

Island-based Partnerships & Statewide Coordination to Protect Hawai'i from Invasive Species

Report for the 2009 Calendar Year



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Safeguarding Hawai'i from Invasive Species

The continuing introduction of invasive species into Hawai'i threatens the survival of the state's unique flora and fauna, costs local farmers money in crop losses and pest control spending, depresses sectors of the state's economy and harms 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: This is 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, inter-island 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, early detection and rapid response; both for new pests around ports of entry and for incipient pests on public and private lands and in aquatic environments.

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.

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 **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; the **Aquatic Invasive Species Team (AIS Team)** for prevention, early detection and control of invasive marine and freshwater species statewide; and the **Invasive Species Committees (ISCs)** for island-based rapid response and on-the-ground control.

Committees comprised of partner agencies oversee each group and this support is key to the successes described in this report. CGAPS and all the ISCs are projects of the Pacific Cooperative Studies Unit of the University of Hawai'i and would not exist without their support. Complete partner lists for the AIS, CGAPS and the ISCs are listed within each section.

Hawai'i Invasive Species Council (HISC)

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 inspection 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 (FY) 2005-2006 by the Legislature via the Hawai'i Department of Land and Natural Resources' budget. Funding has continued at \$2 million dollars in FY 2007 and \$4 million in FY 2008 and FY 2009. Due to the hard economic climate, the budget in FY 2010 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.

HISC Activities and Highlights

Resources:

Approved a \$2,000,000 spending plan for Fiscal Year (FY) 2010. It addresses the four interrelated plan components and support of the HISC:

- Prevention, \$740,000
- Response and Control, \$820,000
- Research and Technology, \$0
- Public Outreach, \$130,000
- HISC Support (includes Central Services fees), \$310,100

A special request was made by the Hawaii Department of Agriculture to temporarily support vital quarantine inspector positions using \$600,000 of the HISC funds in addition to other dedicated funds. By making hard choices to reduce funding to County-based operations and sacrificing other successful elements of the program approximately 22 civil service positions were retained.

Prevention:

- Continued Implementation of the Weed Risk Assessment system screening for plants led to the adoption of voluntary Codes of Conduct by the Landscape Industry Council of Hawai'i.
- DLNR's Division of Aquatic Resources (DAR) implemented a hull fouling and ballast water prevention and early detection program in conjunction with the Aquatic Invasive Species Team (AIST).
- DOH continued their project for West Nile Virus (WNV) surveillance, analysis. Unfortunately due to cutbacks in funding and staff this project has closed.
- HDOA hired an Invasive Ant Coordinator to improve response plans and technologies to address invasive ants. A new apiarist will address the Varroa mite infestation.

Response and Control:

HISC funded the Invasive Species Committees and AIST to implement Early Detection, Rapid Response, and Incipient Control efforts. *See the rest of this report for details.*

Research and Technology:

In FY09 the Research and Technology working group was allocated \$500,000 to fund new research and technology projects in three areas:

- An international biocontrol workshop with South Pacific islands.
- Bishop Museum's Hawaiian Biological Survey project for the HISC Alien Species Database Project.
- Research and Technology Grants: (\$330,000 for 10 projects).
- May 2009 MISC hosted the International Miconia Conference in Ke'anae, Maui. More than 110 individuals from eight countries attended presentations and workshops that focused on research needs, biocontrol agents, modeling, control techniques and outreach.

Public Outreach:

- The HISC POWG worked to inform the public and engage them in the early detection efforts by reporting potential invasive species to the statewide hotline, 643-PEST.
- Outreach at community events reached over 50,000.
- Electronic media supported HISC, ISCs, and CGAPS messages via Web site our www.hawaiiinvasivespecies.org which received more than 63,300 visits. Outreach funds also provided partial support for posting materials to the Web site and list serves, and for implementing other electronic media methods.
- Education materials produced range from refrigerator magnets, key rings, and pens to posters, brochures, displays and printed and portable document format (PDF) newsletters, as well as a statewide electronic newsletter.

The complete report on HISC activities to the Legislature may be found at: <http://www.hawaiiinvasivespecies.org/hisc/pdfs/2009hisclegislativereport.pdf>.

STOPPING THE SILENT INVASION
LEADERSHIP, COORDINATION, AND ACTION
PROTECTING HAWAII FROM INVASIVE SPECIES

643-PEST
Protect Hawai'i With One Call
Call the Pest Hotline to report invasive pests.

Strawberry guava invades native forests
Introduced to Hawaii from Brazil in 1825, strawberry guava is an invasive species that many enjoy. People eat the fruit fresh or in jam, or use the wood for smoking meat. However, strawberry guava's potential damage may outweigh its utility. Strawberry guava has no natural enemies or competitors in Hawaii. It forms dense thickets replacing native Hawaiian plants, and damages the watershed services that diverse forests provide. Its spread over thousands of acres is beyond the possibility of control by existing methods. These are just some of the reasons why there is a public conversation about the proposed introduction to Hawaii of a scale insect that is the natural population control of strawberry guava in Brazil. Learn more about [strawberry guava and biocontrol](#) and the [facts and fiction](#) about strawberry guava control (pdfs). Further information is provided by the Institute of Pacific Islands Forestry: [Biological Control of Strawberry Guava in Hawaii](#)

[Look inside a strawberry guava thicket \(video\)](#) NEW

Hawaii Invasive Species Council (HISC) Cabinet-level work on invasive species	Coordinating Group on Alien Pest Species (CGAPS) Management-level coordination and initiatives	Invasive Species Committees of Hawaii (ISCs) Island-based response and control programs	Hawaii's high-profile invasive species
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About the problem of invasive species
What is an invasive species? An invasive species is an alien species (plant, animal, or microbe transported by humans to a location outside its native range) whose introduction does or is likely to cause economic or environmental harm or harm to human health (U.S. Presidential Executive Order 13112).
Hawaii is in the midst of a growing invasive species crisis

Partnerships to meet Hawaii's invasive species challenge
Preventing and controlling invasive species is so important that several groups have formed in recent years to work on these issues on multiple levels:

- Grassroots, island-based partnerships work to protect each island

The Hawaii Invasive Species Council is coordinating body for Hawaii State Agencies but works with both CGAPS and the ISCs to partner with Federal, County and non-profit groups on invasive species.

Coordinating Group on Alien Pest Species (CGAPS)



CGAPS is a voluntary partnership 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 quarterly meetings and the CGAPS Steering Committee holds ad hoc meetings to plan and promote optimal invasive species policy and funding initiatives, promote communication, increase collaborations, and plan public awareness initiatives.

Key Accomplishments

CGAPS collaboratively produced a ten-point Vision and Action Plan for Hawai'i, finalized in December, 2009:

- Provides a new look at the top ten areas that require focused and coordinated effort to make the changes necessary for protecting Hawai'i from invasive species.
- Federal and State agencies and NGO participants on the CGAPS Steering Committee met multiple times to discuss statewide programs and needs. Special attention was paid to shortfalls and areas where others could help. The previous CGAPS Action Plan was produced in 1995.
- Each of the 10 points provide some background information on the issue, a vision of success when that issue is addressed, some long-term needs, and a short list of immediate actions that CGAPS participants can accomplish in the next three years.
- The ten points and visions are as follows:
 - 1. Border Protection:** *Hawai'i will have an effective biosecurity system that is adequately funded and staffed to prevent alien-pest species from entering the state, regardless of origin or import pathway.*
 - 2. Smuggling of Pests:** *Smuggling of invasive pest species will be treated as a serious offense by State and Federal agencies, and the risk of new species arriving illegally will be greatly reduced.*
 - 3. Importation of Invasive Plants:** *Hawai'i will be protected from importation of new invasive plants.*
 - 4. Brown Treesnake:** *The risk of brown treesnakes arriving and becoming established in Hawai'i is eliminated.*
 - 5. Aquatic Invasives:** *Hawai'i will have an effective biosecurity system that prevents aquatic invasive species from entering the state and spreading.*

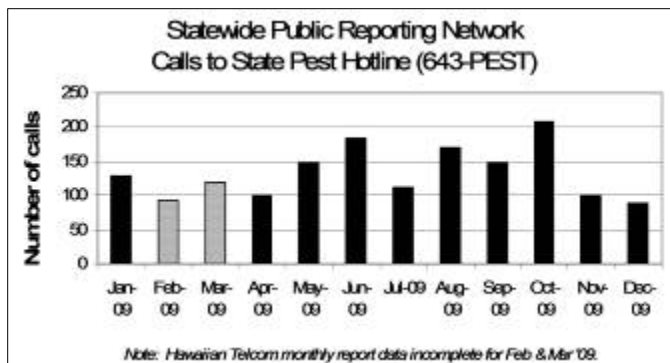
- 6. Inter-island Spread of Pests:** *Each island will be protected from alien pests present on other islands.*
- 7. Federal Laws that Expose Hawai'i to Unnecessary Risk:** *Hawai'i will reduce the risk posed by federal laws or agreements that do not protect Hawai'i.*
- 8. Early Warning for Pests Not Present in Hawai'i:** *Hawai'i's early-warning system will identify threatening pests in nearby jurisdictions and effectively prevent their entry.*
- 9. Early Detection and Rapid Response:** *Hawai'i will effectively detect new incursions of pest species and launch rapid-response measures while these species are still controllable or eradicable.*
- 10. Capacity to Control Widespread Pests:** *Hawai'i will have the capacity to control the widespread pests that cause unacceptable harm to its economy and ecosystems.*

Continued to build citizen awareness to aid in early detection of harmful species for rapid response:

- CGAPS, with outreach staff with the HISC, DLNR, HDOA, and the Invasive Species Committees of Hawai'i, worked together to promote the use of the State Pest Hotline, 643-PEST (643-7378) to report sightings of invasive species.
- CGAPS coordinated the statewide radio broadcast of a Pest Hotline jingle to remind people to call to report invasive pests. HISC funds supported the airing of



A Pest Hotline logo was created and used on promotional items for early detection workshops.



Public reports of invasive species to 643-PEST fluctuate with media stories and PSAs.

- Radio ads are believed to account for the 128 hotline calls in January 2009 (during airing), compared to 37 in January 2008 (no PSA aired).
- Calls to the hotline have been fairly steady, with larger volumes of calls occurring after media stories of events such as snakes captures.

Continued to build support in the green industry for initiatives that reduce the chances of new invasive plants being imported and sold:

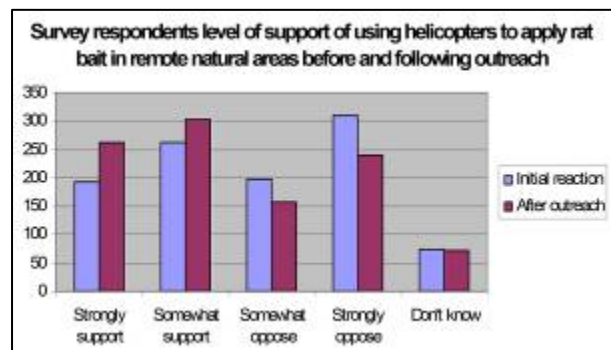
- CGAPS worked with the plant industry representatives, Hawai'i Farm Bureau Federation, Hawai'i Forest Industry Association, and regulatory agencies on a cooperative approach to add known invasive plants to the Restricted Plant List. However, a meeting on this topic was held in July, 2009 between these groups and others, where it was regrettably agreed that adding more plants to the already long

list of pests (plants, insects, pathogens, etc.) which inspectors must watch for would decrease the efficacy of inspections overall. In 2010, CGAPS will again work with all parties to find a mutually acceptable solution to this issue.

