

# **THE BUSINESS OF FARMING: RESILIENCE, REALITY, AND RETURN ON INVESTMENT**

**Round Table Meeting January 2024**

**Remember Round Table follows  
Chatham House Rule**



# **SESSION FOUR: Disease and Invasive Species Challenges - Problems and Solutions**

**Round Table Meeting January 2024**

**Please remember to follow Chatham House Rule.**



# **Moderator**

# **Jenny Maloney**

**Global-Americas Strategic  
Accounts Manager  
Bayer CropScience Vegetable Seeds**



**Luke Flory**  
**Professor and Associate Chair**  
**University of Florida**



**Chelsea Arnott**  
**Coordinator**  
**Hawai'i Invasive Species**  
**Council**



**Dr. Donna Lalli**  
**Associate Administrator**  
**USDA APHIS**



**Dr. Alan Rudolph**  
**Vice President**  
**for Research (Retired)**  
**Colorado State University**



# **Luke Flory**

**Professor and Associate Chair  
University of Florida**

# Invasive Species

(1) **non-native** to the **ecosystem**  
under consideration

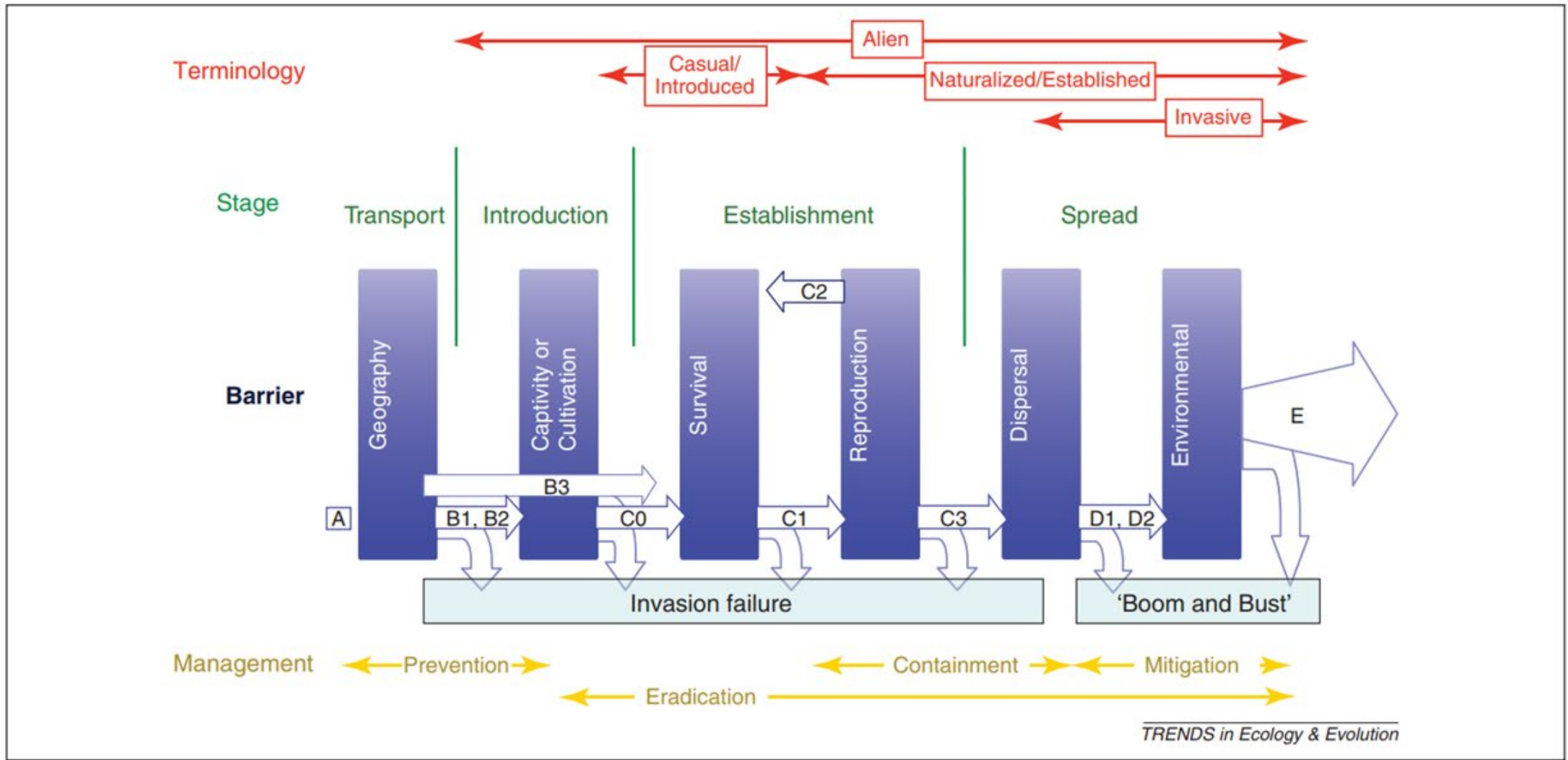
AND **(likely spread rapidly)**

(2) whose **introduction** causes or  
is likely to cause economic or  
environmental harm or harm  
to human health

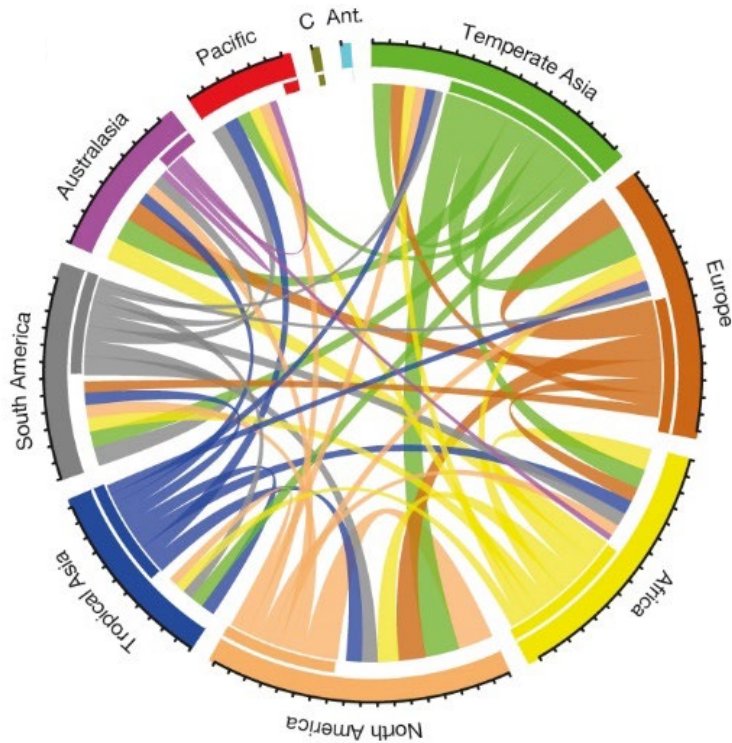
(Executive Order 13112, Feb 3, 1999;  
also established the National Invasive Species Council. )

## Synonyms?

- Alien species
- Noxious weed
- Invasive weed
- Exotic
- Non-native
- Non-indigenous
- Introduced species

