

Kaua`i Invasive Species Committee

2003 Action Plan

**Including:
FY03 Addendum
FY04 Addendum**

**Cover Image omitted (available in
2003kiscactionplanFY03FY04_withimages.pdf version)**

**KISC logo omitted (available in
2003kiscactionplanFY03FY04_withimages.pdf version)**

EXECUTIVE SUMMARY

Alien species are increasingly recognized as a threat to biological diversity and human welfare worldwide. Oceanic islands are particularly vulnerable to invasive species, and Hawaii especially so because of its role as a transportation hub. Hawaii has one-third of the endangered species in the United States, and invasive alien species pose the greatest threat driving these and other native species toward extinction. Kaua'i alone has over 95 threatened and endangered species federally listed by the U.S. Fish and Wildlife Service. More native species have been eliminated in Hawaii than anywhere else in the United States, yet these islands retain more native bio-diversity than the famous Galapagos.

At the same time, invasive species pose huge threats to Hawaii's watersheds and water resources, tourism-based economy, agriculture, health, and general quality of life; and Hawaii'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) recently formed, 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 our 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, washing out entire hillsides. If Miconia escapes the Wailua area and becomes established in the rugged terrain of the Lihue-Koloa 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, Fountain Grass, Ivy Gourd, and Thorny Kiawe. Thorny Kiawe, differing from the more widespread species of Kiawe, has incredibly long and dangerous thorns. It is invading the beautiful Kaua'i beaches, endangering our native coastal strand, restricting beach access, and threatening the tourism industry.

KISC also plans to target specific invasive animals such as the Coqui frog, Greenhouse frog, and the Little Red Fire Ant, while preventing the arrival of new species, such as the Brown Tree Snake. Additionally, KISC believes education is an essential tool to gain public awareness and participation.

KISC members realize that a unified community effort is needed to effectively tackle targeted species. KISC's strength is in its diverse committee giving it a wide basis of experience and expertise. KISC members include concerned community members and groups, ranchers, farmers, nurserymen, visitor industry members, private landowners, government agencies, and non-profit organizations. This island wide cooperation is Kaua'i's best chance at tackling the invasive species crisis.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	i
MISSION STATEMENT	1
POLICY STATEMENT	1
PROJECT NEED: THE IMPORTANCE OF INVASIVE CONTROL ON THE ISLAND OF KAUA`I	2
• Hawaii's alien species crises	2
• The formation of KISC	2
• The need for continued funding for invasive pest eradication	3
TARGET SPECIES	5
• PLANTS	5
1. Miconia (<i>Miconia calvescens</i>)	5
2. Thorny Kiawe (<i>Prosopis juliflora</i>)	7
3. Fireweed (<i>Senecio madagascarensis</i>)	8
4. Fountain Grass (<i>Pennisetum setaceum</i>)	8
5. Pampas Grass (<i>Cortaderia jubata and Cortaderia selloana</i>)	9
6. Ivy Gourd (<i>Coccinea grandis</i>)	10
7. Fire Thorn (<i>Pyracantha angustifolia</i>)	10
8. False Kava (<i>Piper auritum</i>)	11
9. Cattail (<i>Typhus latifolia</i>)	11
10. Other	11
• ANIMALS	12
1. Caribbean Frogs (genus <i>Eleutherodactylus</i>)	12
2. Little Red Fire Ant (<i>Wasmannia auropunctata</i>)	13
3. Snakes, Rabbits, other vertebrates	14
• PUBLIC AWARENESS	15
1. Nursery Surveys/Education	15
2. Public Relations and Education	15
MAP: MICONIA ON KAUA`I	16
EVALUATION	17
KISC PROJECTED BUDGET FY03	18
FY2003 ADDENDUM	19
FY2004 ADDENDUM	25

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

HAWAII'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 Hawaii 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 U.S. Hawaii 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 Hawaii 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 Hawaii 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 Hawaii's watersheds and water resources, tourism-based economy, agriculture, health, and general quality of life; and Hawaii'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, Division of Forestry and Wildlife (DOFAW) and State Parks (DLNR), Koke'e Resource Conservation Program (KRCP), Hui o Laka/Kokee Museum, Kamehameha Schools, Hawaii Department of Agriculture (HDOA), the National Tropical Botanical Garden (NTBG), The Nature Conservancy Hawaii (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), and the Garden Island Resource Conservation & Development, the Pacific Missile Range Facility (PMRF), University of Hawaii College of Tropical Agriculture and Human Resources (U of H – CTAHR), Sea Grant, and the County of Kaua`i. KISC is also receiving support from Mr. Duane Nelson of Coordinating Group on Alien Pest Species (CGAPS) and Big Island Invasive Species Committee (BIISC), Mr. Randy Bartlett of Maui Pineapple Co. and Maui Invasive Species Committee (MISC), Mr. Earl Campbell of the United States Fish and Wildlife Service (USFWS), Mr. Mark White, Director of Island Programs, TNCH, and others.

KISC is currently in the process of locating and mapping the current ranges and number of populations of the priority list and creating a database. Committee members have written up an operating budget for Fiscal Year 03 (our FY ending on June 30), developing objectives and methods for the priority list and worked up an initial plan for hiring a coordinator and work crew.

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 the 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. The need for KISC here on Kaua`i is great and with the support of the community at large, the State of Hawaii, 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 on an island-wide basis. 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 is developing the capacity to survey, map, and control incipient invasive pests, acting as both a rapid response team and as a long-term invasive species management program. The other Hawaiian Islands have already formed invasive species committees; we are following their lead. Maui was the first to form a committee in 1997. Big Island (Hawaii) 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.

Here on Kaua`i, thanks to DoFaW, KRCP and others, there is a good start on the number one alien invasive plant threat: *Miconia calvescens*. Currently, all known populations of *Miconia* have been removed and these areas are being monitored. A public awareness program is essential to locate any new populations and stay on top of this serious threat.

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 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. A 1997 paper by J. Y. Meyer and J. Florence (*Journal of Biogeography* 23:775-781) states that 40-50 species endemic to Tahiti are on the verge of extinction primarily because of the invasion of *Miconia*. 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 Hawaii 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, is unseen during helicopter surveys; some seeds can remain dormant in the soil for up to eight 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 Hawaii's and Kaua`i's economy, environment, and quality of life. KISC is committed to a quick response with long-term sustainable efforts to eradicate and control these unwanted invaders.

Public education on Kaua`i needs to be developed and expanded regarding invasive species issues. The public's support will be a critical factor in the successfulness of KISC's objectives. The State's initial and continued support of KISC in its first and developmental year is critical to KISC achieving its goals and overall long-term survival.

TARGET SPECIES

Miconia, Thorny Kiawe, Fireweed, Caribbean 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 Lihue-Koloa 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: 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. The source was determined to be a single plant imported by a nursery business on Kuamo'o road. 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), which had been involved in the original control effort. Soon after, DOFAW, assisted by volunteers and staff of the Koke'e Resource Conservation Program (KRCP), began systematic searches of the WRSP. Miconia searches in the Homesteads area, and a public awareness campaign were also resumed.