- CGAPS continued to work with the plant industry to promote awareness and voluntary use of the Hawai'i Pacific Weed Risk Assessment (HPWRA), a prediction tool that can identify potentially invasive plants before they are imported and spread.
- CGAPS is in the planning stages of creating a website to make the HPWRA information more user-friendly and accessible to plant industry and the public.

Provided public information and outreach coordination for rodent control on offshore islets and main island conservation areas:

- Participated in an outreach working group to promote public awareness and support for controlling rodents in conservation areas.
- Worked with a professional survey company to assess respondents' support for various proposed measures.
- Conducted a survey of conservation personnel to identify additional partners and disseminate information about the project.



When provided with facts, survey participants became more supportive of using helicopters to apply rat bait to protect native species in remote conservation areas.



Partnered with agencies and UH to produce Backyard Conservation, distributed to more than 113,000 households.

Educated the public about invasive species and what they can do to help:

- Gave presentations to classes, industry associations and community groups, and staffed displays at events.
- Prepared presentations for outreach by partner agencies.
- Wrote and provided articles and press releases on invasive species topics.

Year-end Perspective

Some projects had to be discontinued in 2009 due to budget shortfalls and spending restrictions. Projects included citizen monitoring for West Nile Virus and avian influenza by reporting dead birds for disease testing, and the purchase of radio broadcast time to promote public reports of coqui on Kaua'i and O'ahu before they become large infestations. It is hoped that public outreach projects such as these may be continued in the future, as they are important lines of defense from more profound costs.

Administrative and Technological Support

- Project administration and support is provided by Pacific Cooperative Studies Unit at the University of Hawai'i (<http://www.botany.hawaii.edu/faculty/duffy/PCSU.htm>).
- The CGAPS website is maintained by Hawaiian Ecosystems at Risk project (www.hear.org). HEAR is currently funded by the US Geological Survey through the Pacific Basin Information Node (PBIN). Further information about CGAPS can be found at www.cgaps.org.

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*denotes CGAPS Steering Committee member agency

DAR Aquatic Invasive Species Team (AIS Team)



The Division of Aquatic Resources, Department of Land and Natural Resources continued to address the impacts and threats of aquatic invasive species (AIS) in Hawai'i. Preventing and controlling AIS pose unique challenges compared to land-based invasive species programs. Generally, pathways of introduction remain an issue, and the lack of response and control tools are major obstacles in addressing the threat of AIS. Hence, the Aquatic Invasive Species Team (AIST), DAR and its partners continue to spend a large amount of effort developing and testing tools, approaches, and methods for sustainable prevention and control of AIS.

Key Accomplishments

Continued with short- and long-term control techniques to control alien invasive algae in Kāneʻohe Bay:

- Built on research from 2008 where alien invasive algae removed using the Supersucker (floating platform with suction pumps and hoses which divers guide to remove algae from the reef) re-grew to initial levels within six months of being cleared. DAR oversees Supersucker operations, managed in partnership with University of Hawai'i and The Nature Conservancy (TNC).
- In July 2009 re-clearing began on the reef using the Supersuckers in a study to determine the efficacy of increasing the native sea urchin population to graze the alien algae and inhibiting its rapid re-growth.



Supersucker barges at work



*Left: A Kāneʻohe Bay reef covered with invasive algae
Right: A healthy reef after invasive algae removal*

- Urchins were collected from Z-slab artificial reefs along the West Coast of O‘ahu, quarantined at the State of Hawai‘i’s Anuenue Fisheries Research Center (AFRC) to prevent any naturally-occurring diseases from being accidentally transferred, then the animals were placed onto newly cleared sections of reef.
- Monitoring of the urchins’ progress and/or the possible re-growth of alien algae are being conducted to determine required stocking densities and the efficiency of using cultured collector urchins as a native biocontrol agent.
- The artificial Z-slab reefs will be monitored to measure any impacts from urchin removal as well as urchin population recruitment and migration in the area.



DAR AIST diver Ryan Buzzetti guides the Supersucker, while a native urchin grazes alien algae

Investigating the culture of native sea urchins to aid in the long-term control of invasive algae:

- Previous research at the University of Hawai‘i has shown that out-planting of native sea urchins is a highly effective tool for controlling alien algae on a small scale. Large scale use would require the culture of native sea urchins, which may allow managers to control the growth of invasive algae without endless mechanical removal.
- Once urchins are available in sufficient numbers, out-planting trials will test for effective densities and strategies. All activities will be closely monitored for algal abundance, coral health, and reef improvement.

An Herbivory Enhancement Area (HEA) was implemented on Maui in July, 2009 to fully protect herbivorous fishes and sea urchins in the area to provide a natural control for algae:

- A previous DAR study that found that reefs which had large numbers of herbivorous fish had very little or no macroalgae, and reefs that were closed to fishing tended to have more herbivorous fish.
- Stakeholders were engaged in planning the HEA which extends from Kekaa fronting the Sheraton Hotel to the southern edge of Honokowai Beach Park.
- Data gathered from this project will be used to evaluate the potential of protecting herbivorous species in other areas that have been severely impacted by invasive algae.



The HEA protects native herbivores like these manini, which graze down macroalgae

Eradicated an invasive algal species in a Kailua Kona resort pond in 2009:

- First reported in 2008, the seaweed was identified as *Gracilaria salicornia* by the University of Hawai'i Botany Department, and traced back to an aquaculture facility at the Natural Energy Laboratory of Hawai'i Authority (NELHA).
- DAR worked with the resort to eradicate the population through lowering the salinity in the pond by altering its well source.
- DAR will continue to communicate with the resort to ensure the eradication remains successful. This project was a positive example of government and private sector maintaining good communication and collaboration to control invasive species.

DAR and the AIST surveyed a sailing vessel which ran aground in Kāne'ohe Bay, O'ahu, in June 2009, and controlled new alien species that had been attached to the boat's hull:

- The boat, which had traveled from Washington State to Mexico, the Marquesas Islands, and finally to Hawai'i, had hull fouling organisms which included three different taxa of algae, two of which were new alien species to Hawai'i, and numerous invertebrates, with two types of barnacles also found to be alien species.
- The vessel grounding and resulting scars represent a good example of a potential pathway for alien species' introduction to Hawai'i. These scars and surrounding reefs will be monitored to determine if any of these alien species were able to colonize the reef. If these introductions are detected in the environment, rapid-response eradication will be attempted.



New alien species on this grounded vessel's hull were found during a rapid response survey

DAR continued work to address the introduction and spread of AIS via hull fouling, which is responsible for the majority of AIS introductions to Hawai'i's waters:

- Conducted AIS inspections on hulls using new technologies such as a remotely operated vehicle, a variety of pole cameras, and underwater drop cameras. Inspections are conducted on high-risk events such as unexpected arrivals, vessel groundings or vessels that may carry AIS on their hulls.
- DAR is also assisting The Papahānaumokuākea Marine National Monument with inspections of vessels that enter one of the largest protected marine areas in the world. This program requires that 100% of the vessels (excluding US Coast Guard and Military vessels) undergo a hull inspection and certification before entering monument waters. The Monument has very few non-native species and requires rigorous inspection of vessel hulls, ballast



Jason Leonard, DAR Ballast Water and Hull Fouling Coordinator, conducts a hull survey using a pole camera

water, ancillary and scientific gear, to maintain the biosecurity of this potential World Heritage Site.

- Continued work with the Alien Aquatic Organism Task Force (AAOTF) to develop a comprehensive plan for preventing the introduction and dispersal of alien aquatic organisms found on the hulls of vessels. The AAOTF includes representatives from state and federal agencies, shipping industries, the scientific community and non-government organizations.
- DAR is reviewing how others are managing this vector as well as conducting studies, such as an assessment of recreational vessels in Hawai'i, to get a better understanding of how to address hull-fouling issues.

DAR continued working on minimizing the introduction and spread of AIS into Hawai'i from vessel ballast water:

- New ballast water rules (HAR Chapter 13-76, relating to Non-Indigenous Aquatic Species) have allowed the State to manage ballast water on a local level, by working with the shipping industry to limit the amount and reduce the risk of ballast water discharged in Hawai'i's waters.
- Further verification of compliance is in the planning stages with the recently acquired sampling tools including a Ballast Water Assurance Meter which was recently approved by the US Coast Guard as the first tool to accurately check for ballast water exchange.

DAR collaborated with the Moloka'i Invasive Species Committee (MoMISC) in June 2009 to remove upside down jellyfish (*Cassiopea* sp.) from Kaunakakai waters:

- Approximately two hundred jellyfish were removed from the recreational swimming area due to the mild sting that this species causes when disturbed.
- The site will be monitored over the next year to determine removal success. Previous efforts in Hawai'i have shown the manual removal of this species may be effective in its long-term control or eradication.

DAR initiated a community-based invasive species control project on Moloka'i with funding from The National Fish and Wildlife Foundation:

- The year-long project will consist of mechanical invasive algae removal, community clean-up events, educational workshops, outreach activities and algae re-growth monitoring.
- A bio-security protocol for the processing and recycling of alien algae is being developed; insuring that there will be no reintroductions and that algae biomass is utilized in a beneficial manner.
- This project will serve as a model for community-based invasive species control across Hawai'i and will take place at four locations: Kaunakakai Harbor, Keawanui Fishpond, 'Ualapu'e Fishpond & Kaloko'eli Fishpond. This project has demonstrated



Brian Hauk, DAR AIST supervisor, nets upside down jellyfish in one of two partnership projects on Moloka'i

a positive collaboration between government and community groups and individuals in accomplishing invasive species control.

Continued partnerships to remove alien algae and study the re-growth of native macroalgae/seagrass:

- Partnered with the University of Hawai'i to remove the alien mudweed *Avrainvillea amadelpha* and monitor the natural re-growth of native seagrass and macroalgae. Approximately 235 human hours were required to remove an estimated 3000 kgs of *Avrainvillea amadelpha* from the restoration area, a 40-m diameter (1256 m²) circle plot located 225 meters offshore Paikō Lagoon, O'ahu.
- DAR also assisted in community alien algae cleanup events in Maunalua Bay organized by TNC and Malama Maunalua. These efforts and studies support TNC and Malama Maunalua's acquisition of economic stimulus funds from NOAA's Restoration Center.



DAR assisted in community alien algae cleanups

Algal and Snowflake Coral Surveys:

- DAR has been conducting visual underwater surveys from shore to the barrier reefs for five major invasive marine macroalgae species (*Gracilaria salicornia*, *Kappaphycus/Euchuma* spp. complex, *Acanthophora spicifera*, *Avrainvillea amadelpha* and *Hypnea musciformis*) around the state since 2005.
- Portable global positioning system devices are used to record spatial data along with relative algal abundances. Data points are imported into ArcGIS software allowing the generation of accurate maps that project algal abundance and distribution.
- Algal maps are essential for determining further management strategies, including comprehensive approaches utilizing mechanical removal, native grazers and the local reintroduction or protection of native species.
- DAR conducted surveys for alien snowflake coral (*Carijoa riisei*) around the known boundaries of infestations in Kaua'i County.