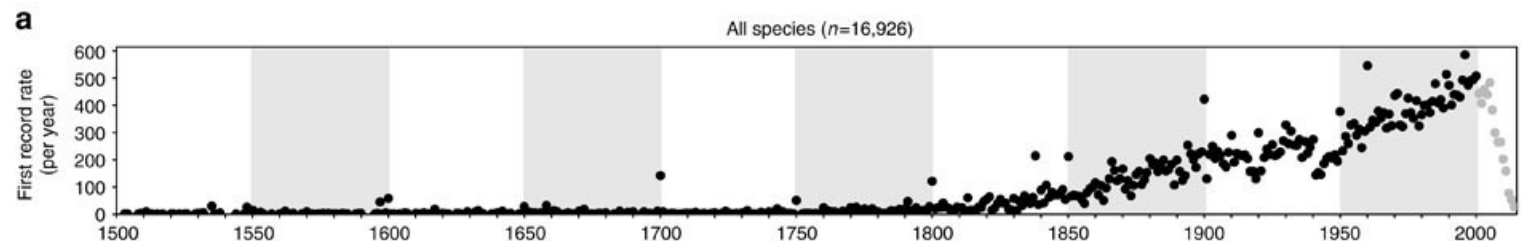
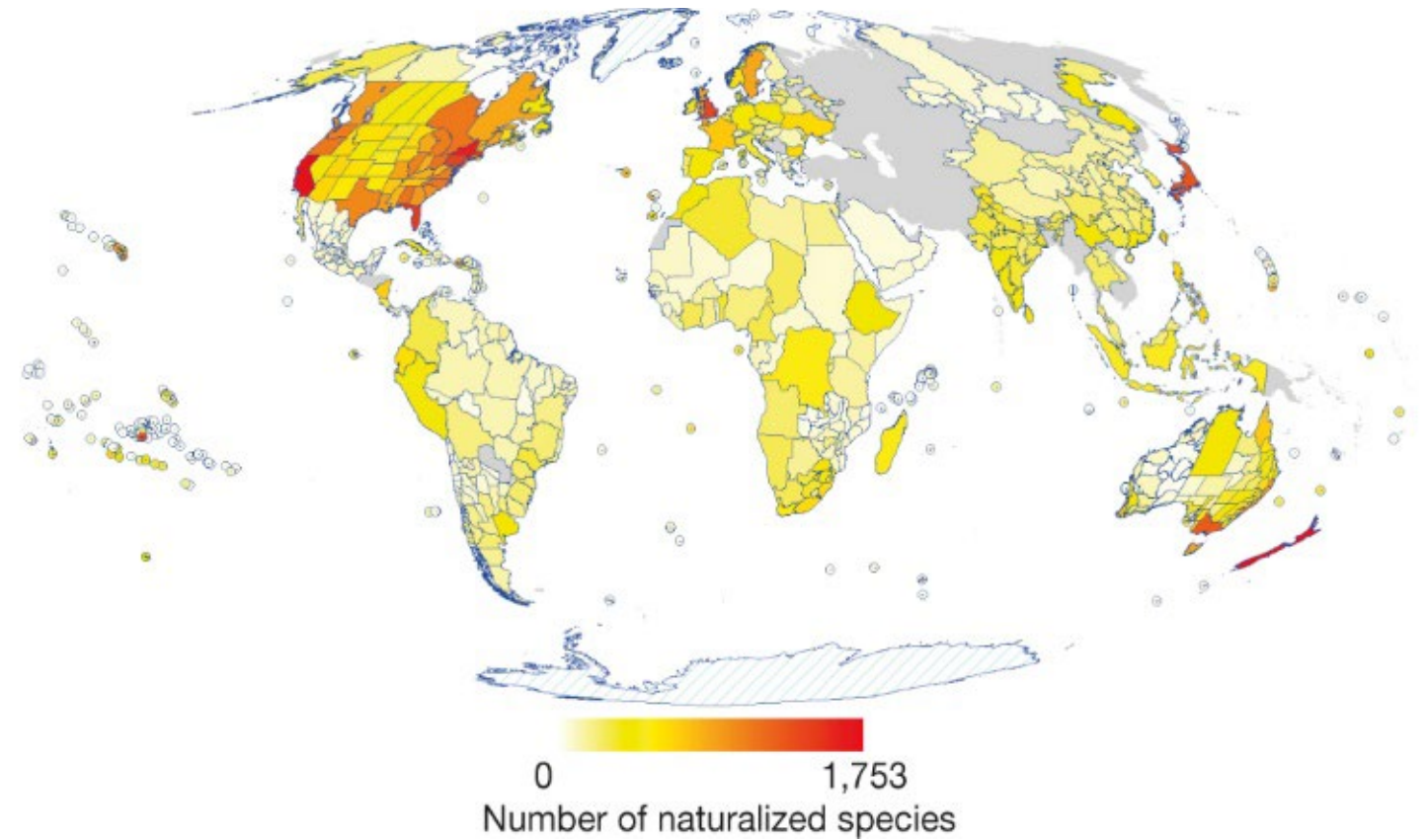


