Hawai‘i Invasive Species Update for East Hawai‘i Master Gardeners

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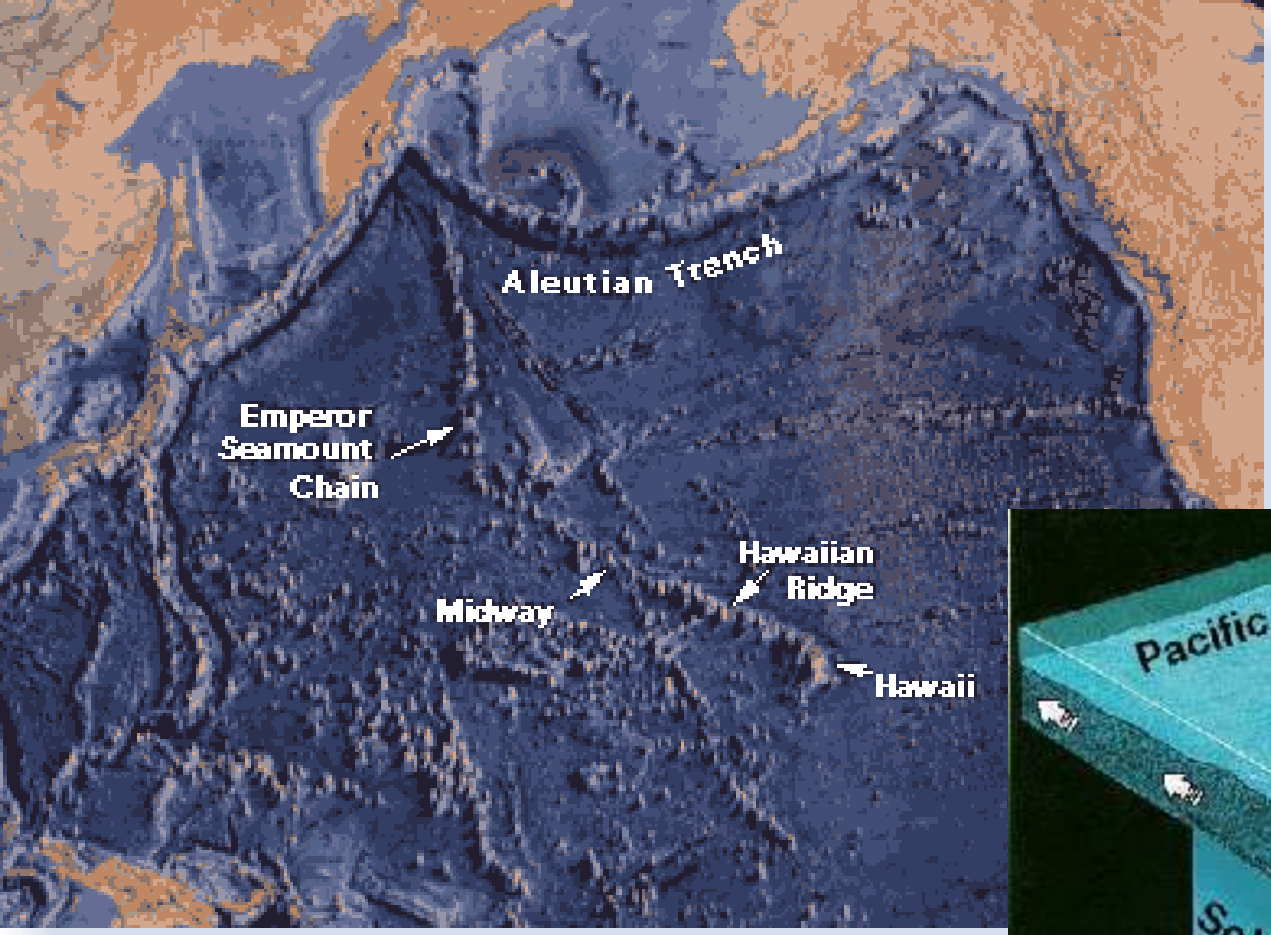
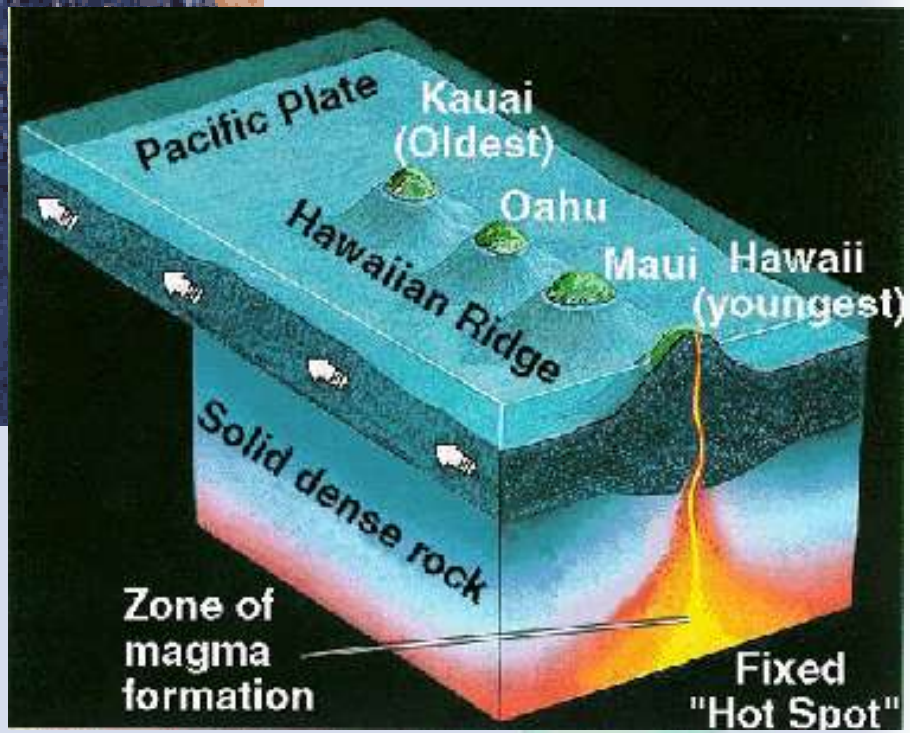
The Hawaiian islands are physically the most isolated islands on Earth. For millions of years, this kept out many plants and animals that may be common on continents or other islands.