Surveys and maps are crucial to strategizing and implementing management plans

- Surveys in partnership with the University of Hawai'i used an autonomous underwater vehicle to map the seafloor of Hanapēpē Bay (Port Allen) to determine potential substrate in which the soft coral could inhabit in continuation of the control project beneath the Port Allen Commercial Pier. DAR has had to experiment with control strategies, as few control methods exist or are approved for aquatic invasives.
- Divers surveyed for snowflake coral in remote areas around parts of Kaua'i, Ni'ihau, Kaula Rock and Five Fathom Pinnacle. These surveys will help support the development of an Integrated Assessment for NOAA's National Ocean Service to determine future management needs and strategies.



DAR AIST diver Cathy Gewecke surveys persisting snowflake coral at Port Allen

Identified control methods for harmful invasive fish in the Kawai'ele Bird Sanctuary and Mānā Plain Conservation Area, Kaua'i:

- The presence of invasive fish, specifically tilapia, is hindering the growth of aquatic vegetation which endemic and endangered water bird species (e.g. *Himantopus mexicanus knudseni*, *Gallinula chloropus sanvicensis*, *Anas wyvilliana*) depend on.
- Six fish control methods were reviewed including: dewatering, netting/ trapping, electrofishing, blasting/ explosives, biocontrol and piscicides (chemical treatment). The review process was done through analysis of technical literature, consultation with experts and evaluation of case studies, and the results have been presented in two reports: "Invasive Fish Control and Eradication: A Preliminary Plan for the Kawai'ele Bird Sanctuary, Mānā Plain Conservation Area, Kaua'i, Hawai'i" and "Implementation Plan for Tilapia Control in the Kawai'ele Site."
- Chemical treatment with rotenone (CFT Legumine™) was identified as the most suitable method to eradicate tilapia in the sanctuary, with no significant undesirable effects, provided that risks are mitigated by neutralization with potassium permanganate followed by monitoring. Consultations with U.S. Fish and Wildlife Service rotenone experts indicate that the implementation of a rotenone treatment in the sanctuary would be safe and relatively easy because the site characteristics are very appropriate for this type of treatment.
- The application of chemicals to water bodies requires a series of permits, licenses and multi-agency approval and public support. Thus, sufficient time and resources would have to be set aside to address these.
- Dewatering and fish collection with nets have been identified as next best alternative; however, there are a number of issues that would need to be resolved. This project is a multi-agency collaboration, but DAR is working on the initial steps to obtain the appropriate authorization to use rotenone in the sanctuary.

Conducted research on chemical tools that could be used for effective management of AIS in Hawai'i:

- The 2003 State of Hawai'i AIS Management Plan cites the need "to research management efforts and effective measures in Hawai'i and elsewhere regarding [the control of] specific species, and use this knowledge when developing strategies and plans to address these species". This project's overall objective is to offer DAR and other resource managers options for effective management of AIS in Hawai'i.
- A comprehensive assessment scrutinized more than 70 active ingredients that have been tested or that show potential against AIS.
- Legal and regulatory issues related to the application of chemical substances to aquatic systems have been investigated, and dialogue with other State departments that hold authority over this matter has been initiated. A framework for the utilization of chemical control and eradication of AIS tools is under development.

Addressed aquaculture as a vector to reduce the spread of AIS in Hawai'i:

- DAR reviewed its authorities and permits for aquaculture of regulated species. Instituted a DAR policy to discourage the culture and sale of non-native *Gracilaria* spp., largely based on the rapid response event from the transfer of *Gracilaria salicornia* from an aquaculture company at the National Energy Laboratory of Hawai'i Authority (NELHA) to an uninfected area. Originally, this species was transferred from O'ahu to NELHA for commercial aquaculture. Aquaculture activities have been the primary vector in which *Gracilaria salicornia* has spread across the state. There has been an increasing demand for this non-native species as a food item while the State of Hawai'i spends a tremendous amount of resources controlling it.
- DAR has begun working even closer with the Department of Agriculture (DOA) in reviewing requests to import non-native aquatic species. In particular, DAR has taken a position that we would like to see a zero-risk determination for any import of non-native algae before the species is imported into the State of Hawai'i. DAR will continue dialogue and cooperation with DOA on this issue.

Administrative and Technological Support

- Project administration and support for the urchin project is provided by Pacific Cooperative Studies Unit at the University of Hawai'i (<http://www.botany.hawaii.edu/faculty/duffy/PCSU.htm>).

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Big Island Invasive Species Committee (BIISC)



The Big Island Invasive Species Committee (BIISC) is a voluntary partnership of private citizens, community organizations, businesses, land owners, and government agencies to address invasive species issues on the island of Hawai'i. BIISC's mission includes education, early detection, rapid response, control and eradication of invasive pests threatening agriculture, native ecosystems, industry, human health or the quality of life within Hawai'i County. While challenged by some of the most established invasive species populations in the State, BIISC successfully worked all over the Big Island to limit the spread and damage caused by invasive species.

Key Accomplishments

Eradicated and contained priority target species:

- BIISC continues control efforts of Miconia within the Wao Kele O Puna Forest Reserve in partnership with DLNR and the Office of Hawaiian Affairs (OHA). Aerial surveys were conducted.
- Surveyed 90 acres for a Miconia outlier population in Laupā hoehoe.
- Miconia control was also done in Fern Forest Subdivision and Maku'u Forest Reserve (608 plants controlled).
- Treated plume poppy, the “dry forest Miconia” in the Ka'ū Forest Reserve, controlling 71 plants in 773 acres.
- Red mangrove, a coastal invasive threatening native fish habitat and shoreline access, had a total of 10,315 plants controlled.
- Wax myrtle was controlled on state and private lands, with a total of 1,990 plants removed.



Crew controlling red mangrove

Early Detection and Rapid Response Activities:

- Surveyed over 500 miles of road and completed roadside surveys in Upper Puna, South Kona, North Kona, and South Kohala.
- Assisted the USDA with surveys for a new pest on the native nai'o (*Myoporum sandwicensis*) populations.
- Began a number of rapid response actions on rubber vine (*Cryptostegia madagascariensis*) in North Kona and South Kohala, Smokebush (*Buddleja madagascariensis*) in Upper Puna, Cherokee rose (*Rosa laevigata*) in Upper Puna, pink jasmine (*Jasminum polyanthum*) in Upper Puna, and *Parkinsonia aculeata* in South Kona.
- Collected 19 new island records as determined by the Bishop Museum Herbarium (2 additional new records pending determination).
- Certified as the Brown Tree Snake responders for the Big Island, after attending a training program on O'ahu.

Outreach & Education:

- The outreach specialist attended 52 events, ranging from festivals to speaking engagements, reaching 9,497 people.
- Five printed articles were published and one radio interview. The website was updated.
- Priority outreach messages included education on little fire ants, biocontrol, and outreach to the plant industry.
- The BIISC Outreach Specialist joined the County of Hawai'i Little Fire Ant Working Group.
- An oral presentation was made at the Hawai'i Conservation Conference on biocontrol history and successes in Hawai'i.



Event in Ka'ū: Mother holding BTS Sample

Year-end Perspective

During 2009 BIISC lost and gained key staff, while continuing to make progress against priority species and rapid response to early detected problem species. An Outreach Specialist began work at the beginning of the year and a new Field Supervisor began in May 2009. The BIISC manager shifted positions mid-year. The new BIISC manager will begin in March 2010 and the BIISC strategic plan will be updated. Results of a pilot high resolution aerial imagery project in the Ka'ū district will help direct BIISC's work. An aerial survey of the NE coastline would help determine the northernmost extent of *Miconia* on the Big Island. Early detection and rapid response will remain a priority. Increasing partnerships, volunteer assistance, and Citizen Early Detection Networks will

all be goals in 2010. Outreach targets for the next year include a more focused campaign educating plant industry operators.

Funding continues to be a challenge as BIISC had significant Federal funds during 2009 and those funding sources may not be available again in the coming years. Matching the Federal funds was sometimes difficult due to the drop in state funds.

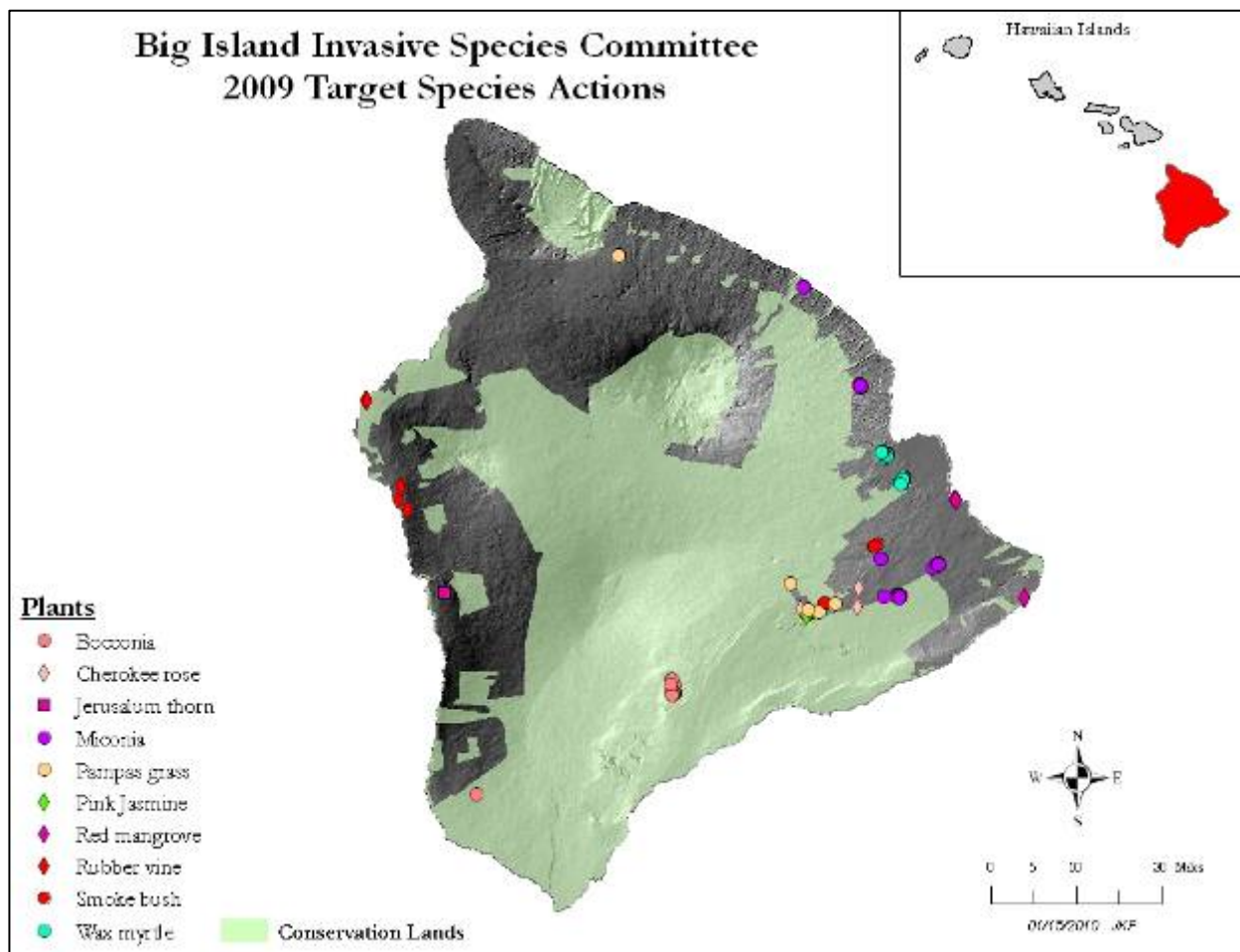
Administrative and Technological Support

- Project administration and support is provided by Pacific Cooperative Studies Unit at the University of Hawai'i (<http://www.botany.hawaii.edu/faculty/duffy/PCSU.htm>).
- The BIISC website is maintained by Hawaiian Ecosystems at Risk project (www.hear.org). HEAR is currently funded by the US Geological Survey through the Pacific Basin Information Node (PBIN). Further information about the Big Island Invasive Species Committee can be found at www.bigislandisc.org.

