



# Port of Entry/Exit Pest Monitoring Program

Chelsea Arnott



# Filling a Critical Gap

## Pest Monitoring at Ports of Entry

- Airports and seaports create major biosecurity risks
- Monitoring for targets that aren't currently on any federal or state watch list
- Complements HDOA's Biosecurity Authority and Program





# Port of Entry Monitoring Program

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## Funding

DOT funded the program as a pilot project. Funding expired March 31, 2022.

Program currently operates with HISC funds.

State Appropriation Bill to support HDOA's biosecurity programs

Congressional Direct Spending (CDS). Includes budget for program expansion – Assigned to DLNR-HISC



# Port of Entry Monitoring Program

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## Targets

Mosquitoes (*Aedes* spp., *Culex* spp., *Anopheles* spp.). Lead DOH



Africanized bees -AHB (*Apis mellifera scutellata*). Leads UH & DOA



Coconut rhinoceros beetle - CRB (*Oryctes rhinoceros*). Lead DOA



Ants (*Little fire ant* and *red imported fire*). Lead DOA



Japanese beetle (*Popillia japonica*). Lead DOA





# Port of Entry Monitoring Program

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## Monitoring sites



Six airports:

- Lihue Airport
- Daniel K. Inouye International Airport
- Molokai Airport
- Kahului Airport
- Hilo International Airport
- Ellison Onizuka Kona International Airport



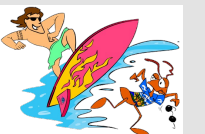
Four seaports:

- Honolulu Harbor
- Nawiliwili Harbor
- Hilo Harbor
- Kawaihae Harbor



# Platform for Collaboration

- Brings together five different State departments (HDOT, HDOA, HDOH, DLNR & UH)
- Capitalizes on existing capacity from partner projects.
- Provides opportunities to train partner agency staff
- Sponsors research projects to evaluate new technology
- Economic analysis to evaluate the cost benefit of airport surveillance





# Mosquitoes

## Biology/Distribution

*Aedes aegypti* (Dengue fever) is only present on Big Island

*Anopheles* spp. (malaria) is not present in Hawai'i

*A. aegypti* was intercepted at Kahului Airport (2017) & Honolulu Harbor (2021)

## Economics

The benefit to monitoring and rapid responding to new mosquitos:

7:1 Benefit-Cost ratio for Dengue

33:1 Benefit-Cost ratio for Zika

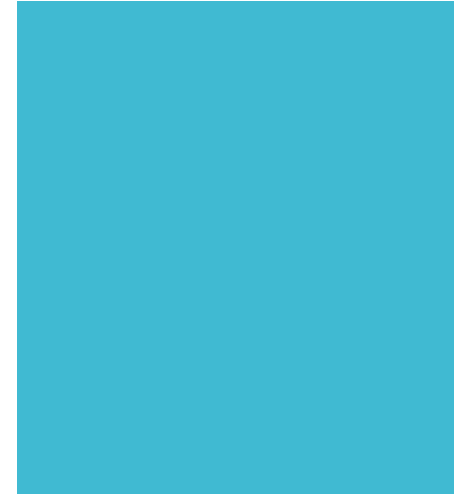
\$14.9 billion impact to the tourism industry

## Impacts

New species of mosquitoes can **transmit new diseases**

Decline in visitor arrivals

Human health impacts to visitors, residents, and native wildlife



# Mosquitoes

- Mosquito ID training for Maui VC office
- Successful interception of *Aedes aegypti* at OGG in Nov. 2017
- SOP for mosquito monitoring at airports
- Increased mosquito surveillance capacity for DOH
- Funded research to test existing technology and develop new trapping technology. DOH updating light trap.
- Activation of notification chain protocol in Aug. 2021 - Interception of *Ae. aegypti* at Honolulu Harbor





## Mosquito traps



# Mosquitoes



Setting up a Biogents trap at Kona airport



Setting up a CDC light trap at Hilo airport



Maui staff setting mosquito traps at Kahului airport

# Africanized Bees

## Biology/Distribution

More aggressive, reproduce quickly, produce less honey

Established in the continental U.S. as close as California

Not present in Hawai'i

## Economics

\$220M Bee Keeping Industry

\$10 million queen bee industry

\$14.9 billion impact to the tourism industry

## Impacts

Delayed and Grounded flights

Airport closures





# Africanized Bees

- Capacity to perform DNA analysis at UH
- Increased frequency of monitoring
- Capacity for swarm trap processing
- Each island has internal capacity
- Facilitation of AHB action plan meetings
- AHB training in AZ for HDOA staff
- Procured materials/supplies for response
- 152 swarms intercepted to date (all AHB negative)







## HDOA staff Training the ISCs







## Setting Up Swarm Traps







## Swarm Trap Processing Training







# Africanized Bee Training in Arizona





# Coconut Rhinoceros Beetle

## Biology/Distribution

Currently only on O'ahu

MP and CRB Response Team has helped to contain CRB to a single island

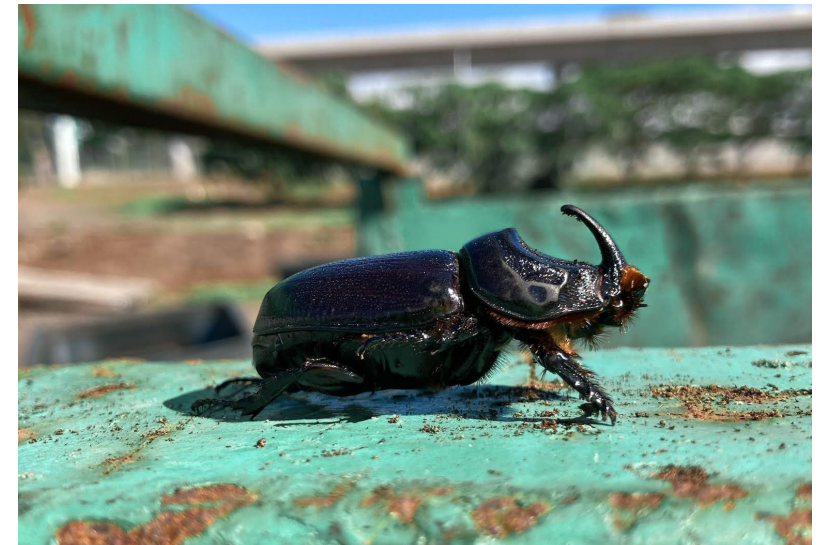
## Impacts

Hawaii's airports are landscaped with about **3,200 palms**

Palms infested with CRB become a hazard to people, equipment, and airport property

