Kia'i i Nā Moku o Maui Nui

"Guarding the Islands of Maui County" 2013

Newsletter of the Maui Invasive Species Committee

The Wiliwili Blooms Again

By Shannon Wianecki
MISC Editor and Curriculum Writer

The fate of the *wiliwili* tree (*Erythrina sandwichensis*) looked grim in December of 2008. Three years prior, an alien wasp had arrived in Hawai'i and swiftly began attacking all trees in the *Erythrina* genus, including the African coral and the native Hawaiian *wiliwili*. It laid its eggs in leaf tissue, causing leaves to shrivel into gnarled galls around developing wasp larvae.

No one knows how the wasp got to Hawai'i—it most likely hitched a ride from Taiwan. New to science, it was named *Quadrastichus erythrinae*, or the Erythrina gall wasp, after its victims. Without a natural predator in the islands to keep it in check, it darted from tree to tree, leaving behind a trail of devastation. Arborists and conservationists watched in horror as *Quadrastichus* marched from residential neighborhoods into the native forest.

"I was pretty hopeless then," says Art Medeiros, who spearheads dryland forest restoration on the slopes of Haleakalā Maui. One of his projects, Pu'u o Kali, represents the heart of the *wiliwili* population worldwide.

Wiliwili is the keystone species of the Hawaiian dryland forest, the pillar that provides the ecosystem's framework. "*Wiliwili* is crucial on the lava flow," Medeiros says. "It flushes the flow with nitrogen once a year, preparing the soil for other native plants, such as *'ilima*, *'āwikiwiki*, and hibiscus."

"Of all the forests I've been to, a deep *wiliwili* forest is one of the most beautiful," says Medeiros. "When the leaves are flush, or when they fall, and the porcelain-like barks are glowing . . . there is no more flashy ecosystem in the Hawaiian Islands." The species has cultural significance as well. Hawaiians carved surfboards out of its buoyant wood and crafted handsome lei out of its scarlet seeds.

The wasp was first detected on O'ahu in April of 2005. Nonnative *Erythrina* species fell prey first. In July, state entomologist Mach Fukada spotted galls on coral trees at Queen Ka'ahumanu Shopping Center on Maui. Within a week, the Big Island and Kaua'i reported that *Quadrastichus* had also reached their shores.

Stunned biologists launched into action. Invasive species experts met with Maui County Mayor Alan Arakawa to devise a strategy. The County agreed to release emergency funds and MISC led cooperative efforts to prune and mulch infected trees.

Initially, biologists thought that removing infected limbs might save the trees and prevent the wasp from spreading into pristine areas. That wasn't the case. The gall wasps attacked the new growth on trimmed trees even more vigorously. Pesticide treatments were expensive and unrealistic for wilderness populations.

See "Wiliwili"on page 10

In this issue:

Message from the Manager

By Teya Penniman
MISC Manager

"Since the 1970s, more than 50 natural enemies have been released. Not one has attacked a non-target species or become invasive."

I admit it. I was a skeptic when I first started hearing Committee members talk about releasing non-native insects to help control non-native plants. It seemed counter-intuitive: MISC's *raison d'être* is to eradicate certain harmful alien species, not support rearing and releasing non-native biota. What if the process was flawed? What if releasing natural enemies was like the Greek tale of Pandora, who peeked inside the forbidden box, causing disease, sickness and evil to spill forth? What if we released a zombie killer that took out our forest gems or prized flowers? But as I learned more, I came to understand and embrace the need for biocontrol. I now see it as addressing the imbalances caused by invasives and more like the last thing left in Pandora's box.

Conservation, and especially invasive species work, is not for the faint of heart. On any given day you might find our hardy field staff hanging out the open door of a helicopter scanning a precipice for pampas grass, wielding machetes through snaggy, pokey bushes searching for miconia, or hauling fire hoses up and down Māliko gulch at night for coqui frog control. Even residential work has its hazards: unchained dogs, homeless encampments, and the occasional unreasonable resident. MISC has extensive training, a good safety program, and protective equipment, but the nature of the work involves some risk.