>13,000 naturalized  
vascular plant species,  
~1,800 in Florida alone



Globally, between 4 % and  
44% of species in a community  
are non-native

### Global exchange and accumulation of non-native plants



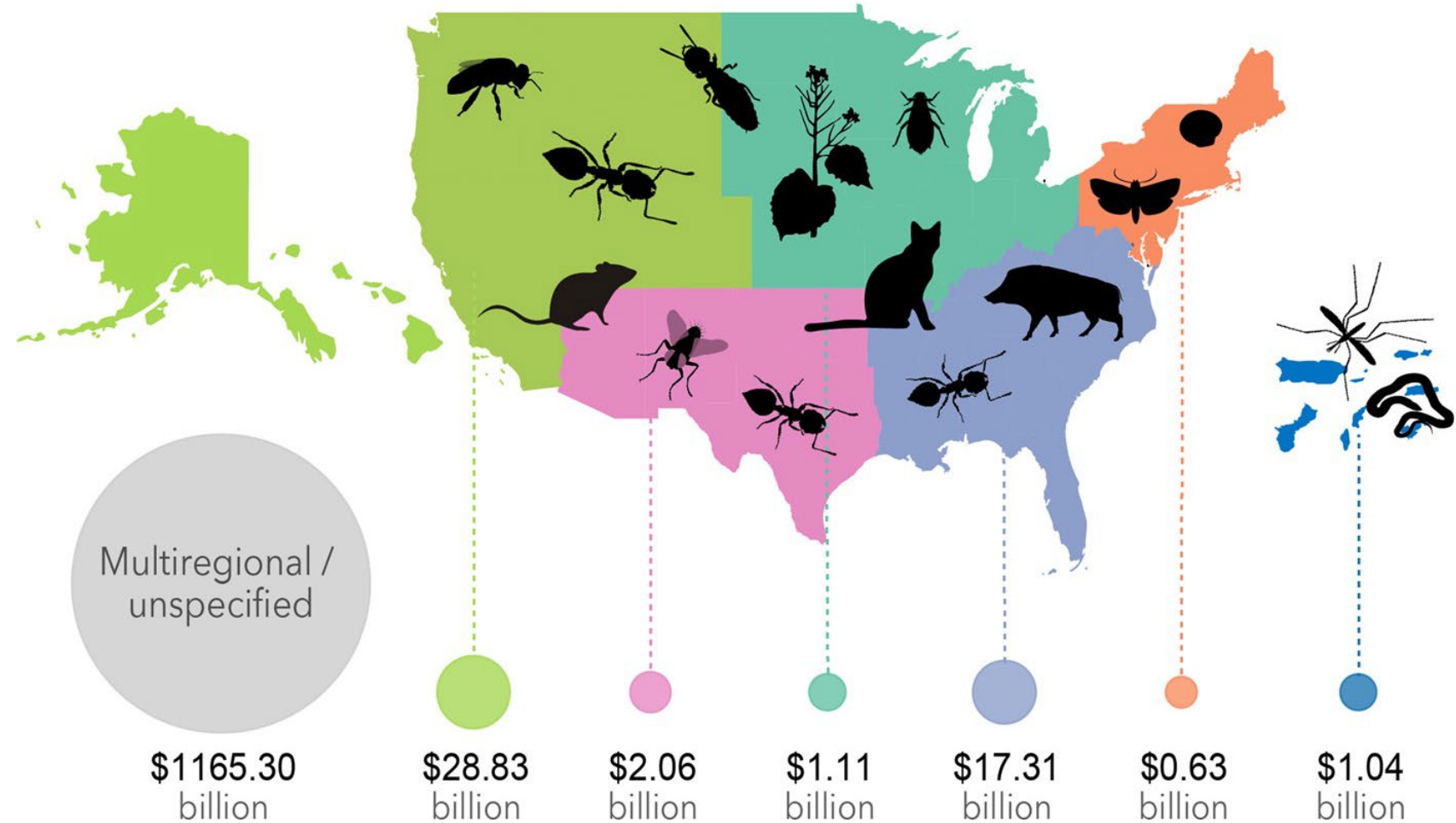


# Cost of biological invasions in the USA

**Invacost.**

**\$1.22 trillion**  
(1960-2020)

- Annual invasion costs increased from \$2B in 1960–69 to \$21B in 2010–20
- **Agriculture sector (\$510B)** and terrestrial habitat (\$644B) were impacted most
- Majority of costs were due to damages, but management costs are significant
- \$42M/yr on management costs in Florida's natural areas (Hiatt et al. 2019)



Interactions between invasive cogongrass, fire, and drought suppressed the foundation longleaf pine (*Pinus palustris*)



~\$50B timber industry in the southern US

*Microstegium vimineum*

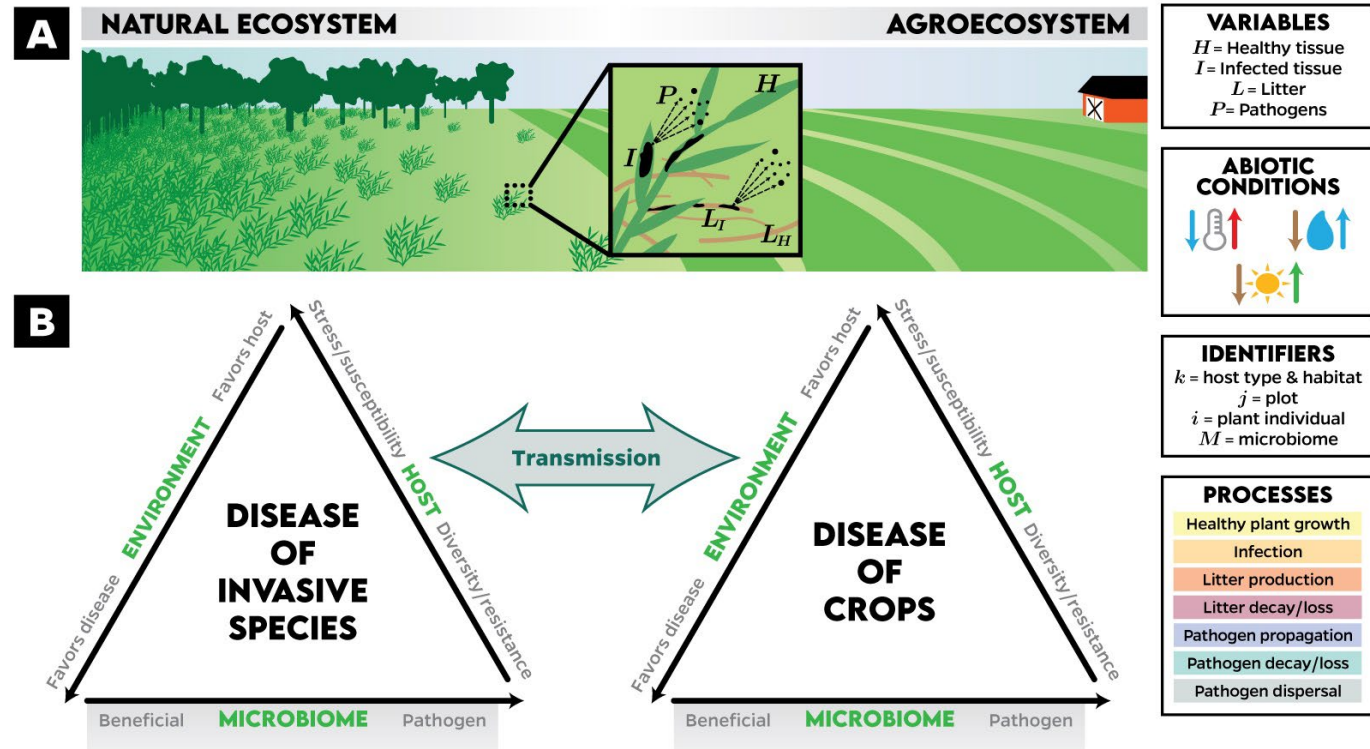


# Invasive plants as conduits for the spread of pathogens from natural to agroecosystems

*Bipolaris* spp.