At this time, the potentially "contaminated" area on Kaua`i is estimated to be around 2200 acres. This is based on the experience of control teams on the islands of Maui and Hawaii, 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 water, or birds using the river corridor as a flyway.

Approximately 15% of this area (400 acres), primarily within the WRSP, was searched intensively between 10/2000 and 10/2001. This search targeted "high priority" locations, such as undeveloped lands, stream channels, hau bush, etc.

where *Miconia* would most likely be growing. The search generally did not cover private properties and developed areas such as yards or pastures within the “contaminated” area. By 10/2001, the “priority” areas had all been covered, and the limits of the *Miconia* infestation (at least within WRSP) had been identified.

After 10/2001, effort has been directed to revisiting the core population within the WRSP, and removing seedlings that have germinated since the original search took place. Generally, a period of one year is allowed to elapse between visits. This seems to be a good interval between site 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. So far, no “missed” adults have been found in the second trip through the core area, indicating that the original search was thorough.

Paid staff and volunteer labor expended at this point are approximately 200 person days.

As of this writing, search efforts have resulted in the removal of 1125 *Miconia* plants. Of these, about 50 were flowering, or were large enough to be considered mature. Only one new mature plant has been discovered since 6/2001. Reconnaissance hikes and helicopter over-flights of the surrounding area, particularly the Forest Reserves *mauka* of the Homesteads, have not yet revealed any plants outside the core area.

Objectives: Because the KISC is in its infancy much of its energy will be spent implementing a structure to support invasive species control for the long-term. Although time must be spent setting up an effective mapping database and collecting information about each invasive species due to the efforts of DOFAW and KRCP it is possible to begin treatment for key species, such as *Miconia*. KISC intends 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, and treat and map all plants discovered. Join the existing *Miconia* effort in the State Park led by DoFaW and KRCP and complete a sweep of unsearched areas.
- Begin annual monitoring of sites where mature plants have been found and mapped, and remove any seedlings. Work with DoFaW and KRCP to carry out annual monitoring and be prepared to lead this action
- Identify likely *Miconia* habitats on private property in the Homesteads area, and develop a protocol for contacting landowners and performing searches. KISC coordinator and control team will, in cooperation with HDOA contact landowners and search appropriate areas to eradicate and map any discovered *Miconia*.
- Set up a database for improved record keeping, and assure that resources are devoted to this project for the long-term so that adequate follow-up takes place. KISC members and coordinator will review progress near the end of the year and develop a strategic plan for continuing a comprehensive *Miconia* eradication program.

- Perform annual air surveys of appropriate areas such as the Wailua Game Management Area, Expand ground searches of forested sections of the Wailua River every 2-3 years.
- Increase public education efforts, and respond rapidly to any reported sightings of Miconia elsewhere on Kaua`i. KISC will develop an outreach program to increase public education and have a KISC hotline.
- 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 coordinator 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 focus area to find Miconia trees. Seedlings and small trees are pulled, while the large trees are frilled and treated with 20% Garlon-4 in crop oil (in accordance with the label). These areas are re-mapped, if necessary, and new data is recorded.
- A mailing will be sent out to private property landowners to begin private property searches. HDOA will follow up with letters to those landowners that do not respond and if necessary access to search will be obtained legally. Private land will be systematically searched, discovered plants eradicated, and sites mapped. These areas will be added to our annual monitoring schedule.
- To maintain complete records KISC plans to purchase a Global Information mapping System and setup a database.
- Educational materials will be distributed to the public. Radio shows, trade shows, displays, press releases and other means will be used to enhance public awareness and responsiveness.
- A portion of an all day workshop will be used to re-evaluate our Miconia control program and allocate the necessary resources towards its continued control and eradication, as KISC's number one long term target.

2. Thorny Kiawe (*Prosopis juliflora*)

Background: It must be noted that *Prosopis juliflora* varies from the more common species of Kiawe (*Prosopis pallida*) found in 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 located on O`ahu, Kaua`i and Ni`ihau. On Kaua`i there are currently three known populations: on the beaches of Mahaulepu, Barking Sands and the area between Waimea Bridge and Kekaha. 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). It is considered a major threat to the tourism industry on Kaua`i not only because of its treacherous thorns, but also because it restricts access to the beaches. It also seriously threatens endemic coastal strand vegetation.

Mechanical control and the herbicides Spike and Garlon-4 have been identified as the most efficacious means to control *Prosopis*. Trials have been initiated to determine what methods KISC will use.

Objective: KISC will complete a survey and a map of all located. The timing of the control efforts will depend on the outcome of the trials and whether or not mechanical control measures will be required in some areas.

Method:

- Identify landowners in suspected habitats, gain access, and map populations.
- Complete trials to determine what method is most effective before beginning a large-scale treatment plan. These trials are currently being carried out and results will be available in the near future.
- Treat and monitor populations.

3. Fireweed (*Senecio madagascariensis*)

Background: Fireweed is a yellow flowering weed currently listed on Hawaii's Noxious Weed List by the Department of Agriculture. This plant is poisonous to horses, cattle, and other livestock posing a serious threat to pasturelands. For every seed head there is about 80 viable seeds. In Australia, yearly losses of \$2,000,000 are attributed to fireweed. An area of fifteen acres located near Halfway Bridge on the southeastern part of the island, at an elevation of 1,000 feet, is the only known infestation zone of fireweed in Kaua'i. The HDOA is currently managing this site for treatment.

Objectives: Due to the small extent of fireweed on Kaua'i, KISC intends to eradicate the known populations. Because the seed is easily spread by wind or mechanical means (tractor-mowers) continued investigation of other populations is necessary.

Methods:

- Control methods at this time consist of roguing, which is labor intensive (every 4-8 days). Areas are combed and flowering plants are pulled to make sure that no plants have seeded.
- Other methods of controls would be to use a pre-emergence called Pendulum WDG or Snapshot. Both stop seeds from germinating. Pendulum WDG would be applied by sprayer and Snapshot comes in a granular form.
- Establish a buffer zone around known infestation sites.
- KISC control team will work in coordination with HDOA to monitor, search 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 Hawaii's Noxious Weed

List by the Hawaii Department of Agriculture. Fountain grass has the potential to degrade pasturelands, particularly in drier areas. It may become a significant fire hazard if it should ever spread to areas such as Waimea Canyon. It is also fire adapted and can sustain fires that spread quickly into adjacent areas. It is spread easily by vehicles, humans, wind, and water and can become established at elevations ranging from sea level to over 8000 feet. A more thorough investigation is needed to determine the full range of infestation on Kaua'i. A very small outbreak was discovered in Kilauea and treated. Two other populations exist on the West side of the island. The first is a small population That has been treated and must be monitored. The second population is located on private land on rugged terrain, and may be inaccessible.

Objective: Treat 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.

Methods:

- Survey areas which have been previously treated for resprouts.
- For treatment KISC plans to apply Velpar or Round-up to Fountain grass populations.