The same is true for biocontrol. Releasing a new natural enemy involves arduous and rigorous testing processes to ensure that it won't harm non-target species. Does this mean it's 100% guaranteed? No, but the numbers produced by the Hawai'i Department of Agriculture's biological control program are pretty impressive. Several have played critical roles in protecting native forest species, such as the *wiliwili*, from extinction.

Some invasive pests, like strawberry guava or fireweed, wreak havoc with watersheds and pasture lands, but are so widespread that physical control is no longer a viable option. Chemical control over large landscapes would pose unacceptable risks to the same watersheds we're trying to protect. For such species, the careful testing and release of natural enemies offers the only option. Once a control agent has been released, tracking its progress is a lot less risky than sending field crews on ground and aerial missions.

Which brings us back to Pandora. In horror, she tried to clamp the box shut once she saw what she had unleashed. Only one item remained behind, which became known as Hope. Biological control is pretty much the last tool we have in the box for combating widespread invasive species.

Thanks to a successful biological control, the seeds of the wiliwili *tree,* Erythrina sandwicensis, *may become trees.*

Kia'i i Nā Moku o Maui Nui

"Guarding the Islands of Maui County" is the official newsletter of the Maui Invasive Species Committee. To join our mailing list please call 573-6472 or email miscpr@hawaii.edu.

Editor: Shannon Wianecki
Design: Lissa Strohecker
Editing Team:
Elizabeth Anderson
Teya Penniman
Abe Vandenberg

Contributors:
Djami Djeddour
Darcy Oishi
Brooke Mahnken
Forest & Kim Starr

MISC
MAUI INVASIVE SPECIES COMMITTEE

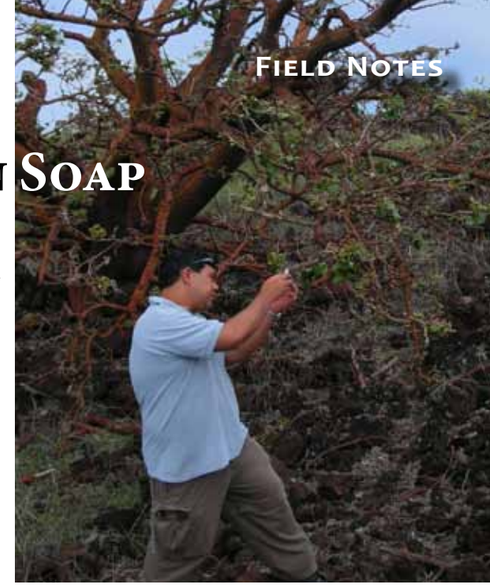
website: mauiisc.org
blog: mauiinvasive.org

miscpr@hawaii.edu
808.573.MISC (6472)
P.O. Box 983
Makawao, HI 96768

The Maui Invasive Species Committee is a partnership of government, non-profit, and private organizations working to protect Maui County from the most harmful invasive plants and animals.

Better than Soap

By Darcy Oishi
Plant Pest Control Branch Manager
Hawai'i Department of Agriculture



Darcy Oishi on Maui, releasing the biocontrol that attacks the Erythrina gall wasp.

Back in my *hana buttah* days growing up in Nu'uanu, spiraling whitefly arrived in Hawai'i. It quickly became a huge problem. Whiteflies can be nasty. They produce honeydew, a sticky substance that encourages mold growth and can spread diseases. They are all kinds of bad for plants. It was out of control. There was a plus side, at least for me.

I was paid to wash the whiteflies off the plants with soapy water. Talk about heaven—I got to play with soapy water and I was paid to do it. I was happy seeing whiteflies on the birds of paradise and other plants in the yard. Whiteflies=money! Then the Hawai'i Department of Agriculture went and ruined it for me. They found some insect that ate whiteflies and released it into the wild. I didn't know this is what happened. All I knew was that the problem got better and my income source dried up. Thank you, Department of Agriculture.

Fast-forward a few years: my first professional involvement with biocontrol was on the regulatory side of the equation. The common perception is false; in reality biocontrol is heavily regulated. It takes a lot effort, research, paper work, and justification to get a biocontrol agent released into the environment. In fact, I once created a flow chart of the regulatory process and it looked like a board game. I don't think Milton-Bradley would be interested though—the rules are too complex. Skeptics can rest assured, the regulatory process is rigorous at every level.

