



DETECTION & CONTROL OF INVASIVE SPECIES IN MAUI COUNTY
HAWAII INVASIVE SPECIES COUNCIL
FINAL REPORT – FY22

PBS HAWAII **MISC**
MAUI INVASIVE SPECIES COMMITTEE

PBS Hawai'i and the Maui Invasive Species Committee Presents:

A Virtual Screening and Panel Discussion on:
The Green Planet
Episode 5: Human Worlds
July 26, 2022 | 2:00 p.m. - 3:30 p.m. HST

Be the first in Hawai'i to watch the final episode of this exciting new series narrated by Sir David Attenborough, featuring conservation efforts on Maui. Afterwards, join an expert panel for a live discussion about the work being done to protect Hawai'i's environment from invasive species like miconia

			
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Flyer promoting the BBC Green Planet film featuring work on miconia



INTRODUCTION

The purpose of this grant was to support field work and outreach activities on Maui and Molokai, focused on a suite of invasive species that threaten Maui County's watersheds, biological diversity, agriculture, and quality of life. Funding from the Hawai'i Invasive Species Council (HISC) provided critical support for this work.

The Maui Invasive Species Committee (MISC) and Molokai/Maui Invasive Species Committee (MoMISC) are projects of the University of Hawai'i—Pacific Cooperative Studies Unit (UH-PCSU). Other key partners involved in the projects include the County of Maui, Hawai'i Department of Land and Natural Resources, Hawai'i Department of Agriculture (HDOA), Hawai'i Ant Lab, The Nature Conservancy, US Department of Agriculture, Haleakalā National Park, and community members.

Key objectives included:

Priority Target Species

1. Detect and control little fire ants (LFA).
2. Maintain early detection / rapid response (EDRR) capacity on each island.
3. Conduct early detection surveys.
4. Reduce and control coqui frog populations.
5. Detect and target high-priority species for island-wide or local eradication wherever feasible.

Outreach and Education

1. Increase public detection and control of little fire ants (LFA).
2. Foster public awareness and concern about invasive species.
3. Increase public and private support for MISC and MoMISC programs.
4. Advance awareness of biosecurity and invasive species issues.
5. Participate in statewide invasive species outreach projects.
6. Educate and empower communities to control coqui frogs.

Data Collection and Management

1. Improve data management.
2. Continue developing acoustic monitoring techniques for coqui frogs.

Accomplishments: Early detection work focused on species not believed to be established on the islands. Survey and control work targeted 34 invasive plant species, four invertebrates including one marine species, and three vertebrate species. Ground and aerial surveys covered approximately 22,000 acres and removed more than 32,500 plants. The following sections outline deliverables noted in the grant proposal and related accomplishments.

PRIORITY TARGET SPECIES

1. Detect and control little fire ants (LFA)

The project goal is to prevent the island-wide establishment of little fire ants on Maui. Early detection of new infestations is critical, along with prompt and consistent treatment and effective monitoring. Project deliverables included:

- Survey 15 high-risk sites.
- Complete 4 treatment cycles in Nāhiku.

High-risk sites: MISC conducted LFA surveys at one beach park and one nursery. The Hawai'i Department of Agriculture (HDOA) took the lead for other nursery surveys. MISC worked with the Hawai'i Department of Transportation contractor for invasive species roadside surveys. MISC staff prioritized locations for LFA surveys along state roads and identified all ants collected by SWCA. No LFA were detected.

Nāhiku infestation: Due to the challenging terrain of this 175-acre site (see Figure 1), aerial treatment was previously determined to be the only feasible option for control. Staff conducted seven aerial treatment cycles. This innovative strategy used a helicopter to deliver an insect growth regulator to the foliage and ground below, using a customized gel-bait matrix. In the fall, MISC surveyed the entire infestation using baited vials, a grid system to ensure coverage, and handheld recording devices. The activity included all MISC field staff and support from PCSU partner projects. The surveys confirmed that the treatment strategy is working. Of the nearly 5,000 baited vials retrieved, 90% had no ants present. Of those vials that contained ants, LFA was present in only 6—approximately 1.3% of all vials retrieved (see Figure 2).

Figure 1. Opening trails for Nāhiku survey



New sites: A new infestation was discovered in Ha'ikū through public reporting, making it the 19th site on Maui. Staff delimited the area and initiated a six-week interval treatment schedule.

Overall Status of LFA infestations: At the end of 2022, eight sites were under active treatment and six were in the monitoring phase (no LFA currently detected) (see Figure 3). The number of sites where little fire ants have been eradicated stood at five, but several might be considered eradicated during 2023. Key statistics:

- Number of acres under management: 258 acres.
- Number of vials deployed by MISC and partners: 25,918
- Number of suspicious ant reports received and followed up: 67
- LFA kits requested from the public: 177
- Public submissions of ants & number of samples submitted: 192 / 816

Figure 2. Survey results at Nāhiku

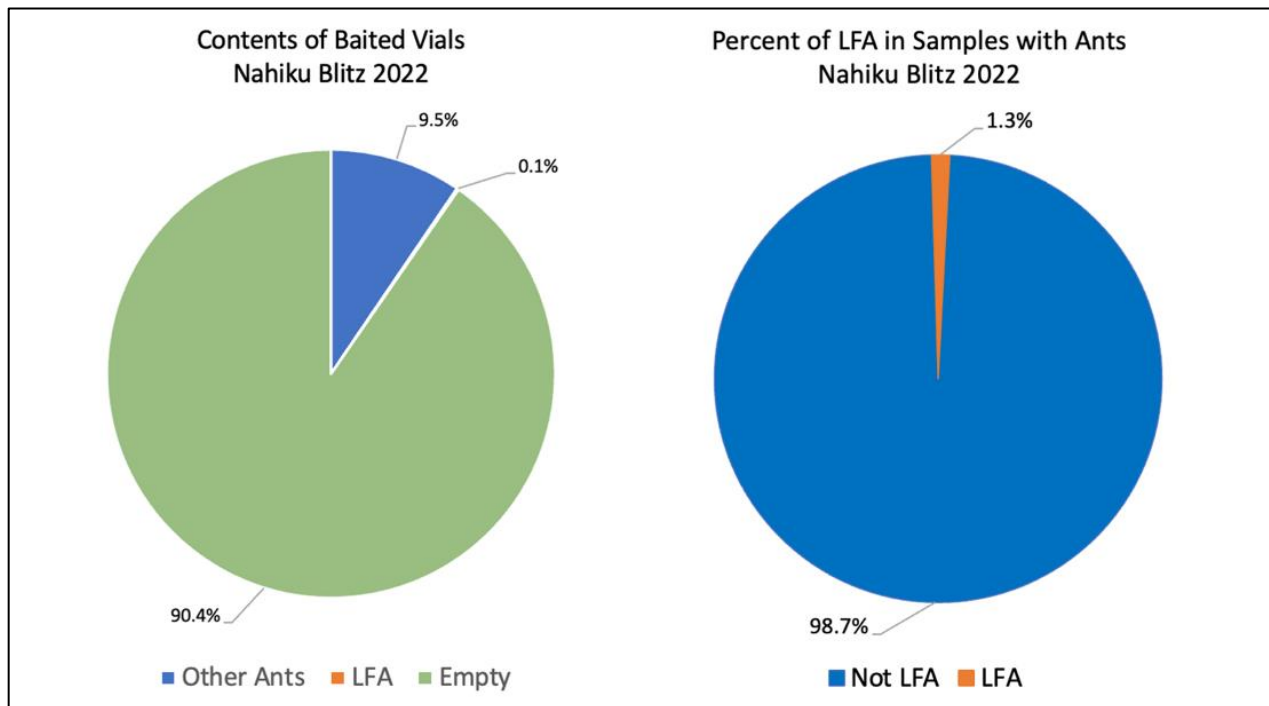
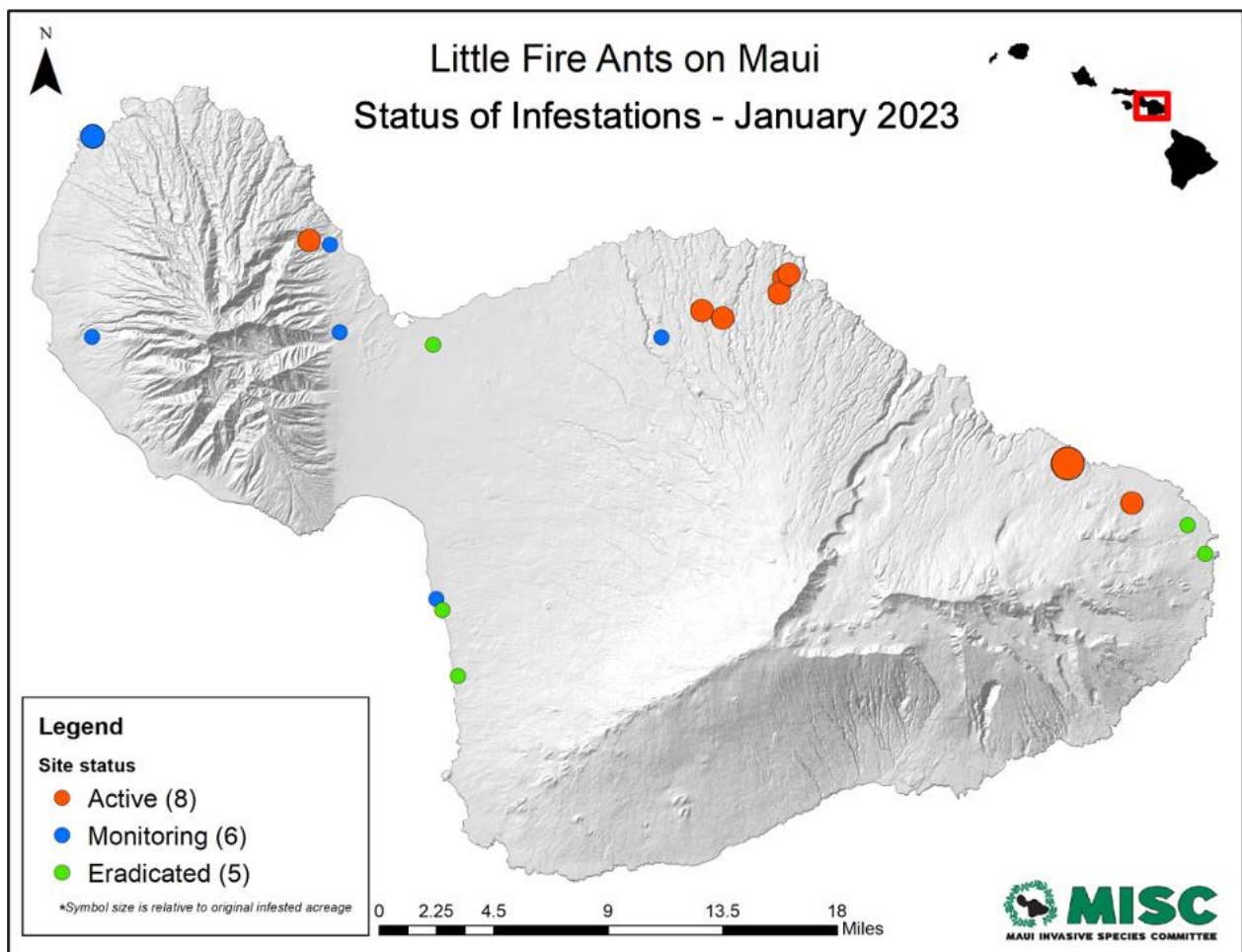


Figure 3. Status of LFA infestations



2. Maintain early detection / rapid response (EDRR) capacity.

Early detection and rapid response capacity was maintained and enhanced on Maui and Molokai.