Industrial hemp



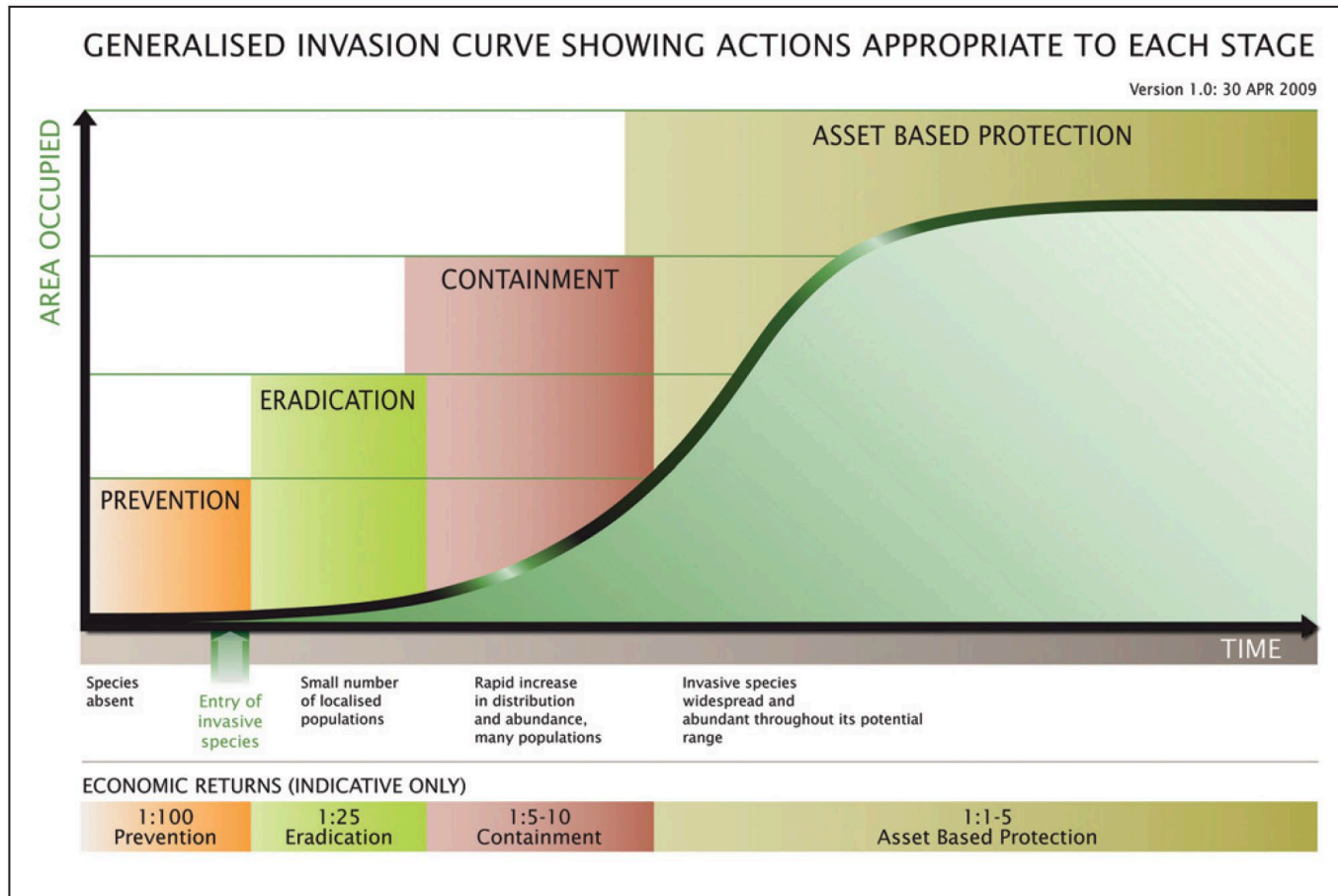


Figure 1-3. Generalized invasion curve showing actions appropriate to each stage. (© State of Victoria, Department of Economic Development, Jobs, Transport and Resources. Reproduced with permission.)

- Better understanding of invasive species ecology and impacts and how they change over time is needed
- Prevention and early eradication provide, by far, the greatest ROI
- Horizon scanning, risk assessment, and early detection & rapid response must be accelerated

**ECOSPHERE**  
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ARTICLE | Open Access |

## Identifying invasive species threats, pathways, and impacts to improve biosecurity

Deah Lieurance , Susan Canavan, Donald C. Behringer, Amy E. Kendig, Carey R. Minter, Lindsey S. Reisinger, Christina M. Romagosa, S. Luke Flory, Julie L. Lockwood ... [See all authors](#)

First published: 14 December 2023 | <https://doi.org/10.1002/ecs2.4711>





# **Chelsea Arnott**

**Invasive Species Coordinator  
DLNR - Hawai'i Invasive Species Council**



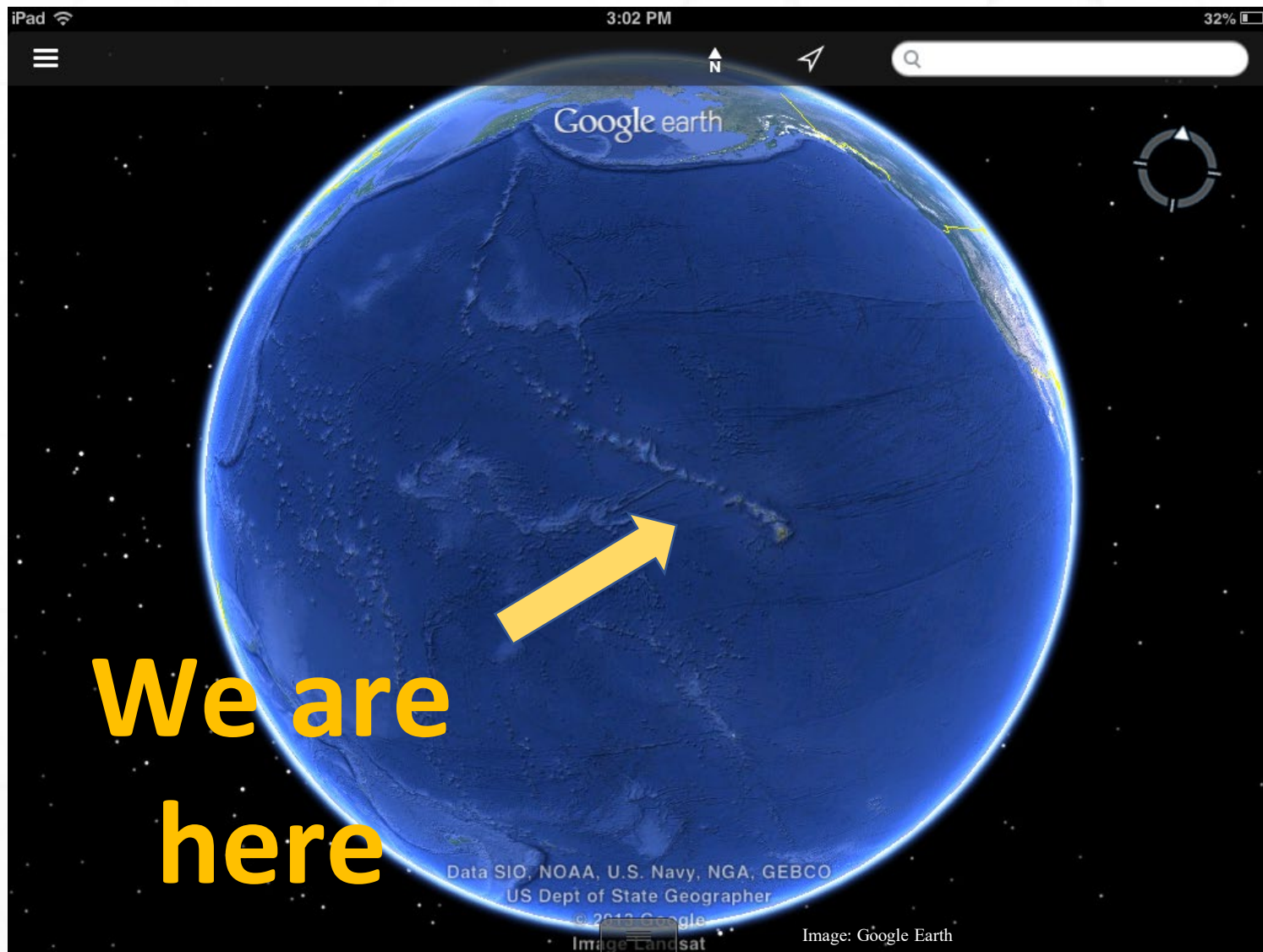
# Invasive Species & Biosecurity in Hawai'i