**BIISC Species Summary Table
2009 Calendar Year**

Target Species	Acres* Surveyed	Mature Plants Controlled	Immature Plants Controlled	Effort (Hours)
Plume poppy	773	27	44	1,890
Cherokee rose	8	20	20	255
Jerusalem thorn	4	2	0	34
Miconia	1,439	167	1,089	2,717
Pampas grass	18	11	0	101
Pink jasmine	0.2	32	0	430
Red mangrove	15	3435	6,880	807
Rubber vine	85	32	141	262
Smoke bush	13	449	0	458
Wax myrtle	388	362	1,628	864
Total	2,743			

*May include aerial surveys



Contact Info

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BIISC and Partners

Bishop Museum; Coordinated Groups on Alien Pest Species; Coqui Frog Working Group; Department of Hawaiian Homelands; Fern Forest Community Association; Dr. Betsy Ostertag; Dr. Fred Stone; Hawai'i Community College Forest Team Program; Hawai'i County; Hawai'i Department of Agriculture; Hawai'i Department of Health; Hawai'i Department of Land and Natural Resources/Division of Forestry & Wildlife; Hawai'i Invasive Species Council; Hawai'i Office of Hawaiian Affairs; Hawai'i Volcanoes National Park Service; Kamehameha Schools; Malama O Puna; Office of Hawaiian Affairs; The Nature Conservancy; University of Hawai'i College of Tropical Agriculture & Human Resources (Hilo); University of Hawai'i Pacific Cooperation Studies Unit; U.S. Fish & Wildlife Services; U.S. Department of Agriculture (USDA) Forest Service; USDA Natural Resources Conservation Services; The Nature Conservancy of Hawai'i; USDA Wildlife Services Branch; U.S. Geological Service (USGS) -Biological Resources Division; USGS-Pacific Basin Information Node; Volcano Coqui Conquistadores; University of Hawai'i College of Tropical Agriculture & Human Resources.

Maui Invasive Species Committee (MISC)



In 2009, the Maui Invasive Species Committee worked to protect the islands of Maui and Lānaʻi from a suite of harmful invasive plants and animals. Dedicated field staff, strong partnerships, and effective outreach were critical to a successful year.

Key Accomplishments

Kept the aggressive forest invader, miconia, out of Maui's native forests:

- Surveyed over 29,000 acres in East Maui for *Miconia calvescens* during ground and aerial operations. Crews removed 104,018 miconia plants.
- Hosted the four-day *2009 International Miconia Conference* in Keʻanae, Maui. Miconia experts from eight different countries shared research results and strategized about future needs across the Pacific. MISC staff and partners gave three presentations at the conference.
- During the miconia field trip, participants helped remove 4,668 plants from the East Maui forest, while gaining first-hand experience with a miconia invasion in Hawaiʻi.

Moved Maui closer to being coqui-free:

- Eradicated four more populations of coqui frogs. Eleven of seventeen populations have been eradicated. Three “revolving door” sites, where frogs are being re-introduced to the island, underscore the need for improved inter-island quarantine.
- Maintained the state's only coqui-free certification program, with 28 businesses now certified as coqui-free. The program website, including a list of certified businesses is at: www.coquifreemaui.org
- Tackled Maui's most challenging coqui site, Māliko Gulch. Installed high-volume citric acid sprinklers, cleared access trails into the gulch, tested use of aerial spraying, and secured strong support from local landowners for work on coqui frogs.
- Responded to 36 new coqui reports and visited 168 sites on Maui.



Targeted 20 different plant species, 3 vertebrate species, and one plant disease:

- In addition to work on miconia, crews removed 8,220 plants of 19 other invasive plant species on Maui, including pampas grass, ivy gourd, and fountain grass.
- On Lanai, work focused on two plants – ivy gourd and fountain grass – with 3,712 plants controlled.

- Initiated control action in response to report of newly discovered invasive plant – milk thistle – in upcountry Maui. Charles Darwin described “the great beds” of milk thistle as “impenetrable” and as “intricate as those in a labyrinth.”
- Veiled chameleon surveys covered 52 properties in upcountry Maui. No veiled chameleons were found, suggesting that control efforts have successfully reduced this invader to very low levels. Recent research on the related Jackson’s chameleon revealed that this species preys on highly endangered native land snails, underscoring the importance of keeping the larger and more adaptable veiled chameleon out of native habitat.
- Partnered with the Hawai’i Department of Land & Natural Resources to reduce mitred conures in East Maui.
- Conducted banana bunchy top virus surveys at 2,438 Maui sites. Controlled 1,169 infected plants at 106 sites. Surveyed 654 sites on Lāna’i; no BBTv was detected.



Darwin’s bane: milk thistle

Conducted surveys for high-risk species along roadsides and at landing zones:

- Botanists drove 850 miles of roads while looking for 100 invasive plant species. Surveys resulted in 2 new state records, 7 new records of naturalization, 3 new island records, 2 range extensions, and 3 unknown species. Identified a total of 14 species as potential candidates for eradication.
- Conducted surveys for incipient plant species at 23 landing zones to ensure that conservation workers were not vectoring plant seeds into high-value natural areas. No significant non-native species detected at sites surveyed.

Partnered with other agencies to address harmful invasive species:

- Controlled clidemia and other plants in Kīpahulu - Haleakalā National Park.
- Removed strawberry guava from a restoration area on Lāna’ihale in concert with the Lāna’i Native Species Recovery Program.
- Worked with the Hawai’i Department of Agriculture to develop an island-wide response to the discovery of the little fire ant in West Maui.
- Trained partner agencies in use of ropes (rappelling) for conservation work.
- Represented MISC at county and statewide conservation organizations.

Shared information about invasive species with students, community groups, and the general public:

- Published twelve monthly articles on invasive species topics in the Maui News (circulation of 22,000) plus two additional Viewpoint articles. Used public TV to broadcast information about the miconia conference and raise awareness about the little fire ant infestation on Maui.
- Created informative displays at eight community events, reaching an estimated 4,180 people. Installed two temporary displays at the Kahului Airport on BBTv, nettle caterpillar, and little fire ant. Presented the 6th annual Mālama i ka ‘Āina award

honoring a local professor who educates Maui Community College students about invasive species.

- Reached 350 people during presentations to community groups. Topics included MISC's target species and the impacts of HDOA staffing reductions. Gave two poster presentations at the Hawai'i Conservation Conference.
- Brought the invasive species message to 2,060 students during 49 classroom visits. Led 6 volunteer trips to work on forest restoration or miconia; involved 144 students and teachers.
- Held 8 Early Detection training workshops, targeting industries and agencies with outdoor workers. Conducted a curriculum workshop for teachers and invasive species outreach professionals on Hō'ike o Haleakalā, Maui's science-based curriculum.
- Hosted two Maui summer interns from the AmeriCorps program and welcomed one year-round Youth Conservation Corps intern.



Giant snake threatens 'i'iwi during County fair parade.

Year-end Perspective

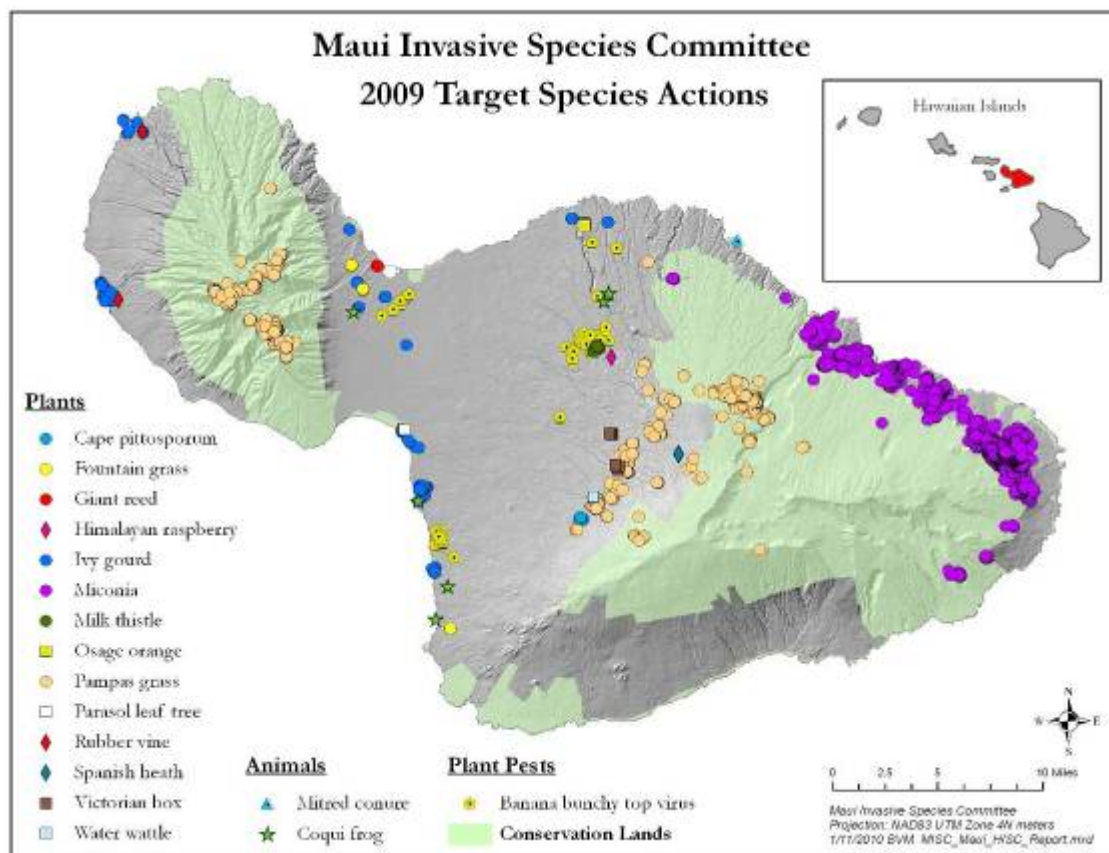
The year 2009 brought unprecedented challenges for MISC: major budget reductions in state funding; dramatic cuts to key positions at HDOA; and the arrival of the dreaded little fire ant on Maui's shores. But it also brought success. The 2009 international miconia conference, aptly titled, "*Pulling it all Together*," provided a unique forum for 110 participants to focus their collective experience on the problem of miconia. The use of biocontrol for intractable invaders moved forward with HDOA's release of an agent for *the Erythrina* gall wasp and the passage of a supportive resolution by the Maui County Council. Our partners came through with funding to help the Invasive Species Committees weather the budget crisis. And field staff – the heart and backbone of our work – yanked, sprayed, knocked on doors, helicoptered in out of wet and windy camps, and slowly, inexorably, fought back against the weeds and pests that threaten Maui County. We expect the next year to be more difficult. We will need all the support we can muster. But we do not plan to slow down.