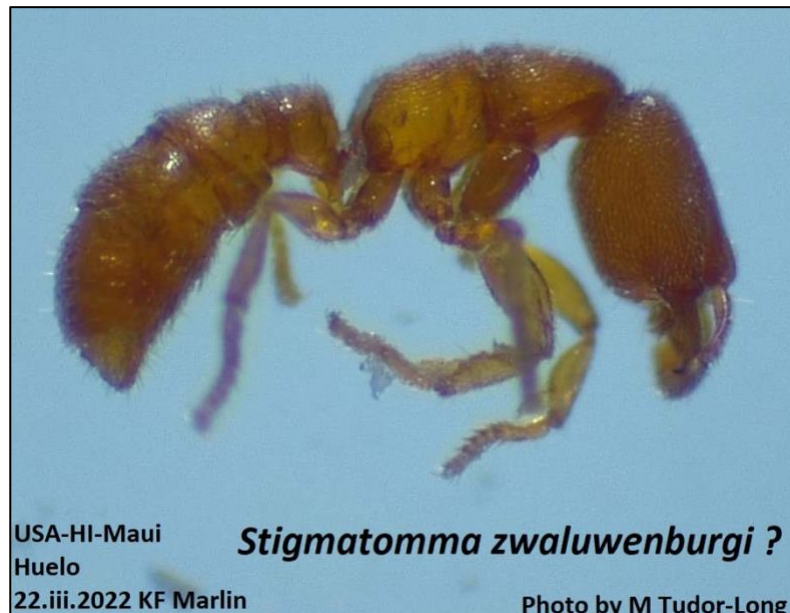
- Trainings completed on plant, vertebrate, and invertebrate identification and appropriate control methods.

As new employees joined the LFA and coqui teams, each received training on target species detection and control, including on invasive plants, invertebrates and vertebrates. Cross-training by staff working on different teams helped enhance overall early detection capacity.

MISC has developed enhanced capacity in early detection of ant species. Initially, LFA surveys focused on the presence or absence of little fire ants. MISC now identifies the species of every ant collected, a protocol that has led to some interesting discoveries. In March 2022, a MISC employee collected a

Figure 4. *Dracula* ant detected on Maui

single specimen of Van Zwaluwenburg's Dracula Ant (*Stigmatomma zwaluwenburgi*) (see Figure 4); this species had only been collected a handful of times anywhere in the world. The Dracula ant had not been seen in Hawai'i since 1967, and had never been detected on Maui. This tiny, blind cryptobiotic species spends its entire life underground; its native range has never been identified. The level of care that led to this discovery helps increase the likelihood that the arrival of other detrimental ant species, such as the red imported fire ant (*Solenopsis invicta*), will not go unnoticed.



MISC staff have been trained to assist with early detection surveys at the Kahului airport as part of the statewide ports of entry project. MISC participated in the development of the statewide Plant Pest training project, including creation of key training presentations to help horticulturalists gain familiarity with plant pests not known to occur in the Islands. MISC provided office space for the key responder with the 643Pest project, which facilitated communication and cross-training. Staff responded to reports from the public about plant pests and sent voucher specimens to HDOA staff for confirmation.

MISC and MoMISC staff participated in statewide monthly working groups on rapid 'ōhi'a death and attended quarterly CGAPS meetings where partner agencies shared updates on new incursions.

3. Conduct early detection surveys.

Early detection surveys focused on species not known to occur on Maui or Molokai.

- Conduct early detection surveys on Maui and Molokai.
- Record and archive monitoring for future research.

Invasive Plants

Small Chinese violet (*Asystasia gangetica* subsp. *Micrantha*): A local herbalist posted images of an unknown plant to the Hawai'i Plant ID site managed by MISC's Early Detection Specialists. The Starrs identified the invasive plant as small Chinese violet, a new island record for Maui, a species they first collected on Hawai'i Island two decades ago. Based on surveys in nearby areas, small Chinese violet appears to be established on the island. The closely-related large Chinese violet is widespread in coastal and lowland areas of the island; a literature review suggests this new species to the island does not pose a significant threat to Maui's watersheds.

Assa-peixe (*Vernonanthura polyanthes*): MISC received a report of an invasive tree in East Maui that was new to the island. Review of aerial imagery, along with roadside and ground surveys, indicated that the species was already too widespread to take on as a new target; however, the tree was not known from West Maui. MISC's Early Detection Specialists discovered a lone tree in 'Īao Valley near the river, and staff subsequently removed that plant.

Grass survey & control: MISC and MoMISC worked with University of Hawai'i (UH) graduate student Kevin Faccenda, who conducted roadside surveys for grass species on Maui and Molokai. MISC shared geospatial data for grasses and provided logistical support. A summary of his results included a list of species to consider for future control work. In response, MISC controlled the only known location of feathertop (*Cenchrus longisetus*) (see Figure 5). This fire-promoting grass ranked out as "high risk" under the Hawai'i-Pacific Weed Risk Assessment (HPWRA). It recovers quickly after fire, forms dense clumps that will dominate an infested area, and is known to degrade the quality of pasture lands. Two other grass species were proposed for MISC to consider as potential target species, *Schizachyrium condensatum* and *Hyparrhenia hirta*. These species will be considered for action at a future MISC committee meeting.

Figure 5. Feathertop controlled in Kula



Nursery surveys: Staff conducted surveys at three Central Maui nurseries for invasive plants, observing very few species that tend to naturalize. MISC has conducted periodic nursery surveys since 1999 and it appears there are many fewer invasive plants for sale. The surveys identified Philippine pink (*Medinilla apoensis*) as a species to watch for; it was assessed as “high risk” for invasiveness by the HPWRA.

Invertebrates and Other Plant Pests

Airport early detection surveys: MISC conducted periodic trap checks at the Kahului airport for Africanized honeybees, coconut rhinoceros beetles, and little fire ants as part of the statewide early detection project focused on ports and harbors. None of the target species were detected. MoMISC conducted monthly surveys and trap maintenance at the Molokai airport.

Coconut rhinoceros beetle (*Oryctes rhinoceros*): In Hawai‘i, the coconut rhinoceros beetle (CRB) is known only from O‘ahu. Landscape palms and endemic and endangered loulu palms are at greatest risk from this pest. Despite major efforts to control this pest, surveys indicate that it continues to spread on O‘ahu (see Figure 6). In addition to work at the airport, surveys focused on 21 locations that have large plantings of palms; an estimated 675 palms were inspected with no obvious CRB damage detected. MoMISC conducted CRB surveys on Molokai over 182 acres, with no suspect damage observed.

Figure 6. Coconut rhinoceros beetle and trap on O‘ahu



Naio thrips (*Klambothrips myopori*): This sap-sucking insect feeds on native naio trees (*Myoporum sandwicense*), an important species of native ecosystems in Hawai‘i. Naio thrips are on Hawai‘i Island and O‘ahu, but have not been detected on Maui. Cultivated and wild naio plants were inspected, consistent with the statewide plan. Staff began monitoring the online *iNaturalist* site for reports of naio or naio thrips, and discovered new locations for surveys. Surveys occurred at 35 different locations and inspected 159 plants, with no detections of naio thrips (see Figure 7).

Figure 7. Checking a naio plant for thrips



Queensland longhorn beetle (*Acalolepta aesthetica*): This pest can affect a wide number of beneficial plants, including breadfruit, kukui, citrus, cacao, and avocado, and is currently known only from Hawai'i Island. MISC's Early Detection Specialists became familiar with symptoms of this pest and conducted limited surveys in the 'Īao Valley area, with no detections.

Rapid 'Ōhi'a Death (*Ceratocystis lukuohia* and *C. huliohia*): MISC staff participated in statewide efforts to protect native 'ōhi'a trees from the fungal disease known as ROD. Staff responded to ten reports of suspect trees and sent samples to the US Department of Agriculture lab in Hilo. No ROD was detected on Maui or Molokai during this time period.

Banana bunchy top virus (BBTV): The Hāna crew controlled 48 infected banana plants in the Wai'ānapanapa area. BBTV has become too widely established for control on most of Maui, but has not been known to be established in East Maui, where there are a number of collections that contain unique Polynesian varieties. A more defined strategy for survey and control is needed for East Maui. In the interim, MISC has worked to provide BBTV outreach materials to key partners in the area.

Molokai operations: MoMISC staff conducted surveys for little fire ants over 236 acres with no detections. Staff searched 15 acres near the Kaunakakai wharf for the stinging upside-down jellyfish (*Cassiopea andromeda*) with no detections (see Figure 8). Staff also found no coqui frogs during surveys over 150 acres. MoMISC staff controlled 55 plants with BBTV. They also responded to inquiries from a plumeria tree farmer about damage to his trees. With assistance from the University of Hawai'i, MoMISC confirmed that the farm is infested with the plumeria tree borer, and that other insects and pathogens may also be affecting the trees.

Figure 8. Upside-down jellyfish (DLNR Division of Aquatic Resources photo)



4. Reduce and control coqui frog populations.

Coqui frogs have become established in residential areas, small gulches, and throughout Māliko gulch in Haʻikū on Maui's north shore. Resources have never been adequate to eradicate coqui from Maui. Primary objectives are to prevent coqui from spreading throughout Maui by responding to small outlier infestations, eradicating satellite populations where feasible, and containing and reducing spread in the Haʻikū area. Project objectives included:

- Remove coqui from outlier locations.
- Eradicate coqui frogs from satellite populations.
- Reduce infestation levels at targeted management units.
- Conduct spray operations over 100 acres in the Māliko area
- Expand the community engagement program
- Measures of effectiveness include: acres treated, gallons of citric acid applied, and citric acid sprayed by residents.