In 2008, my role changed when I began running the biocontrol program for the State of Hawai'i. We've gotten out the door a wasp to attack the Erythrina gall wasp and another wasp to attack the stinging nettle caterpillar. Both are doing a great job. We recently got permission to release a caterpillar to feed on fireweed. Biocontrol is happening now, and it is an exciting time. These pests have been costly to deal with and now we have real solutions to offer. That's not to say the challenges no longer remain. Skepticism on the part of the public and even our stakeholders will always remain. Good biocontrol is forgotten. Bad biocontrol lingers in the public memory.

Growing up here, I never realized how pervasive the positive impacts of biocontrol are. It's not something that's taught.

If you go hiking you will likely encounter lantana, or any number of weeds, which would be worse, if not for an insect or a disease that was released to control it. Walk through an urban setting and all around there are plants that would be deformed or dying because of insect pests, were it not for biocontrol. Because something was done to control these epidemics, you can choose *not* to use pesticides. Stroll through a cattle pasture and even there you'll see biocontrol at work: from the weeds down to the cow patties.

As I sit here taking a break from working on biocontrol issues for the State, I can reflect on where I came from, where we are at, and perhaps more importantly, where we are going. Things are different today. There is more of a spotlight—and a microscope—focused on what we do now than there was 30 years ago and that is fine by me. I just hope there isn't a young kid out there who lost an income source because of me. If there is, well, maybe they'll take my place when I retire.

Loope Unleashed

By Shannon Wianecki
MISC Editor and Curriculum Writer

When Lloyd Loope arrived on Maui in 1980 to work at Haleakalā National Park, his wife surveyed the seemingly barren landscape. "Why would they send a plant ecologist here?" she asked.

Why indeed. Back then herds of goats stampeded the volcanic summit while pigs rototilled the rain forest below. Exceptionally rare Hawaiian plants and insects were reduced to mere snacks for exotic pests. Haleakalā National Park needed a champion, someone to rally support for the drastic measures required to undo the damage.

For nearly three decades, Loope has given Hawaiian resource managers, legislators, and the public the necessary information to preserve our state's natural bounty—initially as Haleakalā National Park's plant ecologist and later as research biologist for the United States Geological Survey. In 1969, he was among the first research scientists employed by the Park Service. Assigned to the Grand Tetons, he later migrated to the Everglades where Haleakalā found and recruited him.

Loope's first task was to provide the scientific background for getting rid of the goats. It's hard to imagine now, but eradicating invasive animals from the summit of Haleakalā wasn't an easy sell. "Because the topography was difficult, I didn't even know if it could be done," he says. The Sierra Club had started fencing to keep ungulates out, and with Loope's expertise—plus plenty of peoples' sweat and muscle—it was done. Fencing proved to be the critical first step in the restoration of the native Hawaiian forest.

Next Loope drafted the feral pig management plan for Kīpahulu. His mentor Chuck Stone said: this could be the most important thing you ever do. It was significant, but Loope followed that coup with another, and another. After goats and pigs, it was rabbits running amok at Hosmer's Grove. Then miconia. Then fire ants. Each time an invasive species staked a claim on Maui, Loope met it with stern resolve and sounded the alarm.

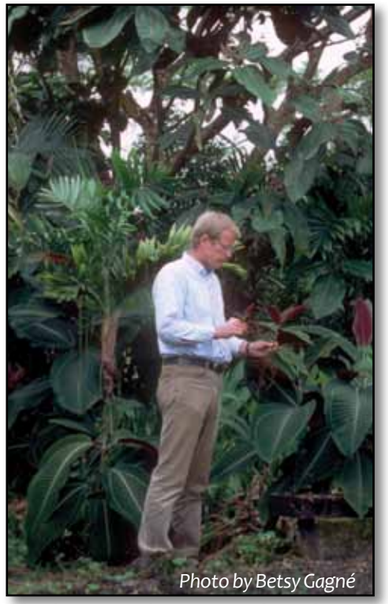


Photo by Betsy Gagné

Lloyd Loope and miconia in the early 1990s

Loope's career is a story of conservation triumphs—victories over bureaucracy and misunderstanding. His impeccable scientific scholarship, dogged persistence, and unabashed passion has allowed him to convince the right people at the right time to defend native Hawaiian ecosystems.