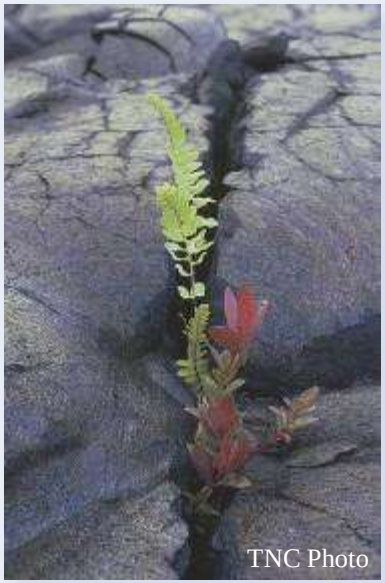
Islands were formed when lava poured out of two holes in the Pacific plate—“hot spots”.

The Hawaiian Island chain was never attached to a continent or close to any island.

These islands and its nearshore environment were a blank slate. No seeds in the soil, no animals walking across a land bridge to our islands, and no “living reef”.

So, how did plants and animals get here?

Wind, Wings and Water (currents).



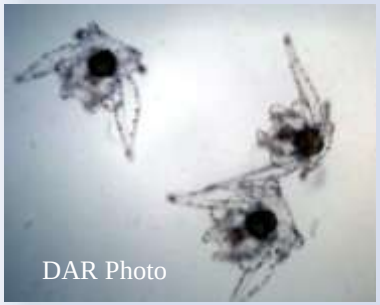
With a lot of luck…

Some seeds, spores and insects arrived on the wind.

A few birds flew or were blown off course. In them or stuck to their feathers were more seeds.

Some seeds managed to float here on ocean currents or waves.

Some freshwater and marine species with long larval stages were able to drift here with the currents.



Examples of change over time

These honeycreepers are all descended from a few original colonists that flew or were blown across the ocean millions of years ago.

Slowly, over uncountable generations, birds spread out into different areas, different habitats, and they started eating different foods.

With millions of years came slow, incremental changes.

Note the curved bill of the ‘i‘iwi…

John Caruthers/TNC photo

And the curved flower of the trematolobelia…

They fit perfectly. The curved bill allows it to feed on the nectar, and the plant benefits from being pollinated.

Change over time:

The ancestor of this “stink bug” arrived millions of years ago. Over time, these bugs lost the ability to produce a stinky smell because it’s predators weren’t present.

Today, Hawai‘i has stinkless stink bugs, called koa bugs.