The **cost to remove and replace a single palm can be over \$2,500**

**\$8 million to remove and replace palms at all airports**



# Coconut Rhinoceros Beetle

- Training to ISCs & DOT staff
- 2 CRBs detected at HNL
- Each island has internal capacity
- Palm surveys
- Database (NRDS)
- Signs
- BMPs







## CRB Training for the ISCs







## CRB Training for Airport Staff





# Invasive Ants

## Biology/Distribution

Little Fire Ant (LFA) is currently widespread on the eastside of Hawai'i island

Red imported fire ant (RIFA) is not present in Hawai'i, but established in the continental U.S. as close as California

## Economics

Control costs for LFA on Hawai'i island alone averages \$200 million per year

\$200 million per year in damages to tourism and agricultural sectors if RIFA does establish

## Impacts

High populations of LFA in previous years prompted complaints from ITO workers from being stung at check-in counters.

Stinging ants would impact tourism and already impact agricultural production on Big Island

Stings can cause blindness in pets





# Invasive Ants

- Routine surveys at all airports
- Reduction in LFA infestation at ITO
- Streamlined survey system – NRDS (app tracks barcodes in vials)
- Improved communication with DOT staff at ITO and KOA
- BMPs
- Signs



# Japanese Beetle

- Widespread and destructive pest of turf, landscape, and ornamental plants and field crops in the US.
- Highly polyphagous species (feeds on > 300 plant species)
- Currently the most widespread turfgrass pest in the US
- Can have significant effects on Hawaii's urban forest and landscape industry and diversified agriculture.



# Future of the Program

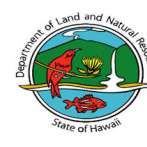
- Expand targets.
- Expand to all seaports.
- Expand to military installations.
- Establish collaboration with other states and islands in the Pacific Region.



# Thank you!

Hawaii Invasive Species Council (HISC)  
Port of Entry/Exit Pest Monitoring Program

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# Invasion of Little Fire Ants

Michelle Montgomery  
Hawai`i Ant Lab



What kind of Hawai`i do  
YOU want to live in?

Think about it... VISUALIZE



# Little Fire Ant (*Wasmannia auropunctata*)

- One of the most invasive ant species in the world
  - #2 on the global “scary scale”
- Tiny (1.5mm in length)
- Many queens
- Build 3-d supercolonies
- Opportunistic nesters
  - Terrestrial/arboreal
  - No mounds
- Adaptable to a variety of climates and zones
  - Tropical, subtropical, Mediterranean, temperate
  - Indoor, outdoor





# Impacts

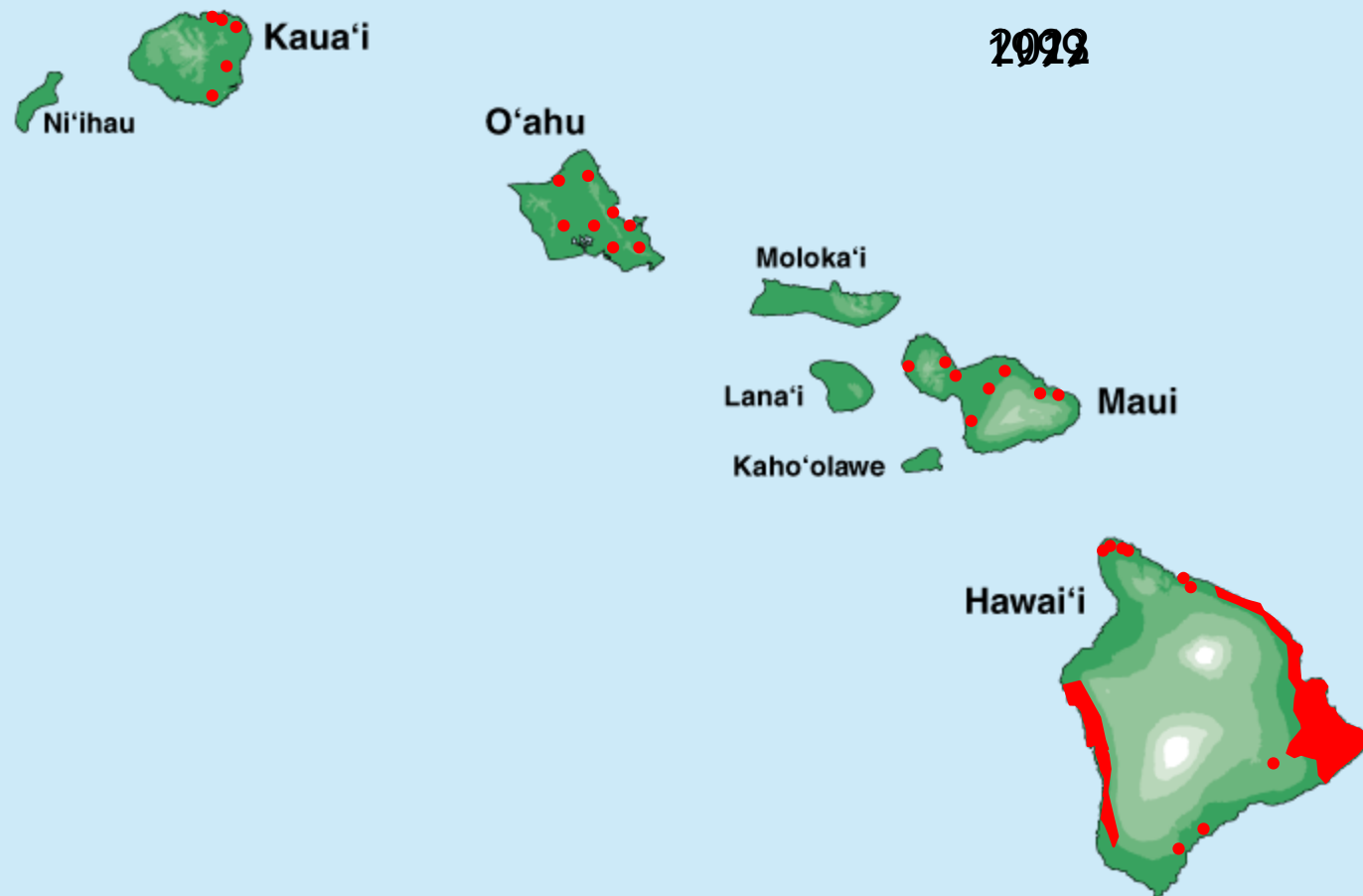
- Residential
  - People
  - Pets
- Agriculture
  - Farm phytophagous insects/vectors of plant diseases
  - Competition for nectar resources/reduced pollination
  - livestock
  - Sting workers
- Forest/Undisturbed areas
  - Extirpates other arthropods
  - Birds, reptiles, mammals