"You can only cry wolf so many times, so I try to be selective."

"You can only cry wolf so many times," he says, "so I try to be selective."

One of his major accomplishments was a temporary ban on the importation of myrtle species into Hawai'i—protecting native 'ōhi'a trees from new strains of a potentially deadly rust. At first, the state's agriculture department argued that a Myrtaceae ban wouldn't work. The California flower and foliage industry called it absurd, and USDA officials suggested that it was against international law. Loope maintained that Hawai'i has a right to protect its biodiversity. The Board of Agriculture agreed and enforced it. Loope continues working to make the ban permanent.

A founding member of the Maui Invasive Species Committee (MISC), Loope has served as its trusted scientific advisor. He's been a persuasive advocate for biocontrol, realizing its unequaled potential to combat the most entrenched invasive species.

"I'm really good at recognizing a problem," says Loope. "I scream about it and I get other people working on it, then I stay in the background." Throughout his career, he's hired and coached some of the brightest conservation stars on Maui. If a teacher's worth is measured by that of his students, Loope has ample recommendation. Biologist Art Medeiros calls him "humble" and "brave." "He's like a father. He doesn't do things for himself. He works in a spirit of collegiality."

Loope's love of nature took root when he was a boy, exploring the Blue Ridge Mountains in Virginia. He received a bird guide for his thirteenth birthday; before his fourteenth, he'd recorded over 100 species. That year, he got sick with mumps during the warbler migrations in early May. "Lying in bed, I heard all these birds that I recognized from the record of birdsong," he says. "I couldn't see them, but I still remember how wonderful it was to hear them."

Thanks in large part to Loope's efforts, children in Hawai'i today are able to experience the wonders of their native environment. At his retirement party, regards poured in from across the Pacific. The gathering was so joyous that some suggested he retire every year thereafter, so that we might reunite to celebrate.

Congratulations, Lloyd!

Lloyd Loope at his retirement party in 2012

Restoring Balance: Biocontrol

By Elizabeth Anderson
MISC Program Specialist

When the U.S. Forest Service (USFS) hired Tracy Johnson as a research entomologist back in 2000, one of the individuals on the hiring panel said, "We don't just need a scientist doing research, we need someone to get the bugs out the door." And that is just what Johnson has worked steadfastly to do.

The "bugs" Johnson concerns himself with are biocontrol agents, the equivalent of insect 007s carefully selected to attack some of the worst invasive species in Hawai'i.

The U.S. Forest Service is one of the Maui Invasive Species Committee's key partners despite having no actual land holdings in Hawai'i. In addition to providing annual funding to MISC through the Forest Health initiative, the USFS's Institute of Pacific Islands Forestry continues to be on the forefront of research into biocontrol agents for important MISC targets, like miconia.

Biocontrol research is something "you must be in for the long haul in order to see the fruits of your labors," explains Johnson. Some species, like the arctiid moth for fireweed, were in the lab in quarantine when he started thirteen years ago; they were finally released in 2012.

"You must be in for the long haul in order to see the fruits of your labors."

One of the most visible and controversial biocontrol projects Johnson has been involved with is the release of the biocontrol agent for strawberry guava. He wore multiple hats on that project, including public relations and education liaison. "I'm encouraged to find that the vast majority of people are very supportive once they understand what we do and why," he says. "It's perfectly reasonable that they distrust the idea of introducing a new species at first. After all, introduction of invasive species is the very source of the problem. I try to explain the level of care that is taken in evaluating biocontrol agents before they are introduced and the outstanding safety record of the last 40 years – beginning in the 1970s when attitudes about native species led to stronger standards for their protection."

Funding for biocontrol research and implementation has seen significant ups and downs over the years. While conservation managers intuitively recognize the need for funding long-term strategies like biocontrol, it is sometimes difficult to balance those big picture objectives with the day- to- day needs of paying on-the-ground control crews and the electric bill.

But Johnson knows the investment is worth it. "Biocontrol is about restoring balance to ecosystems that are out of balance to a degree that other management approaches simply cannot resolve."

