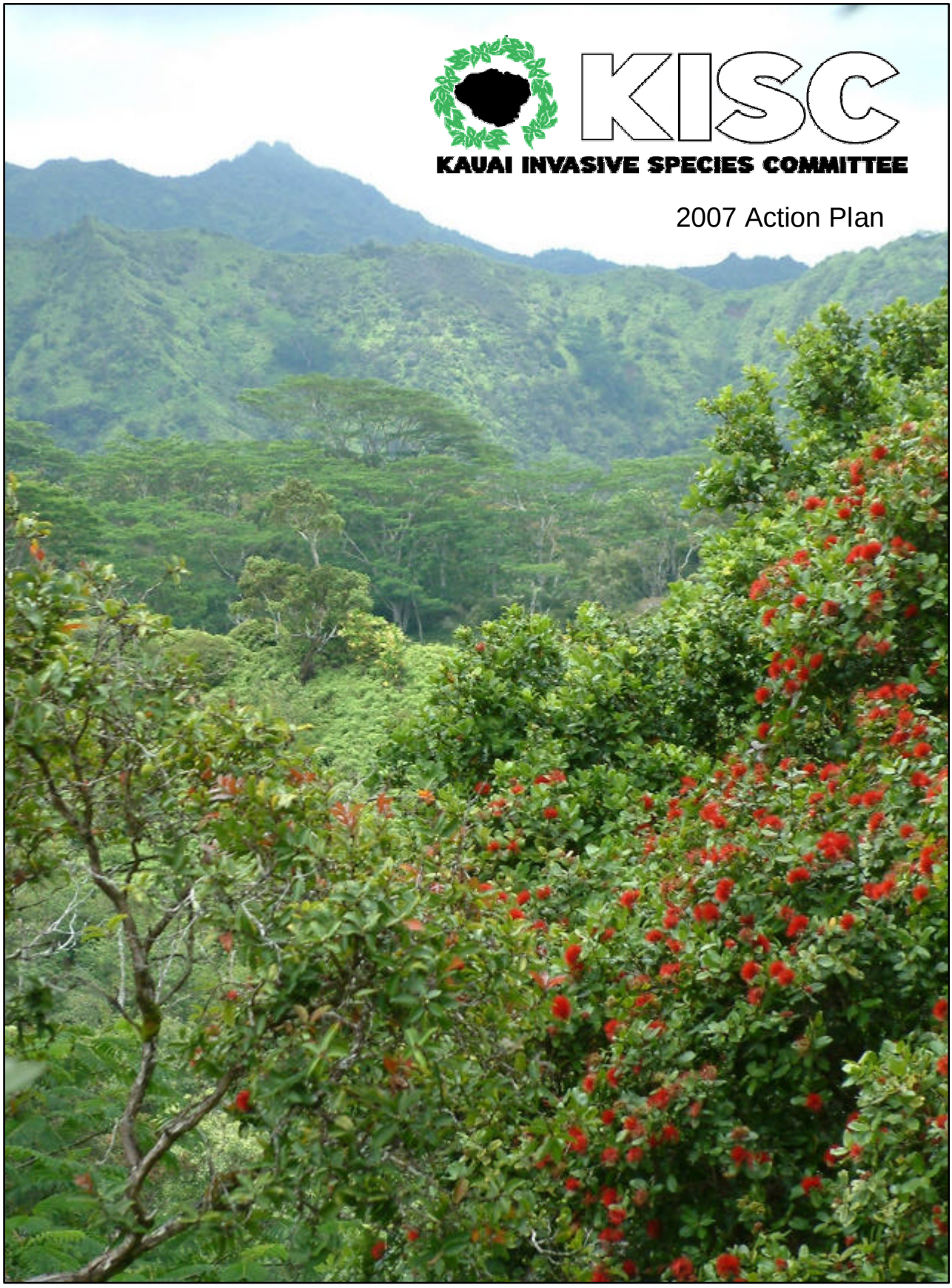


Kaua`i Invasive Species Committee: PO Box 1988, Lihue, HI 96766 • Phone: (808)246-0684 • Fax: (808)632-0841

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The introduction of invasive nonnative species has contributed in a major way to biological impoverishment in the past and is now the predominant cause of biodiversity loss in Hawaii. More native species have been eliminated in Hawaii than anywhere else in the United State. According to the U.S. Fish and Wildlife Service (USFWS), Kauai's high rate of endemic plants (224; the highest in the Hawaiian archipelago and quite possibly in the world) make it a biodiversity hotspot of global magnitude. Additionally, Kaua`i has over 95 threatened and endangered species. Unless prevented and controlled, the impacts of invasive nonnative species on this unique native biota will create further loss of biodiversity and ecosystem degradation

At the same time, invasive species pose huge threats to Hawai`i's watersheds and water resources, tourism-based economy, agriculture, health, and general quality of life; and Hawai`i's residents are beginning to recognize the problem. With this recognition comes hope that it may be possible to marshal adequate resources to address the problem in a comprehensive fashion. Given rational management based on good science and with the help of informed citizens, this threat can and will be addressed.

The Kaua`i Invasive Species Committee (KISC) was formed in December 2001, as a voluntary partnership of community members, private organizations, and government agencies. KISC is a consensus-based committee that has adopted a mission statement, an action plan, and a prioritized list of targeted incipient invasive plants and animals with *Miconia calvescens* being its top priority. Miconia is the greatest concern because of its persistent ability to act as an umbrella, shading out plants underneath it. This creates monotypic "seas" of Miconia up to 40 feet high. Because of its shallow roots it can cause severe amounts of flood damage and erosion washing out entire hillsides. If Miconia escapes the Wailua area and becomes established in the rugged terrain of the Halelea Forest Reserve, it will challenge all of Kaua`i's resources to control it. Approximately 100,000 acres of native wet forest, prime habitat for Miconia, are at risk. Other targeted weeds include Pampas Grass, Fire Weed, Fountain Grass, Ivy Gourd, and Long Thorn Kiawe, all of which pose a threat to our native ecosystems but are insipient enough to potentially be controlled.

KISC also targets specific invasive animals and insects such as the Coqui frog and the Little Fire Ant. Prevention, early detection and rapid response for species that threaten Hawai`i, such as the Small Indian Mongoose and Brown Tree Snake, are also important aspects of KISC's overall program goals. Education programs to increase public awareness in the community for both children and adults will help to increase KISC's capacity in detecting and preventing introductions of invasive species from other islands.

MISSION STATEMENT

KISC is a voluntary partnership of government, private and non-profit organizations, and concerned individuals working to 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.

POLICY STATEMENT

The continued introduction and spread of unwanted pest and invasive organisms harms our economy, water supply, native bio-diversity, health, and the lifestyle and culture unique to this island.

The Kaua`i Invasive Species Committee (KISC) is a voluntary partnership of government, private, non-profit organizations, and individuals working together to:

- Prevent the introduction of potentially damaging pest species to the island.
- Eliminate recently arrived (incipient) pests before they spread beyond control.
- Manage established pests in order to reduce their negative impacts.
- Educate and involve the public as to the magnitude of the invasive species problem and the need for control programs such as KISC.

KISC is intended to supplement existing programs and aims to assist in the coordination of efforts island-wide.

KISC's priorities will be those species that are recognized as having the greatest potential to harm human welfare and native biodiversity, and where the use of limited resources are most likely to be successful.

PROJECT NEED

THE IMPORTANCE OF INVASIVE SPECIES CONTROL ON THE ISLAND OF KAUA`I

Hawai`i's Alien Species Crisis

Alien species are increasingly recognized as a threat to biological diversity and human welfare worldwide. A recent article in the Journal of Science stated: "Many fear that another century or so of frenetic international traffic will lead to an 'ecological homogenization' of the world, with a small number of immensely successful species" (Enserink 1999). Oceanic islands are particularly vulnerable to invasive species, and Hawai`i especially so because of its role as a transportation hub. Because of their evolution in isolation from many forces shaping continental organisms, ecosystems of the Hawaiian Islands are substantially more vulnerable than most ecosystems of the continental United States.

Hawai`i has one-third of the endangered species in the United States, and invasive alien species pose the greatest threats driving these and other native species toward extinction. More native species have been eliminated in Hawai`i than anywhere else in the United States, yet these islands retain more native biodiversity than the famous Galapagos. Although habitat destruction has been an important cause of extinction and endangerment, the introduction of alien species has been the predominant cause of bio-diversity loss in Hawai`i for a century. Kaua`i has over 95 threatened and endangered species federally listed by the U.S. Fish and Wildlife Service. At the same time, invasive species pose huge threats to Hawai`i's watersheds and water resources, tourism-based economy, agriculture, health, and general quality of life; and Hawai`i's residents are beginning to recognize the problem. With this recognition comes hope that it may be possible to marshal adequate resources to address the problem in a comprehensive fashion. Given rational management based on good science and with the help of informed citizens, this threat can and will be addressed.