Chelsea Arnott  
DLNR-Forestry & Wildlife and  
Program Support for the Hawai'i Invasive Species Council

January 19, 2024

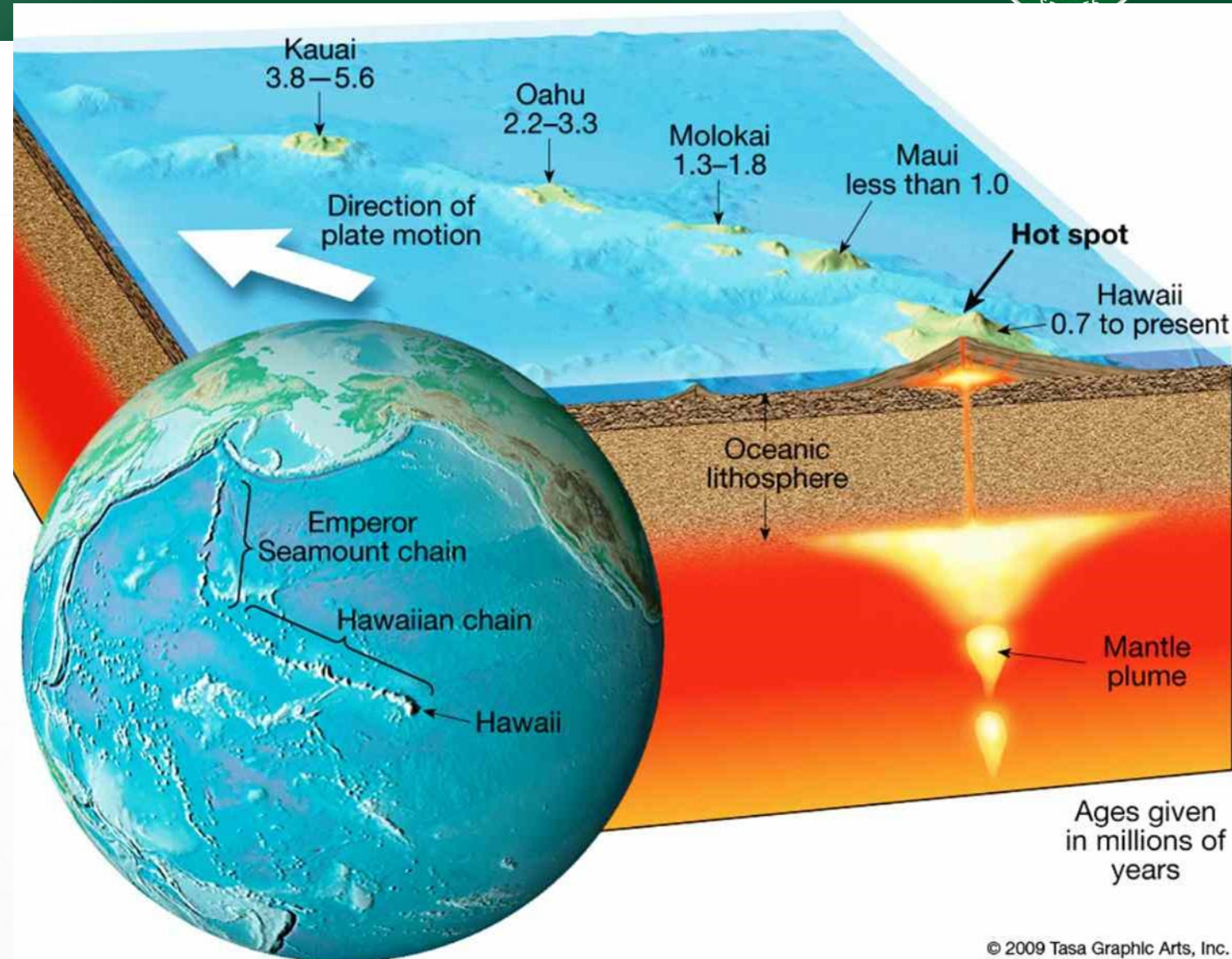


The Hawaiian Archipelago is remote. The Pacific Ocean connects, but it also poses quite a challenge for species to reach our shores.





- The Hawaiian Islands were/are formed via hotspots: unusually hot magma that melts hole in the Pacific plate, allowing volcanoes to form.
- The Pacific plate moves slowly northwest and the islands move with it, eroding over time.
- The Hawaiian Islands were never attached to a continent, no “land bridge” for plants and animals to get to HI.



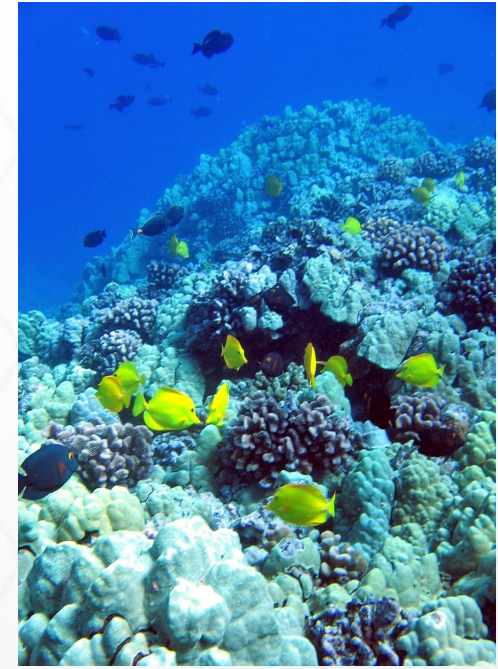
# Natural history: Hawaii's First Arrivals via the 3 W's



- Some seeds, spores, insects, and even spiders arrived on the “**wind**”
- A few birds flew or were blown off course. In them or stuck to their feathers were more seeds—they arrived on “**wings**”
- Some seeds floated here on ocean currents or “**waves**”. Ocean currents also carried eggs or larval fish, invertebrates, algae, and even freshwater stream species



Image: Sam Gon



# History of Species Arrivals in Hawai'i



Species Arrivals

Nearly 20,000 native species

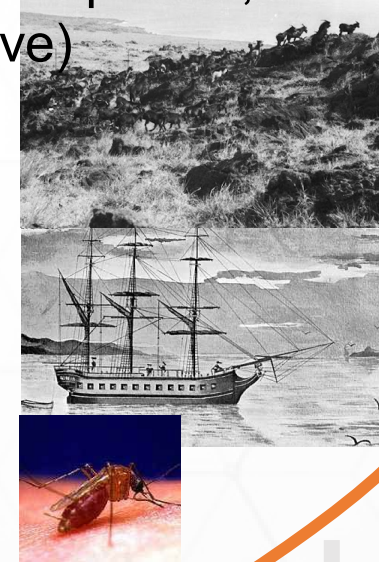


70 + million years ago

Polynesians arrive bringing the first non-native species = 34, a few (like rats) became invasive



Western contact: more non-native species = 500?, (some, like goats and mosquitoes, were invasive)