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

Background: This species, recognized as one of the worst invasive weeds in natural areas of California, is also invasive in New Zealand and South Africa, and was added to the Hawaii Noxious Weed List in 1993. Each plant can produce thousands of seeds that are wind-dispersed and can remain viable, persisting in the soil seed bank for at least six years before germinating. There is currently only one suspected Pampas grass population which is located in a private landscaped yard in Princeville.

Objective: Treat all known populations and survey potential habitat.

Methods:

- Identify suspected population in Princeville by contacting landowner to gain permission to collect a sample.
- 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.
- In open fields the KISC crew will treat *Cortaderia* by applying Roundup.
- In more inaccessible areas the KISC crew will treat *Cortaderia* with Velpar.
- Community education materials distributed within the neighborhood will be an integral part of discovering new populations.

6. Ivy Gourd (*Coccinea grandis*)

Background: This species (on Hawaii Noxious Weed List) exploded in the 1980s on Oahu and in the Kona area of the Big Island, creating huge problems for agriculture and conservation of lowland sites. There are four known populations of Ivy Gourd in Kaua'i. They are located in Anahola, Moloa, Kapaa, and Nawiliwili and cover an estimated 20-plus acres. This number may change as these known populations are surveyed and mapped. These core sites will be treated with Spike or Garlon as the label prescribes, monitored and re-treated (if necessary) at least two times per year. A third population is located near Port Allen airstrip. It was treated by the Department of Agriculture.

Objective: Treat all individuals of all known populations, map them, and conduct comprehensive surveys of areas near known infestations. These sites and buffer zones will be monitored and retreated as needed.

Method: KISC plans to use Spike to treat Ivy Gourd populations. In some areas it will be necessary to treat Ivy Gourd with Garlon-4 in crop oil.

7. Fire thorn (*Pyracantha angustifolia*)

Background: *Pyracantha* is native to southwestern China. This shrub has thorny spikes and bright orange to brick-red fruit. This fruit is well liked by birds and spread in this manner. Currently all known trees exist in Koke'e and Waimea Canyon State Parks. Cooperation with the Koke'e Resource Conservation Program (KRCP) and the State Parks greatly improves the likelihood of eradication.

Objective: KISC's goal is elimination of all *Pyracantha* trees on Kaua'i and continued observance of treated areas for seedlings.

Methods:

- Large trees are frilled with a machete and treated with 20% Garlon 4 mixed with crop oil.
- *Pyracantha* that cannot be frilled such as small ground crawling shrubs are notched and treated with Garlon.
- Small seedlings are pulled with careful attention to the hazardous thorns.

Pyracantha (Koke'e population) has been surveyed and treated by KRCP (except for at least one site around a cabin the owner wants to keep. Possible removal will happen after the lease change in 2005/2006). Continued monitoring will be conducted in partnership with State Parks and KRCP.

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

Background: One population of False Kava was identified at Kahili Mountain Resort. This was treated and is continually monitored by DoFaW. There is a rumored population of False Kava in Waimea.

Objective: KISC will develop public awareness, especially to awa growers, cultural practitioners, and awa farmers from the South Pacific. KISC will also investigate the rumored population in Waimea. It will be necessary to obtain more information regarding the location and method of eradication.

9. 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. 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, only three populations have been confirmed; Kealia, Nukoli`i, and Puhī. Others may exist in Hanapepe, Mahaulepu, and Niumalu.

Objective: USFWS has appropriated funds to Sea Grant to survey and eradicate Cattail on Kaua`i. KISC will support Sea Grant in any way possible to achieve these results.

Methods:

- KISC will work with Sea Grant.
- Cattail will be treated with Rodeo with surfactant and applied by drizzle foliar.
- To gain community cooperation KISC and Sea Grant will provide education for taro farmers about the risk of cattail to the taro industry.

10. Other Plants

Objective: KISC will continue to assess additional invasive plant species for potential future control. KISC will continue to survey and monitor these species as time permits and seek systematic reporting of observations by others. Peripheral populations of established weeds, if the threat is immediate, may be treated to prevent further spread.

Methods: KISC will inform the green industry, state and private agencies, and the public to be on the lookout for any species of concern and report them to KISC.

ANIMALS

1. Caribbean Frogs (genus *Eleutherodactylus*)

Background: Two species of small brown Caribbean frogs of the large Neotropical genus *Eleutherodactylus* have been introduced to Hawaii in the past 10 years or so. *E. coqui* is colloquially called “coqui”, while *E. planirostris* is referred to as the “greenhouse frog.” Currently there is a population of *E. planirostris* frogs located around the Sheraton Hotel in Poipu. Kaua`i had only one known *E. coqui* frog contained in a small area at the Marriott Hotel in Nawiliwili. Efforts to eradicate the *E. coqui* frog are thought to be successful. The loud call has not been heard since the last attempt to catch the frog after which it was thought to be injured or eradicated.

Both species reached Hawaii and are being spread throughout the State in nursery materials. This is the well-documented means of spread of these and related species throughout the Caribbean region as well. *E. coqui* is well studied in its native Puerto Rico and from these studies we can readily deduce the problems this and related species could cause in Hawaii should they become widespread. Basic ecological information relevant to determining these effects include the following:

1. The frogs can occur at densities up to 8,000 per acre, and may occur at higher elevations in Hawaii.
2. They consume an average of 45,000 prey items per acre per night (approximately 16 million prey items per acre per year).
3. They do not require standing water for a tadpole stage; eggs are laid in leaf axils or in leaf litter.
4. Females produce 4-6 clutches per year, each clutch consisting of 16-41 eggs.
5. The frogs reach sexual maturity 8 months after being laid as eggs.
6. 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:

1. 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;
2. 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;

3. They 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;
4. They may serve as a potential food source for any snake species that may become established on Kaua`i in the future, thereby making it easier for any such snakes to maintain artificially high population densities, as has occurred with the brown tree snake on Guam.

Another negative consequence of these frogs' establishment on Kaua`i 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 have complained about the noise at night, and some residents have even threatened to leave Maui if the frogs could not be removed. These complaints have stemmed from areas having no more than 30 – 80 frogs, not the thousands that the species are capable of attaining. 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 generally.

Objective: Continue to verify and document locations and sizes of Caribbean frog populations on Kaua`i. Control newly discovered individuals to prevent new infestations, with priority given to locations that sell or rent plants.