Despite the whims of funding and the challenges associated with raising tiny insects in a controlled laboratory environment, Johnson's commitment is unwavering. "There are millions of species that are completely ignored by humans, yet they are very important in the grand scheme," he says. "A few of these have potential to make a huge difference to us in Hawai'i."

Lloyd Loope remembers when Johnson first entered the conservation scene in Hawai'i. "He had an awesome educational background for the position," says Loope. Since that time, "his interest in non-target effects of biocontrol has served him well. Tracy is smart, conscientious, highly motivated, and enthusiastic about his work, while being cautious. His communication skills are better than those of most of us scientists and have been honed particularly by several years of intense controversy over the release of *Tectococcus ovatus* [the biocontrol agent] against strawberry guava."


Photo by Daniel W. Clark

Sometimes it's about what you don't see. An 'i'iwi feeds on a rare Lobelia grayana *in the Maui rainforest. Biocontrol researchers like Tracy Johnson focus on effective, safe ways to keep weeds out of watersheds and natural areas, protecting rare native plants and animals.*

Johnson's communication skills have given him a unique relationship with MISC and other partners. "I view the invasive species committees and watershed partnerships statewide as my primary clientele, with deep respect for their work on the front line against invasive species. My job is simply to give them additional tools to help them succeed," he says. "The sad truth is that there is no shortage of extremely serious weeds in Hawai'i for biocontrol researchers to focus on. We are looking at decades of work for many researchers targeting dozens of weeds. I hope to build our capacity to a level more adequate to this task."

The Path to Biological Control

1. Discover a pest species.

Oh no! An alien gall wasp is crippling our wiliwili trees!

2. Study pest and determine origin.

We've never seen a wasp like this before in Hawai'i! Do you know what it is?

3. Apply for permits to bring potential biocontrol to Hawaii

Yes, I submitted 4,309 pages of documentation last week. Did you receive them?

4. Travel to the pest's native range.

Hello Tanzania! Has anybody seen a wasp the size of a comma?

5. Find pest in the wild

Could this tiny speck be the egg of a predatory wasp??

6. Propagate them in quarantine

Do you need some romantic music? Privacy?

7. Test against non-target species

My wasp would rather die than eat that native Hawaiian insect.

8. Apply for permits-round 2

I can document that ...and that....oh, yes

9. Identify potential release sites

Hmm, yes...this is perfect! Plenty of pests.

10. Convince public of need

This tiny parasatoid is our best hope to save the trees.

RELEASE!

Get to work little guys!

Techno Talk:

Classical biological control is the planned introduction of an organism (usually insect or pathogen) from a pest species' native range for the purpose of reducing the pest's vigor, reproductive capacity, or density where it is invasive. Biological control agents are simply the natural predators of a pest species-the insects or diseases that keep the species in balance in its native ecosystem. Before scientists release a biological control agent in Hawai'i, it undergoes rigorous testing to ensure that it will not do any harm-a process that typically takes 5-10 years or more.

Artwork: Brooke Mahnken
Inspiration : Darcy Oishi

Taming the Wild Ginger

By Djami Djeddour
Weed Biocontrol Scientist, CABI

Wild gingers, *Hedychium spp*., belong to the same family as edible ginger (*Zingiber officinale*), but they have no culinary value. Native to moist tropical forests of Central and South-Eastern Asia, they are cultivated the world over as ornamentals. Their large, glossy leaves flare out around tall, reedy stems. Their orchid-like, showy blossoms come in a breathtaking array of colors and exude a heady perfume. Such is their aesthetic appeal, that they are showcased in the finest Hawaiian lei. Their scientific name *Hedychium* (pronounced "heh-DIK-ee-um"), is derived from the Greek "hedys," meaning sweet, and "chion," meaning snow. It refers to the type species for the genus: white ginger (*Hedychium coronarium*). This sweetly fragrant species is the best-known ornamental ginger. In the 19th century, Cuba adopted it as the nation's official flower—a symbol of purity, rebelliousness, and independence.