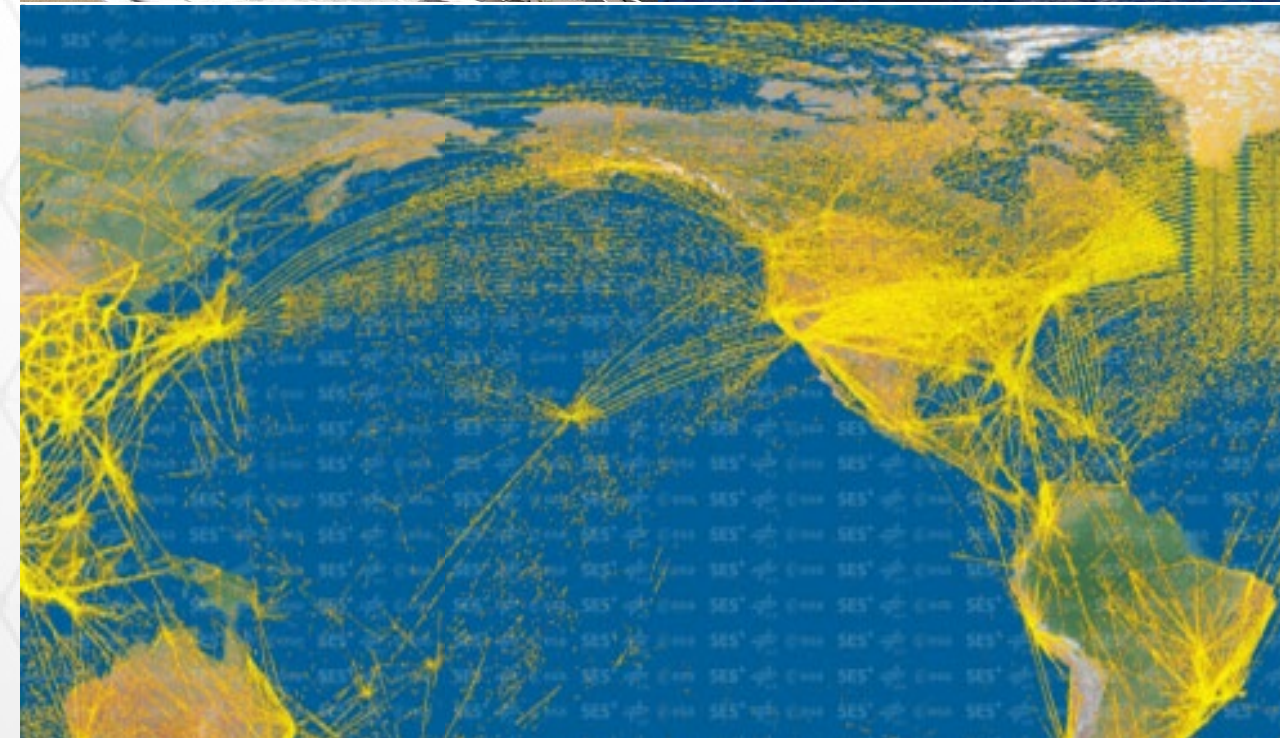
1.4 mil. residents and 9+ mil. Visitors/year



1,000 years ago 245 years ago 10 y/a

TIME

# TODAY: 1.4 mil. residents and 6+ mil. Visitors/year



- Hawai'i went from 0 to **40 land and freshwater reptiles**, 0 to **6 amphibians**, **20+ insects/year** (the Kahului Airport Risk Assessment found average of **one new insect or plant disease/day!**); **10,000+** plant species introduced (200+ damaging ecosystems); **421 new marine/brackish** water species;
- 50% of native habitat remains—but is threatened by **invasive species** and **climate change**

See Bishop Museum, summarized from multiple papers; KARA report,

[https://www.hawaiiag.org/hdoa/pi\\_pq\\_KARA.htm](https://www.hawaiiag.org/hdoa/pi_pq_KARA.htm)

# Invasive Species are a Problem!



## Environmental



The **Brown Tree Snake** is responsible for the extinction of 9 of 13 forest bird species and 3 species of lizard

## Cultural



'Ōhi'a is the foundation of Hawaiian forests and a central figure cultural practices. Over one million "ōhi'a trees have died due to the fungal disease **Rapid 'Ōhi'a Death**.

## Agricultural



Coffee farms in the Galapagos have been completely abandoned due to the **little fire ant**.

## Infrastructure & Safety



On Hawai'i Island, 90% of the damage from Hurricane Iselle in 2014 was from invasive **Albizia** tree,

## Island Way of Life



**Coconut Rhinoceros Beetle** is threatening food security of more the 40,000 households in the Soloman Islands that are reliant on the coconut.

## Human Health



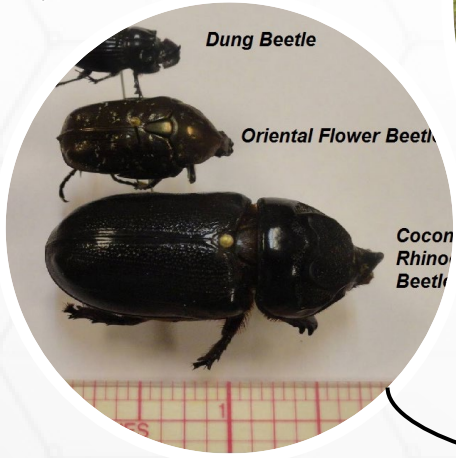
**Mosquitos** can carry human diseases like malaria and dengue fever.



\$200M/yr  
On Hawaii Island  
alone



\$2B/yr

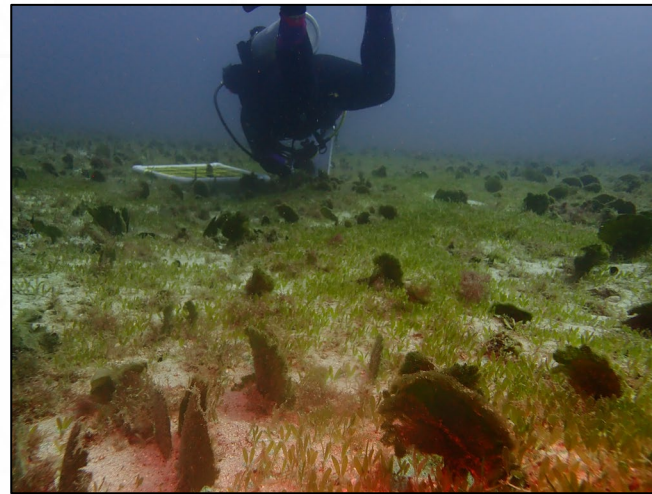


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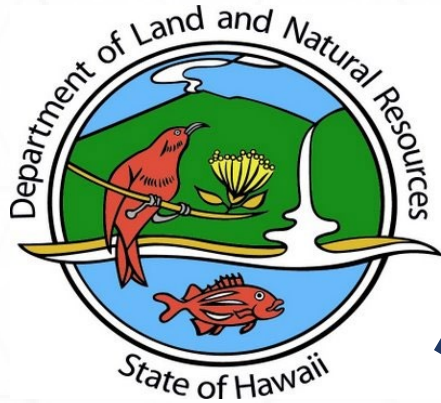
\$700M/yr



# Invasive Species and Climate Change

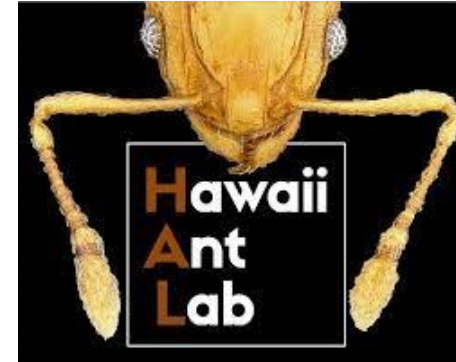


# Hawai'i Invasive Species Council





# A Larger Collective of Agencies & Partners





# Importance of Collaboration & Coordination

**What's at Risk?**

Tourism

Watersheds

Horticulture

Native species

Agriculture

Our health and lifestyle

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**Hawaii Interagency Biosecurity Plan**  
2017–2027

Catalyzing action on new initiatives – Western Governors Association Biosecurity and Invasive Species Initiative.