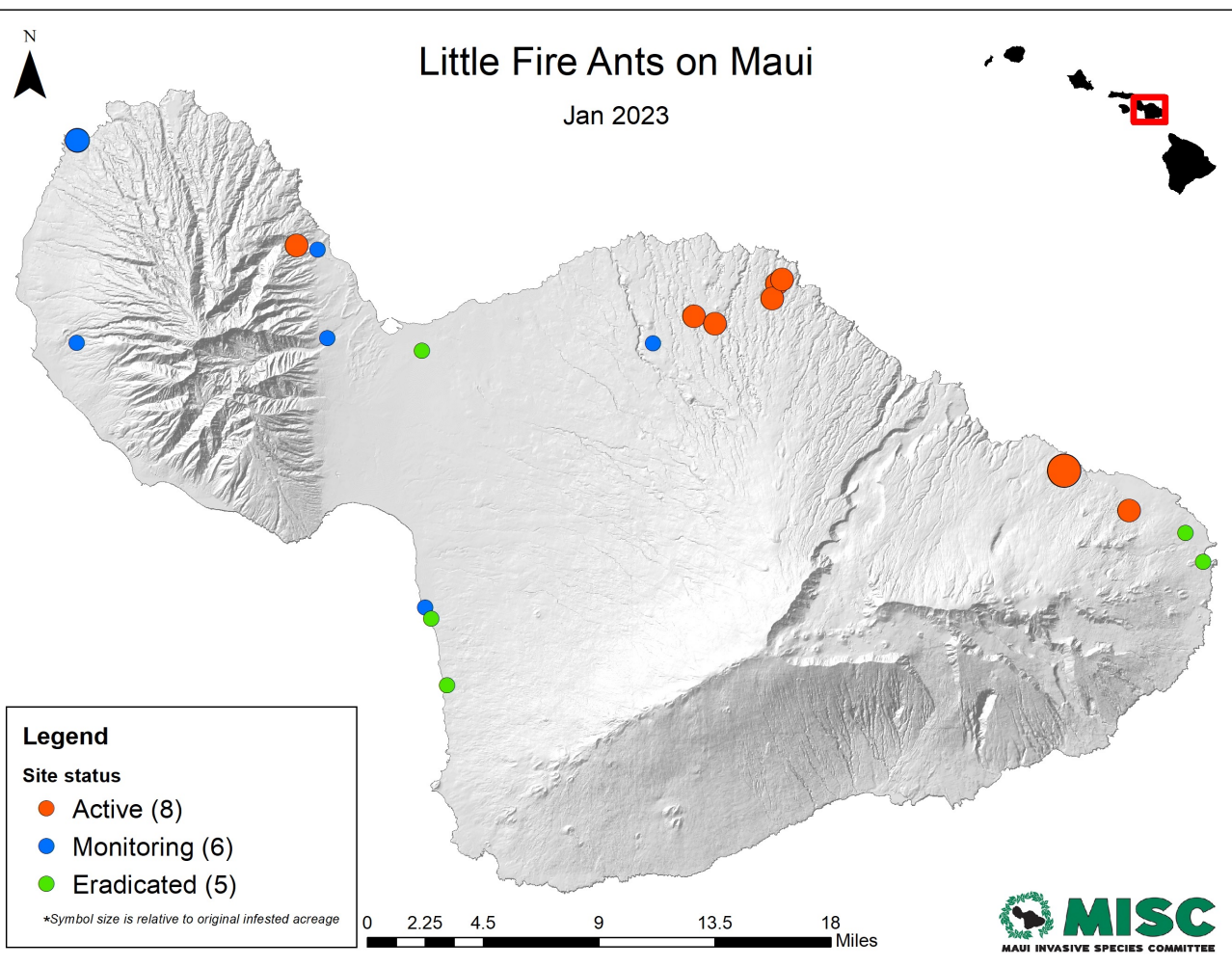
# LFA in Hawai`i

- Detected in 1999 on Hawai`i Island (Big Island) and Kaua`i
  - Introduced early/mid 1990's to Hawai`i Island nursery system
  - Spreading for ~30 years of
- Steady stream of new detections on Maui, O`ahu, and Kaua`i since 2015
  - More infestations exist than we know of