Administrative and Technological Support

- Project administration and support is provided by the Pacific Cooperative Studies Unit of the University of Hawai'i: www.botany.hawaii.edu/faculty/duffy/PCSU.htm
- The MISC website is maintained by the Hawaiian Ecosystems at Risk project (U.S. Geological Survey); statewide data is collated by the USGS Pacific Basin Information Node. MISC's website is at: www.mauisc.org.

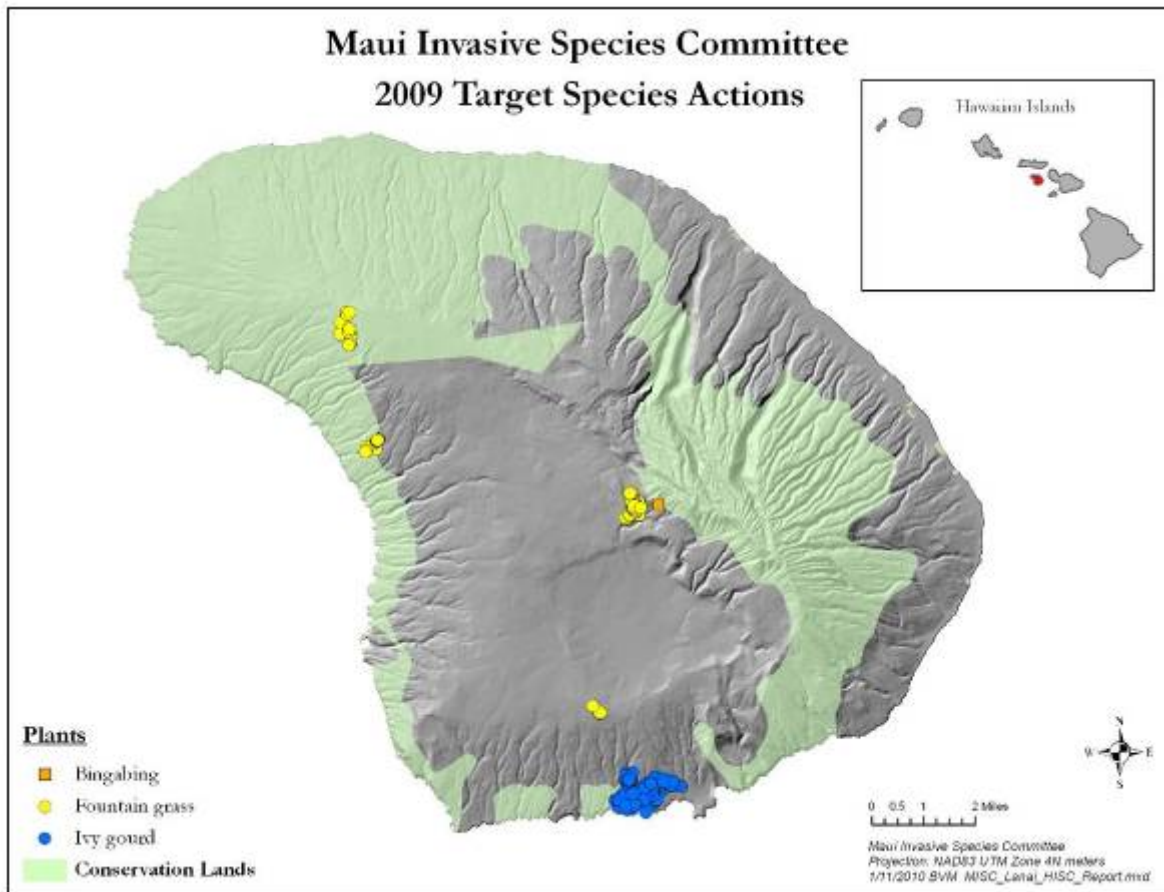
MISC Species Summary Table (Maui)
2009 Calendar Year

Target Species (Maui)	Acres Surveyed	Mature Plants Controlled	Immature Plants Controlled	Effort (Hours)
Banana bunchy top	658	1,169	n/a	1,150
Cape pittosporum	114	0	11	11
Fountain grass	422	4	8	321
Giant reed	74	4	0	6
Himalayan raspberry	4	0	1	1
Ivy gourd	2,039	47	1,269	632
Miconia	29,191	1,275	102,743	12,066
Milk thistle	348	50	525	45
Osage orange	11	1	126	10
Pampas grass	20,329	1,378	3,210	3,047
Parasol leaf tree	180	0	4	12
Rubber vine	144	1	0	12
Spanish heath	6	112	130	22
Victorian box	40	2	1,336	20
Water wattle	<1	33	8	2
Total	53,560			



**MISC Species Summary Table (Lānaʻi)
2009 Calendar Year**

Target Species (Lānaʻi)	Acres Surveyed	Mature Plants Controlled	Immature Plants Controlled	Effort (Hours)
Bingabing	15	1	0	22
Fountain grass	875	178	1,047	1,020
Ivy gourd	1,052	176	2,310	676
Total	1,942			



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MISC Partners

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Moloka'i/Maui Invasive Species Committee (MoMISC)



The Moloka'i/Maui Invasive Species Committee is a subcommittee of the Maui Invasive Species Committee. On Moloka'i, MoMISC is the primary organization that receives and responds to all pest calls from the public. MoMISC detects, responds and controls incipient invasive plants and animals that threaten our environment, economy, and human health. MoMISC has two full-time staff and carries out large projects with the help of Committee members and partner agencies.

Key Accomplishments

Added albizia as a target species for eradication:

- Surveyed over 339 acres for albizia and conducted initial control of the infested site.
- Treated 885 mature and 1,000 immature trees.
- Partner agencies contributed 345 in-kind hours and 145 staff hours to albizia control.



TNC's Justin Avelino & MISC's Abe Vandenberg girdle albizia.



DLNR DAR's Jason Durin & Brian Hauk and MoMISC's Kamalani Pali conduct jellyfish survey and control.

Partnered with Department of Aquatic Resources to control stinging upside down jellyfish (*Cassiopea andromeda*):

- Responded to calls from the public of being stung while swimming and canoeing.
- Surveyed over 8 acres at the Kaunakakai harbor for upside down jellyfish.
- Manually removed 434 jellyfish.

Partnered with the Department of Agriculture and USDA in early detection surveys for nettle caterpillar (*Darna pallivitta*) and light brown apple moth (LBAM):

- Initiated early detection surveys in February 2008.
- Surveyed over 5,000 acres for nettle caterpillar and light brown apple moth.



Nettle traps and GPS units used

- Monitored between 10 and 25 traps monthly; recorded all data.



Native akulikuli re-establishing at rubber vine removal site.

Six species headed for eradication; controlled other priority pest species:

- In 2009, detected and controlled less than 5 mature plants for giant reed, New Zealand flax, Australian tree fern, fountain grass, pampas grass, and tumbleweed.
- Other plant pests controlled included mule's foot fern, cat's claw, rosa, wood rose, mangrove, palm grass, and banana bunchy top disease.

Educated the public on invasive species issues:

- Participated in island-wide events showcasing current pest threats.
- Held invasive species workshops for targeted groups.
- Contributed invasive species articles in "Nature's Newsflash" and the local newspaper.
- Maintained informational kiosks at the airport, harbor, as well as distributing pest fliers island-wide.
- Responded to pest calls from the public.



MoMISC's Lori Buchanan & Kamalani Pali and TNC's Justin Avelino update Young Brother's KIOSK.

Year-end Perspective

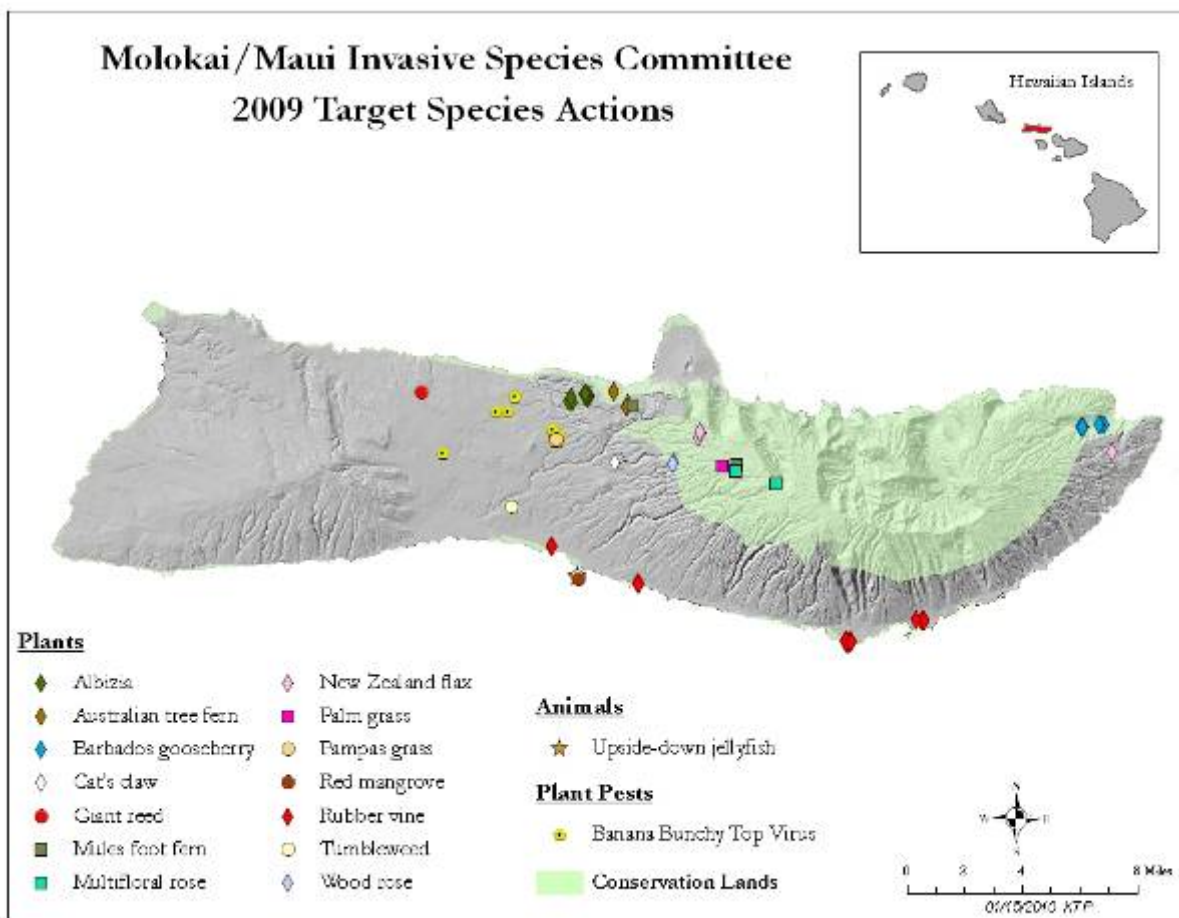
Long-standing partnerships with government agencies, private businesses, and community members were crucial to MoMISC's success. Support from The Nature Conservancy Moloka'i Program and the Maui Invasive Species Committee helped MoMISC fulfill its mission. Large projects, such as albizia control, depended on partner participation. For 2010, MoMISC is aiming for no detections in five of its priority species. Aerial surveys will resume to verify that no miconia has become established in Moloka'i's watersheds. The 2009 economic recession created hardships for the Invasive Species Committees. The ISCs' positive reputation and ability to leverage funds generated support to maintain operations. Showing true 'ohana spirit, the ISCs asked their partners to rally behind state agencies facing severe budget cuts. The message of malama 'āina must remain a top priority for the State of Hawai'i.