The Formation of KISC

The Kaua`i Invasive Species Committee recently formed as a voluntary partnership of community members, private organizations, and government agencies. The first meeting was held in December of 2001. KISC has developed a consensus-based committee that has adopted a mission statement, an action plan, and a prioritized list of targeted incipient invasive plants and animals with Miconia calvescens being the top priority. KISC members realize that a unified effort is needed to effectively tackle this problem. KISC members include concerned community members and groups, ranchers, farmers, nurserymen, visitor industry members, private land owners, the Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DOFAW) and State Parks, Koke`e Resource Conservation Program (KRCP), Hui o Laka / Kokee Museum, Kamehameha Schools, Hawai`i Department of Agriculture (HDOA), the National Tropical Botanical Garden (NTBG), The Nature Conservancy Hawai`i (TNCH), the Kaua`i Group Sierra Club, the US Department of Agriculture

(USDA), Kaua`i Department of Water, Kaua`i Community College, Kaua`i Westside Watershed Council, Grove Farm/LLC, Kaua`i Farm Bureau, Natural Resource Conservation Service (NRCS), the Garden Island Resource Conservation & Development (GIRC&D), the Pacific Missile Range Facility (PMRF), University of Hawai`i College of Tropical Agriculture and Human Resources (UH-CTAHR), Sea Grant, and the County of Kaua`i. KISC is also receiving support from the Coordinating Group on Alien Pest Species (CGAPS) as well as coordinated efforts between all island ISCs, under the umbrella of the Hawaii Invasive Species Council (HISC).

KISC is focused on island-wide invasive species issues concerning, but not limited to, the threat to Kaua`i's watershed areas, the native forests and diverse native species, the pasture lands, agricultural crops, recreational resources and the visitor industry. As stated in our Mission and Policy Statements, KISC is focused on eradicating incipient invasive species, controlling the spread of established invasive populations and preventing the entry of new invasive species. Under present conditions, Kaua`i faces the unchecked threat of pest introductions due to the lack of adequate quarantined transportation of people, goods, and plant materials. Because of this, it is vital that early detection protocols and surveys be fully functional and implemented at all times.

The need for KISC here on Kaua`i is great and with the support of the community at large, the State of Hawai`i, and KISC's funding sources, KISC will make a significant impact on both the preservation of our irreplaceable resources and the prevention of possible negative effects on the local economy.

The Need for Continued Funding of Invasive Pest Eradication

Resource managers, ranchers, farmers, and other concerned community members recognize that although active on-site vigilance and management are essential for protecting native ecosystems, pastures, and crops, long-term protection of these areas may depend more than anything else on the success of keeping new alien plant and animal species from becoming established and spreading island-wide. Preventing establishment and spread of new introductions is not only cost-effective, but also essential. Likewise, resource managers recognize the need to work together on invasive species problems and solutions. KISC is a grass-roots organization that has the capacity to survey, map, and control incipient invasive pests, acts as an early-detection rapid-response team, as well as conducts long-term invasive species management. The majority of KISC's funding comes from Federal, State and County level organizations such as; The US Forest Service, US Fish and Wildlife Service, National Fish and Wildlife Federation, Hawaii Invasive Species Council, The State of Hawaii, Hawaii Community Foundation, and the County of Kauai. Invasive Species Committees have now become established on all of the main Hawaiian Islands. Maui was the first to form a committee in 1997. Big Island (Hawai`i) established a Melastome Action Committee (BIMAC) in 1995 that focused on Miconia and expanded its focus to become an Invasive Species Committee (BIISC) in 1999. Oahu formed an Invasive Species Committee (OISC) in the fall of 2000.

Each island has a different mix of agencies, personalities, and interest groups, with each contributing uniquely toward effective grassroots action against invasive species. Maui's successes and failures, in particular, guide efforts statewide. In addition, the Invasive Species Committees have the potential for contributing to national and world models for such efforts. KISC's primary target will continue to be the invasive tree *Miconia calvescens*. This species, native to neo-tropical Central and South American forests at 1000-6000 ft elevation, is now known to be an unusually aggressive invader of moist tropical island habitats. Introduced to Tahiti in 1937, dense thickets of Miconia had, by the 1980s, replaced the native forest over most of the island, with dramatic reduction of biological diversity. The invasion of Miconia has threatened 4050 species endemic to Tahiti toward the brink of extinction (Meyer and J. Florence 1997). After the late botanist F.R. Fosberg saw this species in Tahiti in 1971, he reported, "It is the one plant that could really destroy the native Hawaiian forest." Because of its attractive purple and green foliage, it had already been brought to Hawai`i as an ornamental plant in the 1960s, and no sustained efforts were made to control it until it was well established on the Big Island. An alarm was finally raised after conservation agencies detected Miconia on Maui.

Now Miconia has become something of a household word and progress is being made to control it state-wide. However, despite the considerable progress made, Miconia will continue to be a primary target for years to come for several reasons: Miconia can produce large amounts of seeds per year; it can occasionally flower and seed below the forest canopy and is unseen during helicopter surveys; some seeds can remain dormant in the soil for up to ten years before germinating. The management challenges for Miconia and other aggressive alien invaders provide examples of why committed, long-term funding is crucial to the effective control strategy for Kaua`i's worst pests. Populations of targeted invasive species remain, established seed banks persist, landowner access is pending in some areas, new areas need to be surveyed, and there is a steady stream of new introductions that have the potential to devastate the State of Hawai`i's and Kaua`i's economy, environment, and quality of life. KISC is committed to early detection, a quick response with long-term sustainable efforts to eradicate and control these unwanted invaders.

Public education and outreach on Kaua`i is developing and expanding regarding invasive species issues. Funding made available through HISC has enabled KISC to increase capacity by utilizing their Public Relations and Outreach Specialist who targets school curriculum, develops educational materials, acts as liaison to the landscaping and horticultural trade, and interacts with the public at various venues across the island. The public's support will be a critical factor in the successfulness of KISC's objectives.

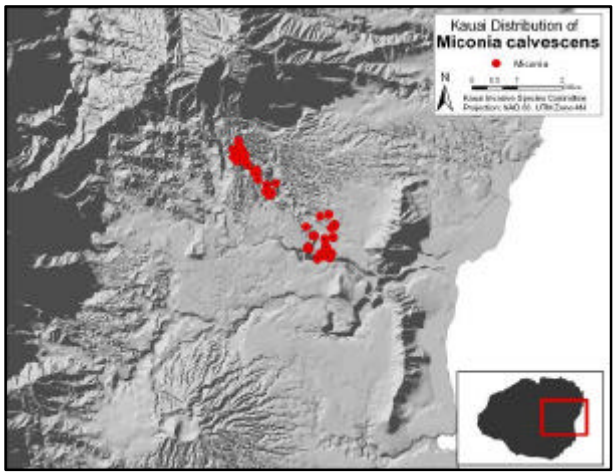
With continued funding KISC has been able to establish an office/base-yard that serves as their hub of operations. This facility is located in the central part of the island and business center, Lihue.

TARGET SPECIES

Miconia, Thorny Kiawe, Fireweed, Coqui frogs, Fountain grass and other species that are being addressed by KISC pose serious threats to Kaua`i. These alien pests affect recreational areas, pastures, tourism, State and private conservation reserves, native forest watersheds, agriculture, and the island's special quality of life shared by both residents and visitors. As a community based organization, KISC is dedicated to controlling the island's worst invaders as well as to help prevent the introduction of new invasive pest species to Kaua`i.

PLANTS

1) Miconia (*Miconia calvescens*)



Miconia is KISC's number one targeted plant species. It is the top priority and will receive the time and resources necessary to eradicate all discovered populations and individual plants.
If Miconia escapes the Wailua area and becomes established in the rugged terrain of the Halelea Forest Reserve, it will challenge all of Kaua`i's resources to control it. Approximately 100,000 acres of native wet forest, prime habitat for Miconia, are at risk.

Background:
Miconia calvescens is native to South and Central America and was introduced to the Hawaiian Islands in the 1960's via the horticultural trade for its landscaping appeal. Also known as the velvet tree, Miconia is a unique plant with large, velvety green and purple leaves. Annual seed production for a single miconia plant is well over one million seeds which are dispersed via birds, wind, water and humans. With this enormous reproductive capacity it did not take long for this landscape ornamental to escape its cultivated surroundings. Though hardly a dominant species in its' native forests Miconia has thrived on the Pacific islands. In Tahiti Miconia dominates over 70% of the forests and causes significant erosion problems. Control of *Miconia calvescens* on the island of Kaua`i began in the mid-1990's after plants

were reported in the Wailua Homesteads area. An effort coordinated by Department of Agriculture (DOA) personnel resulted in the removal of several dozen plants, primarily from private properties near the nursery. Another dozen plants were located on State land nearby in the canyon of the Wailua River State Park (WRSP).