Methods:

- Work with HDOA and other interested parties to develop a control program.
- Work with USDA, HDOA, Farm Bureau, the nursery industry, and plant retail outlets to develop a preventative action plan and implement it.
- Monitor the Marriott and other hotels and nurseries for *E. coqui*.
- Determine an effective treatment for the *E. planirostris*.
- Treat *E. planirostris* at the Sheraton and monitor other areas for other populations.
- Collaborate with local experts within the state and other Invasive Species Committees concerning eradication and control of frogs.
- Continue to educate the public and create a KISC hotline for any reports regarding *E coqui*.
- Prepare a rapid response action plan with KISC partners for any newly discovered populations

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

Background: The Little Red Fire Ant, *Wasmannia auropunctata*, is a tiny (<1 mm), slow moving, brownish-orange ant that lives primarily in small clusters numbering a few dozen to a few hundred crawling on the ground, under rocks and potted plants, in cracks and crevices, under leaf litter or stones, or on ornamental trees and foliage. It is also a nuisance pest indoors. [HDOA]

The ant feeds on other insects and arthropods, and the honeydew from sucking insects. It produces painful stings with silver-dollar sized welts. It has been

reported to drive workers out of coffee fields because of the stinging, is attracted to fatty foods in households, and has been known to gradually eliminate other terrestrial species, such as beetles, spiders and centipedes, from newly colonized areas. [HDOA]

It prefers warm areas and will probably restrict its distribution to localities below 4,000 feet elevation. It is active in the shade and seeks refuge from the bright sun. [HDOA]

It is Neotropical in origin, known throughout central and northern South America, the West Indies, warmer portions of Mexico, southern Florida, West Africa, Galapagos Islands, New Caledonia, and Solomon Islands. [HDOA]

The Little Red Fire Ant was discovered and treated at 2 locations (approx. 2 acres) on the North Shore two years ago. These infestations were treated with Amdro toxicant-bait and monitored by the HDOA.

Objective: KISC will assist HDOA with monitoring and any re-treatments. KISC will also assist the HDOA in any outreach efforts.

Methods: For any new Little Red Fire Ant populations KISC will aid the HDOA and follow their treatment procedures:

- Amdro-toxicant bait is used to treat infestation.
- Re-treat and monitor treated populations in co-operation with the HDOA.
- Small sticks coated with peanut butter are used to detect ant infestations

3. 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, mongoose, 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 so as 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. Another all day workshop will be scheduled for KISC member and staff in the 2003 fiscal year. Monitoring of all other invasive pest will be an ongoing effort.

PUBLIC AWARENESS

1. Nursery Surveys / Education

Objective: Begin nursery education to discourage sale of invasive species and provide information about the spread of Caribbean frogs and Little Red Fire Ant.

Methods: KISC will work in cooperation with the Kaua'i Farm Bureau, Landscape Professionals, and the Outdoor Circle to educate nurseries and plant collectors about potential and existing invasive species.

2. Public Relations and 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.

Objective: KISC will educate the public and encourage their cooperation by cultivating a positive organizational image, and making KISC's actions highly visible. A public relations strategy and educational outreach program utilizing all forms of media will be conducted to reach the broadest audience.

Methods: Public awareness objectives would be met by:

- Distribution of information at community events, presenting slideshows and displays, and giving talks at schools and community meetings.
- Presentation of invasive species information through the media; newspaper articles, periodicals, trade journals, and television for a local, as well as statewide and national audience.
- Continued development of an Internet website (see link at www.hear.org Hawaiian Ecosystems at Risk) to provide access to a wide range of data as well as the committee's plans, strategies, and reports.
- Informational inserts in water or electric bills (i.e. Miconia flyers to Wailua residents).
- Posters and/or display cases in prominent public areas (i.e. Airport).

**Image omitted (available in
2003kiscactionplanFY03FY04_withimages.pdf version)
Miconia on Kauai (map updated- 12/01/2003)**

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 Coordinator, 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 annual all-day workshops KISC will re-evaluate the objectives and re-form the goals for the next year's action plan. An all-day evaluation workshop is planned for October 2002. The committee's goal is to make its decisions by consensus. To date, all decisions have been reached 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 (Global Positioning System) 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.

Photo Credits

Front Cover: The Nature Conservancy

Kaua`i Invasive Species Committee Projected Budget – FY03*

Salaries & Wages		
Project Coordinator		\$41,500
Technicians - 1		\$28,000
Benefits		\$17,375
	Subtotal	\$86,875
Material and Supplies		
Herbicides/crop oil/dye/other		\$3,500
Expendable safety gear, e.g. gloves		\$350
Volunteer support supplies		\$900
Tools/applicators		\$750
Radios		\$260
Office supplies		\$720
Maps, surveys, ref materials		\$800
Computer supplies & services		\$1,500
	Subtotal	\$8,780
Equipment		
Vehicle		\$26,000
Office furniture		\$400
	Subtotal	\$26,400
Travel/Tuition		
Helicopter time		\$3,250
Travel		\$3,240
Vehicle Gas		\$2,600
Training		\$1,500
	Subtotal	\$9,090
General		
Utilities & Communication		\$1,000
Office/Base yard rental		\$3,600
Printing and Publications		\$4,000
Repairs		500
	Subtotal	\$9,100
Services		
Contracted Services		\$23,500
Vehicle Insurance		\$500
Vehicle maintenance		\$1,200
Photocopies		\$200
Postage/freight costs		\$600
	Subtotal	\$26,000
Administrative costs of grants		\$14,530
	Subtotal	\$14,530
	TOTAL	\$203,000

*This budget has been based on funds to be contributed to KISC in FY03 by the following agencies:

Hawaii Community Foundation, Department of Land and Natural Resources, Division of Forestry and Wildlife, US Forest Service, US Fish and Wildlife Service, County of Kaua`i and Natural Resource Conservation Service.

KAUA`I INVASIVE SPECIES COMMITTEE (KISC)

Addendum to 2003 Action Plan FY2003

(Result of October 22, 2002
KISC Strategic Planning Meeting)

TABLE OF CONTENTS

STRATEGIC PLANNING MEETING SUMMARY OF TARGET SPECIES	21
1. Miconia (<i>Miconia calvescens</i>)	21
2. Thorny Kiawe (<i>Prosopis juliflora</i>).....	21
3. Fireweed (<i>Senecio madagascariensis</i>)	21
4. Fountain grass (<i>Pennisetum setaceum</i>).....	21
5. Pampas grass (<i>Cortaderia jubata</i> and <i>C. selloana</i>)	22
6. Ivy Gourd (<i>Coccinea grandis</i>).....	22
7. False Kava (<i>Piper auritum</i>).....	22
8. Cattail (<i>Typha latifolia</i>).....	22
9. Frogs (<i>Eleutherodactylus coqui</i> and <i>E. planirostris</i>).....	22
10. Little Fire Ant (<i>Wasmannia auropunctata</i>).....	22
11. Fire thorn (<i>Pyracantha angustifolia</i>)	22
ADDITION OF TARGET SPECIES	22
ACTION LIST	22
1. Giant reed (<i>Arundo donax</i>).....	22
MONITOR/ MAP/ TRIALS	23
1. Hiptage (<i>Hiptage benghalensis</i>).....	23
2. Kahili ginger (<i>Hedychium gardnerianum</i>)	23
3. Fiddlewood (<i>Citharexylum spinosum</i> or <i>caudatum</i>)	23
4. Mangrove (<i>Rhizophora mangle</i>).....	24
EDUCATION AND FURTHER STUDY	24
1. Kudzu (<i>Pueraria lobata</i>)	24
2. Kokee Weed Project.....	24
3. Hapu'u Tree Fern shipping process	24
4. Jackson chameleon (<i>Chamaeleo jacksonii</i>).....	24
5. Brown anole (<i>Anolis sagrei</i>)	24
6. Day geckos (<i>Phelsuma standingi</i>)	24
7. Grey cheeked parakeet (<i>Brotogeris pyrrhopterus</i>)	24
8. Ringed neck parakeet (<i>Psittacula krameri</i>) and Bulbuls (<i>Pycnonotus cafer</i> and <i>P. jocosus</i>).....	24
9. Clerodendron (<i>Clerodendrum quadriloculare</i>).....	24
10. Australian Tree Fern (<i>Cyathea cooperi</i>)	24