Administrative and Technological Support

- Project administration and support is provided by the Pacific Cooperative Studies Unit at the University of Hawai`i (<http://www.botany.hawaii.edu/faculty/duffy/PCSU.htm>).
- The MoMISC website is maintained by Hawaiian Ecosystems at Risk project. HEAR is funded by the US Geological Survey through the Pacific Basin Information Node (PBIN). The Moloka'i Invasive Species Committee website is: www.momisc.org.
- Office facility/baseyard and administrative support are provided by The Nature Conservancy, Moloka'i Program.

**MoMISC Species Summary Table
2009 Calendar Year**

Target Species	Acres Surveyed	Mature Controlled	Immature Controlled	Effort (Hours)
Albizia	340	885	1,000	492
Australian tree fern	767	0	19	21
Banana Bunchy Top Virus	567	152	241	121
Barbados gooseberry	53	13	2,717	95
Cat's claw	9	2	127	16
Coqui frog	9	0	0	11
Fountain grass	67	0	0	6
Giant reed	1	1	0	3
Long-thorn kiawe	2	0	0	19
Mules foot fern	18	1	1	10
Multifloral rose	6	1	23	11
New Zealand flax	32	5	27	53
Palm grass	2	0	40	4
Pampas grass	1	0	1	8
Red mangrove	45	30	1,300	128
Red-vented bulbul	6	0	0	3
Rubber vine	60	4	74	74
Stinging nettle caterpillar	5,007	0	0	121
Tumbleweed	53	1	1	17
Upside-down jellyfish	9	56	378	48
Wood rose	3	2	50	6
Total	7,057			



Contact info

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MoMISC Partners

Castle & Cooke, Ltd., Hawai'i Department of Agriculture, Hawai'i Department of Health, Hawai'i Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife, Hawai'i Invasive Species Council, Maui County Department of Water Supply, Maui County Office of Economic Development, Maui Land & Pineapple Company, National Park Service (NPS) Haleakalā National Park, NPS Pacific Islands Exotic Plant Management Team, Research Corporation of the University of Hawai'i, The Nature Conservancy of Hawai'i, Tri-isle Resource Conservation and Development Council, Inc., U.S. Department of Agriculture (USDA) Natural Resources Conservation Service, USDA Forest Service, U.S. Fish and Wildlife Service, U.S. Geological Survey (USGS) Biological Resources Division, USGS Pacific Basin Information Node, University of Hawai'i (UH) College of Tropical Agriculture and Human Resources (CTAHR), UH Pacific Cooperative Studies Unit, and private citizens.

O'ahu Invasive Species Committee (OISC)



Begun over a decade ago by volunteers, the O'ahu Invasive Species Committee is a partnership of public and private organizations united to protect our island from invasive species that threaten our island's environment, watersheds, agriculture, economy and quality of life. In order to have the greatest impact with the least expense, OISC prioritizes those species that present the greatest threat, but are not yet abundant.

Key Accomplishments

Stopped the spread of Hawai'i's most threatening watershed weed, miconia (*Miconia calvescens*):

- Removed 1,528 immature and 4 mature miconia trees over 3,471 acres of difficult backcountry terrain in the Ko'olau mountains.
- Miconia was removed from 'Āhuimanu, Ka'alea, Kahalu'u, Kalihi, Maunawili, Makiki, Mānoa, Nu'uuanu and Waimānalo.
- Volunteers contributed 348 hours towards miconia surveys in 2009.
- OISC puts 50% of its time towards systematic miconia control because miconia forms dense single species stands that kill off the forest understory, increasing erosion and landslides.



OISC crewmember removing miconia (the large purple plants) in Kahalu'u.

Continued systematic removal of Himalayan blackberry from Pālolo Valley and Mau'umae Ridge:

- Himalayan blackberry (*Rubus discolor*) is a thorny vine that blocks access to trails and recreation areas, clogs streams and displaces native plants.
- OISC crew removed 2,109 plants over 104 acres.
- Volunteers contributed 40 hours towards removal of this species.

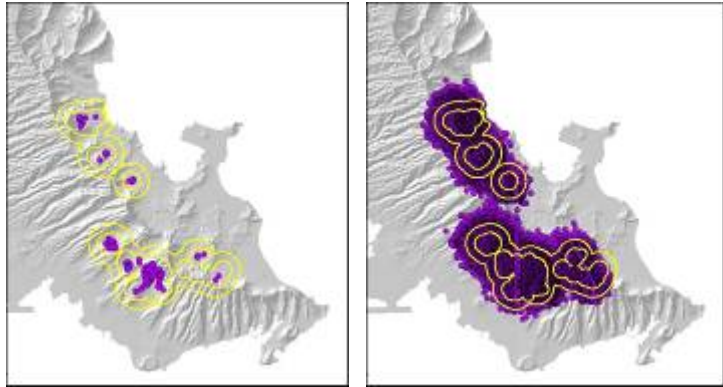


Waterfall climbing during a miconia survey.

Worked with landowners to remove invasive plants from private property:

- Worked in partnership with Royal Kunia golf course, to remove pampas grass: a flammable invasive grass that has displaced native forest on Maui and in New Zealand and overrun coastal shrublands in California.

- Removed 145 individuals of fountain grass (*Pennisetum setaceum*) from Navy Housing near the airport.
- Worked with HDOA and Hawai'i Kai community group to set up a neighborhood watch for coqui frog.
- OISC vertebrate specialist removed frogs from private businesses in Waimānalo and Kaka'ako.



The map on the left shows where OISC has removed miconia in the past. The right map shows miconia density resulting from the current seedbank if no control takes place for 10 years. Predicted spread is based on known miconia biology. Miconia seeds can survive in the soil for 16 years so without continued survey and control work; miconia can still take over the Ko'olau Range. Figures are based on a model developed by OISC GIS Analyst Jean Fujikawa.

Protected Wai'anae coast from fire-prone fountain grass (*Pennisetum setaceum*):

- Surveys for fountain grass along the drier, leeward coast of O'ahu found no plants.

There were small fountain grass populations scattered along the Wai'anae coast and all were removed in 2006. OISC monitors this area because fountain grass' ability to invade dry forests would be devastating to the Wai'anae mountains.

- Continued to survey and remove fountain grass from heavily-traveled roadways and anywhere west of the Pali Hwy. Fountain grass is established in southeast O'ahu, but by containing it to that area, the Wai'anae Coast will be protected.

Discovered and removed incipient weeds through early detection surveys:

- O'ahu Early Detection Program, a partnership between the Bishop Museum and the O'ahu Invasive Species Committee discovered Jerusalem thorn (*Parkinsonia aculeata*) on the Wai'anae Coast. Jerusalem thorn has become a problem in California, Arizona, Florida, the West Indies, Australia, Hawai'i, Guam, and Micronesia. It has been removed.
- Discovered and began removal of Cape Ivy, an environmental weed on the Big Island.

Educated the public about the threats of invasive species and what they can do to help:

- Participated in 16 community events, visited 5 schools, gave 7 presentations and 2 television interviews, and helped facilitate 4 newspaper articles.
- 3,534 people came by the OISC educational booth or attended an OISC presentation. Another 101,000 were reached through television interviews.
- Conducted volunteer events removing a variety of invasive species that resulted in 1,074 hours of donated time.

Year-end Perspective

In 2009, OISC made significant progress towards reducing fountain grass, Himalayan blackberry, miconia and pampas grass; discovered significant weeds, and worked with HDOA to respond to coqui frog reports across the island. OISC's state funding was cut by 65% but we made up the gap by not re-filling positions after staff resigned. We feel very fortunate that we have been able to hold our team together. However, the decrease in staff forced us to drop control efforts on several species, decrease the amount of education and outreach we do and suspended surveys over approximately 3,500 acres of the miconia search area. In 2010, we will continue to spend 50% of its time surveying and controlling for miconia and work to further decrease the numbers of other target species. Early detection will continue and the field crew will respond to new weeds found by the early detection team. In 2009, OISC leveraged state funds with \$200,000. In 2010, we will continue to seek outside funding to support our programs, but we cannot do that without core state funding. Money from the Natural Area Reserve Fund is the foundation that enables us to attract money from other sources.



OISC crewmember speaking to students at the College of Tropical Agriculture's Agricultural Awareness Day

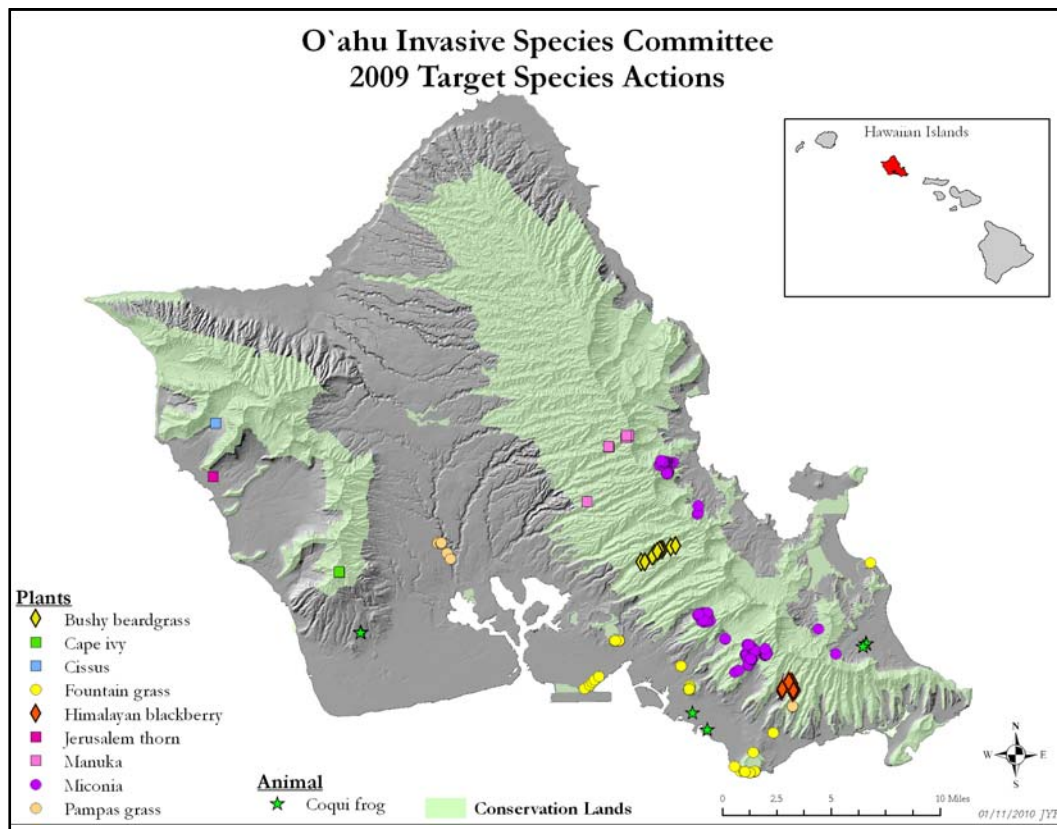
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- The OISC website is maintained by Hawaiian Ecosystems at Risk project (www.hear.org). HEAR is currently funded by the US Geological Survey through the Pacific Basin Information Node (PBIN). Further information about the O'ahu Invasive Species Committee can be found at www.oahuisc.org.