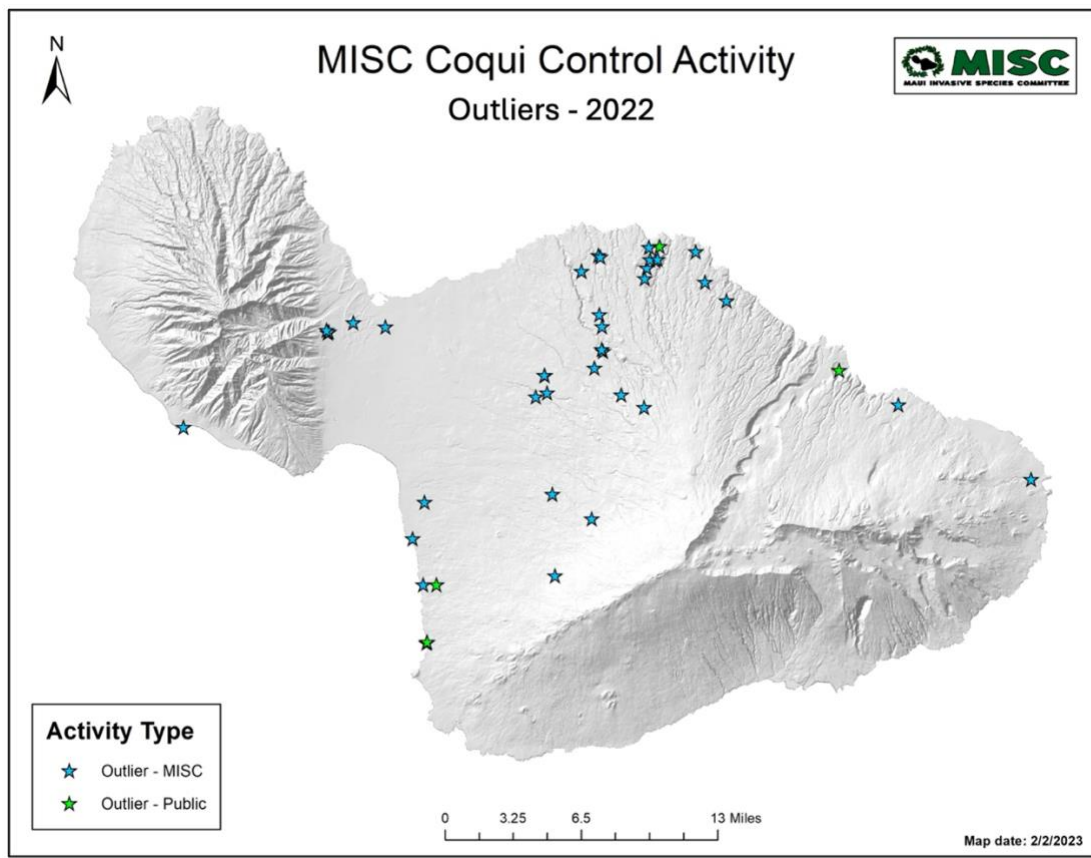
Outliers

Outliers are locations that have only a few coqui present and are outside known infested areas. MISC received reports of new frogs by phone, email, social media, via an online form, and from the statewide online [643-PEST](#) reporting system. Staff conducted initial assessments to determine the validity of each report. MISC fielded more than 250 reports. Methods included hand-capturing frogs and spraying the area with a citric acid solution (see Figure 9). Staff responded to all outliers and removed coqui from 66 sites (see Figure 10).

Figure 9. Hand-capturing coqui



Figure 10. Control of small, outlier coqui frog infestations - 2022



Satellite populations

Satellite populations have more than five calling coqui frogs and are assumed to be reproducing. Since MISC first began controlling coqui, a total of 22 populations have been eradicated (more than one year since last calling frog was heard). Three sites were in a “monitoring” stage at the end of the year, meaning no coqui are currently heard, and nine populations were under active treatment. MISC conducted field operations in each of the satellite populations. One site is on track for eradication within the next year and three other low-level infestations are expected to follow soon after. Three new satellite populations were identified: Auoli in Makawao, Ulumalu in Ha’ikū, and one at a Mākena resort. The Hawai’i Department of Agriculture took the lead on working with the resort; coqui frogs have spread onto some neighboring properties and MISC initiated control operations at those locations.

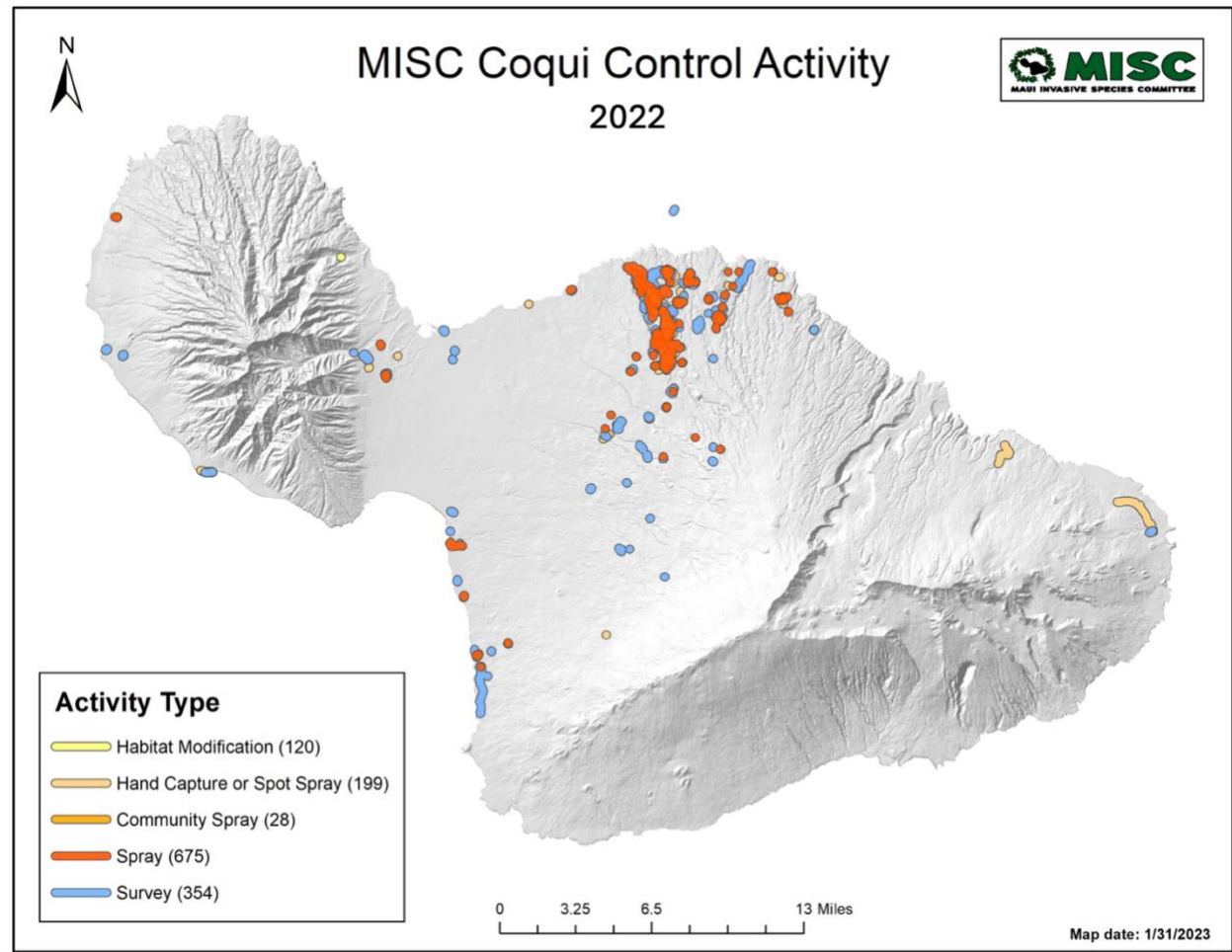
A few sites remain problematic, including a Wailuku nursery, where MISC has devoted significant resources for many years. MISC staff participated in two meetings with DLNR and HDOA leadership, who agreed to send a joint letter seeking increased action by the nursery to eradicate coqui from the site. MISC is hopeful that this collaborative approach will establish a framework for future situations where landowners are not adequately supporting control efforts, especially businesses in the plant industry.

Reduce or contain infestations at targeted management areas

Staff conducted field operations in 42 different management units. Activities included installing

and maintaining pipeline infrastructure, conducting survey and spray operations, hand capturing coqui, and providing residents with citric acid for control. Focal areas included Kauhikoa gulch and Lanikai areas (see Figures 11-13). Staff surveyed 2,808 acres and treated 312 acres. Habitat work focused on 20 acres. Management units that received the most effort included: Kauhikoa residential, Lanikai, Giggie Hill, and Jaws gulch. Staff applied 352,537 gallons of citric acid solution during treatment operations.

Figure 11. Coqui frog control work on Maui - 2022



Barrier fence

MISC continued working on the barrier fence project, which is funded by DLNR-DoFAW. The barrier fence is intended to prevent movement of coqui into areas under control by using a mesh fence that has a horizontal segment. Coqui can climb vertically but can't "hang on" upside down; when they encounter the horizontal mesh segment, they fall back to the ground. Installation and maintenance require removing vegetation on either side of the fence. A contractor has been selected to do the installation and a subcontractor will assist with vegetation clearing. MISC and DoFAW staff met with the contractor and subcontractor to agree on timelines, roles, and responsibilities. MISC created and filled a full-time position to coordinate this project. Obtaining permission for property access has begun. Figure 13 shows proposed locations for the fence segments; Figures 14 and 15 illustrate the design concept and a similar fence installed by a resident along the gulch.