In September of 2000, after a period of no activity, reports by the Kaua`i Sierra Club of reemerging Miconia population reached the Division of Forestry and Wildlife (DOFAW). DOFAW, assisted by volunteers and staff of the Koke`e Resource Conservation Program (KRCP), began systematic searches of the WRSP. In 2002 KISC organized Miconia searches in the Homesteads area, and a public awareness campaign was also resumed.

Aerial surveys were conducted by KISC in 2003 in the Wailua Game Management Area where a population of flowering and fruiting mature trees were discovered. This discovery increased Kaua`i's known infestation area and ground surveys were initiated to eliminate any plants. Since this removal of mature plants, no new flowering trees have been discovered.

Currently, the potentially "contaminated" area on Kaua`i is estimated to be ~3500 acres. This is based on the experience of control teams on the islands of Maui and Hawai`i, where juvenile Miconia have been located as far as 1000 meters away from the nearest adult plant. However, Miconia are often found as far as 2000 meters up or downstream from the source in river valleys. This probably reflects transport by birds using the river corridor as a flyway or by water movement. On Kauai, measurements are also based on species of individual birds found and how far they are capable of flying while distributing eaten seeds.

Approximately 11% of this area (400 acres), primarily within the WRSP, was searched intensively between 10/2000 and 10/2001. After 2001, efforts have been directed to revisit the core population ("hot spots") within the WRSP, and remove seedlings that have germinated since the original search took place. Generally, a period of two years is allowed to elapse between visits as it allows newly germinated plants to grow to a height where they can be easily seen but without any danger of them reaching maturity.

Additional aerial surveys are conducted annually over much of the core area in order to expand our search efforts. Plants spotted by air are marked with a GPS unit with ground crews following up with treatment and more thorough ground surveys. The 2006 aerial surveys were conducted on the outer edge of our traditional core area in order to account for seed dispersal by wind, water and far ranging birds. No seeding plants were found and only a few large juvenile plants were spotted, all within the known infestation area. All plants were then followed up by ground crews and eliminated.

<u>Objectives:</u>
The known population of Miconia on Kaua`i is relatively small and has been managed successfully to the point of not finding any new seeding plants. Because the seed-bank can persist for >10 years we must maintain our ground efforts

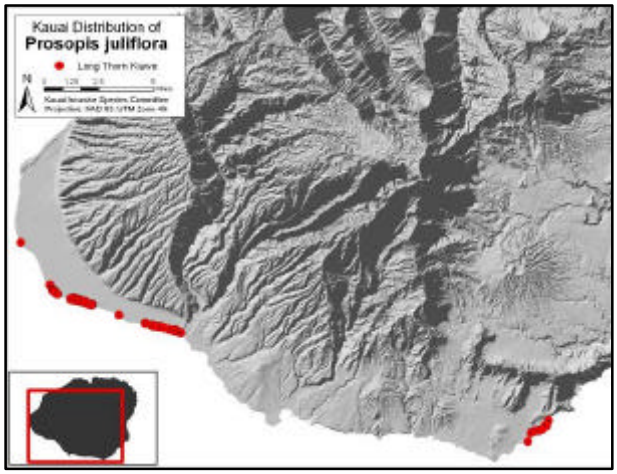
coupled with survey flights at least once every three years (preferably on an annual basis). Our intentions are to eradicate Miconia from Kaua`i. To achieve this KISC plans to:

- Continue to search the Wailua River State Park and all other lands considered high-risk areas, treat and map all plants discovered.
- Perform annual air surveys of appropriate areas such as the Wailua Game Management Area and surrounding Halelea Forest Reserve.
- Conduct monitoring of sites where mature plants have been found and mapped, and remove any seedlings. Work with DOFAW to carry out monitoring in the Forest Reserve.
- Contact landowners for access permission and re-survey likely Miconia habitats on private property in the Wailua Homesteads area.
- Utilize our current database for habitat modeling in order to pinpoint our survey areas and better predict where Miconia is likely to occur. This utility will improve reporting in order to assure that resources are devoted to this project for the long-term.
- Continue to prioritize resources towards Miconia as KISC's number one target, for the long term, to insure adequate follow up takes place. KISC members and Project Manager are to review progress near the end of the year and develop a strategic plan for continuing a comprehensive Miconia eradication program.

Methods:

- Organize transects to allow thorough coverage of search area.
- Seedlings and small trees are pulled, and hung upside-down in trees for roots to dry. Large trees are cut and immediately treated with 100% Garlon-4 (in accordance with the label). For any mature trees found, all panicles with fruits are removed and bagged for incineration and metal marker tag attached indicating date and size of tree.
- All survey areas are mapped using GPS with data and GIS entered into KISC database.
- All gear worn or used during Miconia surveys and treatments are dedicated and only used for Miconia field operations. We have a dedicated Miconia washing machine/ dryer at our base-yard where all gear is decontaminated according to protocol and stored in a separate closet.
- Current distribution data is being used within GIS to quantify specific habitat parameters (such as elevation, precipitation, temperature and land-cover type) in order to make a habitat selection model for Miconia. This will increase our search protocol and effectiveness.

2) Long Thorn Kiawe (*Prosopis juliflora*)



Background:

It must be noted that *Prosopis juliflora* varies from the more common species of Kiawe *(Prosopis pallida)* found on Kaua`i. *P. juliflora* contains thorns up to several inches long which are sharp enough to pierce through automobile tires. This long-thorned variety first appeared in Hawai`i about 1978, and is found on O`ahu, Kaua`i and Ni`ihau. On Kaua`i there are currently three known populations: on the beaches of Mahaulepu, and from Pakala Point to Mana on the western side of the island. The potential range for *Prosopis* is within a few hundred feet of the high water mark from Nawiliwili to the Napali Coast (approx. 40 miles). *P. juliflora* is in the legume family, producing multiple seed pods which can tolerate saltwater, are drought resistant and persist in the soil for multiple decades. Long Thorn Kiawe is considered a major threat to the tourism industry on Kaua`i not only because of its treacherous thorns, but because it restricts access to the beaches. Long Thorn also seriously threatens endemic coastal strand vegetation by creating a monotypic, impenetrable bramble that no native vegetation can grow through. Mechanical control and the herbicides Spike and Garlon-4 have been identified as the most efficacious means to control *Prosopis*.

Objective:

Prosopis juliflora is a long-term target for both KISC and HDOA. The relatively slow growth rate of Long Thorn makes it a manageable target that does not require rapid response but its ability to out-compete native vegetation in combination with the persistent seed-bank make it a primary target that can be managed over the long term. Our objective is to:

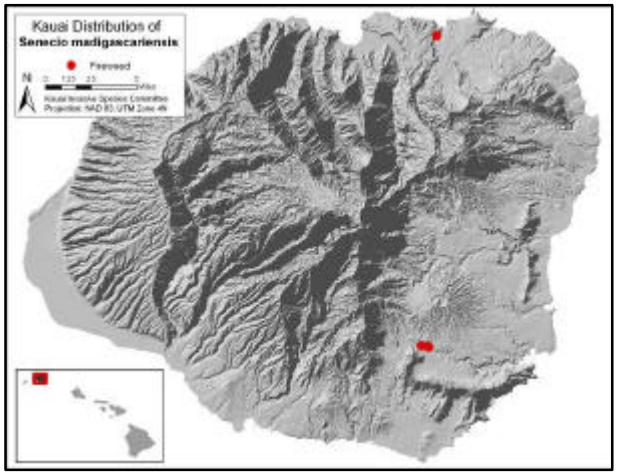
- Keep areas of light infestation under control by continual monitoring/treatment for seedlings and re growth.
- Continue work at the well established hedge in the Mana area that spans about 4 miles along the coast. Because of sensitive cultural aspects of the area where the hedge is located, mechanized control is not a viable option. Manual removal of Kiawe is very time and labor intensive requiring persistent effort and an appropriate management time frame spanning multiple seasons.

- Opportunistically partner with the Pacific Missile Range Facility on mechanical removal of *P. juliflora* at the base.