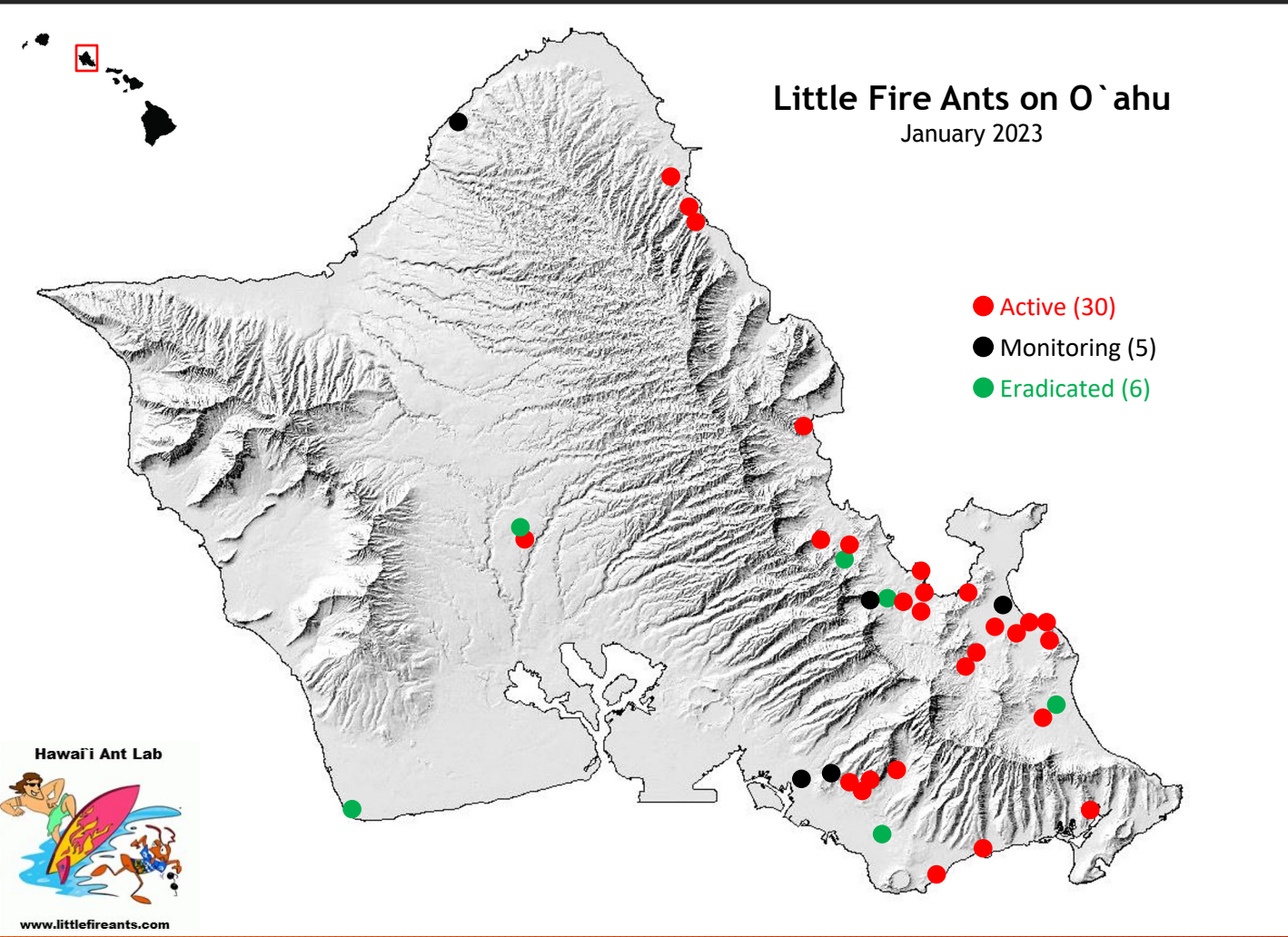
# Progression and status - Maui



- First detected in 2009
- New site detections every year since 2013
  - Most infestations < 9 ac
- Largest infestation > 175 ac



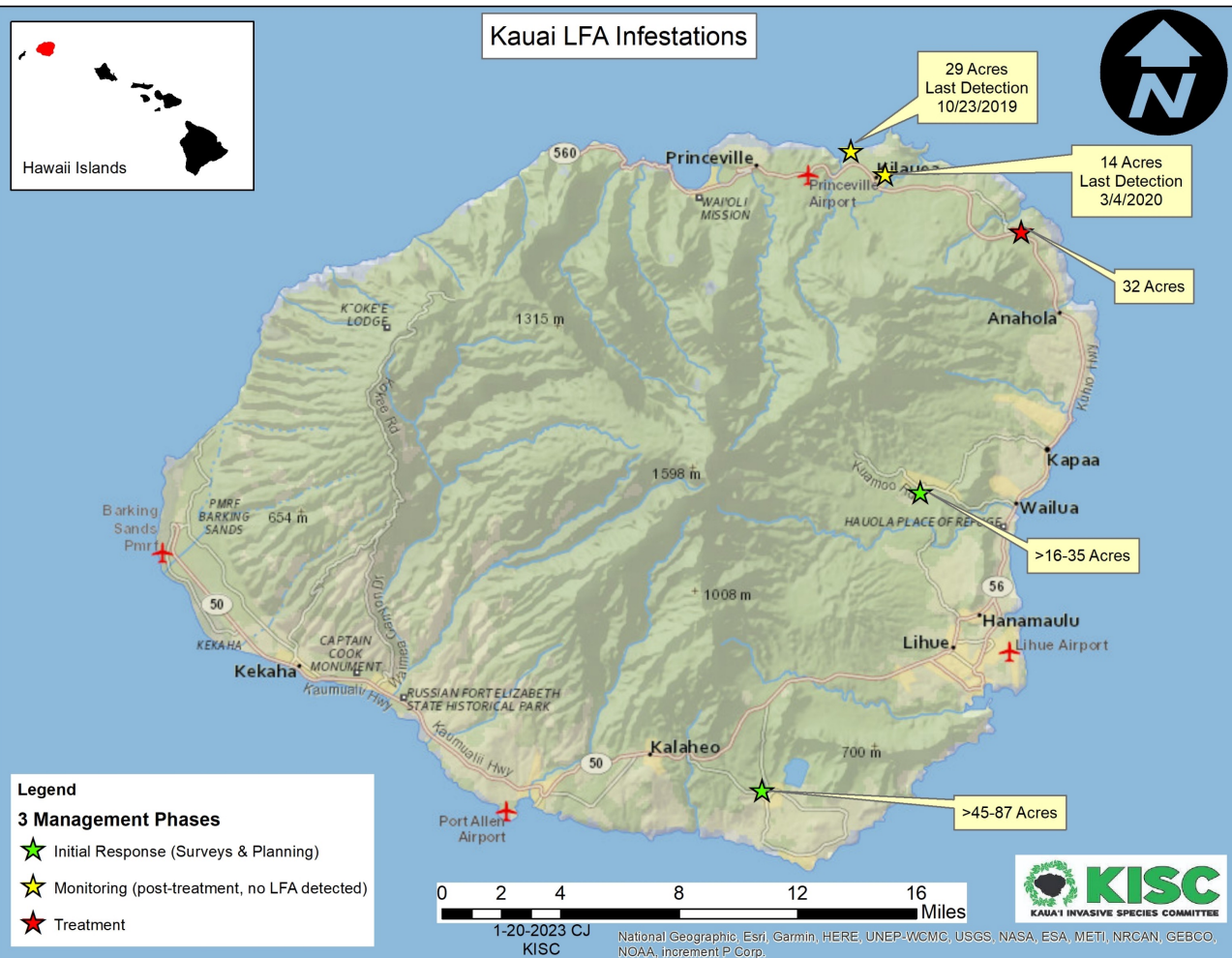
# Progression and status - Oahu



- First detected in 2013
- New site detections every year since 2013
  - Most infestations < 5ac
- Largest infestation > 60 ac
- Some “repeat offender” sites