Strategic Planning Meeting Summary (October 22, 2002)

A review of KISC's original Priority List from KISC's 2003 Action Plan was presented to those who attended the Strategic Planning Meeting. A summary of each species follows:

- 1. Miconia:** In homesteads and Wailua River State Park (WRSP). We are about halfway through homestead private property searches. Have found around 18 (one flowering). We are just about done with second sweep search of park. We have been advised to extend the one mile buffer to two mile buffer from last known plant. Meghan suggested keeping a one mile buffer to be extensively searched and then doing recon. for the two mile buffer area. Are surveys done in GMA? Yes, whenever DoFaW has money a helicopter survey is done. It has been about a year since the last helicopter survey. Is it a useful way to survey? Will not see the plants easily from the air. The *Albezia* gets in the way and unless the *Miconia* are flowering, they are difficult to spot. In WRSP Bryon suggests that we go back to areas of known infestations rather than do full sweeps. Leland suggests putting up posters along roadways and trails. Recommend: keeping *Miconia* as number one priority.
- 2. Thorny Kiawe:** KISC has mapped over 46 miles of coastal areas: the core infestation, satellite populations, and hybrids. What is the attitude of landowners? Do they want to contribute equipment etc.? Need to develop partnerships with the landowners. Have we surveyed inland where other Kiawe is growing? No, we have mostly monitored coastal area, because of the suggested habitat of 200m from shore. We sampled the outside to where it most likely would be found if it existed inland. Adam Asquith suggests we leave it high on the priority list, as funds are available to support our efforts through Fish and Wildlife. Are mechanical means of removal feasible? We haven't actively pursued this at the base. If spike would prevent germination of native plants, since much of the infestation site is now deemed part of the critical habitat, this might not prove to be a good method for removal. Guy suggested that spike would not prevent germination due to the porous nature of the ground. Another method suggested was to bulldoze paths through the Kiawe to more accurately disperse spike. Thorny Kiawe is not only found on Kaua'i, Oahu, and Niihau, but also rumored to be on Molokai with the status unknown on other islands.
- 3. Fireweed (*Senecio madagascariensis*):** Found only at Halfway Bridge. We started out by finding out 1000 plants /mo. We are now down to about 25 plants /mo. Total infestation area is about 10 to 15 acres. Window of opportunity for control is very small now. It spreads rapidly. Recommended that we go after it with intense effort. Suggestions included enlisting the help of the cattlemen industry and 4H. Lelan recommends another sign in that area. Possible government interactions with cost-share programs are available.
- 4. Fountain Grass:** KISC has yet to move on this. Population is found mainly on A&B land with small satellite populations on Robinson land. When it was pointed out that this population seems to be spreading slowly, Mark White contributed that it spread slowly on the Big Island then the population exploded and is now out of hand. Guy's theory is that since it thrives in dry land it is not very happy where it is now because of the high rainfall in this area. If it moves to the west, to the drier side of the island, it will explode. If we do nothing the whole west side, including the canyon and the Na Pali, will be covered with Fountain grass. Is it grazed by goats? No. This weed is a great fire hazard.

5. **Pampas Grass**: Only one known population. So far, untreated. Can it spread in the wild? Yes, it has spread on West Maui and the Big Island and is found in both wet and dry areas. Suggested action: put through Weed Risk Assessment.
6. **Ivy gourd**: Currently treating. We have discovered people are harvesting this plant for culinary purposes. We are trying to contact property owners to get the names and phone numbers of the harvesters to educate them. We have purposely left a small population for these people so as not to risk them planting it elsewhere. We can monitor this population more easily. KISC has treated all outlying populations. Because the population is limited we do have the opportunity to eliminate it. This is a major pest on other islands. Education is primary. Perhaps showing the harvesters pictures of what it can do will discourage their use of it.
7. **False Kava**: There is one known population at Kahili Mountain School. We have treated it but must continue to monitor it. We need to do a wider transect of area to confirm containment.
8. **Cattail**: We are still mapping populations. Have treated one 1-½ acre population at Mahaulepu. Niimalu has a large population that is denser but confined to about an acre. This weed can move quickly to fill wetlands. It forms a dense rhizome mat. Adam Asquith said that within a year, a small population in Niimalu grew to a much larger, denser and more spread out population. We need to work on educating the public. John Plews suggested that it could be confused with native rushes. Guy suggested that it is sometimes good to get false calls to go talk story with the general public. F&W have focused funds toward eradication and there may be more.
9. **Frogs**: *Planirostris* has established populations (Hyatt and Sheraton in Poipu and possibly in Wailua Homesteads). Coqui no established populations. *Planirostris* is not too far-gone for eradication. We will be receiving help from USDA on eradication on Kaua`i. \$250K for this year is dedicated for frog control through USDA/Wildlife Services. Two Coqui have been recently caught in Lawai and one in Puhi.
10. **Little Red Fire Ant**: We have been monitoring two sites on the North Shore. Results showed negative. KISC will monitor every six months. There have been no new sightings.
11. **Pyracantha**: Katie's group (KRCP) has eliminated all known populations in Kokee. It is in a monitoring phase now.

ADDITION OF TARGET SPECIES

ACTION LIST:

1. **Giant reed (*Arundo donax*)**: Giant reed is a large, cane-like grass native to India. It is a major weed in the southern United States where it crowds out native plants, restricts beach access, and clogs rivers and flood control drainages. It is spread by rhizome, not seeds and has been used as a landscaping plant. It has a wide range of habitat and can live in wet or dry environments. The variegated variety is used in haku leis.
Objective: On Kaua`i, eight populations have already been mapped. KISC will continue to survey and map populations and work to secure landowner permission to remove this plant from ornamental situations.

Methods: Chemical treatment of *Arundo* with Velpar, Roundup Pro and Aquamaster herbicide or mechanical removal will be employed. Control methods will continue to be modified as field trials are conducted by the KISC crew.

MONITOR/ MAP/ TRIALS:

1. **Hiptage (*Hiptage benghalensis*)**: This climbing liana smothers and kills vegetation on which it grows and forms dense thickets. The Division of Forestry and Wildlife of the Hawaii Department of Land and Natural Resources has designated Hiptage as one of Hawaii's Most Invasive Horticultural Plants. Its winged fruits (samaras) are wind dispersed. Hiptage threatens dry and moist areas from sea level to the 3500 ft. elevation. Hiptage, a member of the Malpighiaceae family, is native to India and Malaysia and was introduced to Hawaii as an ornamental plant. Its current known distribution on Kaua'i is on the edge of Huleia valley. Although the acreage is unknown, it is estimated to be at least 500 acres.