Methods:

- Hand pull newly emerged seedlings. The root system is too well developed on plants any larger than ~1'.
- On larger plants we use a cut stump treatment; cutting the tree with a chainsaw horizontally as close to the ground as possible. A 50% Garlon/forest crop oil mixed herbicide is applied immediately after the fresh cut for the most efficient herbicide translocation into the root system.
- Plant material is left at the site and we are investigating ways of mulching the downed trees to make access to seedlings easier upon post treatment monitoring.
- A collaborative Long Thorn Kiawe removal project with KISC and The Pacific Missile Range Facility (PMRF) is utilizing mechanized removal of the trees via a hydro-axe which grinds the tree to mulch, followed by a bulldozer which scrapes debris away from the stump (being careful not to disturb possibly culturally sensitive areas). This is then followed up by ground crews making a fresh cut of the stump and immediately applying chemical. Mulching experiments will take place on PMRF land in the fall of 2006. If successful this mulching technique will be applied to the hedge area as well.

3) Fireweed (*Senecio madagascariensis*)



Background:

Fireweed is a yellow flowering weed currently listed on Hawai`i's Noxious Weed List by the Department of Agriculture. This plant poses a serious threat to pasturelands as it is poisonous to horses, cattle, and other livestock. Each plant is capable of producing 25,000 to 30,000 seeds in a single growing season which can persist in the soil for at least 50 years. In Australia, yearly losses of $2,000,000 are attributed to fireweed.

In 1990, the weed was found along the roadway near Halfway Bridge, between Lihue and Koloa on the island of Kauai. This infestation probably started with some

roadside plantings of grass seeds from Australia that contained some unwanted fireweed seeds. Since discovery, this plant has been a target of HDOA with KISC assisting since 2002.

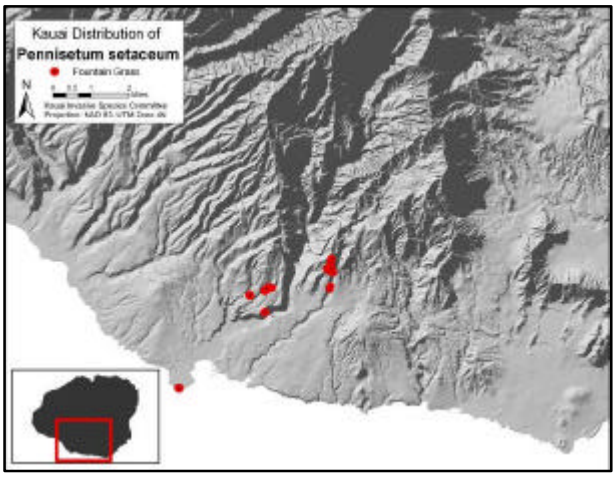
In 2003 Fireweed was discovered at a residence in Kalihiwai. This introduction, again, was due to unwanted fireweed seeds mixed into hydro-mulch and then sprayed onto a hillside. Due to higher rainfall in this area, rapid germination led to quick eradication at this site.

This one known population has effectively been reduced from finding an average of 1000 plants per month to finding zero in FY2006

Objectives:
Due to the small extent of fireweed on Kaua`i, KISC intends to eradicate any known populations. The small population warrants extensive effort due to the potential economic damage that can be incurred by the presence of fireweed. Because the seed is spread by wind or mechanical means (tractor-mowers), or can be easily brought in from neighboring islands, continued investigation for potential new populations is necessary.

Methods:
- Areas are surveyed via transect and any plant found is pulled and disposed of in a plastic bag to make sure that no plants have seeded.
- If a seeding plant is found, the area is flagged and dated. The plant is pulled and bagged for disposal and a granular herbicide (Snapshot™) is spread within a 3 m diameter of the area. Snapshot is a pre-emergent and works by killing seeds before they can germinate.
- KISC control team will work in coordination with HDOA to monitor and survey for outlying undiscovered populations, and re-treat any new plants within the core population.

4) Fountain Grass (*Pennisetum setaceum*)



Background:

Originally introduced as an ornamental, fountain grass has become an aggressive invader and is currently listed on Hawai`i's Noxious Weed List by the Hawai`i Department of Agriculture. Fountain grass degrades pasturelands and is not nutritionally preferred by livestock therefore resisting any grazing pressure. Unlike other non-native grasses, *P. setaceum* colonizes bare or sparsely vegetated areas, such as lava flows, thus threatening primary native ecosystems. Fountain Grass is a significant fire hazard and is in fact stimulated by fire; thus further endangering the native woody plant communities it invades. Seeds are spread easily by vehicles, humans, wind, and water and can become established at elevations ranging from sea level to over 8000 feet. Although it has a wide elevational range, it is usually limited to areas with a median annual rainfall of less than 50 inches.

Kaua`i has two known populations of Fountain Grass: in Kalaheo, Hanapepe, and possibly one on the North Shore which is unconfirmed with a voucher specimen. The core population is located mountainside of Kalaheo and is believed to have been there since the early 1930's. It is assumed that this population has remained pretty much contained due to the higher average rainfall in this area. There have been sightings of plants along the cliffs above Hanapepe River, indicating that this pest is moving west. Most of this core population is located on private land on rugged terrain, and may be inaccessible by ground crews alone.

Objective:

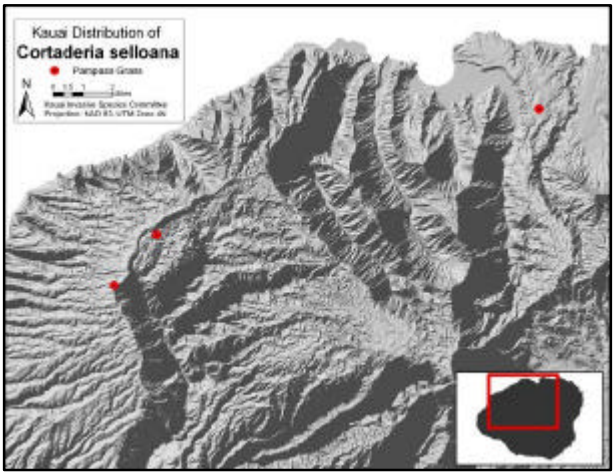
Continue to work in collaboration with the Hawaii Department of Agriculture on all known populations and survey potential habitat for new populations.

- The KISC control team will re-treat the small population location near the Port Allen airstrip and monitor the site.
- KISC and HDOA will seek access to private lands to treat outlying populations of Fountain Grass.
- KISC and HDOA will seek access to acquire a voucher specimen from a possible population on the north shore above Haena Beach Park.
- KISC is also collaborating with TNC to establish an aerial-spray operation to treat fountain grass on inaccessible slopes.

Methods:

- Survey areas for re-sprouts which have been previously treated.
- When accessible, remove any seed-heads from plants and discard in a plastic bag to prevent further seed spread.
- For treatment of non-seeding plants drizzle spray with 8% Round-up mixed with water.

5) Pampas Grass (*Cortaderia jubata or C. selloana)*

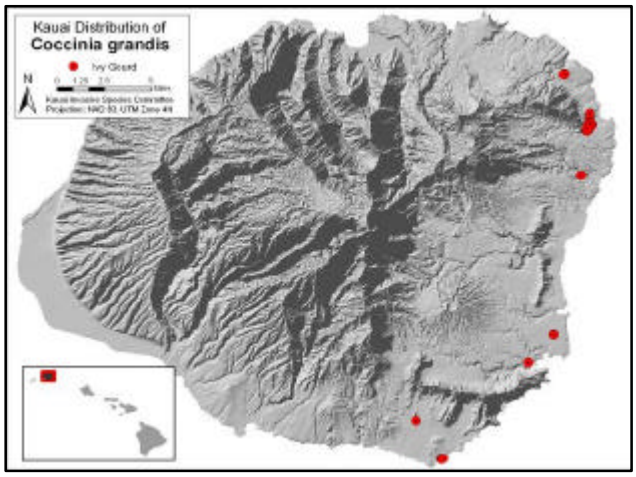


Background:
This species, recognized as one of the worst invasive weeds in coastal areas of California, New Zealand and South Africa, and was added to the Hawai`i Noxious Weed List in 1993. Each plant can produce thousands of seeds that are wind-dispersed up to 20 miles and can remain viable, persisting in the soil seed bank for at least six years before germinating. Pampas grass invades mesic and wet forests to dry alpine shrubland. *C. jubata* reproduces through the process of agamospermous apomixes. Female plants are able to produce viable, genetically identical seed without pollination. *C. selloana* however requires both sexes for crosspollination. On Kaua`i it is believed that we only have female plants of *C. selloana* as we have not seen a dramatic spread. Maui, however, has a real problem with Pampas Grass and it is only a matter of time before we get the male plants here. There are currently 2 remaining populations on Kaua`i; one currently being monitored in Koke`e State Park and one remaining on Kaua`i Lagoons Golf Course. The golf course is willing to remove their plantings as long as we can find them a suitable ornamental replacement. We are currently working with a local nursery to accomplish this goal. A third population of Pampas Grass on Kaua`i was successfully eradicated in Princeville in early 2002.