But in Hawai'i, New Zealand, Australia, South Africa, La Réunion, and the Macaronesian Archipelagos, where gingers have been introduced, beauty has turned to beast. The very characteristics that gained gingers favour in gardens, such as hardiness and capacity for rapid, vegetative growth, have allowed them to naturalize in the wild. Unchecked, they smother many unique and specialized communities and threaten delicate ecosystems. In particular, Himalayan or kāhili ginger (*Hedychium gardnerianum*), has earned its place on the list of 100 of the World's Worst Invasive Alien Species. Resource managers consider biological control the only practical and sustainable approach for the long-term management of Himalayan ginger infestations in native forests.

To this end, CABI, an international non-profit development agency, initiated the first phase of a biological control program for Himalayan ginger in 2008. A consortium of sponsors from New Zealand and Hawai'i funded the scoping study. As with every new biocontrol initiative, the expedition derived its geographical focus from a thorough review of scientific and botanical literature, as well as records from British and Indian herbaria. A short exploratory survey in collaboration with Kerala Forest Research Institute confirmed the state of Sikkim in India to be a hotspot for *Hedychium* biodiversity, including Himalayan ginger.

Natural enemies associated with economic crops in the same family as wild gingers (*Zingiberaceae*), such as edible ginger, turmeric, and cardamom, are well known. But very little information was available on the insect fauna and mycobiota associated with the invasive *Hedychium* species. Repeat surveys in 2009 and 2010 by CA BI and Indian forestry staff revealed a large number of natural enemies attacking *Hedychium*. In 2011 and 2012, the most promising of these were brought into CABI's United Kingdom quarantine facilities.

The potential agents include a large rhizome-boring weevil, a Chloropid fly, several moths, and a fungus. Host-range testing for many of these species is underway and efforts to establish cultures of each insect are ongoing. Since the insects are little known, establishing life history parameters and developmental timings is fundamental to host-range studies. Surveys continue to highlight new insect and fungi species associated with wild gingers. Prioritizing agents based on specificity, damage potential, and life habit is an ongoing process.

Wild ginger should lend itself well to a biological control initiative, as there are no native, representative Zingiberaceae present in Hawai'i or New Zealand. However, the economic, ornamental, and cultural appeal of *Hedychium* species in their introduced range (especially in Hawai'i) cannot be underestimated,

Djami Djeddour inspects ginger.

no matter how damaging the plant is to native forests. Early Polynesian settlers introduced *Zingiber zerumbet* (*'awapuhi*) to Hawai'i. Though not native to the Islands, the species has cultural importance and is included as a test plant for host-specificity studies. If biological control is to be accepted as an essential part of wild ginger management, early engagement with the Hawaiian community and horticultural stakeholders will be of paramount importance. Educational and outreach programs to address concerns and potential challenges will be of great benefit. Furthermore, awareness of the negative impacts of the non-native, invasive wild gingers on native Hawaiian flora and fauna must continue to be highlighted if its cultural reputation and current appeal is to be addressed.

Djami Djeddour is a weed biocontrol scientist at CABI's UK Centre and has 15 years of experience as a researcher in the field of weed and arthropod biological control. As well as working on the potential for biological control of wild gingers for Hawai'i and New Zealand, she has been actively involved in a number of biological control projects targeting European weed species, including the UK's most pernicious weed, Japanese knotweed, which, in 2010, culminated in the first intentional release of a biological agent targeting a weed species in Europe.

'Ulupalakua Cares

By Abe Vandenberg
Education and Outreach Associate

The undulating green lands of 'Ulupalakua Ranch cover over 18,000 acres, from the ocean up to 6,000 feet on the leeward side of Haleakalā. Since 1845, when modern agriculture was introduced to 'Ulupalakua, the lands have gone through diverse changes. Native koa and sandalwood forests gave way to potato patches and rows of corn, cotton, and sugar cane, followed by pasture for what would become the second largest cattle ranch on Maui. Throughout its rich history, 'Ulupalakua Ranch has been a pioneer in conservation, introducing effective biocontrol and committing substantial acreage to permanent preservation.

"Our goals are to protect open space and agriculture."

Back in 1860, 'Ulupalakua landowner and ex-whaling captain James Makee imported a variety of ornamental plants and crops to the area. Among his introductions was *Eupatorium adenophorum*, a spindly shrub with clusters of small white flowers. White loosestrife became known in Hawai'i as Maui *pamakani* (meaning windblown in Hawaiian), and quickly spread to every island except Kaua'i. The wide-ranging weed invaded dry to wet habitats from sea level to 7,000 feet elevation.