Objective: Map, begin trials for control and monitor results.

Methods: Involve land owners/leasers in identifying and mapping infestation. Possibly use aerial surveying due to the ease of spotting it from the air. Oahu Invasive Species Committee (OISC) has begun control efforts using Garlon on cut stumps. Conduct trials for control methods and possibly treat outlying populations.

2. **Kahili ginger (*Hedychium gardnerianum*)**: This species of ginger has leafy shoots 1-2 meters tall and can spread both by rhizome and bird-dispersed seeds. It is native to the Himalayas and adjacent regions and can be found in dense populations in Koke'e.

Objective: Map, formulate a strategic plan and treat to control satellite populations to help protect the integrity of the Alakai Wilderness Preserve.

Methods: In partnership with Kokee Resource Conservation Program, the Watershed Alliance and the Division of Forestry and Wildlife, conduct aerial and ground surveys to map the extent of the infestation. Using GIS mapping and GPS technology, create up-to-date records that will aid in the creation of an action plan outlining defensible infestation lines with control schedules and methods.

3. **Fiddlewood (*Citharexylum spinosum* or *caudatum*)**: This large shrub or small tree is of a genus of over 70 species from Bermuda, the West Indies, and southern United States through Mexico to South America. A number of species are commonly cultivated as ornamentals and can be found lining streets of Lahina, Maui. Seeds are easily bird-dispersed.

Objective: Identify the species. *C. spinosum* has already been put through the Hawaii Weed Risk Assessment and evaluated as a Major Pest. KISC should map the infestation on Kaua'i and present the finding for possibly adding it as an Action Item.

Methods: Using GIS and GPS ascertain the area of infestation of Fiddlewood. It is believed to only be in the Anahola area, but there are unconfirmed reports of it also being in Wailua Homestead.

4. **Mangrove (*Rhizophora mangle*)**: This alien tree has a rounded crown, a dense branching system, and aerial or stilt roots. The unusual fruits of the mangrove germinate while they are still attached to the parent plant. Eventually each germinated fruit, up to a foot in length, drops into the surrounding mud or surf. Mangrove forests form dense groves and because their aerial roots trap sediments,

they are presently choking the traditional Hawaiian fishponds and destroying habitat for endangered Hawaiian stilts in wetland areas.

Objective: Map extent of infestation and look for partnerships for possible control. Investigate control methods.

Methods: Using GIS and GPS ascertain the area of infestation of Mangrove. Contact land owners/leasers and possibly DLNR and other agencies wanting to protect the Fishponds.

EDUCATION AND FURTHER STUDY:

1. **Kudzu (*Pueraria lobata*):** Possible populations in Hanalei as well as in Kokee. It was probably introduced to Hawaii by the Chinese and was cultivated originally for the edible root tubers.
2. **Kokee Weed Project:** When the State Park cabin leases expire (approximately 100 of them) in 2004, 2005, this would be an ideal time to eradicate potential invasives on these properties. KISC will offer to assist State Parks in taking inventory and surveying weeds around the cabins. KISC can also concentrate the next few years on gaining funds for the project of invasive weed eradication around State Park cabins.
3. **Hapu'u Tree Fern shipping process:** This is a Prevention Project. We could establish some kind of monitoring of incoming logs and certifying them free of invasives. It was estimated that 1000/year come into this island. Both the private sector and nurseries bring in logs. KISC needs to find out what other islands are doing for preventative measures.
4. **Jackson chameleon (*Chamaeleo jacksonii*):** Find out the extent of concern regarding this pest.
5. **Brown anole (*Anolis sagrei*):** Seems to already be established here. It occurs in high density. Find out the extent of concern regarding this pest.
6. **Day geckos (*Phelsuma standingi*):** Find out the extent of concern regarding this pest.
7. **Grey cheeked parakeet (*Brotogeris pyrrhopterus*):** There have been reports of 4 individuals. Follow up on whether anything has been done with these reports. Involve the Farm Bureau.
8. **Ringed neck parakeet (*Psittacula krameri*) and Bulbuls (*Pycnonotus cafer* and *P. jocosus*):** Seed companies have contracted Wildlife Services to eradicate. These birds will go after any seed or fruit producing plant.
9. **Clerodendron (*Clerodendrum quadriloculare*):** Species has been identified from a sample brought to Tim Flynn. This species has already been evaluated by the Hawaii Weed Risk Assessment and determined to be a pest. KISC should educate nurseries as to the hazards of selling this particular species.
10. **Australian Tree Fern (*Cyathea cooperi*):** This species is a major threat in the back of Lumahai Valley. KRCP is treating in Kokee State Park. Many nurseries are still selling this plant. Needs more study and discussion.

KAUA`I INVASIVE SPECIES COMMITTEE (KISC)

Addendum to 2003 Action Plan FY2004

(Result of November 19, 2003
KISC Strategic Planning Meeting)

TABLE OF CONTENTS

STRATEGIC PLANNING MEETING SUMMARY	27
1. Target Species Populations and Acres (Table 1).....	27
2. Man Hours per Species (Table 2)	28
TARGET SPECIES SUMMARY	28
1. Miconia (<i>Miconia calvescens</i>)	28
2. Long Thorn Kiawe (<i>Prosopis juliflora</i>)	28
3. Fireweed (<i>Senecio madagascariensis</i>)	29
4. Fountain grass (<i>Pennisetum setaceum</i>).....	29
5. Pampas grass (<i>Cortaderia jubata</i> and <i>C. selloana</i>)	29
6. Ivy Gourd (<i>Coccinea grandis</i>).....	29
7. False Kava (<i>Piper auritum</i>).....	29
8. Cattail (<i>Typha latifolia</i>).....	29
9. Giant Reed (<i>Arundo donax</i>)	29
10. Frogs (<i>Eleutherodactylus coqui</i> and <i>E. planirostris</i>).....	30
11. Little Fire Ant (<i>Wasmannia auropunctata</i>).....	30
12. Fire thorn (<i>Pyracantha angustifolia</i>)	30
MONITOR/ MAP/ TRIALS	30
1. Hiptage (<i>Hiptage benghalensis</i>).....	30
2. Kahili ginger (<i>Hedychium gardnerianum</i>).....	30
3. Kudzu (<i>Pueraria lobata</i>)	31
4. Mangrove (<i>Rhizophora mangle</i>).....	31
Education and Further Study	31
1. Fiddlewood (<i>Citharexylum spinosum</i> or <i>caudatum</i>)	31
2. Kokee Weed Project.....	31
3. Hapu'u Tree Fern shipping process	31
4. Jackson chameleon (<i>Chamaeleo jacksonii</i>)	31
5. Brown anole (<i>Anolis sagrei</i>)	31
6. Day geckos (<i>Phelsuma standingi</i>)	31
7. Grey cheeked parakeet (<i>Brotogeris pyrrhopterus</i>)	31
8. Ringed neck parakeet (<i>Psittacula krameri</i>) and Bulbuls (<i>Pycnonotus cafer</i> and <i>P.jocosus</i>).....	32
9. Clerodendron (<i>Clerodendrum quadriloculare</i>).....	32
10. Australian Tree Fern (<i>Cyathea cooperi</i>).....	32
FY04 Budget	33

Strategic Planning Meeting Summary (November 19, 2003)

A review of KISC's Priority List of KISC's FY2003 Action Plan Addendum was presented to those who attended the Strategic Planning Meeting. A table showing the species populations and acreage was presented (Table 1) as well as a table showing person hours spent per species (Table 2). A summary of each species follows.