Objective:
Treat all known populations and survey potential habitat as well as nurseries for new arrivals of either species. Work with local golf courses to eliminate this plant as a featured species.

Methods:
- In residential and urban areas, where *Cortaderia* is planted ornamentally and where the use of herbicides is discouraged, plants are dug out of the ground and burned in a safe area that can be monitored for seed emergence.
- Chemical treatment for *Cortaderia* is a drizzle spray application of 8% RoundUp mixed with water.

6) Ivy Gourd (*Coccinea grandis*)

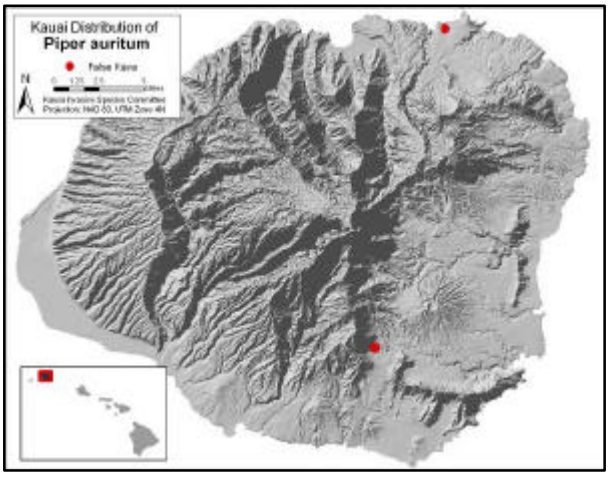


Background:
This species (on Hawai`i Noxious Weed List) commonly used in food preparation exploded on Oahu and the Big Island in Kona in the1980s, creating problems for agriculture and conservation of lowland sites. Ivy Gourd is a choking vine that produces a cucumber-like fruit. Seeds are dispersed mainly by birds and humans and can persist in the seed-bank for up to 4 years. This plant is considered eradicable because it requires both sexes to pollinate; therefore spread is relatively contained and slow. Alternately this target is difficult to kill on the first treatment because of the sheer mass of the vine network as well as the difficulty in finding the main vine in dense vegetation. Repeated treatment is necessary and does show success over time. There are five known populations of Ivy Gourd on Kaua`i, located in Anahola, Moloa, Kapa`a, Lihue and Mahaulepu which cover an estimated 20-plus acres.

Objective:
Treat all individuals of all known populations, map them, and conduct comprehensive surveys of areas near known infestations. These sites as well as buffer zones will be monitored on a monthly basis.

Methods:
- A notch/treat method with a 50% Garlon-4/crop oil mix seems to work well.
- Any fruit found should be removed and bagged and properly disposed of to slow the spread of new plants.
- Conduct continual surveys to find new populations. Common new sources would be residential areas and green waste dumps.

7) False Kava or “Golden awa” (*Piper auritum*)



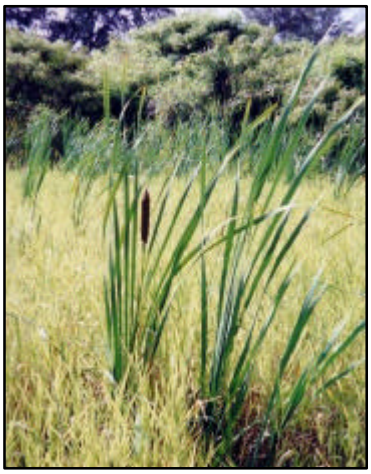
Background:
False Kava is easily be mistaken for true Awa when it is small and poses serious problems for the Awa industry. Primarily false kava “dilutes” the quality of genuine Kava by being harvested and unintentionally mixed. When buyers, both in the Pacific and in larger external markets, learn of this, shipments may be rejected and local and export markets lost. Secondly, it is larger than Kava, grows more vigorously, and can be a weed interfering with the growth of other crops. It may also be an alternate host for pests and pathogens of Kava but this has yet to be demonstrated (Englberger 2001; Pest Alert 19). False Kava is spread by rhizome and seeds via birds, bats, and possibly, rodents. All plant parts are considered plant propagules as rooting can take place even from a leaf or steam piece.

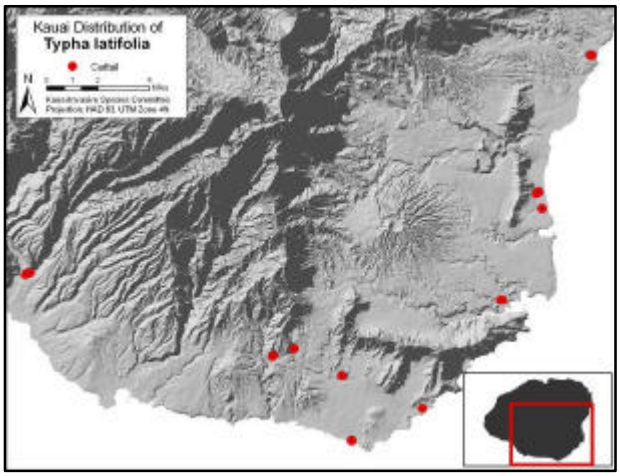
There are two known populations of False Kava on Kaua`i; one at Kahili Mountain Resort and another accidentally planted in a garden setting on private property. Both of these areas are monitored and only small amounts of re-growth have been found post-treatment. Continued monitoring is necessary even with such a small population in order to insure total treatment success. Further surveys will most likely be focused on residential areas were the plant might be intentionally planted.

Objectives:
Continue to monitor known areas of False Kava and treat all plants found. The ultimate goal is eradication while continuing to conduct proactive outreach at farm fairs and through partner agencies.

Methods:
- Cut stump treatment is used followed with application of Garlon 4 in forest crop oil mixed at 50%.
- The cut plant is placed in a plastic bag and properly disposed of.

8) Cattail (*Typha latifolia*)



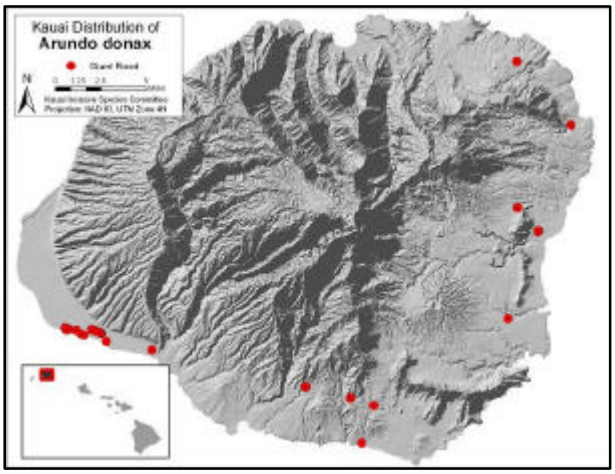


Background:
Cattail is an invasive wetland rush which occurs naturally in Eurasia, North Africa and North America. It spreads via air-blown seeds and underground vegetative runners. It was first collected on Oahu in 1979 and has since spread to the Big Island and Kaua`i. If left unchecked, this plant can form dense, monotypic stands, effectively eliminating all open water in shallow water habitats, areas vital to species such as endangered Hawaiian stilts. Cattail is also a major threat to the taro industry encroaching into both cultivated and fallow lo`i. On Kaua`i, the known populations of cattail are still regarded as incipient. For this reason, the eradication of this potential pest can still be achieved quickly and at relatively little cost. Given the healthy condition of endangered water birds on Kaua`i, the eradication of this invasive wetland plant should be considered as appropriate water bird habitat management. At present, there are several known populations of cattail on Kaua`i; on the North shore in Kilauea, in Omao, at Poipu Beach Park, at the Wailua Golf Course, in Kapaa stream, and a large 4+ acre population in Makaweli Valley, Waimea. Another population is located on U. S. Fish and Wildlife Service (USFWS) land in Huleia and is being monitored and treated by USFWS staff.

Objective:
This weed is relatively easy to kill with a solution of AquaMaster, however, since Cattail seeds can remain viable for up to 100 years, regularly monitoring eradicated infestation sights will be imperative to ensure island-wide eradication. Efforts are also currently underway to add this species to the Hawaii Noxious Weed list.

Methods:
- Cattail is treated with a 20% mixture of AquaMaster/ water/ surfactant and applied by drizzle spray method.
- Seed heads are carefully picked and placed into a plastic bag for proper disposal.
- Makaweli Valley requires some habitat modification prior to treatment which includes removing vegetation and re-aligning and deepening an old drainage ditch in order to drain the backwater area where the cattails are located.