This caused a huge problem after ranching came to 'Ulupalakua in 1886. White loosestrife, which by then carpeted the hillsides, is toxic to horses and cattle. The only control method at the time, manually digging and pulling the weed, was not very effective.

Relief for ranchers came in 1945. Agriculturalist David Thomas (D.T.) Fleming attempted to reclaim the pasturelands of Upcountry Maui using biological control. Entomologists exploring the mountainous regions of Mexico, where white loosestrife originates, had found the plant pest's natural enemy-the Eupatorium gall fly. With the permission of the Territorial Board of Agriculture and Forestry, Fleming released *Procecidochares utilis* in 'Ulupalakua. As its common name suggests, this insect is explicitly limited to white loosestrife. Its immediate success in attacking white loosestrife populations in dry areas such as Kanaio and 'Ulupalakua allowed ranch hands to stop mechanical methods of control.

By 1971, surveyors in Kīpahulu and Waihou had great difficulty detecting even a single white loosestrife plant in areas that previously were covered with dense stands. It persists today in small numbers in streambeds.

Ed Baldwin, whose family owned 'Ulupalakua Ranch from the 1920s to the 1960s, credits the eupatorium gall fly with freeing around 10,000 acres of leeward Haleakalā from white loosestrife. Baldwin was so grateful to D.T. Fleming for finding a solution to the problem that he gave the botanist his choice of land parcels. D.T. dreamt of retiring with an arboretum dedicated to the preservation of endangered plants endemic to the 'Ulupalakua/Auwahi area. Pu'u Mahoe, with a grand view of La Pérouse Bay, was his choice. Today, Fleming Arboretum is the oldest and largest native arboretum in Hawai'i, protecting 92 species, 26 of which are rare or endangered.

In 1963, the Erdman family purchased 'Ulupalakua Ranch, ushering in the latest era of land management. The Erdmans have partnered with conservation organizations to protect and preserve the native biodiversity contained within the ranch's borders. The Erdmans work with state and federal agencies in addition to conservation groups such as Ducks Unlimited, The Nature Conservancy, Native Hawaiian Plant Society, the Leeward Haleakalā Watershed Restoration Partnership, and Maui Invasive Species Committee.

Beginning in 2000, the Erdmans supported a marvelous experiment: the restoration of native Hawaiian dryland forest at Auwahi. The ranch first loaned ten acres of pasture to the Maui Restoration Group, which sought to reestablish the health of this once biologically rich forest. When their efforts succeeded, the Erdmans gave them another 174 acres. Over 100,000 rare native trees and shrubs have since been planted within fenced exclosures. Without the Erdmans' unflinching support and encouragement, the now thriving forest at Auwahi would not exist.

The 'Ulupalakua Ranch's most recent gift to conservation was its largest. In 2009, the Erdmans donated over 11,000 acres to the Hawaiian Islands Land Trust, in order to protect pasturelands and dryland forest habitat from future development. It was the largest-ever voluntary easement donation in the state of Hawai'i. "Our goals are to protect open space and agriculture," said Sumner Erdman, one of the owners of 'Ulupalakua Ranch. "The economics of doing that sometimes are a little bit tough; this partnership will allow us to be able to manage and maintain open space."

Photo by Forest & Kim Starr

The Erythrina gall wasp causes Erythrinae spp. *to lose leaves. Without leaves to release water, limbs become sodden and collapse.*

"Wiliwili" continued from page 1

By October 2006, the last *wiliwili* stand in remote Nu'u had been infected. Newspaper headlines read, "Efforts to control Erythrina gall wasps fail" and "Alien wasp may doom the *wiliwili*."

The conservation community's emphasis switched from saving trees to preserving seeds. Volunteers plucked seeds from lava plains around Maui County, representing the *wiliwili's* diverse genetic pool. Lyon Arboretum on O'ahu agreed to store seeds in anticipation of the worst-case scenario: extinction.