Figure 12. Control actions on Maui's north shore

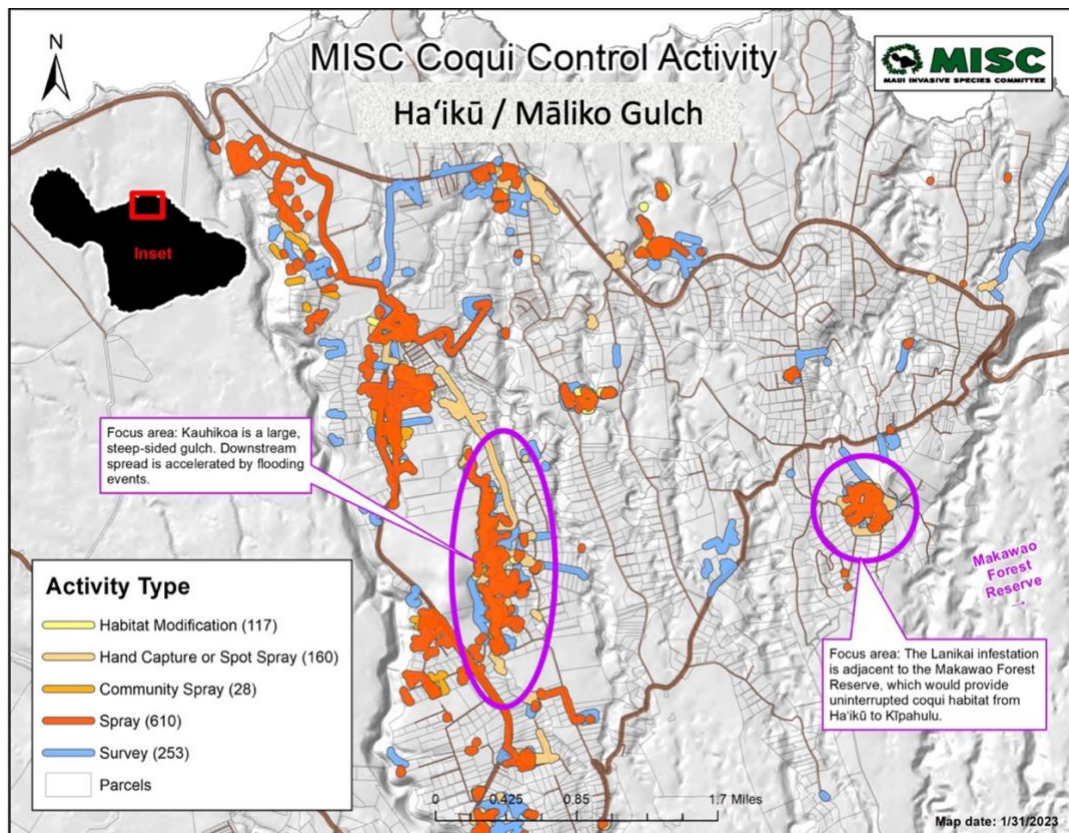


Figure 13. Pipeline location and potential barrier fence sites

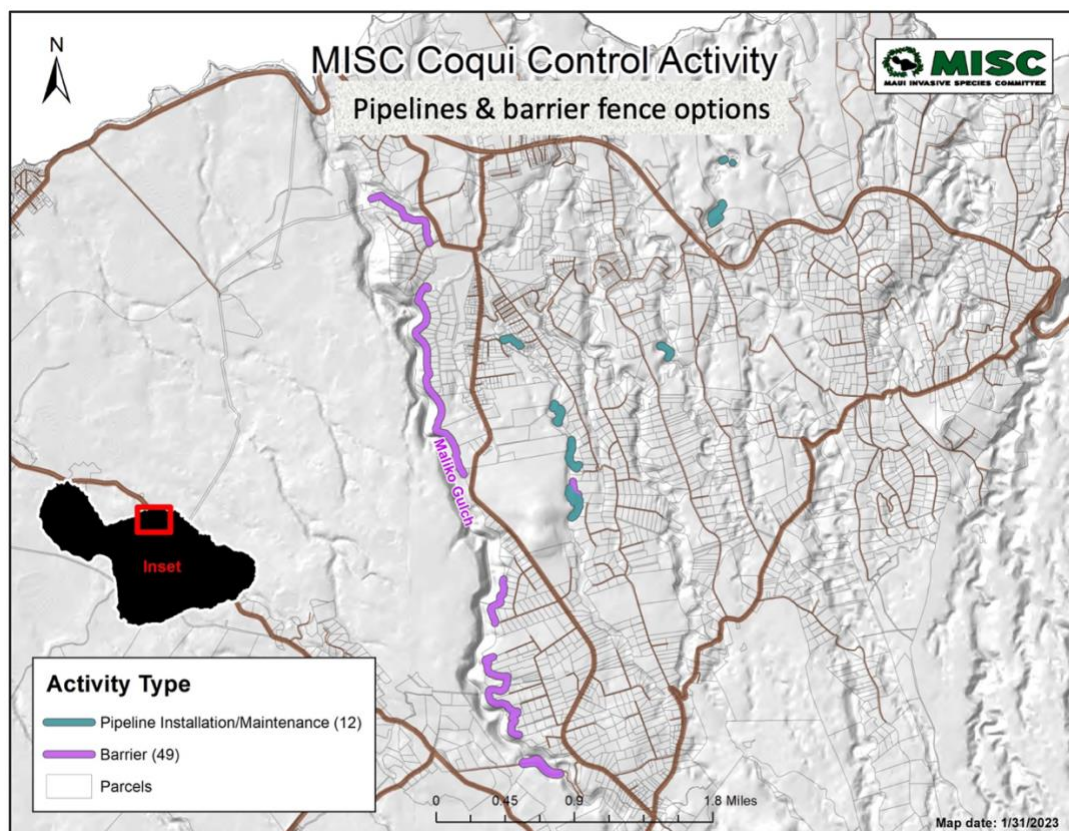


Figure 14. Coqui barrier fence design

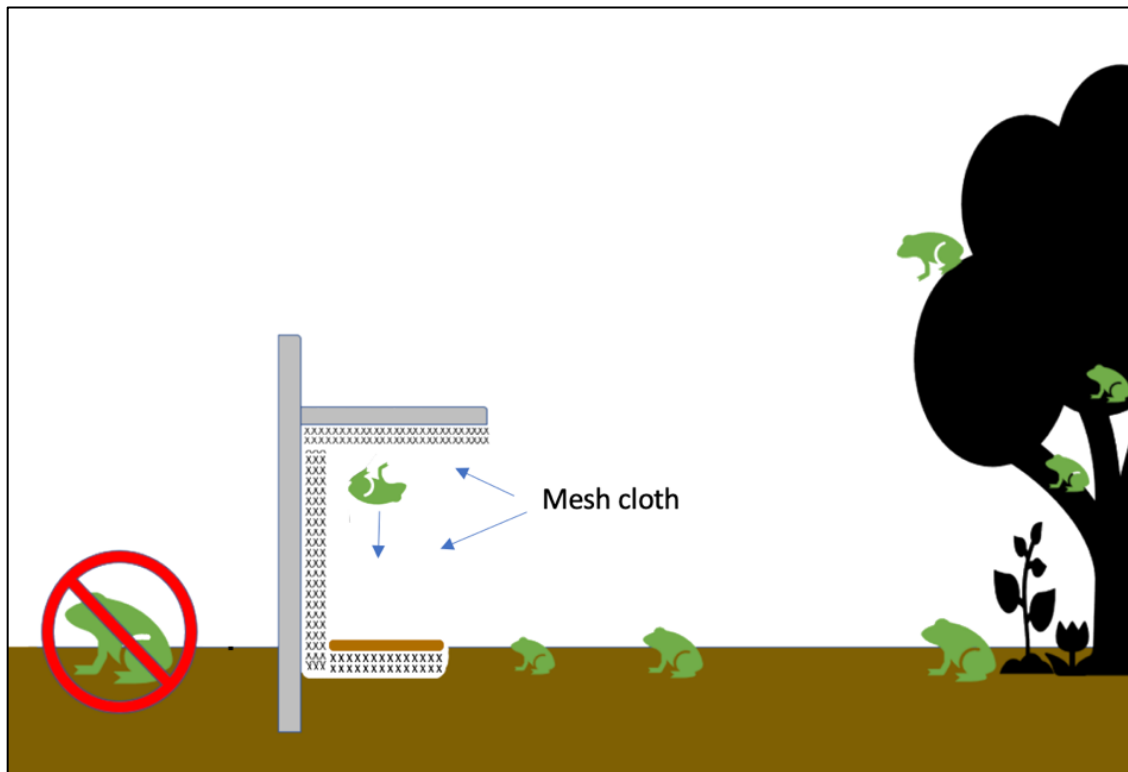


Figure 15. Coqui barrier fence installed by a local resident



Acoustic monitoring

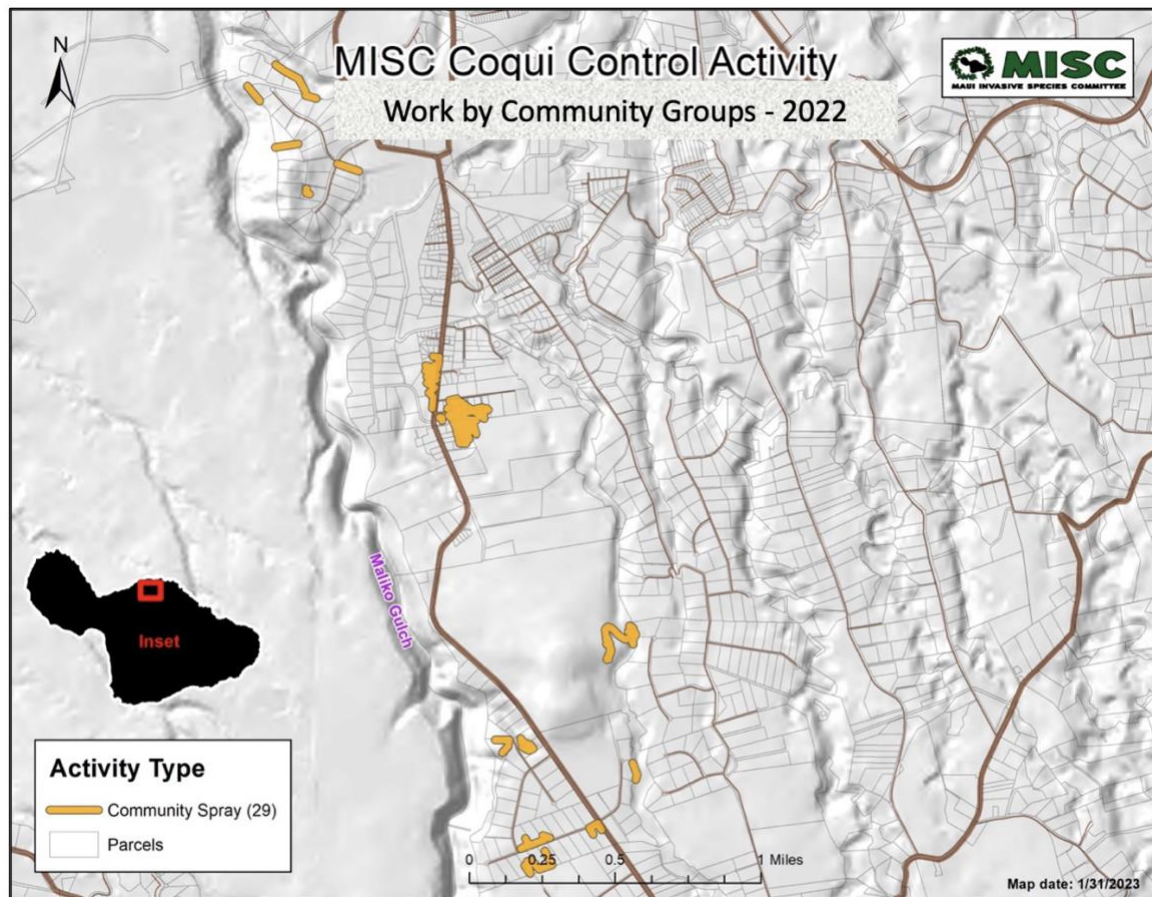
MISC has deployed 32 acoustic monitors in portions of the Ha'ikū-Mālika gulch infestation to determine whether this technology can help provide an independent assessment of control efficacy. Staff made regular site visits to ensure proper functioning of the monitors and retrieve data cards. Conservation Metrics is analyzing the data from the monitors.