Only one species (cactus) was suggested as an additional target species, but was agreed by committee that HDOA would follow up on this.

Under the category of 'Monitor/Map/Trials' Hiptage was moved up to a higher priority for surveying. It was agreed that KISC should prioritize this to determine a base line for invasiveness. It was also agreed that Kahili ginger and Mangrove remain as survey items. Kudzu will be upgraded to a survey item from the 'Education and Further Study' category.

Now that Fiddlewood has been surveyed it was agreed that we pursue this species from an educational perspective. Getting homeowners and landscapers involved with this will be key to its elimination.

All other 'Education and Further Study' species will remain on the list.

1. Table 1 – Target Species (Plants only)

Species	Original Estimate		Treated [†]		Actual Known to Date	
	Populations	Acres	Populations	Acres	Populations	Acres
Miconia	2	755*	2	2386*	3	1170*
Long thorn Kiawe	8	500	7	31	8	500
Fireweed	1	2	1	58	2	2.1
Fountain Grass	2	30	0	0	2	30
Pampas Grass	2	0.167	2	79.3	3	?
Ivy Gourd	7	3.76	7	16.6	8	4.32
False kava	1	0.001	1	4.9	1	0.5
Cattails	5	2.5	9	194	12	7.53
Arundo	5	0.61	8	3.61	10	4.64

* Includes Buffer

† Includes re-treatments

As shown, by the table above, additional populations of almost all target plants were found.

2. Table 2 - Person-hours per species

Table omitted (available in 2003kiscactionplanFY03FY04_withimages.pdf version)

*

*The addition of Kahili ginger, as a survey item, shows a temporary spike in time spent on this species. A partnership to survey the extent of Kahili ginger in the Alakai has been formed involving Kokee Resource Conservation Program, DOFAW, the Watershed Alliance and KISC. Once this survey is complete, involvement for ground work on control efforts will be limited by KISC.

Target Species Summary

1. **Miconia**: Currently, this is our number one target species. DOFAW would like KISC to take the lead on the new outliers found in the Wailua Game Management Area during an aerial survey. DOFAW will assist when able. Searches continue in Wailua River State Park with seedlings continuing to be found. We do have about a 1.5 year buffer in searches considering the rate of growth before flowering. KISC will attempt a 500m ground search buffer and a 1000m aerial search buffer from any known flowering plant. We will now prioritize what areas we will ground search depending on terrain and canopy coverage. The biggest outlying tree was about 6 inches dbh (diameter at breast height). Following seed contamination protocol and using dedicated footwear and equipment will continue to be mandatory. **Action: Keep on list as number one target.**
2. **LT Kiawe**: At Mahaulepu we are just checking for seedlings now. At Kekiola harbor and Mana Drag Strip Craig Kaneshige (HDOA) has been using different rates of Garlon or Remedy in a foliar spray. This method, however, is seeing re-growth after 3 mos. He is now trying the mist blower with herbicide/crop oil mixture. There has been no re-growth with a cut/stump method but the Mana

population is too thick to get to the center to cut. PMRF Base trials seem to reveal spike to be the most effective method and frilling with Garlon to be a close second. **Action: Keep on list and continue partnership work with HDOA. Graded as number 3 priority.**

3. **Fireweed:** Although another population of Fireweed has been discovered, its control is effectively being handled due to its moist location and rapid germination on the North Shore. Current monitoring of the site at Halfway Bridge continues to show a decrease in population density. Continued monitoring at each site will be mandatory. Concern as to the method of introduction (hydro-mulching) should be brought to a CGAPS or HISC level. **Action: Keep on list and continue partnership work with HDOA. Graded as number 4 priority (w/Cattails).**
4. **Fountain Grass:** We have only aerial surveyed; no ground-truthing or treatment has been done to date. Aerial surveys have been about two years apart. This population has spread very little. HDOA is working on obtaining access from property owners to conduct ground survey. This is a species that we could get additional funding for. KISC should pursue this as an active program. It should be a win/win situation with the landowners. **Action: Keep on list and continue partnership work with HDOA. Upgrade to Number 2 priority.**
5. **Pampas Grass:** The two known populations have been treated and are under control. KISC is still monitoring. One individual in Princeville still needs to be addressed. This species should be addressed on a state-wide level if other islands are using it as a landscaping plant. **Action: Keep on list. Downgrade priority.**
6. **Ivy Gourd:** Current technique of cut/stump working well. We haven't prioritized this species as much as other targets but we plan on targeting it more with the addition of new employees. It does not appear as though this population is being harvested any longer by restaurants. Monitoring of treated areas will be essential for spotting re-growth from seed bank. **Action: Keep on list.**
7. **False Kava:** This species' known location has been surveyed to a 500 meter perimeter. More plants were discovered in this survey and have been treated twice. Although it is not known to produce seed, the distribution of plants at this site may indicate otherwise. This species may be sold in nurseries as "Mock Kava". KISC should concentrate on the education aspect of this species. **Action: Keep on list. Downgrade priority.**
8. **Cattails:** Seeds spread by wind and possibly birds. This weed is relatively easy to kill with a solution of Aquamaster. It does seem to be widespread in its distribution. The large Waimea Valley (Makaweli side) population is one of concern as it is in the taro lo'is and appears to cover approximately four acres. There will be participation from other groups on this project; landowners, HDOA, DOFAW. After the removal effort in Waimea Valley, KISC should scale back efforts with cattail. Keep up the educational aspects (ex. KISC should do a display at the Hanalei Taro Festival). **Action: Keep on list and continue partnership work with HDOA. Graded as number 4 priority with Fireweed.**
9. **Arundo:** Although this species is hard to kill the technique of cutting and then spraying when young seems to be effective. This species seems to be moving around in fill dirt and has been used as a landscaping plant. **Group: Keep on list. Downgrade Priority.**
10. **Frogs: Coqui frog:** USDA contained the biggest population in Lawai although there is still a small and spreading population including new hatchlings. Other

reports are still coming in (one at Marriot). Information still needs to be shared from USDA on their control efforts on Kaua'i. KISC should hold the line with follow-up for USDA's efforts until USDA gets funding for next year (FY05). **Action: Keep on list and continue partnership work with HDOA.**