Some spirited third graders from Montessori School of Maui performed a skit about the *wiliwili* and committed to shucking 90,000 seeds for storage at Lyon Arboretum. One student reportedly told his mother, "I feel sick today, but if I don't go to school, no one will protect the *wiliwili*."

Thankfully, the students weren't the only ones willing to go the distance for the *wiliwili*.

Immediately after the gall wasp's appearance in 2005, exploratory entomologists with the Hawai'i Department of Agriculture (HDOA) began searching the world for a solution. Mohsen Ramadan's research revealed that Tanzania had the largest number of Erythrina species on the planet, and was most likely the source of both the *Erythrina* gall wasp and any natural enemies. Ramadan booked a flight to Africa in search of a possible predator.

Ramadan scoured the Tanzanian countryside, traveling for two months on rickety buses with insect samples in tow. "I was lucky enough to find some galls similar to those we had in Hawai'i," he says—and these galls contained a second wasp, a predator that lays its eggs beside those of *Quadrastichus erythinae*. The predator's larvae hatch first, and devour their neighbors. Ramadan dispatched samples back to Hawai'i, where they were identified as *Eurytoma erythrinae*, which feeds exclusively on *Quadrastichus* larvae.

> ***"The onlookers collectively held their breath as thirty Eurytoma wasps emerged and begin landing on galls."***

HDOA performed comprehensive tests to ensure that Eurytoma wouldn't become a new pest. "This insect is specific enough that it will not attack anything other than the Erythrina gall wasp," says Ramadan.

Eurytoma was approved for release in 2008. "Projects like this sometimes take ten years," says Ramadan. "We did it really fast."

It wasn't a moment too soon. Medeiros estimated that between 10 and 20 percent of the 20,000 trees in the Pu'u o Kali forest had already died.

Just before Christmas 2008, a group gathered to witness the introduction of yet another alien species—but this one had been reared in the State's quarantine facilities. Darcy Oishi, who leads the state's biological control program, held up a vial containing *Eurytoma* wasps at the base of a gall-wasted *wiliwili* in Pu'u o Kali. The onlookers—representatives from various conservation agencies—collectively held their breath as thirty *Eurytoma* wasps emerged and begin landing on galls. The group cheered and hooted. "Go get 'em!"

This release signaled the revival of the *wiliwili* forest.

Eurytoma turned out to be a robust predator, attacking *Quadrastichus* as steadily as the latter had attacked the trees. How successful has this biocontrol proven to be? See for yourself during the next *wiliwili* flowering season. When late summer rolls around, drive along the remote, sun-baked Pi'ilani Highway towards Kaupō. Slow down to witness the abundance of trees covered in reddish-orange and iridescent green blossoms—trees that we almost lost.

A stand of wiliwili in bloom is perhaps one of the most remarkable sights in Hawai'i.

MISCellaneous Files

Dear Dr. MISCellaneous:
Eh..So I hear all this talk about biocontrol…you sure that's a good idea? Remember the mongoose?
Leery of Biocontrol

Dear Leery,

Ah yes, the mongoose…the mistake that will plague biological control for, well, hopefully not much longer. Introducing mongoose to control rats did not work, no doubt about it. As everyone now knows, rats are nocturnal and mongoose are diurnal. The two rarely meet. Mongoose not only failed to control rats, they negatively impacted other animals, including native birds. But before we badmouth all biocontrol, let's look at the facts:

1. Sugarcane planters independently brought the mongoose to Hawai'i in 1885 based on (faulty) claims by a plantation owner in Jamaica. This was not a sanctioned introduction and it occurred during an era of little oversight or regulation.
2. There was no science or research behind the introduction. Modern biocontrol is a painstakingly researched process. It's unlikely that an animal or vertebrate would be considered for use as a biocontrol agent today. Vertebrates tend to be "generalist" feeders, unlike insects or pathogens, which feed only on their target species.
3. Since rigorous testing for non-target impacts began, there have been no instances of "host-jumping" in Hawai'i Modern biocontrol has been successful.

Your concerns are valid. No one wants to introduce another problematic species into Hawai'i!

Reassuringly yours,
Dr. MISCellaneous

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P.O. Box 983
Makawao, Hawai'i 96768

Working to protect Maui Nui from invasive species that threaten our environment, livelihoods, and quality of life.

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