Expand community engagement

Five community groups are actively controlling coqui frogs in their own neighborhoods: Ha'ikū Makai, Ha'ikū Hill, Cannery Mauka, Lower Kokomo, and Ha'ikū Mauka. Ha'ikū Town Acres is in process of forming a sixth community control group. MISC attended a meeting of the homeowners' association to discuss how the process works. The subdivision's governing document includes reference to working on coqui, underscoring the heightened awareness of the coqui issue and local commitment. Figure 16 shows the location of spray operations conducted by the community groups. MISC also worked with smaller groups of neighbors who participated in control operations but in a less structured way.

MISC provided residents with bags of citric acids and also pre-mixed citric acid solution. MISC's community liaison provided supplies, equipment and training, and participated directly with residents during some control operations. Community participants applied at least 9,905 gallons of citric acid solution and provided 131 hours of labor controlling coqui.

Figure 16. Location of work conducted by community coqui control groups



5. Detect and target high-priority species.

Maui: Survey and control work on invasive plants is shown in Figures 18, 20, and 23-24.

Miconia (*Miconia calvenscens*): Miconia is one of the most invasive and ecosystem-modifying of all tropical weed species. It is a challenging target due to its production of abundant seeds, seed longevity (20 years or more), and access challenges for ground crews. Miconia had gained a strong foothold in lower-elevation forests of East Maui before it was discovered, making eradication unlikely. Recent surveys have determined that mature and near-mature plants continue to establish in outlier areas, including portions of Haleakalā National Park. The overall strategy is containment—preventing its domination of native forests and its spread to West Maui. During the project period, a total of 3,012 acres were surveyed during ground and aerial operations and 28,612 plants were controlled (see Figure 18).

Ground operations: The Hāna miconia team conducted survey and control operations in the following areas: steep terrain between Makapīpī and Hanawī streams; the hala forest near the Hāna airport, where the number of mature miconia was very high; on portions of Hāna Ranch; and within a 300-meter buffer along the Hāna Highway between Ke‘anae and Hāna. Work near the highway focused on areas with mature plants to prevent spread of miconia seeds along the corridor. The crew controlled 2,216 mature and 26,349 immature plants, while covering 1,003 acres on the ground. The crew also conducted limited roadside surveys covering 361 acres.

Aerial operations: Aerial reconnaissance and control operations resumed after the Hawai‘i Department of Agriculture re-issued the label for use of herbicide paintballs (known as “herbicide ballistic technology”). Aerial surveys covered 1,648 acres and controlled 47 immature plants. Surveys concentrated on the eastern edge of the miconia invasion.

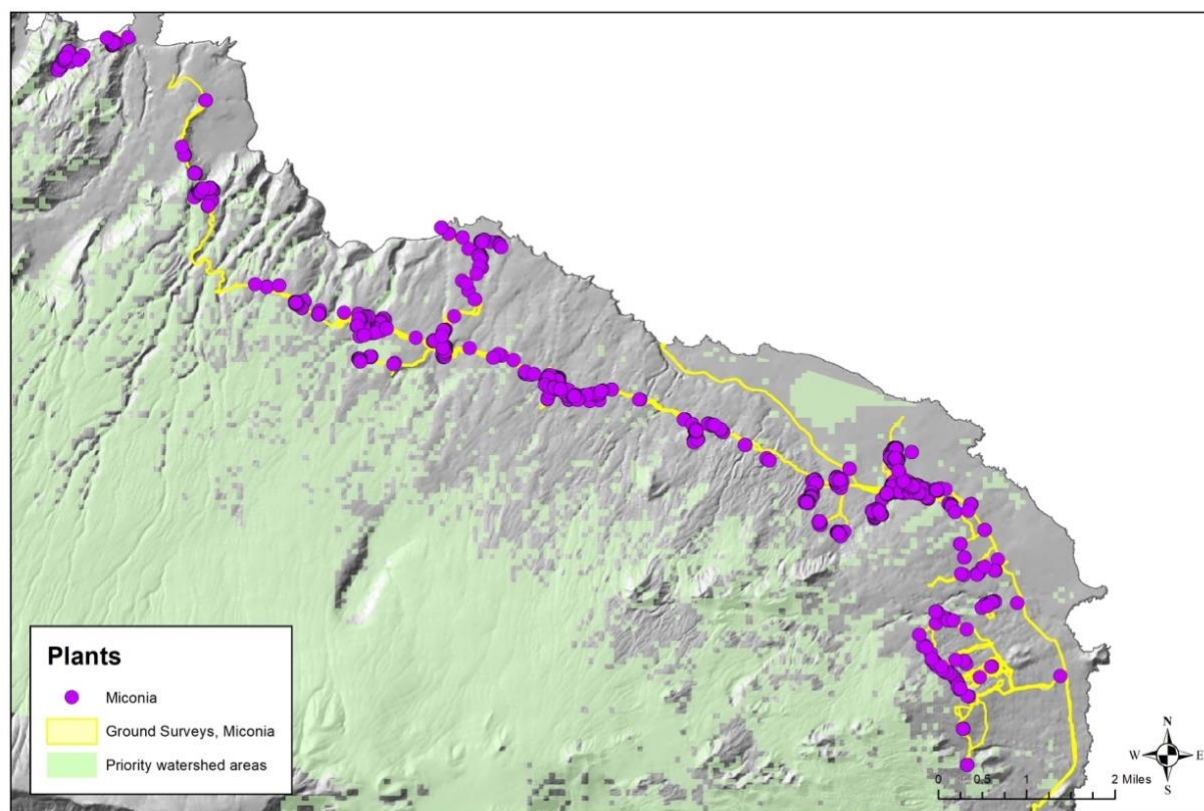
MISC has been working with Ryan Perroy at the University of Hawai‘i on a project that will use high-resolution aerial imagery to map the entire East Maui miconia infestation over the next several years. This project is still in a learning phase, but the potential outcome would be extremely helpful for prioritizing ground and aerial operations.

MISC remains hopeful that an effective biocontrol agent will be available soon. Gregarious butterfly larvae (*Euselasia chrysippe*) prefer to dine on miconia (see Figure 17). Its release into infested areas could help slow the spread of miconia. While it is unfortunate that Maui now has areas with dense stands of miconia, on the plus side, these locations would provide excellent field test sites for releases.

Figure 17. Gregarious butterfly larvae on miconia leaf (West Hawaii Today image)



Figure 18. *Miconia* control operations - 2022



Pampas grass (*Cortaderia jubata* and *C. selloana*): Pampas grass is a large, tussock-forming grass native to South America. Plants produce thousands of wind-dispersed seeds. Two *Cortaderia* species occur on Maui; both have proven to be aggressive invaders in natural areas of California, New Zealand, and South Africa. Pampas grass can invade a wide range of habitats, from lowland areas to near the island's summits. It has taken root in the rain forests of East Maui, and on the steep faces of Mauna Kahalawai. Progress on curtailing pampas grass in East Maui has been substantial, but the species has continued to spread in remote, inaccessible portions of West Maui.

Figure 19. Pampas grass in native forest

MISC staff conducted ground and aerial operations at residential sites, ranches, and forested areas, including the Waikamoi Preserve. Ground surveys included portions of Polipoli and Haleakalā Ranch. Aerial surveys took place in East and West Maui, including the Haipua'ena area of East Maui. A total of 540 immature and 559 mature plants were controlled working across 10,299 acres. Aerial operations covered 9,572 acres; the ground crew covered 727 acres (see Figures 19 and 20).