**OISC Species Summary Table
2009 Calendar Year**

Target Species	Acres Surveyed*	Mature Plants Controlled	Immature Plants Controlled	Effort (Hours)
Bushy beardgrass	527	40	114	530
Cape ivy	7	0	130	56
Cissus spp.	20	5	35	40
Coqui frog	118	8	0	118
Fountain grass	1,134	209	532	248
Himalayan blackberry	105	2	2,107	717
Jerusalem thorn	455	1	0	40
Manuka	3	13	73	119
Miconia	3,472	4	1,528	4,433
Pampas grass	105	289	0	543
Total	5,946			

*May include aerial survey



Contact info

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ISC Partners

Bishop Museum; City and County of Honolulu; Conservation Council of Hawai'i; Coordinating Group on Alien Pest Species; Hawai'i Department of Agriculture; Hawai'i Department of Health; Hawai'i Department of Land and Natural Resources (DLNR)/Division of Forestry and Wildlife; Hawai'i Department of Transportation Highways Division; Hawai'i Invasive Species Council; Honolulu Board of Water Supply; Hui Kū Maoli Ola; Ko'olau Mountains Watershed Partnership; Lyon Arboretum; Marine Corps Base Hawai'i; The Nature Conservancy of Hawai'i; O'ahu Army Natural Resources Program; Sierra Club Hawai'i Chapter; University of Hawai'i College of Tropical Agriculture and Human Resources; Pacific Cooperative Studies Unit; U.S. Department of Agriculture (USDA) Forest Service; USDA Natural Resources Conservation Service; U.S. Fish and Wildlife Service; U.S. Geological Survey Biological Resources Division Haleakalā Field Station.

Kaua'i Invasive Species Committee (KISC)



Kaua'i Invasive Species Committee is a voluntary partnership of government, private and non-profit organizations, and concerned individuals working to detect, control, and eliminate the most threatening invasive plant and animal species on Kaua'i. This work is necessary in order to preserve the island's native bio-diversity and minimize adverse ecological, economic and social impacts that invasive species pose. These partnerships and collaborative efforts help to increase capacity to achieve priority conservation goals on Kaua'i.

Key Accomplishments



Spraying citric acid

Continued response and control of coqui frogs (*Eleutherodactylus coqui*) island-wide:

- Spent 2,406 person hours working in a non-residential area of approximately 20 acres.
- Responded to coqui reports island-wide to dispatch new introductions to Kaua'i at 4 locations.
- Conducted monitoring and control work to ensure that Kaua'i will remain coqui-free.
- Published weekly work notification newsletters (http://www.hear.org/kisc/coqui_news/).

Continued control and eradication work of Hawai'i's most threatening watershed weed, miconia (*Miconia calvescens*):

- Conducted aerial surveys in the Wailua District covering 702 acres.
- During ground-truthing from aerial surveys, the KISC crew was able to quickly locate large maturing trees (within the known infestation area) that, had they been left undetected, would have been difficult to contain.

Partnered with private industry to remove last known population of pampas grass:

- Worked with Marriot personnel to remove 93 plants from Kaua'i Lagoons Golf course. Plants were being used as a feature ornamental on the course.
- Solicited donations from a local nursery and the National Tropical Botanical Garden for plants to restore areas where pampas grass was removed.
- Kept all plant debris on site in greenwaste area



KISC crewmembers removing pampas grass

where KISC crews can monitor for re-sprouts.

Assisted Partnership Agencies:

- Conducted island-wide surveys at nurseries for invasive pests such as nettle caterpillar, little fire ant, naio thrips, and coqui frogs with Hawai'i Department of Agriculture.
- Picked up dead birds for Hawai'i Department of Health for West Nile Virus early detection.
- Picked up dead chickens for U.S. Fish and Wildlife for Avian Influenza early detection.
- Worked with DOD at Pacific Missile Range Facility to monitor and remove long thorn kiawe.



Crewmember cutting long thorn kiawe at PMRF

Educated the public about invasive species threats and the importance of reporting to the pest hotline:



Keiki checking out a snake at Banana Poka

- KISC's outreach program incorporates the HISC outreach objectives and messages into all outreach activities. This year, KISC reached 5,133 people through public events such as Garden Fair, Kaua'i County Fair, Banana Poka Roundup, and Ag Awareness Day. KISC also had displays at a local library.
- KISC reached 924 people through talks to groups like rotary clubs, school visits, direct audiences like boat dive operators and fishermen, hiking tours, Governor's advisory council, DLNR sponsored private landowners workshop, Agricultural Forum, and volunteers and staff for many Kaua'i based organizations.

Year-end Prespective

2009 was a productive year for KISC. A project to remove the last known population of pampas grass capped months of planning with Marriot personnel, as well as Wildlife officials to ensure the safety of local nene and other native ground-nesting birds. Ongoing response and control of coqui frogs was successful at stopping the incursion of this invasive animal; although with populations reaching critical-mass on the Big Island, stopping the inter-island movement of coqui will become more difficult. Early detection work with surveys for miconia, invertebrates, and other invasive plants have been an essential element in protecting Kaua'i's biodiversity and protecting the watershed.

KISC suffered a 76% reduction in state funding for FY2010 and although Federal stimulus funds will help toward making up this deficit, certain target-species work will suffer. It is imperative that dedicated funding from the state is earmarked for continuing conservation work to protect our watersheds, agriculture, properties, health and well being that are threatened by the effects of invasive species statewide.

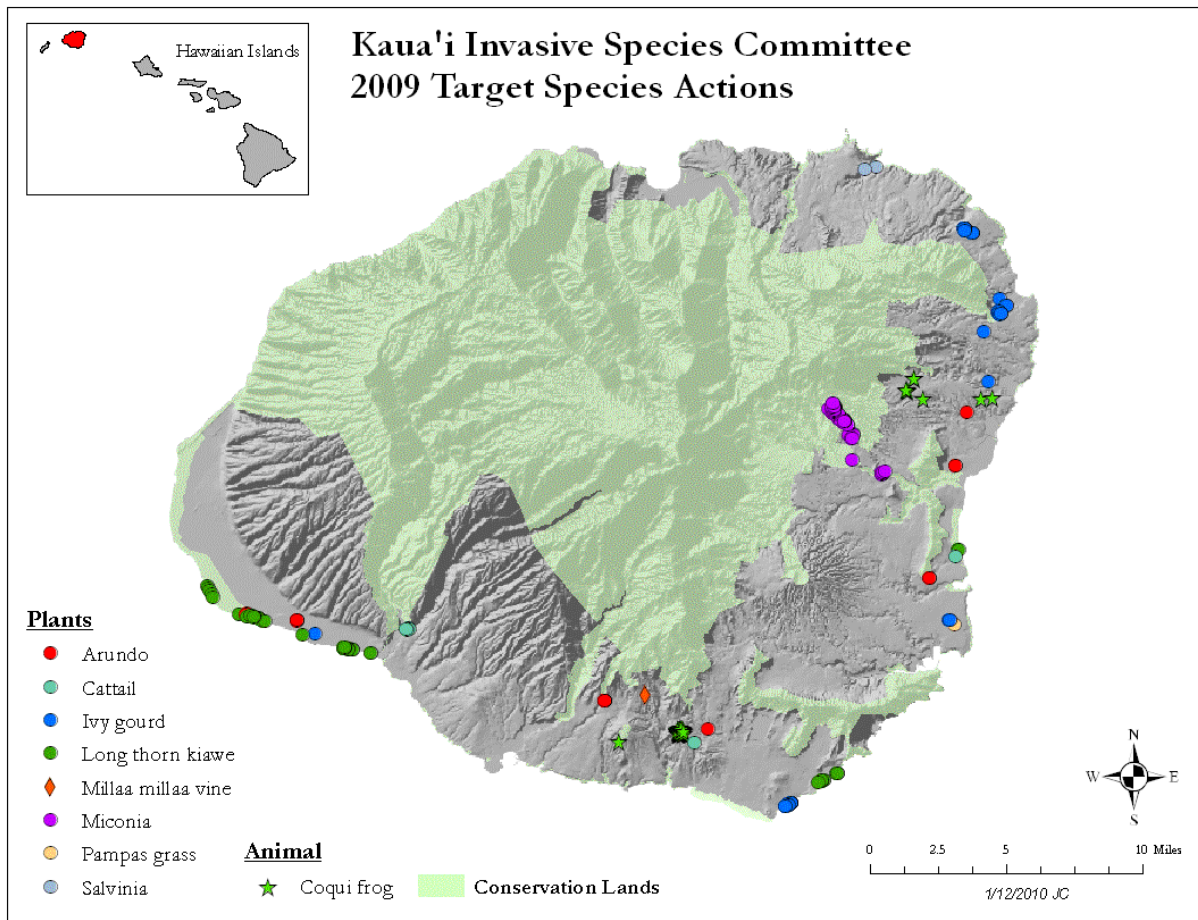
Administrative and Technological Support

- Project administration and support is provided by Pacific Cooperative Studies Unit at the University of Hawai'i (<http://www.botany.hawaii.edu/faculty/duffy/PCSU.htm>).
- The KISC website is maintained by Hawaiian Ecosystems at Risk project (www.hear.org). HEAR is currently funded by the US Geological Survey through the Pacific Basin Information Node (PBIN). Further information about the Kauai Invasive Species Committee can be found at www.kauaiisc.org.