**PESCC**

**PACIFIC  
ECOLOGICAL  
SECURITY  
CONFERENCE**

wsPro  
otifica  
osecu

help manage invasive species in their areas,



# Mahalo

Chelsea Arnott [Chelsea.I.arnott@Hawaii.gov](mailto:Chelsea.I.arnott@Hawaii.gov)

<https://dlnr.hawaii.gov/hisc/>



*Hanohano Ka'ala kau mai luna ē*







# **Dr. Donna Lalli**

**Associate Administrator  
USDA APHIS**

# “Disease and Invasive Species Challenges— Problems and Solutions”

Farm Foundation Roundtable  
January 19, 2024

Donna Lalli , PhD  
Associate Administrator  
USDA Animal and Plant Health Inspection Service

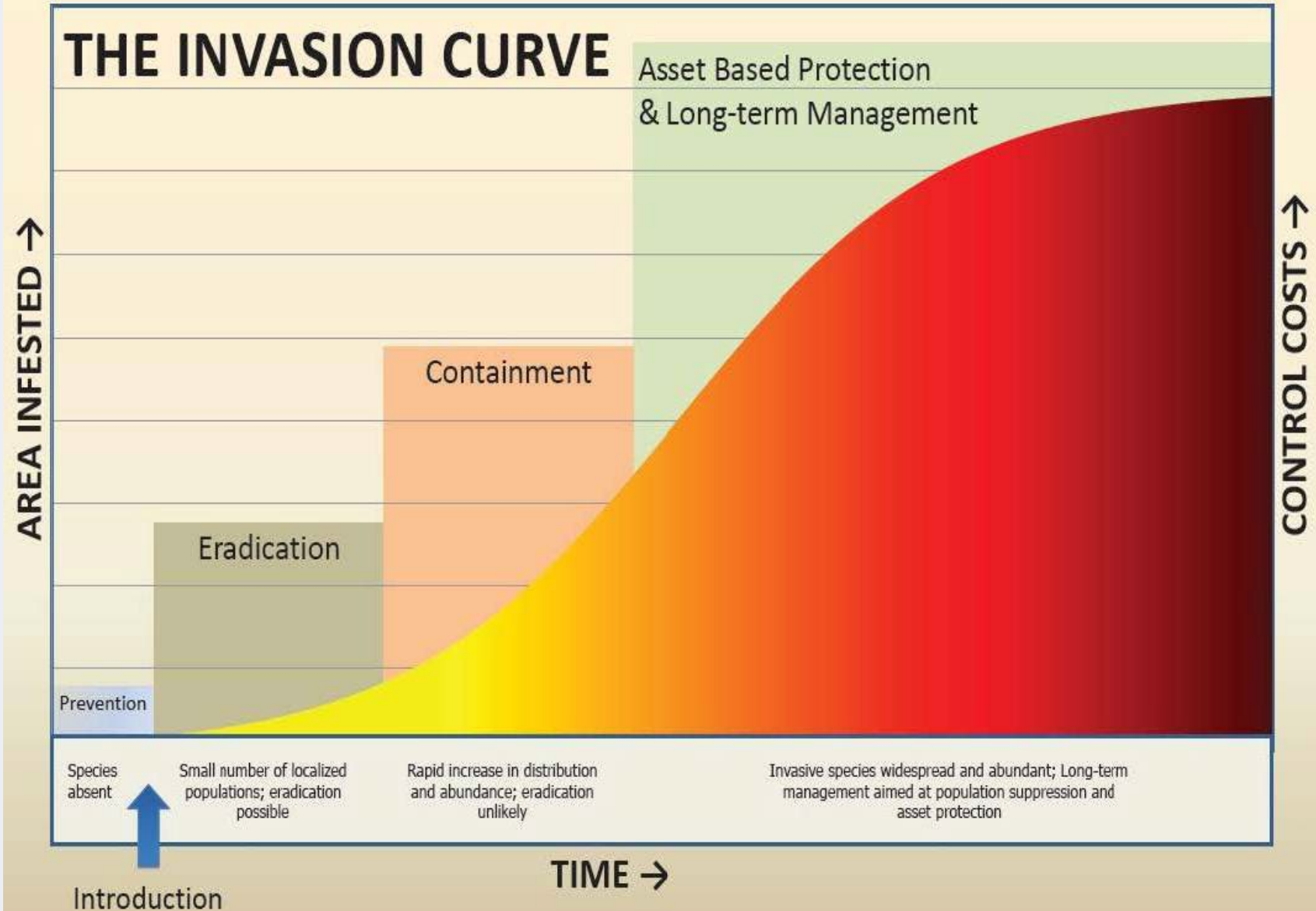




# Safeguarding American Agriculture

- 50+ years of work protecting U.S. agriculture and natural resources
- 8,000+ employees
- Operations in all States, U.S. Territories, and many countries around the world

# Invasive Species—an Overview





# Ensuring Safe Trade

- Safeguarding Continuum: System of interlocking safeguards to assess/reduce risks from harmful pests or diseases
- Begins in other countries, continues at ports of entry, extends across the United States
- Multiple points throughout import process to mitigate threats, allow safe entry of imports



Around  
the World



At the  
Border



Across  
the Nation

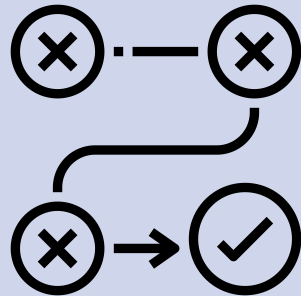


# Lessons Learned

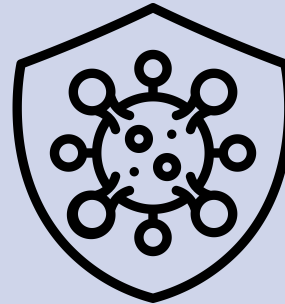
Science-Based



Trial and Error



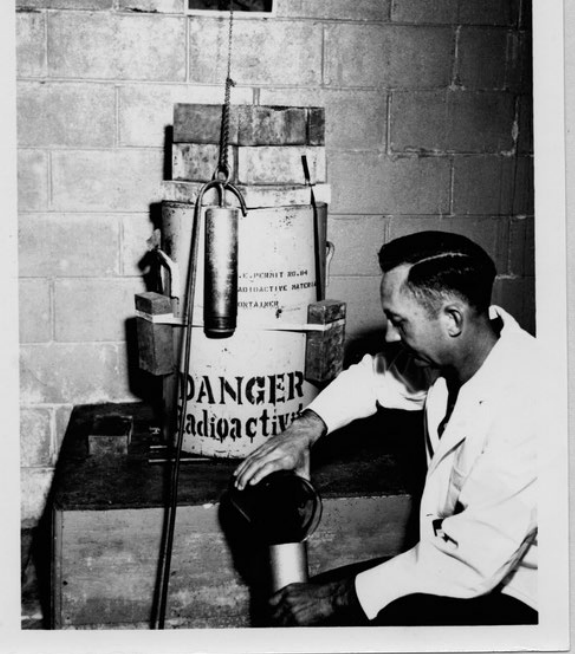
Prevention Over  
Control



Creativity, Ingenuity,  
Resourcefulness



# Screwworm, Fruit Fly, Detector Dogs, Feral Swine



graph No. 10. Loading an irradiation chamber with screw-worm pupae.