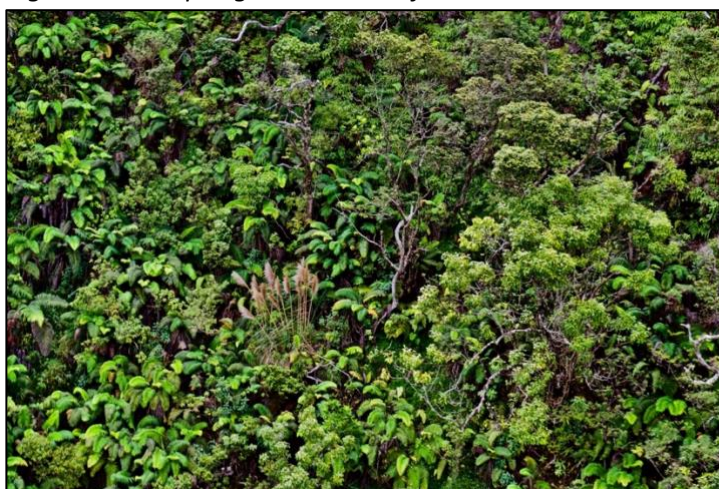
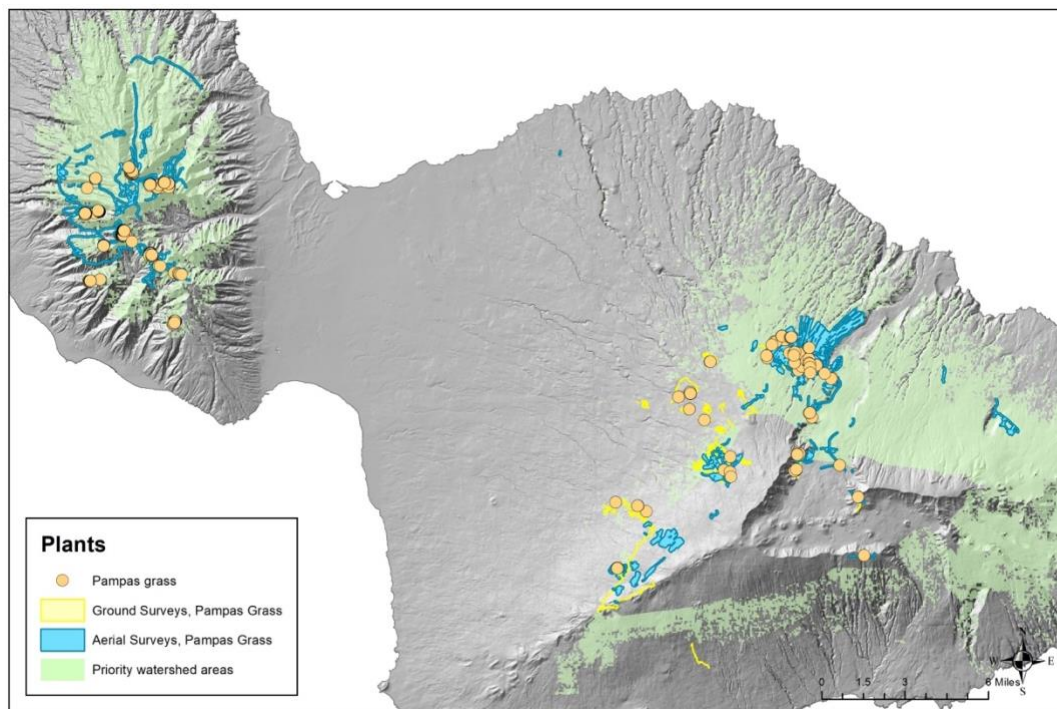


Figure 20. Survey and control work on pampas grass - 2022



Ivy gourd (*Coccinia grandis*): Ivy gourd is a rapidly-spreading perennial vine in the cucumber family that smothers vegetation, and spreads vegetatively and by seed dispersal. Both male and female plants are necessary for reproduction, which makes eradication more feasible. Ivy gourd seeds remain dormant for years, flowering after a heavy rain.

Ivy gourd sites are located in Waiehu, Kīhei, Lahaina, and Kapalua, and include residential properties, a golf course, an agricultural site, and a few semi-rural locations. Three new locations with mature plants were discovered, one in Maui Meadows and the others in Waiehu. With the exception of these new sites, few other locations have produced fruit in recent years. MISC conducted survey and control operations at all known locations, covering 318 acres. A total of 1,196 immature and 119 mature plants were removed. Even though ivy gourd is listed as a Hawai'i Noxious Weed, it is occasionally planted as a food source for use in local cuisines, making outreach especially important for finding new locations (see Figure 21).

Figure 21. MISC flyer promotes reporting new sites



Fountain grass (*Cenchrus setaceus*): Fountain grass is an early colonizer of lava fields and dry forests, and readily adapts to disturbed areas. This invasive grass out-competes native species and fuels wildfires. It has spread beyond control on the island of Hawai'i, where it blankets thousands of acres. This species is on target for eradication on Maui and likely has been eradicated from Molokai. Surveys covered 37 acres. No fountain grass plants were detected at Waiehu Dunes, Maui Lani, or the Waiehu water tank. The Pu'u o Kali site had 2 mature and 2 immature plants that were controlled. Figure 22 shows large fountain grass plants at the site from an earlier year.

Figure 22. Fountain grass at Pu'u o Kali in 2018



Spanish heath (*Erica lusitanica*): Native to southwestern Europe, Spanish heath is invasive in Australia and New Zealand, where it has been declared a noxious weed. The species prefers full sunlight, but will invade forests and take over the shrub layer of native ecosystems. MISC surveyed 67 acres within known infestation areas, including the Pu'u Pahu pasture area of Haleakalā Ranch, and controlled 110 immature and 76 mature plants.

Other species: Staff conducted surveys for four other species at known locations with no detections: rubber vine (*Cryptostegia grandiflora*), Osage orange (*Pomifera maclura*), Asian melastome (*Melastoma candidum*), and wax myrtle (*Morella cerifera*). MISC conducts opportunistic control of parasol leaf tree seedlings (*Macaranga tanarius*) during ivy gourd surveys at a nursery, to prevent spread via the nursery trade. This species is beyond control on West Maui. No contaminated pots were detected.

Molokai: Survey and control work on invasive plants is shown in Figures 25 and 26. The MoMISC team focused on 21 invasive plant species. Surveys covered 8,081 acres and control operations removed 1,292 plants (see Table 1 and Figures 25 and 26). Only half of the species targeted had plants controlled, *confirming* that many are in a monitoring phase and on track for eradication. MoMISC covered six different species during roadside surveys across the island: kahili ginger, parasol leaf tree, fountain grass, New Zealand flax, long-thorn kiawe, and gorse.

Table 1. Invasive Plant Survey & Control Operations – Maui and Molokai

Maui Target Species			
Common Name	Latin Name	Acres	Plants
Cat's claw	<i>Caesalpinia decapetala</i>	<1	0
Fountain grass	<i>Cenchrus setaceus</i>	37	4
Ivy gourd	<i>Coccinia grandis</i>	318	1,315
Pampas grass	<i>Cortaderia spp.</i>	10,299	1,099
Rubber vine	<i>Cryptostegia madagascariensis</i>	<1	0
Spanish heath	<i>Erica lusitanica</i>	67	186
Parasol leaf tree	<i>Macaranga tanarius</i>	<1	3
Osage orange	<i>Maclura pomifera</i>	<1	0
Asian melastome	<i>Melastoma candida</i>	1	0
Miconia	<i>Miconia calvescens</i>	3,012	28,612
Wax myrtle	<i>Morella cerifera</i>	<1	0
Milk thistle	<i>Silybum mariana</i>	4	0
	Subtotal Maui Species	13,738	31,220
Molokai Target Species			
Common Name	Latin Name	Acres	Plants
Mule's foot fern	<i>Angiopteris evecta</i>	14	37
Quail bush	<i>Atriplex lentiformis</i>	11	
Cat's claw	<i>Caesalpinia decapetala</i>	66	
Fountain grass	<i>Cenchrus setaceus</i>	1164	
Rubber vine	<i>Cryptostegia madagascariensis</i>	203	
Australian tree fern	<i>Cyathea cooperi</i>	45	8
Bo tree	<i>Ficus religiosa</i>	1377	1
Kahili ginger	<i>Hedychium gardnerianum</i>	1272	
Macaranga	<i>Macaranga tanarius</i>	1030	
Wood rose	<i>Merremia tuberosa</i>	6	
Tree daisy	<i>Montanoa hibiscifolia</i>	8	
Malabar chestnut	<i>Pachira aquatica</i>	7	15
Barbados gooseberry	<i>Pereskia aculeata</i>	37	
New Zealand flax	<i>Phormium tenax</i>	72	
Long-thorn kiawe	<i>Prosopis juliflora</i>	1473	
Kudzu	<i>Pueraria lobata</i>	1	
Multifloral rose	<i>Rosa multiflora</i>	9	
Fireweed	<i>Senecio madagascariensis</i>	1	4
Palm grass	<i>Setaria palmifolia</i>	2	
Cup of Gold vine	<i>Solandra maxima</i>	2	35
Gorse	<i>Ulex europaeus</i>	1282	
	Subtotal Molokai Species	8,081	1,292
Total		21,819	32,512

