcompete existing plants, resulting in a change in ecosystem components, structure and function. Some plants, like fountain grass and bushy beardgrass, change the fire regime of an area. Animal species like coqui consume large numbers of insects, and veiled chameleons are able to take birds, disrupting pollination services and further jeopardizing threatened and endangered species. Some species also impact ecosystems and human health and quality of life, such as long-thorn kiawe, little fire ants and coqui frogs.

Miconia (*Miconia calvescens*)
- Tree native to Central and South America, introduced as an ornamental.
- Produces millions of seeds per year dispersed by birds, rats, pigs, humans. Seeds remain viable for 10 or more years.
- Potential range is all wet and mesic forests to 6000 ft. elevation.
- Priority Target for BIISC, KISC, MISC, OISC.

Fountain Grass (*Pennisetum setaceum*)
- Bunch grass native to Africa, introduced as an ornamental.
- Produces many seeds per year, wind dispersed. Seeds remain viable for 7 or more years. Promotes and fuels wildfires.
- Potential range is all dry and mesic forests.
- Priority Target for BIISC, KISC, MISC, OISC
Pampas Grass (*Cortaderia selloana* and *C. jubata*)  
- Large bunch grass native to South America, introduced as an ornamental.  
- Produces many seeds per year, wind dispersed. Promotes and fuels wildfires.  
- Potential range is all mesic and wet forests.  
- Priority Target for KISC, MISC, MoMISC, OISC.

Long-Thorn Kiawe (*Prosopis juliflora*)  
- Tree or sprawling shrub native to Africa, introduced for agriculture, or possibly accidentally.  
- Produces many seeds that are water- and animal-dispersed.  
- Potential range is unknown; appears able to hybridize with short-thorn kiawe.  
- Priority Target for KISC, MISC, OISC.

Bushy Beardgrass (*Schizachyrium condensatum*)  
- Tufted grass native to Central and South America, introduction history unknown.  
- Produces many seeds, spread by wind and humans. Promotes and fuels wildfires.  
- Priority Target for OISC.

Rubber Vine (*Cryptostegia grandiflora*)  
- Climbing woody shrub native to Madagascar, introduced and still sold as an ornamental.  
- Produces many seeds that are spread by wind.  
- Moist forests at risk.  
- Priority Target for MISC. Large infestation of *C. madagascariensis* on Moloka`i.
Ivy Gourd (*Coccinia grandis*)
- Vine native to tropical Asia, introduced as a food crop.
- Produces many seeds that are bird dispersed; spreads vegetatively.
- Potential range is unknown.
- Priority Target for KISC, MISC.

Cattail (*Typha latifolia*)
- Wetland rush native to North America, North Africa and Eurasia, introduction history unknown.
- Reproduces and spreads vegetatively and by wind-dispersed seeds.
- Potential range is all low elevation wetlands.
- Priority Target for KISC.

Australian Tree Fern (*Cyathea cooperi*):
- Large tree fern up to 40 feet, native to Australia. Introduced and still sold as an ornamental
- Produces many lightweight spores that are spread long distance by wind.
- Priority Target for MoMISC.

Veiled Chameleon (*Chamaeleo calyptratus*)
- Large chameleon, up to 24 inches. Native to Yemen, illegal introduction for the pet trade.
- Spread intentionally by humans.
- Priority Target for MISC.

Little Fire Ant (*Wasmannia auropunctata*)
- Small, slow moving red ant native to Central and South America, accidental introduction via infested plants.
- Spreads in infected nursery materials, particularly palms.
- Priority Target BIISC, KISC.
Coqui Frog (*Eleutherodactylus coqui*)

- Native to Puerto Rico, accidental introduction via infested plants.
- Spreads in infected nursery materials.
- Priority Target for BIISC, KISC, MISC, OISC, although resources to control this pest have not kept pace with its spread.

**Acknowledgements**

This report was prepared with information from the following individuals:

Teya Penniman, Manager, MISC
Lori Buchanan, Field/Outreach Coordinator, MoMISC
Keren Gundersen, Coordinator, KISC
Ryan Smith, Coordinator, OISC
Julie Leialoha, Manager, BIISC
Tony Montgomery, DLNR Division of Aquatic Resources
Christy Martin, CGAPS
Sky Harrison, Pacific Basin Information Node, U.S. Geological Survey – for data support
Roy Kam, Mike McMahon and Dwight Matsuwaki of Hawai`i Natural Heritage Program and Jean Fujikawa of OISC, for data support and map creation.

Photos courtesy of TNC, HDOA, Forest and Kim Starr of USGS, US Forest Service, USDA National Wildlife Research Center, CGAPS, the ISCs and Mel.