# Progression and status - Kauai



- First detected in 1999
- New site detections every year since 2019
  - 2 large infestations detected 2022
- Largest infestation > 45 ac



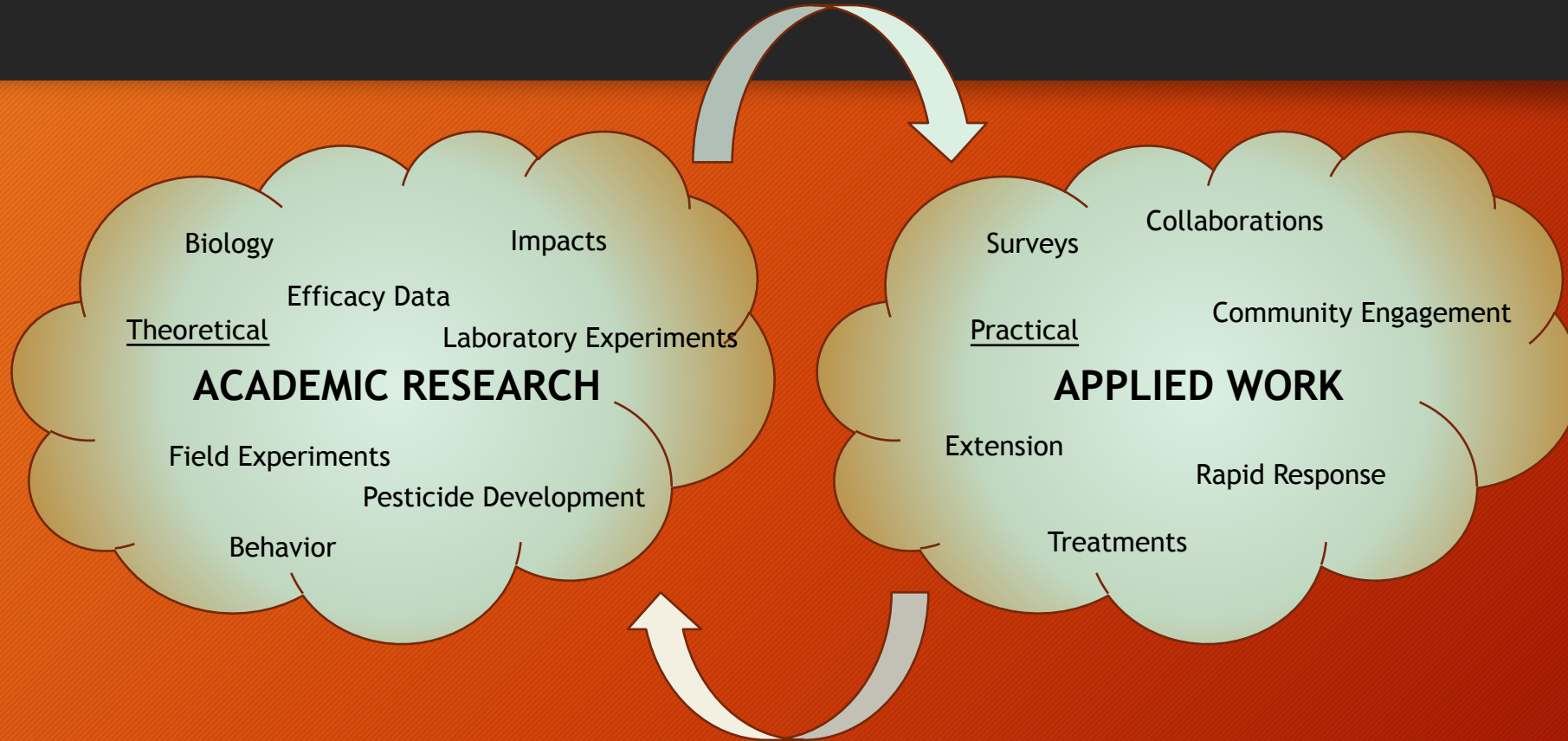
Hawai`i is at a crisis point in regards to LFA

# WHAT'S BEING DONE?

...AND WHO'S DOING IT?



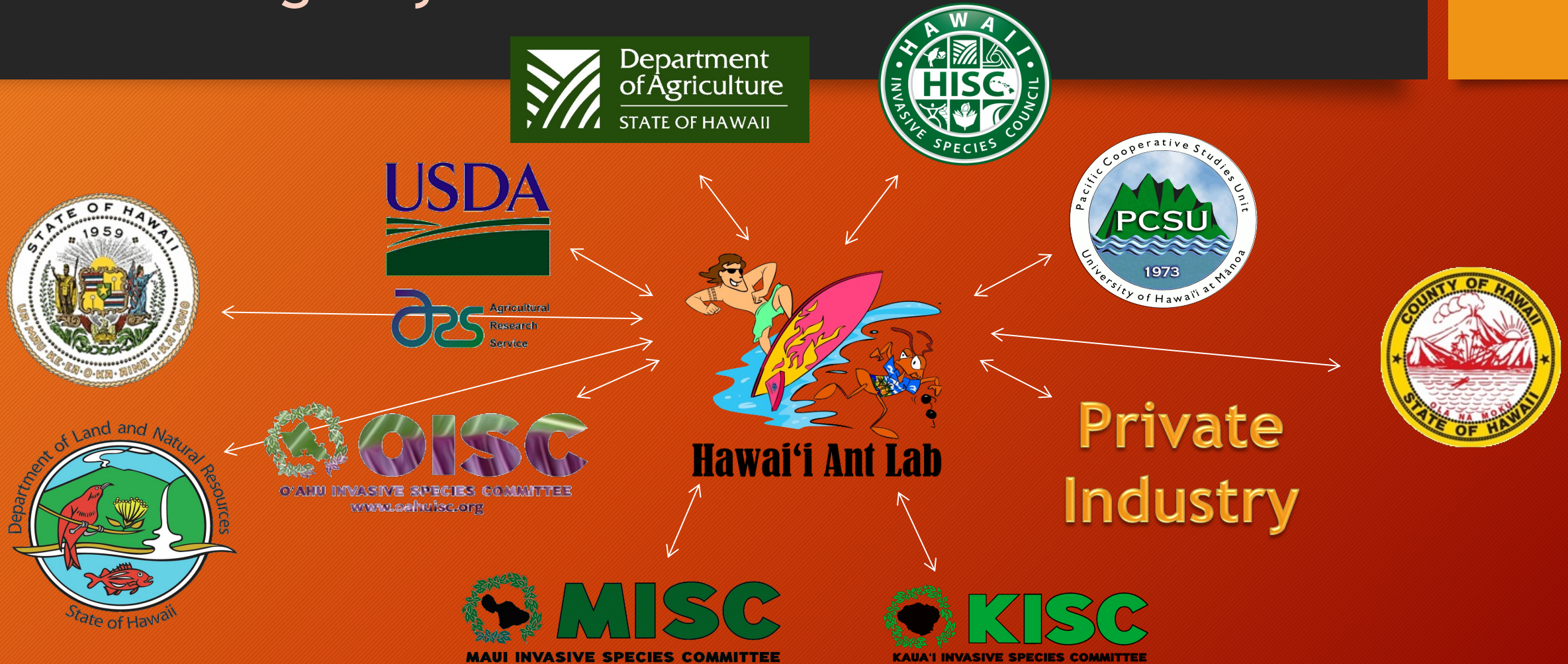
Information and methods developed through academic research is applied in real-world situations to detect, manage, and eradicate pests.