Greenhouse frog: USDA's efforts on the South Shore have not reduced this species very significantly. They also seem to be wide spread across the island. As these frogs are extremely hard to detect, it was agreed that KISC should focus its energy on known threats and ones that we have a chance of controlling. The ecological impact from this species of frogs is also an unknown, unlike its vocal cousin, the coqui frog. **Action: Remove from list and focus on Coqui.**

11. **Ants:** An annual survey of a known historic site revealed a resurgence of this population of *Wasmannia auropunctata* commonly known as Little Fire Ant. Further survey by HDOA has determined that this infestation has grown from the last one and crosses several properties. Treatment will ensue on known population in partnership with HDOA. Continued monitoring will be needed. **Action: Keep on list and continue partnership work with HDOA.**

12. **Firethorn:** KRCP continues work on this. Almost all plants have been eradicated except known individuals around a cabin. **Action: Remove from list.**

Monitor/ Map/ Trials

1. **Hiptage (*Hiptage benghalensis*):** This climbing liana smothers and kills vegetation on which it grows and forms dense thickets. The Division of Forestry and Wildlife of the Hawaii Department of Land and Natural Resources has designated Hiptage as one of Hawaii's Most Invasive Horticultural Plants. Its winged fruits (samaras) are wind dispersed. Hiptage threatens dry and moist areas from sea level to the 3500 ft. elevation. Hiptage, a member of the Malpighiaceae family, is native to India and Malaysia and was introduced to Hawaii as an ornamental plant. Its current known distribution on Kaua'i is on the edge of Huleia valley. Although the acreage is unknown, it is estimated to be at least 500 acres.
Objective: Map, begin trials for control and monitor results.
Methods: Involve land owners/leasers in identifying and mapping infestation. Possibly use aerial surveying due to the ease of spotting it from the air. Conduct trials for control methods and possibly treat outlying populations.

2. **Kahili ginger (*Hedychium gardnerianum*):** This species of ginger has leafy shoots 1-2 meters tall and can spread both by rhizome and bird-dispersed seeds. It is native to the Himalayas and adjacent regions and can be found in dense populations in Koke'e.
Objective: Map, formulate a strategic plan and treat to control satellite populations to help protect the integrity of the Alakai Wilderness Preserve.
Methods: In partnership with Kokee Resource Conservation Program, the Watershed Alliance and the Division of Forestry and Wildlife, conduct aerial and ground surveys to map the extent of the infestation. Using GIS mapping and GPS technology, create up-to-date records that will aid in the creation of an action plan outlining defensible infestation lines with control schedules and methods.

3. **Kudzu (*Pueraria lobata*):** Possible populations in Hanalei as well as in Kokee. It was probably introduced to Hawaii by the Chinese and was cultivated originally for the edible root tubers. It has also been introduced as livestock forage.
Objective: Map extent of infestation. Investigate control methods.

Methods: Using GIS and GPS ascertain the area of infestation of Kudzu.

- 4. Mangrove (*Rhizophora mangle*):** This alien tree has a rounded crown, a dense branching system, and aerial or stilt roots. The unusual fruits of the mangrove germinate while they are still attached to the parent plant. Eventually each germinated fruit, up to a foot in length, drops into the surrounding mud or surf. Mangrove forests form dense groves and because their aerial roots trap sediments, they are presently choking the traditional Hawaiian fishponds and destroying habitat for endangered Hawaiian stilts in wetland areas.

Objective: Map extent of infestation and look for partnerships for possible control. Investigate control methods.

Methods: Using GIS and GPS ascertain the area of infestation of Mangrove. Contact land owners/leasers and possibly DLNR and other agencies wanting to protect the Fishponds.

Education and Further Study

- 1. Kokee Weed Project:** When the State Park cabin leases expire (approximately 100 of them) in 2004, 2005, State Parks will be re-writing the leases and may include stipulations to eradicate invasive weeds. KISC will offer to assist State Parks in this process. Wayne Souza will notify KISC when this process takes place.
- 2. Hapu'u Tree Fern shipping process:** This is a Prevention Project. We could establish some kind of monitoring of incoming logs and certifying them free of invasives. It was estimated that 1000/year come into this island. Both the private sector and nurseries bring in logs. KISC needs to find out what other islands are doing for preventative measures.
- 3. Jackson chameleon (*Chamaeleo jacksonii*):** Find out the extent of concern regarding this pest.
- 4. Brown anole (*Anolis sagrei*):** Seems to already be established here. It occurs in high density. Find out the extent of concern regarding this pest.
- 5. Day geckos (*Phelsuma standingi*):** Find out the extent of concern regarding this pest.
- 6. Grey cheeked parakeet (*Brotogeris pyrrhopterus*):** There have been reports of 4 individuals. Follow up on whether anything has been done with these reports. Involve the Farm Bureau.
- 7. Ringed neck parakeet (*Psittacula krameri*) and Bulbuls (*Pycnonotus cafer* and *P. jocosus*):** Seed companies have contracted Wildlife Services to eradicate. These birds will go after any seed or fruit producing plant.
- 8. Clerodendron (*Clerodendrum quadriloculare*):** Species has been identified from a sample brought to Tim Flynn. This species has already been evaluated by the Hawaii Weed Risk Assessment and determined to be a pest. KISC should educate nurseries as to the hazards of selling this particular species.

9. **Australian Tree Fern (*Cyathea cooperi*):** This species is a major threat in the back of Lumahai Valley. KRCP is treating in Kokee State Park. Many nurseries are still selling this plant. Needs more study and discussion.

Kaua`i Invasive Species Committee Projected Budget – FY04*

Salaries & Wages		
Project Coordinator		\$36,000
Technicians - 2		\$55,500
Benefits		\$29,325
	Subtotal	\$120,825
Material and Supplies		
Herbicides/crop oil/dye/other		\$2,985
Expendable safety gear, e.g. gloves		\$400
Volunteer support supplies		\$500
Tools/applicators/base yard supplies		\$1,800
Vehicle Gas		\$5,200
Office supplies		\$2,470
Maps, surveys, ref materials		\$400
Computer supplies & services		\$1,500
	Subtotal	\$15,255
Equipment		
Vehicle		\$12,000
Computer		\$3,500
	Subtotal	\$15,500
Travel/Tuition		
Helicopter time		\$5,800
Travel		\$4,310
Training		\$1,210
	Subtotal	\$11,320
General		
Utilities & Communication		\$1,332
Rentals		\$65
Printing and Publications		\$3,700
Repairs		\$500
	Subtotal	\$5,597
Services		
Contracted Services		\$3,278
Vehicle maintenance		\$2,000
	Subtotal	\$5,278
Administrative costs of grants		\$16,225
	Subtotal	\$16,225
	TOTAL	\$190,000

*This budget has been based on funds to be contributed to KISC in FY04 by the following agencies:

Hawaii Community Foundation, Department of Land and Natural Resources, Division of Forestry and Wildlife, US Forest Service, US Fish and Wildlife Service, and County of Kaua`i.