9) Giant Reed Grass *(Arundo donax)*



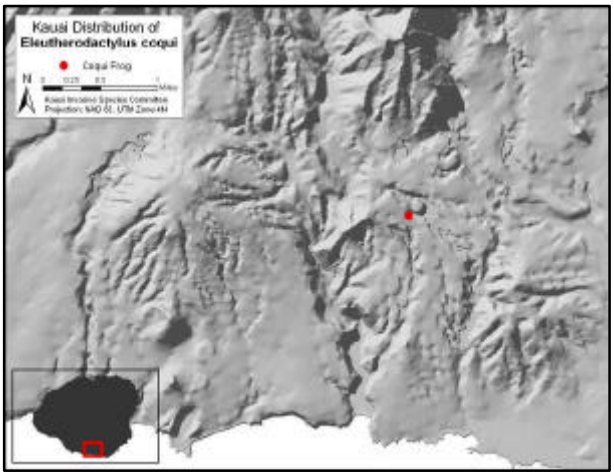
Background:
Originally from the Mediterranean region, *Arundo* has been cultivated for human cultural and practical uses such as making fishing poles and roofing fiber for many centuries. It was first introduced into California in the 1800's and has since become naturalized in much of the Southern United States. This tall reed spreads mainly by underground rhizomes, forming dense stands in moist to wet sites. It is invasive in Florida and California, along riparian areas and roadsides. The dense vegetation interferes with flood control, displaces native plants and animals, and is a potential fire hazard. It has been reported to have growth rates up to .7m per week in favorable conditions (Perdue 1958). *Arundo* is a rhizome, creating dense monotypic stands that can choke out waterways. In addition, *Arundo* is transported easily by flooding waterways or as green waste and can re-sprout from plant matter. Once established, *A. donax* is hard to kill. On Kaua`i populations are found predominantly on the Westside in old irrigation ditches, deserted pastures, near road sides, or in abandoned lots. A few populations exist on the East and North side of the island mostly on residential or industrial land.

Objective:
KISC will continue to control *A. donax* in persistent wild populations while working with private land owners to also remove *Arundo* in landscape environments. Opportunistic surveys for new populations are ongoing.

Methods:
- Large stands of *Arundo* are cut at the base of the stem and immediately treated with 100% RoundUp or AquaMaster depending on how close it is to a water source.
- Small re-growth patches are treated with an 8% mixture of RoundUp or AquaMaster, water, and surfactant applied with a drizzle sprayer**.**

ANIMALS

1) Coqui Frogs (Eleutherodactylus coqui)



Background:

Two species of small brown Caribbean frogs of the large Neotropical genus *Eleutherodactylus* have been introduced to Hawai`i within the past 10 years. *E. coqui* is colloquially called "coqui", while *E. planirostris* is referred to as the "greenhouse frog." The greenhouse frog is considered well established and less of a threat than the coqui on Kaua`i and therefore is not considered a KISC target. The coqui, on the other hand, is widely dispersed on the island of Hawai`i and a serious threat here. Much is known about *E. coqui* in its native Puerto Rico and from these studies we can readily deduce the problems this species could cause in Hawai`i should they become widespread. Basic ecological information relevant to determining these effects include the following:

- The frogs can occur at densities up to 8,000 per acre (and actually have been known to occur double that in Hawaii).
- They consume an average of 45,000 prey items per acre per night (approximately 16 million prey items per acre per year).
- They do not require standing water for a tadpole stage; eggs are laid in leaf axils or in leaf litter which hatch into froglets.
- Females produce 4-6 clutches per year, each clutch consisting of 16-41 eggs.
- The frogs reach sexual maturity 8 months after being laid as eggs.
- They can occur from sea level to at least mid-elevation rainforest and mesic forest (ca. 4000 feet).

As a result of these biological attributes we may expect that, if left unchecked, these frogs will soon spread and establish numbers on Kaua`i too large for control. If so, it is reasonable to expect that they will have the following negative effects on Kaua`i's native species and ecosystems:

- They will exert a tremendous predation pressure on a wide array of native nocturnal invertebrates, including insects, spiders, and snails, many of which are already stressed to the edge of extinction.

- By removing a large percentage of the insect prey base, they will have a large indirect effect on Kaua`i's remaining native forest birds, most of which are partially or largely insectivorous.
- Coqui may serve as a food source for rats and mongooses, allowing these predators to reach even higher densities than occur now and thereby increasing the predation pressure these alien mammals exert on Kaua`i's native birds, tree snails and plants.
- It is also possible that the frogs will serve as vectors of plant nematode eggs by having them adhere to their skins, increasing an already significant problem for some sectors of the horticultural industry.
- Further, if states such as California discover that Hawaiian nurseries are contaminated by these frogs, they may refuse shipments of material not certified to be free of the pests, again increasing costs to the industry.

Another negative consequence of these frogs' establishment is that their loud calls (emitted at 90-100 decibels) prove very annoying and disturbing to the sleep of many residents and visitors. Visitors at several hotels on Maui and the big island have complained about the noise at night, and property values on Hawaii Island have been negatively affected by the frogs' presence. These complaints have stemmed from areas having no more than 30 – 80 frogs, not the thousands that the species are capable of attaining.

Currently on Kaua`i there is a 15-acre core population of coqui located in Lawai. This localized infestation is considered eradicable through intense management and multi-organizational collaboration. While working on this population, KISC is also the island-wide first responder to any new coqui reports coming in directly from the public or from the PEST hotline.

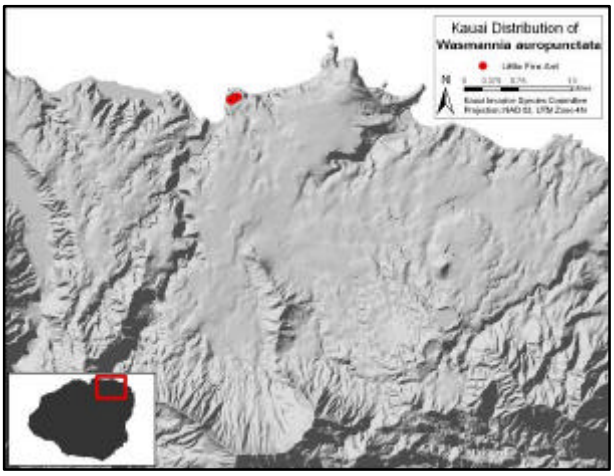
Objective:
Work toward the successful eradication of our core population by implementing the strategic plan developed by the Kaua`i Coqui Working Group established in May of 2005. Members include; HDOA, KISC, Kukui'ula Development, CTAHR, DOFAW, USDA-WS, A&B, County of Kaua`i and adjoining landowners. Likewise, continue to monitor for newly arriving frogs from off-island nurseries through public outreach and rapid response.

Methods:
- Continue to verify and document locations of Coqui frog reports on Kaua`i.
- Control newly discovered individuals to prevent new infestations, with priority given to locations that sell or rent plants.
- Hand capture frogs in areas where spraying is not an option, usually done at private residences in single frog cases.
- Chemical control consists of utilizing two techniques; 1) Citric Acid (16%) foliar spraying at night, spot spraying areas only where frogs are heard calling and 2) Hydrated Lime (3%) ground-drench spraying during the day in a methodical application, one section at a time, to ensure full coverage of the infested area.
- Habitat modification in the core was conducted in November 2005, via hydro-axe and excavator, in order to clear vegetation thus enabling our spraying efforts to

be more efficient and successful. Ground crews maintain this clearing though drizzle spraying Garlon 4 on reemerging broadleaf plants such as strawberry guava and schefflera and utilizing RoundUp to control grass re-growth.

- Continue meeting with the Coqui Working Group in order to re-evaluate project progress and success. Apply adaptive management strategies to deal with unforeseen challenges and changes in the project.

2) Little Red Fire Ant (*Wasmannia auropunctata*)



Background: (excerpt taken from KISC LFA report by Bill Null 2006)
The little red fire ant (LFA) is native to neotropical lowlands and is considered an invasive pest in most of the places it occurs. LFA has been called other names but it received this moniker because of its very small 1/16 inch (1.5 mm) size and its long lasting fire-like burning sting. It is an agricultural pest in that it not only bothers orchard workers but also nurtures populations of *Homoptera* (sucking) insects that cause damage to economic plants. They also are known to have negative impacts on many animals including vertebrates and invertebrates. Populations of many insects including beetles, flies, and other ants have also been adversely affected by the presence of LFA (Wetterer and Porter 2003). Their invasiveness comes from having generalist feeding and nesting habits that allows them to invade new areas and succeed. They are not a subterranean species but nest most anywhere it is convenient at or above the surface; under fallen leaves, branches, rocks, and in the crotches of trees. Also, unlike most other ant colonies with only one queen, colonies of LFA have multiple queens. Should a transported colony fragment have at least one queen, it can establish a new population at its new destination.