Observations from applied work may support findings from academic research or lead to increased need of additional research.



# Interagency Collaborations



Expertise - Man power - Community relationships - Funding - Policy



# Taking Action

- Hawai`i Ant Lab (Hawai`i and Oahu islands)
- Big Island Invasive Species Committee
- Maui Invasive Species Committee
- O`ahu Invasive Species Committee
- Kaua`i Invasive Species Committee
- Hawai`i Department of Agriculture

A leading research body on LFA in the world

Leading response group for Hawai`i and O`ahu islands

Rapid response, survey, management, eradications

Outreach, extension, trainings, community and industry consulting

Pesticide registrations

Consultant and project partner for island ISCs, HDOA, and other Pacific Island nations and territories



# Taking Action

- Hawai`i Ant Lab (Hawai`i and Oahu islands)
- Big Island Invasive Species Committee
- Maui Invasive Species Committee
- O`ahu Invasive Species Committee
- Kaua`i Invasive Species Committee
- Hawai`i Department of Agriculture

Survey

Outreach, extension, trainings

Community management assistance



# Taking Action

- Hawai`i Ant Lab (Hawai`i and Oahu islands)
- Big Island Invasive Species Committee
- Maui Invasive Species Committee
- O`ahu Invasive Species Committee
- Kaua`i Invasive Species Committee
- Hawai`i Department of Agriculture

Leading response group for Maui LFA

Rapid response, survey, management, eradications

Outreach, extension



# Taking Action

- Hawai`i Ant Lab (Hawai`i and Oahu islands)
- Big Island Invasive Species Committee
- Maui Invasive Species Committee
- O`ahu Invasive Species Committee
- Kaua`i Invasive Species Committee
- Hawai`i Department of Agriculture

Partner response group for O`ahu

Rapid response, survey, management, eradication

Outreach, extension



# Taking Action

- Hawai`i Ant Lab (Hawai`i and Oahu islands)
- Big Island Invasive Species Committee
- Maui Invasive Species Committee
- O`ahu Invasive Species Committee
- Kaua`i Invasive Species Committee
- Hawai`i Department of Agriculture

Leading response group for Kaua`i LFA

Rapid response, survey, management, eradications

Outreach, extension



# Taking Action

- Hawai`i Ant Lab (Hawai`i and Oahu islands)
- Big Island Invasive Species Committee
- Maui Invasive Species Committee
- O`ahu Invasive Species Committee
- Kaua`i Invasive Species Committee
- Hawai`i Department of Agriculture

State regulatory authority

Rapid response, survey, management, eradications (Agriculture)

Bound by lots of “red tape”



# Taking Action

- Hawai`i Ant Lab (Hawai`i and Oahu islands)
- Big Island Invasive Species Committee
- Maui Invasive Species Committee
- O`ahu Invasive Species Committee
- Kaua`i Invasive Species Committee
- Hawai`i Department of Agriculture

Working together and with HISC to  
develop long term action plans  
Islands  
State-wide