Figure 23. Invasive plant surveys on Maui

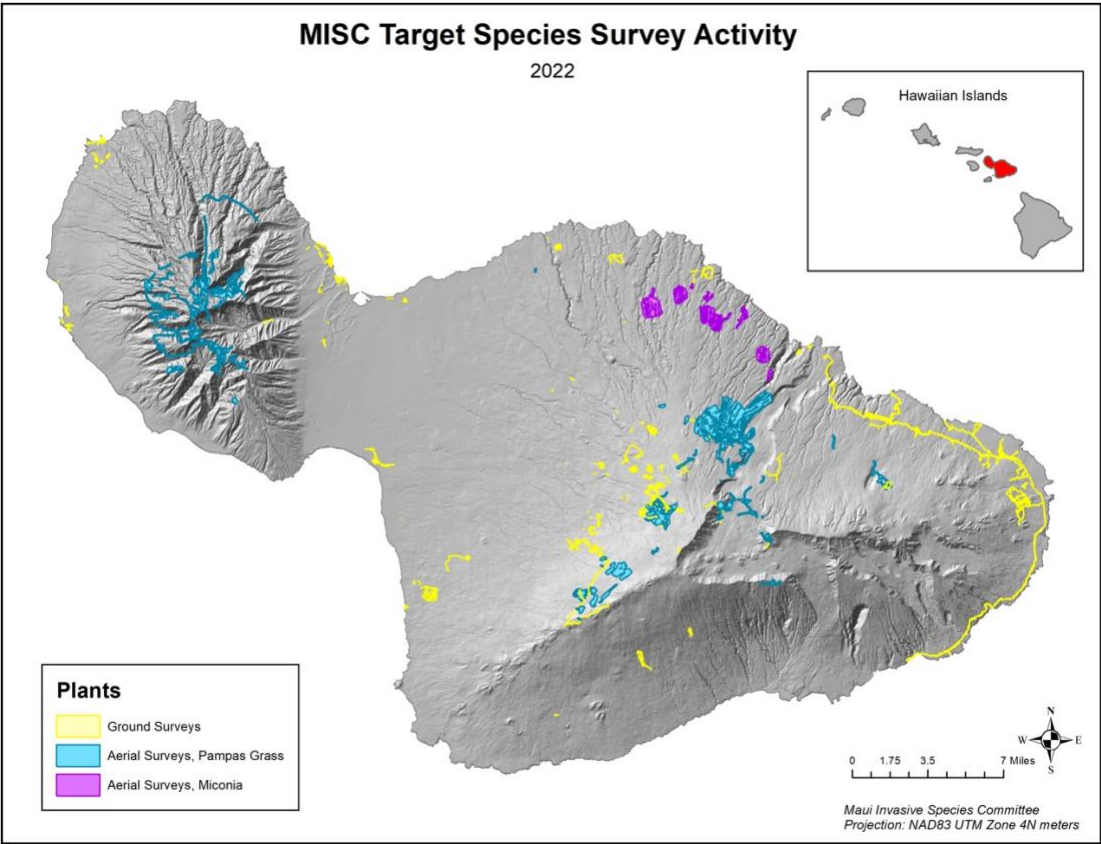


Figure 14. Invasive plant control on Maui

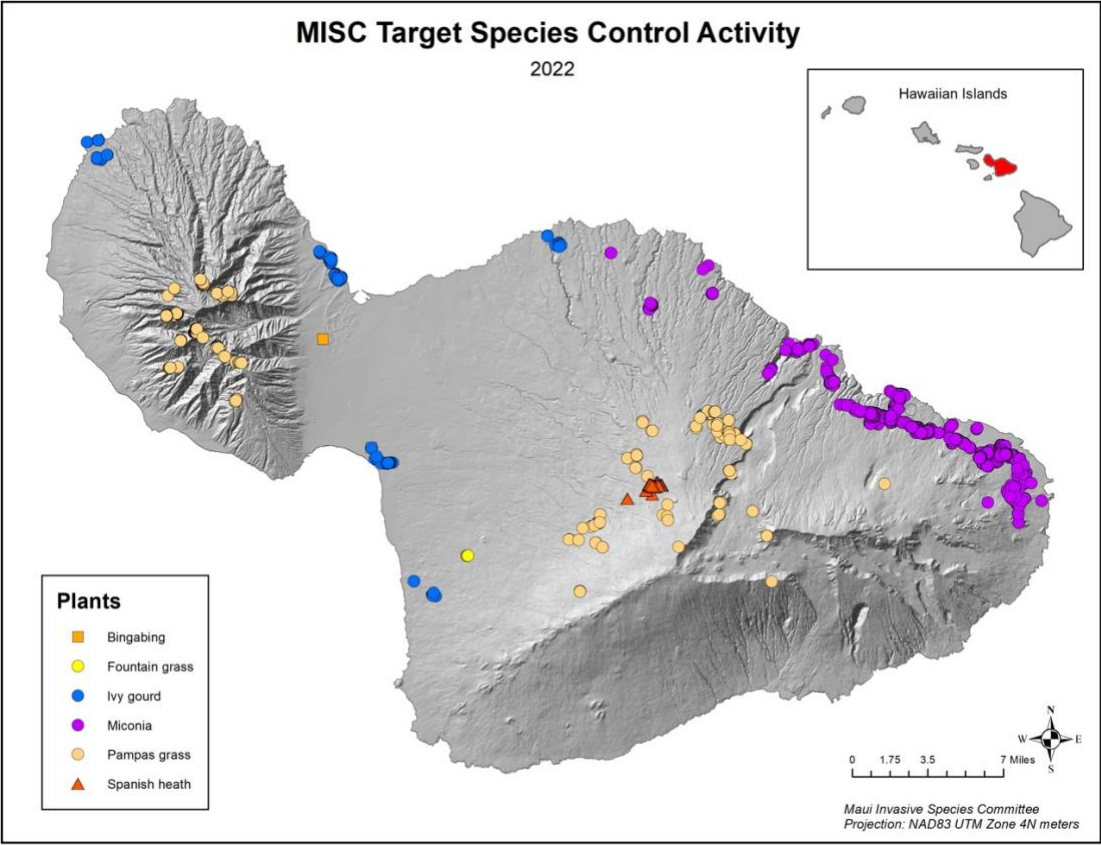


Figure 25. Invasive plant surveys on Molokai

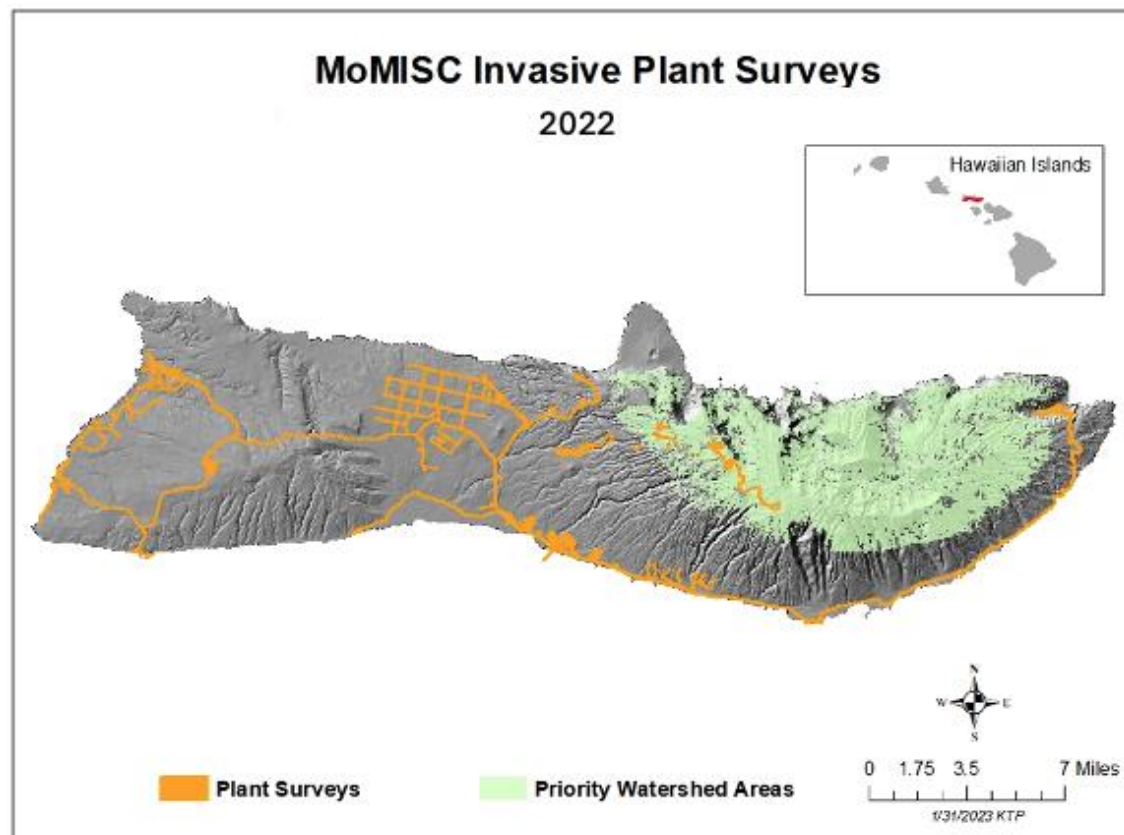
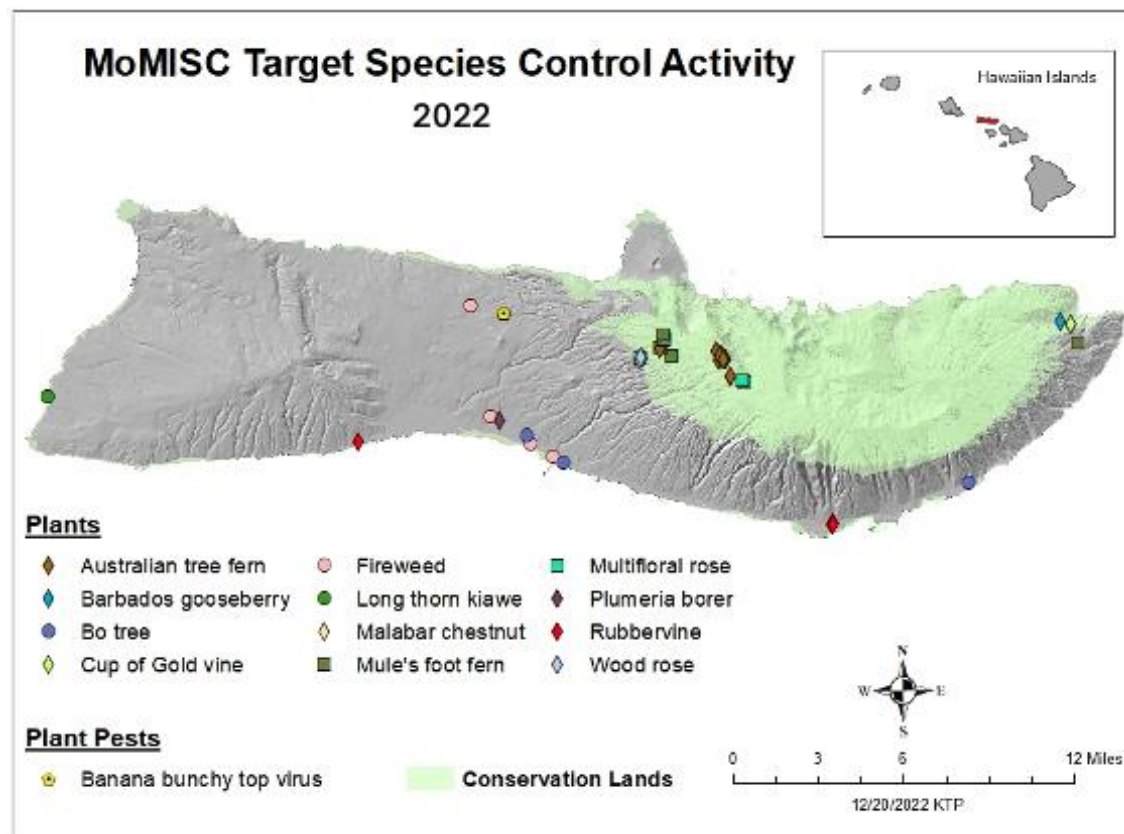


Figure 26. Invasive plant control work on Molokai



Invasive vertebrates

- Rabbits: MISC responded to three different reports of loose rabbits on Maui and removed one. Traps were set at two other locations without capture. A higher-priority response will be mounted for rabbits detected near natural areas.
- Mitred conures: MISC does not currently have access to the location where the population of mitred conures is located.
- Rose-ringed parakeets: Rose-ringed parakeets are a serious agricultural pest on Kaua'i, where numbers have reached an estimated 10,000+ birds and control efforts are underway to reduce the population. First detected on Maui in the summer of 2021, the most birds ever observed was 12 individuals. MISC removed five birds from the Napili area (three during 2022), and hand-captured one in South Maui. Two other birds were turned in or captured by members of the public. The latest surveys detected five birds. Additional resources are needed to prevent this species from spreading on Maui. MISC continues to share information about the species during outreach events to raise awareness and encourage reports of new sightings (see Figure 27).