In 1999 that the Hawai`i Department of Agriculture (HDOA) first discovered LFA established in Hawaiian Paradise Park south of Hilo on the Island of Hawai`i. It is assumed that the population arrived there on plant material from a nursery in southern Florida. Sometime later in 1999 a container of ornamental plants was shipped to Kaua`i for landscaping a private estate. When it was learned that the container had some palms from an infested Big Island nursery, personnel from HDOA conducted a survey of the property. The survey resulted in documenting the presence of LFA on Kaua`i.

Personnel from both HDOA and the Hawai`i Department of Health's Vector Control Branch on Kaua`i initiated an eradication project by applying the proprietary pesticide Amdro at the infested site. Subsequent to the 1999 discovery and treatment of LFA, HDOA and KISC personnel returned to the site in 2003 to resurvey the area previously infested. This survey reconfirmed the presence of LFA and, when performing surveys beyond the initial infestation it was found that the population of LFA had spread to an adjacent property. Amdro was applied to about five acres on both residential properties. Since then biannual surveys have been conducted with the latest occurring on 31/May/06. Following each survey, the area is treated with Amdro. Although unsure about complete eradication of LFA at this site, and because it has not spread beyond the treated area of 2004, it is believed that the population is contained and thus controlled from further spreading.

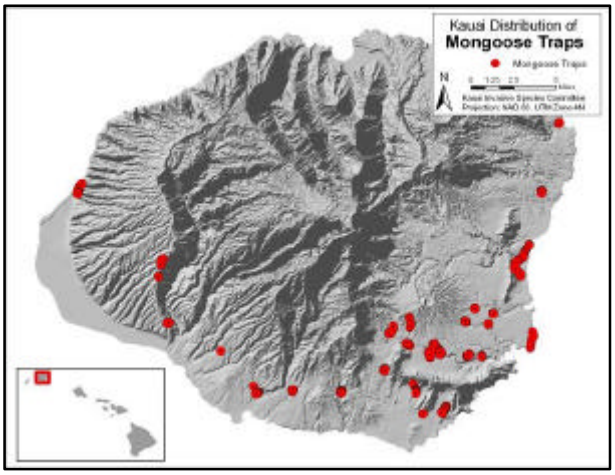
During 2005-2006 a US Fish and Wildlife grant was received to survey Kauai to determine if any other populations of LFA exist. This survey was completed in 2006 with over 56 nurseries, resorts, and transfer stations inspected. There were no detections of any LFA.

Objective:
KISC will continue to assist HDOA with surveying, monitoring and re-treatments of the known population of LFA. KISC will also assist the HDOA in any outreach efforts by contacting and re-surveying area nurseries, hotels and other sources with a large amount of imported plant materials.

Methods:

- Every known nursery on Kaua`i was visited by the KISC Pest Survey and Response Technician in the summer of 2006. Nurseries were given information about the LFA problem including an Insect Pest Alert flyer.
- Each nursery was asked the source of their plants. If Big Island plants had been purchased, permission to survey their nursery at a future date was requested. In addition to nurseries, hotels, resorts, golf courses, and new developments were also approached to learn the origin of plants used for landscaping their grounds.
- Green waste is another potential source for harboring LFA so each of the county's transfer stations and landfill were also surveyed.
- Surveys for LFA are conducted using either SPAM luncheon meat placed in an open vile or peanut butter laced chopsticks. Each bait station is placed ~15 feet apart, usually at the base of a tree or rooted plant, in a transected line. Bait is left out for 1-1 and ½ hours and then picked up and examined for the presence of LFA.
- A GPS waypoint is taken at each of the bait sites which corresponds to the numbered vile/ chopstick in order to pinpoint the exact location of LFA should one be found.
- If a LFA is confirmed, the area is then treated with the granular pesticide Amdro.
- KISC will continue to monitor and retreat previously treated populations in co-operation with the HDOA.

3) Mongoose *(Herpestes auropunctatus)*



Background:
Intentionally introduced to Hawai`i as a bio-control for the unsuccessful control of rats in 1883, the mongoose is now a serious threat to the endemic forest birds, ground nesting shorebirds and sea turtles on all islands except for Kaua`i and Lanai. Mongooses are diurnal predators and have easily exploited bird populations that have evolved relatively predator free. The life cycle of a mongoose lends to their invasive success; reaching sexual maturity at 10 months of age, mongoose can breed 2-3 times a year producing up to 9 offspring annually. There have been credible sightings of mongoose on Kaua`i since the early 1960s with one confirmed road kill in 1976. It is estimated that mongoose have been accidentally brought to Kaua`i via shipping containers but they have not been brought here in numbers that would support a stable population. Because the presence of mongoose is incipient (sporadic at best) KISC has had a fulltime mongoose person on staff, responding to any reported sightings by monitoring trap/ tracking lines in order to insure proactive action against the establishment of a viable population here.

Due to shifts in funding and the need to utilize focused expertise, USDA-Wildlife Services will now be taking on the responsibility of responding to all mongoose sightings. KISC will continue to act as a clearinghouse for any reports that are received as well as house historic data and GIS information.

4) Snakes, Rabbits, and other Vertebrates

Background:
A variety of other alien vertebrates are not currently known to be established on Kaua`i. However these animals, including snakes, lizards, turtles, frogs, exotic birds, and rabbits could possibly be released by pet owners or travel in cargo shipments. Other vertebrate pests, such as bulbuls, may potentially arrive on Kaua`i from neighboring islands.

Objectives:
Assist State DLNR personnel in responding to any and all such reports of new alien vertebrates to increase the likelihood that these species will be prevented from becoming established on Kaua`i. KISC will continue to assess additional invasive animal species for the need for future control. Monitoring of all other invasive pest will be an ongoing effort.

EARLY DETECTION

Early detection is an essential prerequisite for successful eradication of insipient invasive species. KISC is in a great position, with a well established mission, to focus on the enhancement our early detection program. Currently we are working on a multifaceted approach towards early detection including: 1) Utilizing a "plant prevention field guide"; a book of additional invasive pests (taken out daily with our ground crew) containing information on plants with a high potential of arriving on Kaua`i from neighboring islands that are not yet established here. 2) Organizing and conducting an island wide roadside survey based on those done on Maui, Molokai and Oahu. A roadside survey is a relatively easy way to get baseline data of what plants are on the island and how they are distributed. This is going to be an island wide effort in which we collaborate with partnerships within State, local and non-profit organizations. And 3) developing an Early Detection Workshop through our outreach education program. These workshops will be targeted at conservation workers in the field, the interested public and local, State and Federal employees who commonly monitor areas such as ports of entry, roadsides and State Lands. These three elements of early detection will broaden our scope of observation by utilizing the existing labor and skills already available on the island.

PLANT PREVENTION FIELD GUIDE

1 2 3



Plant prevention list

KISC has developed a list of 10 plant species to be aware of while the crew is out in the field. The list is made in collaboration with the other ISCs by comparing their priority targets to ours and determining any potential new invasive plants that could easily be brought here from neighboring islands. This list is to act as a field guide to enhance our early detection work. The list is relatively short and easy to keep track of while still attending to our top priority targets.

4

5

7

The list includes:

1. Bingabing (*Macaranga mappa*)
2. Osage Orange (*Macluara pomifera*)
3. Fox-tounged Melastoma (*Melastoma sanguineum*)
4. Glorybush (*Tibouchina herbacae*)
5. Wax Myrtle (*Morella cerifera*)
6. Wolly Mullein (*Verbascum thapsus*)*
7. Yellow Himalayan Rasperry (*Rubus ellipticus*)
8. Gorse (*Ulex europaeus*)
9. Plume of Poppy Tree (*Bocconia frutescens*)
10. Himalayan Blackberry (*Rubus bicolor*)

* not pictured here

8

9

10

ROADSIDE SURVEY



Background:
KISC is planning to implement a more rigorous early detection program this year starting with conducting a roadside survey of invasive species on the island. Roadside surveys were conducted on Maui and Molokai and one is scheduled on Oahu for early 2007. The success of these surveys will all serve as a guide for our work here on Kaua`i. Forest and Kim Starr conducted the Maui roadside survey in 2001. Maui's survey took six months to complete, covered 1,246 miles and recorded over 16,000 locations for 100 species. Molokai followed suit and conducted a survey in 2004. By contrast, Molokai took one week to complete, covered 142 miles and recorded 986 locations for 41 species. Once implemented the Kaua`i roadside survey should take about a month and a half to complete based on projections of Maui and Molokai's timeframes.

Objective:
The intent of the survey is to get baseline data of invasive species composition and distribution. A comprehensive base like this will be useful to Kaua`i conservation work in the future with regards to early detection, feasibility of control and restoration. Monitoring roads allows managers to receive information on what species occur here and where (baseline data). Likewise, a road survey of this nature is easy, repeatable and quick, provides landscape level data, and requires only a moderate amount of training.