GU Number 72

day 2019

Box	Temperature
Box 8	64.9
Box 9	61.3
Box	63.6
Box	62.7
Box	64.9
Box	63.3
Box	63.6

of Shipper  
Aug

# Partnerships to Ensure Success



# “Disease and Invasive Species Challenges— Problems and Solutions”

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# Appendix

- National Invasive Species Council: <https://www.doi.gov/invasivespecies>
- National Invasive Species Information Center:  
<https://www.invasivespeciesinfo.gov/subject/prevention>
- APHIS' Safeguarding Continuum: [https://www.aphis.usda.gov/publications/plant\\_health/fs-ppq-safeguarding-continuum.508.pdf](https://www.aphis.usda.gov/publications/plant_health/fs-ppq-safeguarding-continuum.508.pdf)
- National Feral Swine Management Program:  
<https://www.aphis.usda.gov/aphis/ourfocus/wildlifedamage/operational-activities/feral-swine>
- Fruit Fly Exclusion and Detection Program:  
<https://www.aphis.usda.gov/aphis/ourfocus/planthealth/plant-pest-and-disease-programs/pests-and-diseases/fruit-flies/fruit-flies-home>
- National Detector Dog Training Center:  
<https://www.aphis.usda.gov/aphis/ourfocus/planthealth/ppq-program-overview/nddtc>





# **Dr. Alan Rudolph**

**Vice President for Research  
Colorado State University**



# Gaps and Opportunities in Detecting Species Jumps of Dangerous Pathogens

Most of the Large Outbreaks of Disease are From Pathogens that Jump  
from Animals To Humans

# Wildlife Markets are a Source of Concern



# A Rise in Biocontainment Facilities Worldwide



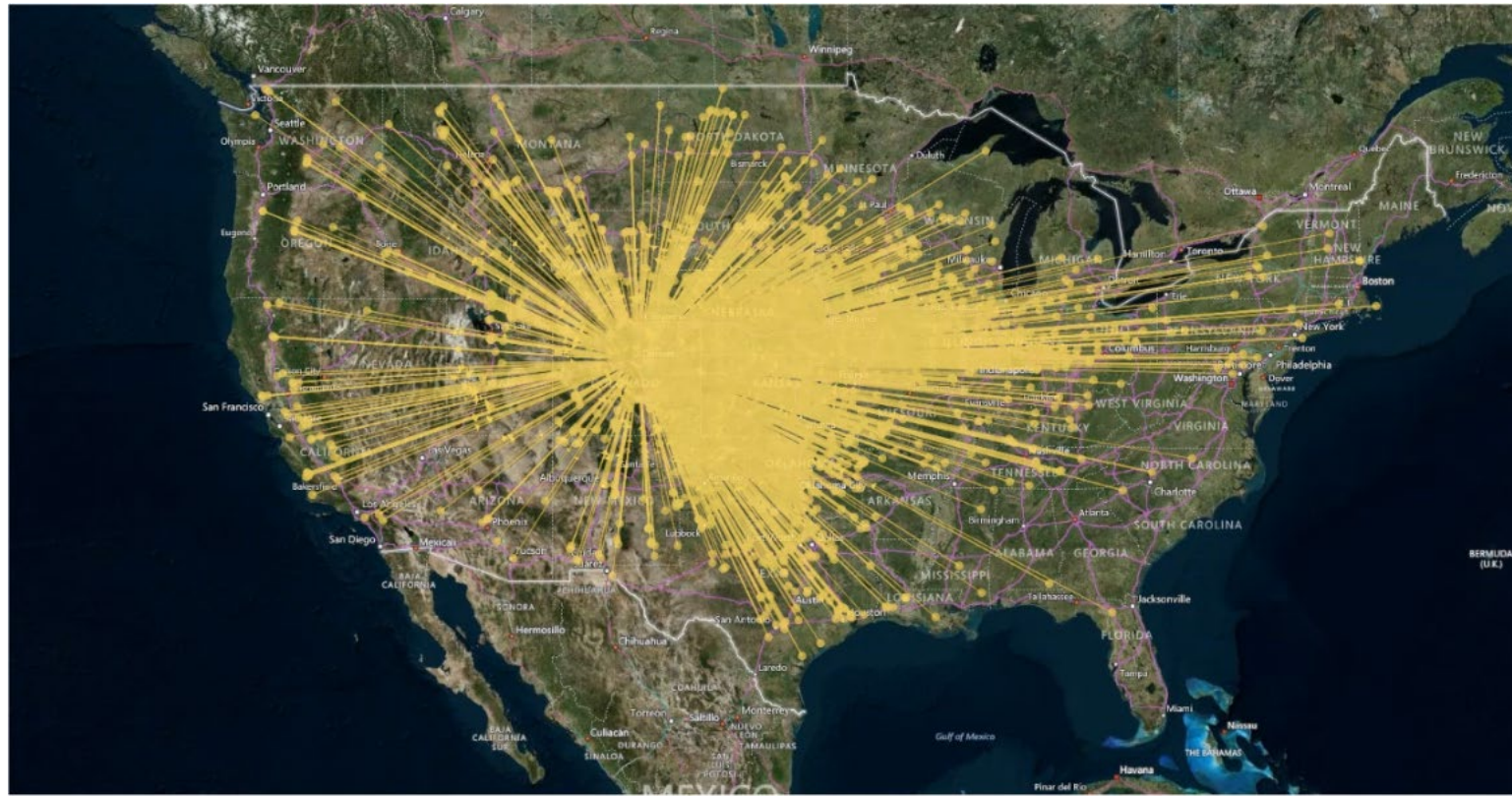
**Figure 1.** Global proliferation of BSL4 labs. Only BSL4 labs with a known year in which operations began are included in the graph



**12 New**

**BSL4 labs planned across nine countries since the start of the pandemic**

# The Distribution of Animals To The National Western Stockshow



# Future Areas of Need To Build More Resilience

- Policy and Compliance
- Education and Outreach
- Proactive Surveillance using Field Dx
- Market incentives
- Transparent and Accurate Communication



# QUESTION AND ANSWER

*Please submit your questions on the meeting app or use one of the microphones.*

- **Go to app** 
- **Go to Your Agenda**
- **Find The Session**
- **Q&A Tab**



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**Global Americas - Strategic**  
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