# What's the future look like?

For LFA in HI

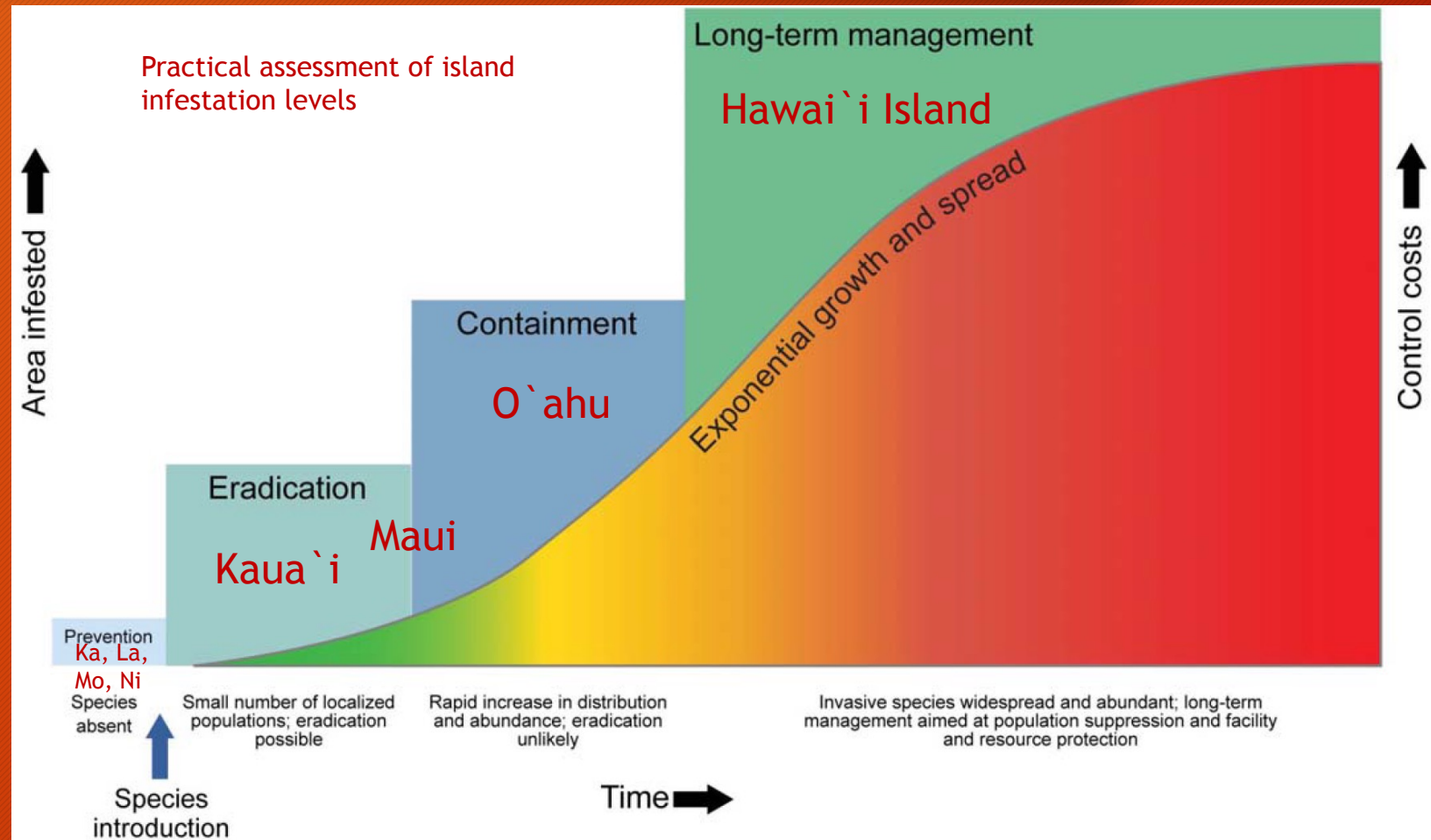


# Cost-Benefit

LFA are here to stay. Mitigation efforts ongoing.

Efficacy of efforts over time direct result of available resources.

- Early investment = available resources = better response = slower spread and lower impacts = lower long term cost
- Lack of or poor investment = insufficient response = faster spread and greater impacts = higher long term costs

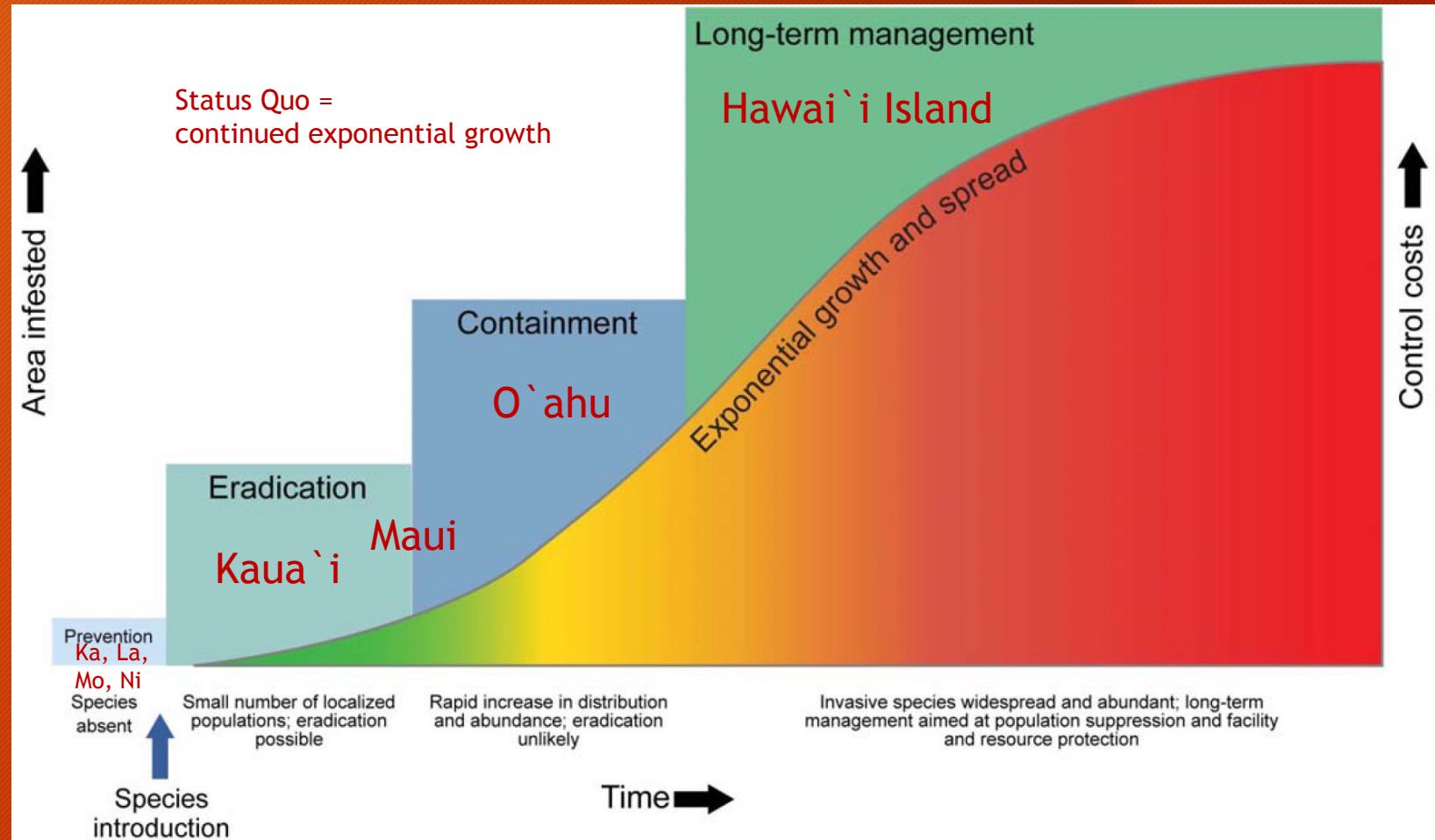




# Cost-Benefit

LFA are here to stay. Mitigation efforts ongoing.

- Resources must be sustainable
  - To meet shifting needs as situations change
  - Current and past resource availability marginal at best
    - Non-recurring
- HI is at a tipping point





What kind of Hawai`i do  
YOU want to live in?