Methods:
- Form an advisory working group
  - Utilize skills and expertise from collaborating partners (i.e. NTBG, HDOA, TNC, State Parks)
- Compile a list of target species
  - Include current KISC/ISC targets
  - Request additional plants of interest from other conservation organizations on island
  - Refer to the state weed risk assessment list
- Make a list and map of publicly accessible roads to be surveyed
- Train observers
  - Should be done with someone who has conducted roadside survey before
- Conduct survey

    - Need 2 skilled observers, a 4 x 4 truck, GPS, maps, datasheets and a camera
    - Devise timeline for conducting survey based on number of species on the plant list and miles of road to be surveyed
- Design database, enter survey raw data
- Write up and distribute survey results to collaborators and interested parties

EARLY DETECTION WORKSHOPS

Background:

The purpose of starting early detection workshops is both for public outreach and professional training. In order to make the most of our limited resources in our fight against newly arriving invasive species we realize that, through education, we can have many more observers available to do some of our early detection work for us. The workshops are intended to train various factions of the interested public and allied work force employees what potentially invasive species to be aware of when they are out in the field. This segment of our early detection program is just in the beginning phases; we will be collaborating with the Maui Invasive Species Committee (MISC) who is also working on conducting similar workshops.

Preliminary Outline of Methods:

- Collaborate with MISC about their workshops about format, content, and success
- Make a list of who these workshops are intended for
    - ISC Staff, NTBG staff, Department of Transportation, port of entry employees, state organizations, non-profit organizations
- Outline implementation of the workshops/train others to give them
    - Expertise will be provided by National Tropical Botanical Gardens has plant vouchers and personnel who can assist with teaching plant ID. KISC will develop the workshop format and provide and pamphlets or teaching materials
- Plan the first “pilot” workshop for ISC and NTBG employees.
    - Provide continued training of staff for early detection
    - Allows us to get feedback on how the workshop is conducted and what changes could be made before making the workshops public

PUBLIC AWARENESS

KISC is committed to raising public awareness about invasive species and building community involvement to address the issue. The community's participation and support is crucial to the sustainable success of KISC's efforts. With public awareness, KISC's priority species will be more likely recognized and reported, resulting in earlier detection of new populations. With community involvement, the introduction of new invasive species can be prevented.

Through various avenues, KISC will educate the general public, as well as targeted audiences, on the mission and projects of KISC, the impacts of invasive species, the identification of current priority species, and tangible actions to help.

GENERAL COMMUNITY EDUCATION

The cooperation of the community of Kaua`i is the key factor in discovering any new populations of KISC's priority target species. Its support is critical for preventing the arrival of new harmful alien invaders. KISC will make all project actions highly visible in order to directly address concerns and facilitate public understanding.

Objective:
KISC will raise awareness, build participation and partnership, brand a positive organization image, and connect with the community on a grassroots level with a diverse demographic.

Method**:**

- KISC will host species-specific community meetings, such as Coqui in Lawai, as well as sending out printed materials to neighbors that are in proximity of work sites and survey areas, such as Miconia alerts in Wailua.
- KISC will participate in community events, submit press releases, and distribute outreach products.
- KISC is devoted to being an active and positive member of the community and will continue to offer lectures at a variety of events such as Agricultural Awareness Day and the Garden Fair.
- To familiarize the public with its name and mission, KISC will distribute logo giveaways, such as bumper stickers and magnets. KISC will also provide displays at high traffic areas, such as libraries and the airport.
- KISC will utilize the various forms of media on Kaua`i to inform a broad-based audience on current projects and invasive species concerns.
- KISC will include community action in its messages in order to engage the public in invasive species prevention. For example, KISC will collaborate with the Department of Land and Natural Resources to educate hikers at trailheads on invasive species seed dispersal by providing information and a boot scrubbing station.
- KISC will also assist in conducting public early detection workshops.

SPECIFIC TOPICS TO TARGET AUDIENCES

Objective**:**
KISC will address a variety of specific audiences that are relevant to its mission because of their role in preventing the spread of invasive species.

Method**:**
- The horticultural industry of nurseries, landscapers, and botanical gardens will continue to be a major target. KISC will continue to foster relationships with members of the green industry by providing information about Coqui frogs, little fire ants, and other agricultural pests and encouraging participation in the Voluntary Codes of Conduct and the Weed Risk Assessment.
- KISC will work in partnership with the Kaua`i Landscaping Industry Council and the Kaua`i Farm Bureau to educate the public on horticultural and agricultural pests and ways to prevent further invasion.
- KISC will work with the Kaua`i Visitors Bureau to provide information to tourists on immediately reporting invasive species, such as snakes, as well as on the best practices to prevent outside introduction of new species.
- KISC will educate transportation entities, such as Young Brothers and the SuperFerry, on early detection, target species, and inspection.
- KISC will provide a workshop series for partners to facilitate better inter-agency communication about and collaborative rapid response to new invasive species.

PARTNERSHIP PROJECTS

KISC's mission is to work collaboratively and in partnership with other entities on Kaua`i focusing on invasive species prevention, control and eradication. By continuing to build a broader foundation on which to not only unite invasive species efforts but to also draw from available expertise, KISC will be able to increase capacity on limited funding for targeted species control.

Past partnership projects include Long Thorn Kiawe removal at Pacific Missile Range Facility, clearing of invasive species at National Tropical Botanical Garden's Limahuli Preserve, assisting with weed removal and clearing for a fence-line with Waipa Foundation, and a nene relocation project with DLNR's Division of Forestry and Wildlife.

KISC will continue to utilize on-island partners to enhance its mission of building community interest and participation. Partnering with various groups and agencies in a variety of ways also helps to increase in-kind contributions that are needed to match funding. Awareness as to the threats and effects of invasive species can be fostered in partnerships in both marine and terrestrial ecosystems.

BUDGET

KISC Historical Budget ($thousands)

	2002	2003	2004	2005	2006	2007
Total	**30.0**	**168.0**	**190.0**	**497.0**	**547.4**	**630.0**
Funding by Source						
Federal	**30.0**	**70.0**	**110.0**	**199.0**	**86.0**	**98.0**
Forest Service		45.0	60.0	60.0	59.0	98.0
NRCS	20.0					
Pulling Together- NFWF					15.0	
U.S. Fish & Wildlife Service	10.0	25.0	50.0	59.0	12.0	
U.S. Fish & Wildlife Service (Ants)				80.0		
State Projections	**0.0**	**68.0**	**75.0**	**293.0**	**395.4**	**202.0**
State NAP Fund		3.0	30.0	33.0		
DOFAW & Pass Through		65.0	45.0	40.0	68.2	2.0
State from HISC funds				220.0	277.2	150.0
Coqui*					50.0	50.0
Other Sources	**0.0**	**30.0**	**5.0**	**5.0**	**66.0**	**330.0**
Hawaii Comm. Found.		25.0				
County*		5.0	5.0	5.0	66.0	330.0
Funding total	**30.0**	**168.0**	**190.0**	**497.0**	**547.4**	**630.0**

* Note: As broad-base funding drops, funding for specific target work (coqui) increases

EVALUATION

It is imperative that KISC evaluate itself to determine if its programs are effective. With the diverse knowledge-base of the committee, KISC can benefit significantly from the committee's input. The KISC Manager, with assistance from other staff members, is responsible for follow-up evaluations and reporting results to the KISC committee regularly at periodic KISC meetings. At an annual all-day workshop KISC will re-evaluate the objectives and re-form the goals for the next year's action plan. The committee's goal is to make its decisions by consensus.

The KISC Coordinator and staff are responsible for documentation of all KISC activities, monetary expenditures, and accomplishments in terms of areas surveyed/treated and plants removed/treated. Maps of known locations of all target species (including annotation with population structure, fertility and history of control efforts) are being kept and updated as new reports come in. Special attention is given to all populations of target species, which appear to have fruited and/or have persisting seed banks. Short-term and long-term control operations are aimed at exhausting the seed banks established by previously controlled plants. Careful GPS data, along with data archiving and mapping of all other information gathered, is evaluated to generate an effective schedule for continued follow-up re-treatments.

By using adaptive management regarding methods of control and a reevaluation of objectives, KISC can better balance control efforts with committed funding. Prioritization of identification and eradication of incipient species as well as broadening the base of community support will be important to quickly responding to

Photo Credits

Front Cover: Lehua Prevetz-Lafayette
Plant Photos: KISC crew, Forest and Kim Starr
HEAR www.hear.org and PIER www.hear.org/Pier/index.html websites
Maps courtesy of Jeff Schlueter, GIS Analyst, KISC