Figure 27. Rose-ringed parakeet flyer



OUTREACH AND EDUCATION

Outreach and education activities focused on sharing the importance of invasive species work and collaborating on statewide outreach and education efforts. MISC and MoMISC activities reached at least 34,225 people through local print/online media, at least 300,000 through local broadcasts, and more than 1,000,000 through the international broadcast of the BBC segment on miconia. Staff engaged directly with an estimated 2,620 adults and students through outreach events, workshops, and classroom visits. An active online presence helped promote messaging about invasive species, with more than 200,000 views.

Outreach topics, venues and media approaches were diverse (see Table 2). The “Invasives” category covers events and presentations where the suite of MISC and MoMISC targets were featured. Little fire ants, plants, and coqui frogs received the most targeted outreach. Workshops included teacher workshops using the Maui-Mauka Conservation Awareness training, teacher training using the Hō’ike o Haleakalā curriculum, and efforts to advertise the opportunities. Landscape industry activities included articles or presentations about best management practices and the annual award given to a member of the landscape industry.

Table 2. Outreach and education activities by topic and category - 2022

Topic Areas	Media or Outreach Strategy						Total
	Broadcast	Event	Presentation	Print/online	Classroom	Workshop	
General Topics							
Biodiversity				3	1		4
Biocontrol				1			1
Conservation careers		2		3	1		6
Fire				1			1
Health				2			2
HISAM			2	3			5
Landscape industry		1		5			6
Watersheds			1	1	3		5
Workshops	1		2	5	2	7	17
Target Species							
EDRR			1	1	3		5
Invasives	2	6	4	8	1		21
Birds	1						1
Coqui	2		2	7			11
LFA	1		2	8	8		19
Plants	5		1	6	9		21
Plant pests				2		1	3
Marine			1				1
Totals	12	9	16	56	28	8	129

Highlights

Broadcast media: The media highlight of the year was BBC’s *Green Planet* series. The final episode in the series focused on “Human Worlds,” and included a segment on MISC’s work on miconia. In 2021, the BBC team spent a week on the ground and in the air capturing work on miconia, including use of herbicide paintballs (see Figure 28). This was an exceptional opportunity to tell the miconia story. Three MISC staff participated in an online panel that

followed a virtual screening of the episode on PBS Hawai'i. The segment aired on PBS in August 2022 and resulted in considerable news coverage in both broadcast and print media. Viewership of the series in the UK has been estimated at more than 3 million. Other coverage of the segment included:

- PBS Hawai'i Panel Discussion: [Green Planet Series Episode 5: Human Worlds](#)
- *Hawaii News Now*: [Maui's battle against miconia featured in new BBC series: The Green Planet](#)
- *Maui Now*: [Sir David Attenborough narrates BBC's Green Planet segment filmed in East Maui](#)
- *Maui News*: [BBC series to spotlight Maui crew's battle against invasive miconia](#)
- *Maui News*: [Tackling miconia crucial to native species, watersheds](#)

Figure 28. Clip from BBC's "The Green Planet: One Sharpshooter Way to Stop an Invasive Plant"



Print and online news media: More than 50 articles by and about MISC highlighted work conducted on Maui and Molokai (see Figures 29-30). Articles also focused on statewide activities, such as HISAM and "Stop the Ant" month.

Monthly "Kia'i Moku" articles in the *Maui News* provided information about the biodiversity and watersheds at risk, how the work is done, and the important role of community members. Topics included:

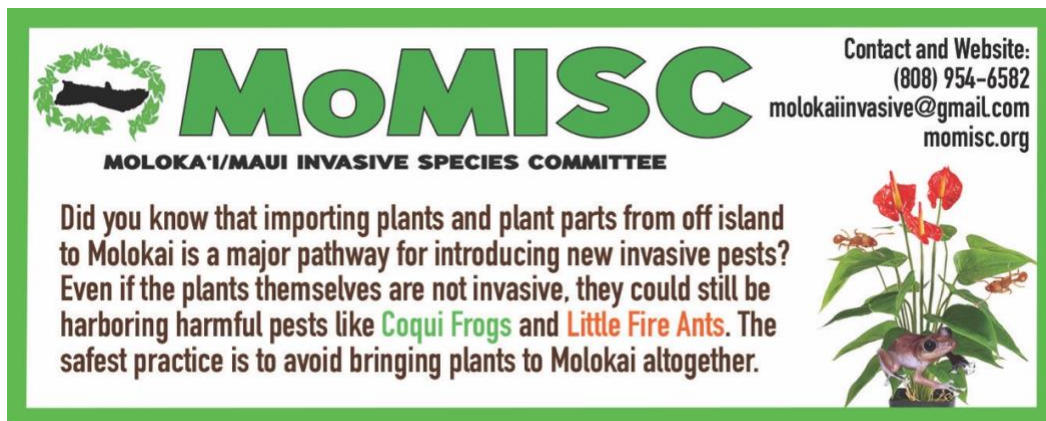
- [New Year's resolution? Twelve ways to protect Maui from invasive species all year long](#)
- [Avocado pest now widespread on Maui — but there is hope](#)
- [Gardening this spring? Plant pono](#)
- [Plant native, cultivate a connection](#)
- [Habits are key to preventing the spread of rat lungworm](#)
- [Dracula ant reemerges on Maui](#)
- [Protecting rabbits from new disease discovered on Maui](#)

- [Hawaiian crow may soon soar on Maui](#)
- [New training helps nurseries be on the lookout for invasive species](#)
- [Citizen Science can help Stop the Ant](#)
- [The sweet history of uala: A staple food to give thanks for](#)
- [Invasive species can cause native ecosystems to go up in smoke](#)
- [Stemming the tide](#)

Figure 29. MISC article on citrus greening in Hawai'i Landscape magazine



Figure 30. MoMISC ad in the Molokai Dispatch



Events, presentations, and displays: MISC and MoMISC had tables or displays at 9 public events and gave 16 presentations or online webinars. On Molokai, staff maintained an

information kiosk at the airport. Events included: Earth Day, Hawai'i Farmers Union United Annual Convention, Hui No Ke Ola Pono, Mālama Wao Akua Art Exhibition, Maui Arbor Day and Garden Expo, Hāna Limu Festival, a job fair, and the Maui Huliau Foundation conservation careers event. These events reached at least 1,533 individuals.

Landscape Industry: The annual Mālama i ka 'Āina Award recognizes a private citizen or business for helping prevent the spread of invasive species in Maui County. The event in 2022 marked twenty years since its inception. The award is co-sponsored by the County of Maui, the Maui Association of Landscape Professionals, and MISC. This year's recipient was Kevin Gavagan, Assistant Director of Engineering at the Wailea Four Seasons Resort, honored for his decades-long dedication to the resort's cultural program and efforts to restore Kaho'olawe's native landscape (see Figure 31). The plaque included a glass rendering of Gavagan's favorite native tree – the wiliwili – made by artist Jupiter Nielsen.

Workshops: MISC organized or collaborated with other partners on 8 workshops, including a teacher workshop on the Hō'ike curriculum, early detection training for Hawai'i Department of Transportation staff, 3 training events for tour guides, and a workshop on rapid 'ōhi'a death (see Figures 32 and 33). These activities reached an estimated 184 people.

Classroom visits: MISC staff provided classroom lessons for 447 students at 7 different schools using the Hō'ike o Haleakalā curriculum. MISC field staff occasionally help out to help make the connection between efforts to protect natural areas and potential careers in conservation.

Figure 31. Mālama i ka 'Āina award recipient Kevin Gavagan

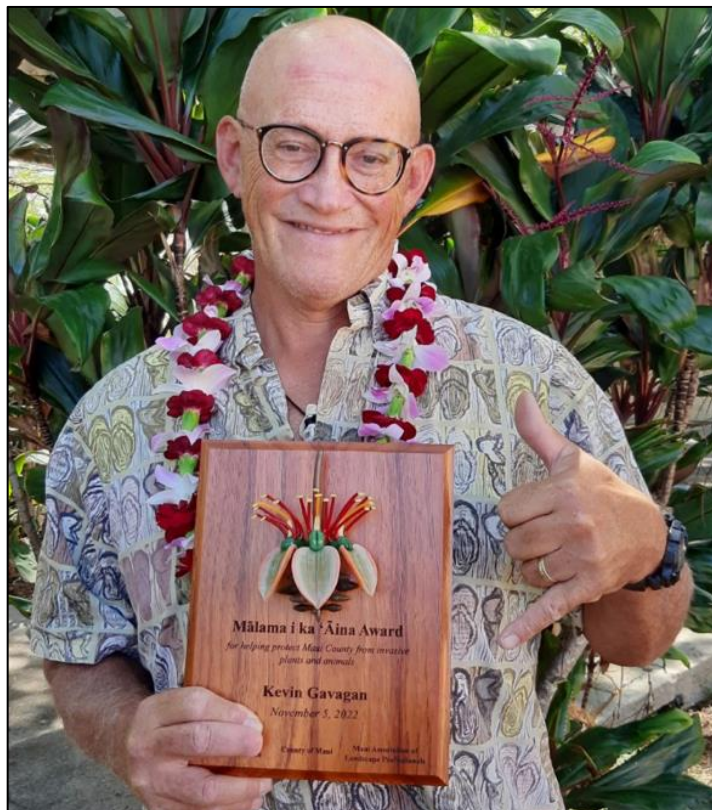


Figure 32. Hō'ike teacher workshop at 'Āhihi Kīna'u Natural Area Preserve



Figure 33. MISC Plant Coordinator highlighting areas to check for invasive plant hitchhikers



Online presence: Four different websites provided information and resources about MISC and MoMISC target species and programs ([MISC](#), [MoMISC](#), [Coqui-free](#), [Hō'ike o Haleakalā](#), and the [Maui-Mauka Conservation Awareness Training](#) program). MISC also maintained two social media platforms, [Instagram](#) and [Facebook](#), and a [YouTube channel](#). MISC used email campaigns to keep the public informed about our work. Total reach included more than 153,745 page views of webpages and a page reach of 191,943 for the social media platforms. Email campaigns reached at least 4,094 people. Figure 34 shows posts on MISC's Instagram page.

Figure 34. Instagram posts by MISC



For more information about this project:

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