Thank you





# The Dual and Synergistic Impacts of Climate Change & Invasive Species

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UNIVERSITY OF GUAM  
Cooperative Extension & Outreach





# Examples of how climate change exacerbates the impacts of invasive species...

- Climate change is increasing the movement, establishment, and spread of new and existing invasive species
- Increased wildfire, drought, and storm severity due to climate change reduces the resilience of ecosystems, making them more prone to invasions
- 25% of introduced species will be novel (they are being moved outside their native range for the first time) as a result of climate change
- Warmer, more acidic oceans reduce coral reef resilience and their ability to buffer storms
- Increase in disease spread due to warmer temperatures



*In native 'ōhi'a forests (top) that have been invaded by strawberry guava (bottom), there is a 27% reduction of water going into soils, streams, and groundwater systems—a 55% reduction in times of drought*



## Impacts from this confluence include:

- Increased impacts to soil moisture, infiltration capacity & rate, and recharge
- Increased biodiversity loss
- Accelerated loss of native ecosystems
- Impacts to agriculture and greater food insecurity
- Risks to public health
- Impacts to trade and the economy
- Damage to property and infrastructure
- Magnified disaster risk: landslides, floods, and fires
- Reduced efficacy of traditional weed control methods

*Conversely, protecting forest and reef ecosystems from invasive species improves their resilience and ability to withstand climate change.*

***But how do we plan and manage natural resources in so much uncertainty? What does climate science tell us?***



*Miconia calvescens*



# Formation of Regional Invasive Species & Climate Change Management Networks to:

- Bridge these two historically separate disciplines/networks
- Focus attention on research needs and findings
- Communicate research findings to managers and decision-makers



## Regional Invasive Species & Climate Change (RISCC) Management Networks

Welcome!

The RISCC management networks reduce the joint effects of climate change and invasive species by synthesizing relevant science, sharing the needs and knowledge of managers, building stronger scientist-manager communities, and conducting priority research.

Explore resources for your region:

[PACIFIC ISLANDS](#) [NORTHWEST](#) [NORTH CENTRAL](#) [SOUTHEAST](#) [NORTHEAST](#)





The Pacific Regional Invasive Species and Climate Change (Pacific RISCC) Management Network facilitates research and practical communications on these interacting change drivers in Hawaii and US-Affiliated Pacific Islands



# Example product: Monthly Manager Research Summary

## Increasing the resilience of ecological restoration to extreme climatic events

Chela J Zabin<sup>1,4</sup>, Laura J Jurgens<sup>2</sup>, Jillian M Bible<sup>3</sup>, Melissa V Patten<sup>4</sup>, Andrew L Chang<sup>1,4</sup>, Edwin D Grosholz<sup>4</sup>, and Katharyn E Boyer<sup>4</sup>

Extreme climatic events (ECEs) are increasing in frequency and magnitude as part of global climate change, with severe consequences for both nature and human societies. While many restoration projects account for gradual climate change, ECEs are rarely considered. Through a literature search and the use of expert opinion, we reviewed the impacts of ECEs on habitat restoration projects, and the degree to which they were resilient. ECEs had overwhelmingly negative impacts on habitat restoration, although some projects also reported positive outcomes. The severity of impact varied among and within projects. Nearly all projects that included more than one focal species, life stage or genotype, restoration method, site, habitat type, or microhabitat reported better outcomes for at least one of these project aspects. We suggest that practitioners may be able to reduce risk from future ECEs through a portfolio approach, incorporating heterogeneity into project design, including in site selection and propagate choices.

*Front Ecol Environ* 2022; 20(5): 310–318, doi:10.1002/fee.2471

Extreme climatic events (ECEs) – statistically rare climate events such as severe storms and tornadoes, heat waves, and extended drought, which can result in extreme ecological impacts (Smith 2011; IPCC 2012) – are increasing in frequency and severity with global climate change (Easterling et al. 2000; Herrero et al. 2014). ECEs can decimate the built

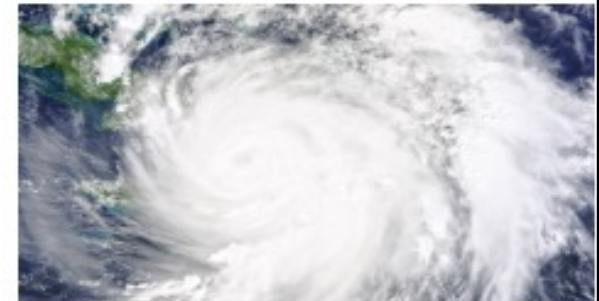
Ecological restoration, intentionally or unintentionally, has helped buffer some of the impacts of ECEs by reinstating conditions that enable greater resilience to large disturbances. For example, improved river–floodplain connectivity can mitigate flood impacts (Hey and Philippi 1995; Opperman et al. 2010) and restoring coastal foundation species can protect shorelines

Aloha, Hafa adai, Yokwe, Talofa, Aili, Mogeihini, Ran alim, Kaselehlie, Hello from the Pacific Regional Invasive Species and Climate Change Management Network

### Manager Research Summary Series

Please read below for our monthly Research Summary for November, 2022. Pacific RISCC Research Summaries highlight interesting and relevant research at the nexus of climate change and invasive species for managers in the Pacific. Here we will highlight a publication, tool, or product that may be useful as well as management implications. Did you receive this from a colleague? Subscribe to the Pacific RISCC Listserv below!

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Extreme Climatic Events (ECEs) are rare, high-impact events such as hurricanes, heat waves, and extended drought, and they are increasing in frequency and intensity across the Pacific. Photo credit: [www.fws.gov](https://www.fws.gov).

### Research Highlight

Increasing the Resilience of Ecological Restoration to Extreme Climatic Events, Zabin, Jurgens, and Bible et. al. 2022

#### Management Considerations:

- Plan for Extreme Climatic Events (ECEs) by considering the potential impacts of extreme events most likely to impact your area, possibly exceeding historical events.

## Increasing the Resilience of Ecological Restoration to Extreme Climatic Events, Zabin, Jurgens, and Bible et. al. 2022

### Management Considerations:

- Plan for Extreme Climatic Events (ECEs) by considering the potential impacts of extreme events most likely to impact your area, possibly exceeding historical events.

### Take Home Points:

- ECEs can create major setbacks for restoration projects by destroying or damaging structures or sites, and by threatening restored species.
- To increase the resilience of restoration projects to ECEs, spread risk across time and space by using the portfolio approach.

**Written, reviewed & edited by:** Elliott Parsons, Jeff Burgett, & Nikki Read





# Mahalo!

For more information, visit  
[www.PacificRISCC.org](http://www.PacificRISCC.org)



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