**KISC Species Summary Table
2009 Calendar Year**

Target Species	Acres Surveyed*	Mature Plants Controlled	Immature Plants Controlled	Effort (Hours)
Cattail	250	3,736	0	222
Coqui Frog	3,309	n/a	n/a	2,406
False Kava	3	60	0	29
Giant Reed	130	133	0	116
Ivy Gourd	1,340	149	452	285
Little Fire Ant	38	n/a	n/a	202
Long Thorn Kiawe	817	28	5,874	674
Miconia	1,294	2	397	602
Pampas Grass	206	92	1	122
Other	739	51	0	519
Total	8,126			

*May include aerial surveys



Contact info

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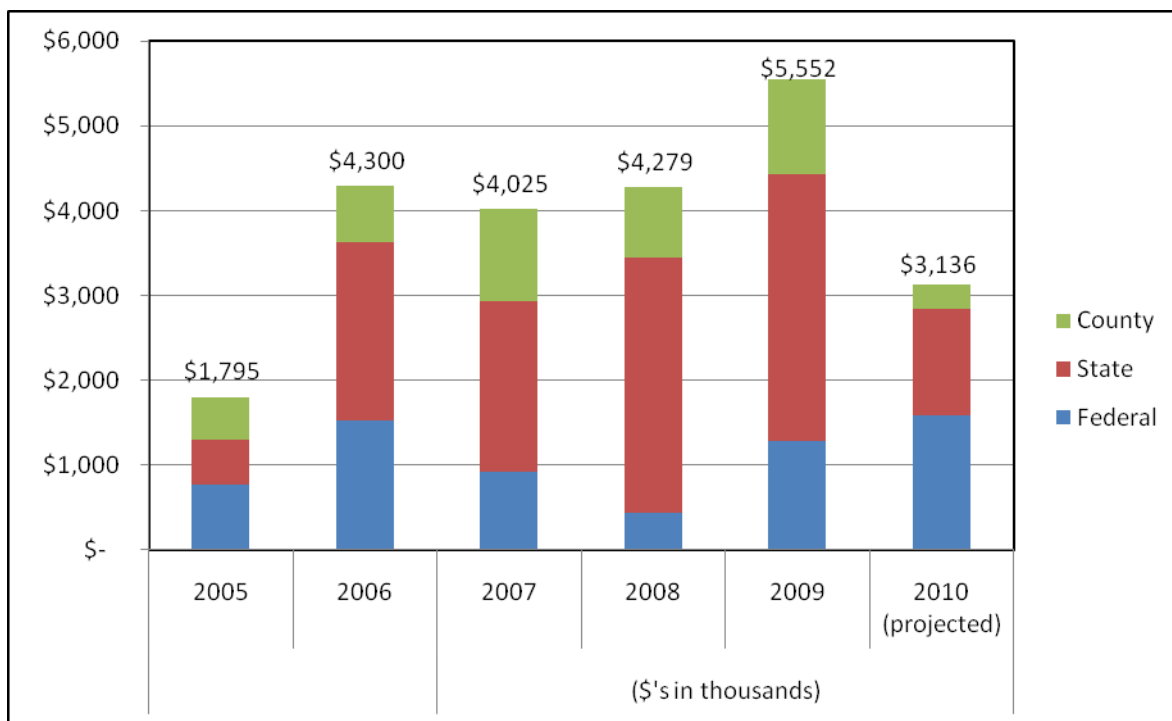
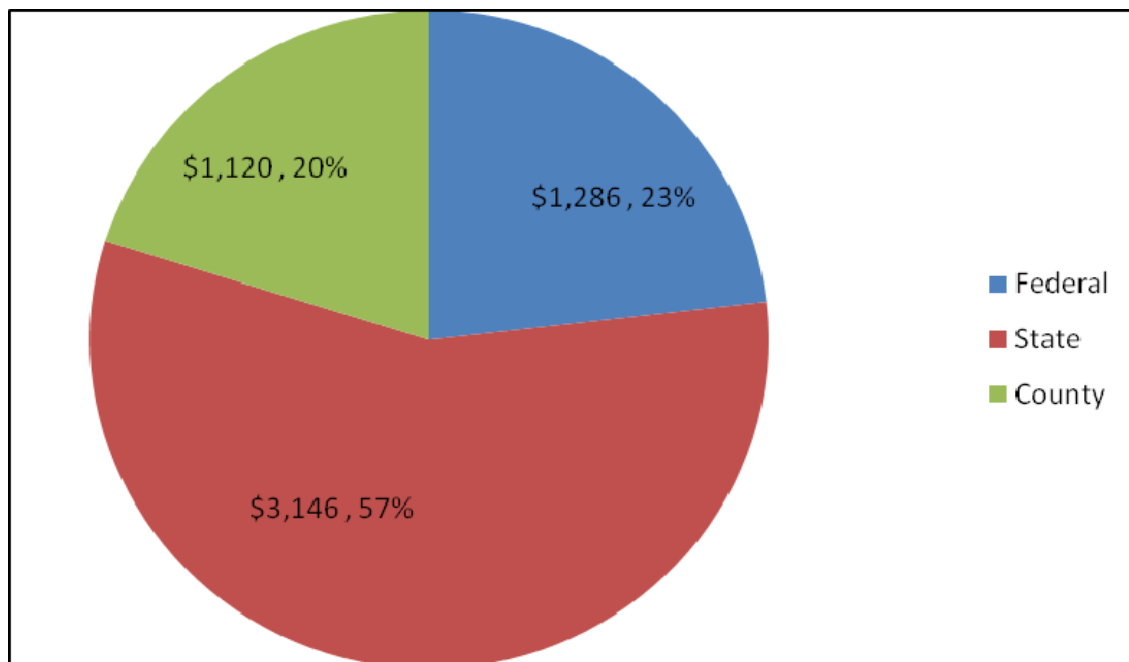
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KISC Partners:

A & B Properties, County of Kaua'i, Department of Land and Natural Resources (DLNR) Division of Aquatic Resources (DAR), DLNR Division of Forestry and Wildlife (DOFAW), Garden Island Resource Conservation and Development (GIRC&D), Grove Farm/LLC, Hawai'i Department of Agriculture (HDOA), Hui o Laka/Koke'e Museum, Kamehameha Schools, Kaua'i Community College, Kaua'i Coqui Frog Working Group, Kaua'i Department of Water, Kaua'i Farm Bureau, Kaua'i Native Plant Society (KNPS), Kaua'i Westside Watershed Council, Koke'e Resource Conservation Program (KRCP), Kuku'iula Development, National Tropical Botanical Garden (NTBG), Natural Resource Conservation Service (NRCS), Pacific Cooperative Studies Unit (PCSU), Pacific Missile Range Facility (PMRF), Research Corporation of the University of Hawai'i, Rural Development Project, Sea Grant, DLNR State Parks, The Kaua'i Group Sierra Club, The Nature Conservancy Hawai'i (TNCH), University of Hawai'i College of Tropical Agriculture and Human Resources (UH/CTAHR), US Department of Agriculture (USDA), and private citizens.

Statewide Funding Summary

State funding for the invasive species partnerships has driven the development and success of these globally recognized programs. This funding is matched by multiple federal and local programs and benefits communities by providing both meaningful work and by protecting the natural resources that makes Hawaii a rich, vibrant place to live.



Priority Target Species

The ISCs choose their targets based on the threat they pose to Hawai'i and the feasibility of control or eradication. Species may threaten Hawai'i's unique marine and terrestrial ecosystems, agriculture, fisheries, public health, the economy or Hawai'i residents' quality of life.



Australian Tree Fern (*Cyathea cooperi*)

- Large tree fern up to 40 feet, native to Australia.
- Displaces native plants, especially in native cloud forests.
- Introduced and still sold as an ornamental.
- Produces many lightweight spores that are spread long distance by wind.
- Priority target for MoMISC.



Bushy Beardgrass (*Schizachyrium condensatum*)

- Tufted grass native to Central and South America, introduction history unknown.
- Habitat-altering weed that fuels brush fires.
- Produces many seeds, spread by wind and humans.
- Priority target for OISC.



Coqui Frog (*Eleutherodactylus coqui*)

- Native to Puerto Rico, accidental introduction via infested plants.
- Consumes native insects, takes prey base away from native birds.
- Loud calls disturb the public.
- Spreads in infected nursery materials.
- Priority target for BIISC, KISC, MISC, MoMISC and OISC.



Fountain Grass (*Pennisetum setaceum*)

- Bunch grass native to Africa, introduced as an ornamental.
- Highly flammable and creates a fire hazard.
- Produces many seeds per year, wind dispersed. Seeds remain viable for 7 or more years.
- Potential range is all dry and mesic forests.
- Priority target for BIISC, KISC, MISC, MoMISC, OISC.



Giant Reed (*Arundo donax*)

- Tall reed native to Mediterranean.
- Invades streams and rivers, disrupts flow and displaces native plants and animals.
- Priority target for MISC.



Gorilla ogo (*Gracilaria salicornia*)

- Seaweed native to the Indo-Pacific.
- Threatens Hawai'i's reef coral ecosystems by overgrowing and smothering coral colonies. Reduces marine species diversity and alters marine community structure.
- DAR/AIST target in Kāne'ohe Bay and Waikīkī.



Himalayan blackberry (*Rubus discolor*)

- invades riparian areas, altering stream flow and degrading stream health
- Thorny vine that blocks access to trails and other recreational areas.
- Displaces native plants.



Hookweed (*Hypnea musciformis*)

- Seaweed native to Florida and the Caribbean.
- Forms large, dense floating mats and tens of thousands of pounds wash up each year on Maui beaches.
- Fragments easily (facilitating spread) and grows rapidly.
- Target for DAR/AIST on Maui.



Ivy Gourd (*Coccinia grandis*)

- Vine native to tropical Asia, introduced as a food crop.
- Spreads into forests and overtakes native plants.
- Produces many seeds that are bird dispersed; spreads vegetatively.
- Priority target for KISC, MISC.



Little Fire Ant (*Wasmannia auropunctata*)

- Tiny ant native to Central and South America, accidental introduction via infested plants.
- Painful bite is a public nuisance and can hamper orchard and coffee production.
- Spreads in infected nursery materials, particularly palms.
- Priority target BIISC, MISC, KISC.



Long-Thorn Kiawe (*Prosopis juliflora*)

- Tree or sprawling shrub native to Africa, introduced for agriculture, possibly accidentally.
- Thorns can puncture truck tires and blocks access to recreation and conservation areas.
- Produces many seeds spread by water and animals.
- Potential range is unknown; appears able to hybridize with short-thorn kiawe.
- Priority target for KISC.



Miconia (*Miconia calvescens*)

- Tree native to Central and South America, introduced as an ornamental.
- Carpets hillsides, killing native plants and inducing erosion.
- Produces millions of seeds per year dispersed by birds, rats, pigs, humans. Potential range is all wet and mesic forests to 6,000 ft. elevation.
- Priority target for BIISC, KISC, MISC and OISC.



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

- Native to South America, introduced as an ornamental.
- Large bunch grass displaces native plants, blocks access to recreation areas, fire hazard.
- Produces many seeds per year, wind dispersed.
- Potential range is all mesic and wet forests.
- Priority target for KISC, MISC, MoMISC, OISC.



Plume Poppy (*Macleaya cordata* formally *Bocconia frutescens*)

- A large shrub to small tree native to tropical America. Introduced as an ornamental.
- Invades dry to mesic forests, forms dense thickets and displaces native plants.
- Priority target for BIISC.



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



Smothering seaweed (*Kappaphycus* sp./*Euchuma complex*)

- Seaweed native to the Philippines.
- As indicated by its name, this alga forms extremely dense mats that overgrow and smother corals.
- DAR/AIST target in Kāneʻohe Bay, Oʻahu.



Snowflake coral (*Carijoa* sp.)

- Octocoral that forms dense colonies on shaded underhangs in shallower waters and large carpets in deeper ocean.
- Threatens Hawaiʻi's black coral which grows in deeper ocean.
- Priority target for DAR/AIST at Port Allen, Kauaʻi.



Veiled Chameleon (*Chamaeleo calyptratus*)

- Native to Yemen, illegal introduction for the pet trade.
- Could prey on endangered native birds and their eggs.
- Spread by humans.
- Priority Target for MISC.

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

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