Change over time:

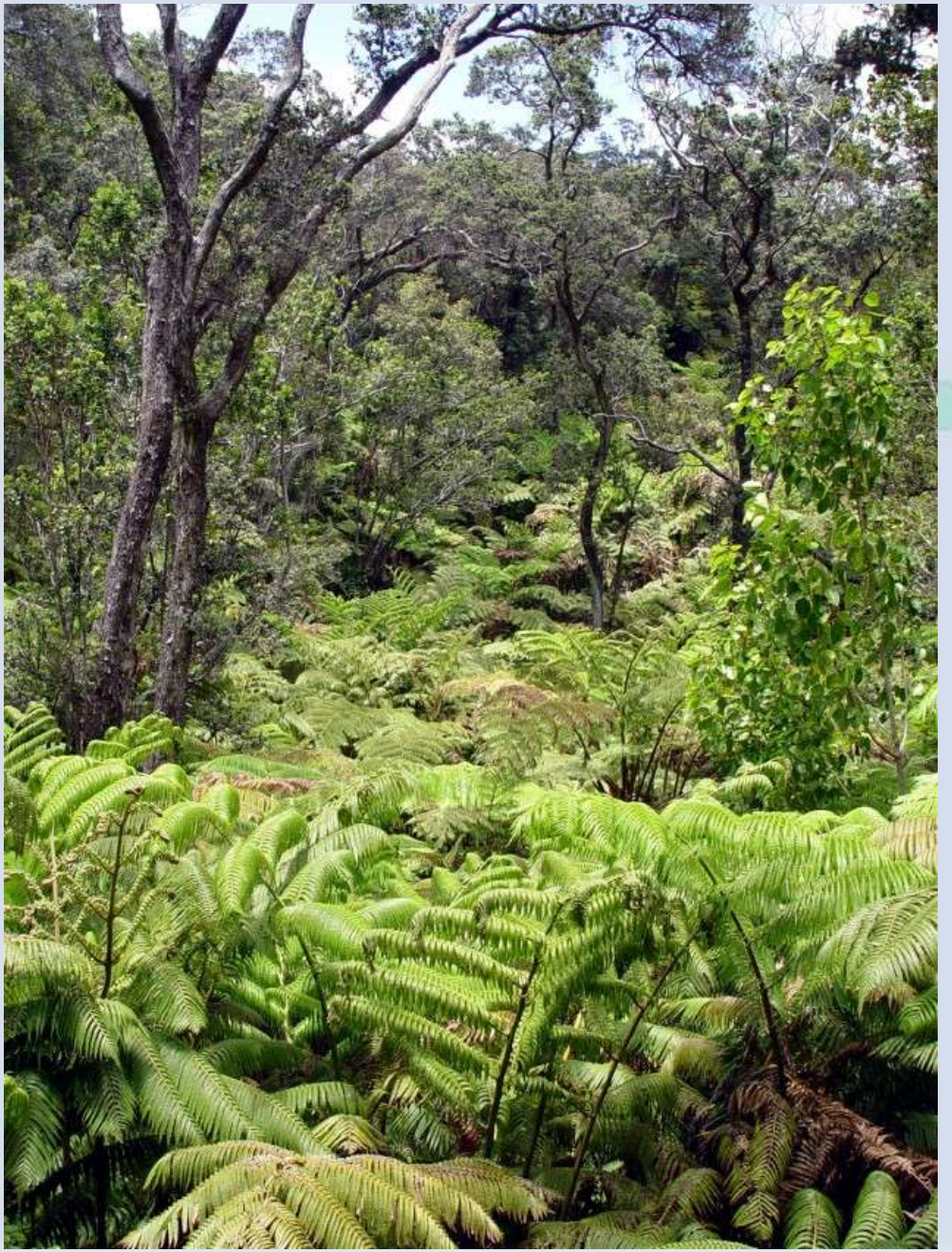
This is a mintless mint. When its ancestor arrived, there were none of its regular predators, and therefore no need to produce a minty flavor.

After millions of years, Hawai‘i has mintless mint. It also has a curved flower and is pollinated by ‘i‘iwi.

Change over time:
This is a tiger cowrie.

Although Hawai‘i’s nearshore environment is connected to Indo-Pacific island waters, arrival, survival, and colonization of marine species was rare.

This isolation (and unknown circumstances) lead to Hawai‘i’s tiger cowries being twice as large as tiger cowries from Africa to the Indo-Pacific.



Hawaii's native ecosystems are the result of 70 million years of isolation and very slow change.

And then…
Hawaii got an incurable case of…

HUMANS.

Polynesian arrival

- Landscape conversion
- Impacts on flightless birds
- Non-native species = 34

Kalo
Coconut
Polynesian pig
Polynesian rat
Geckos
(And more)

A species, like rats, proved to be invasive

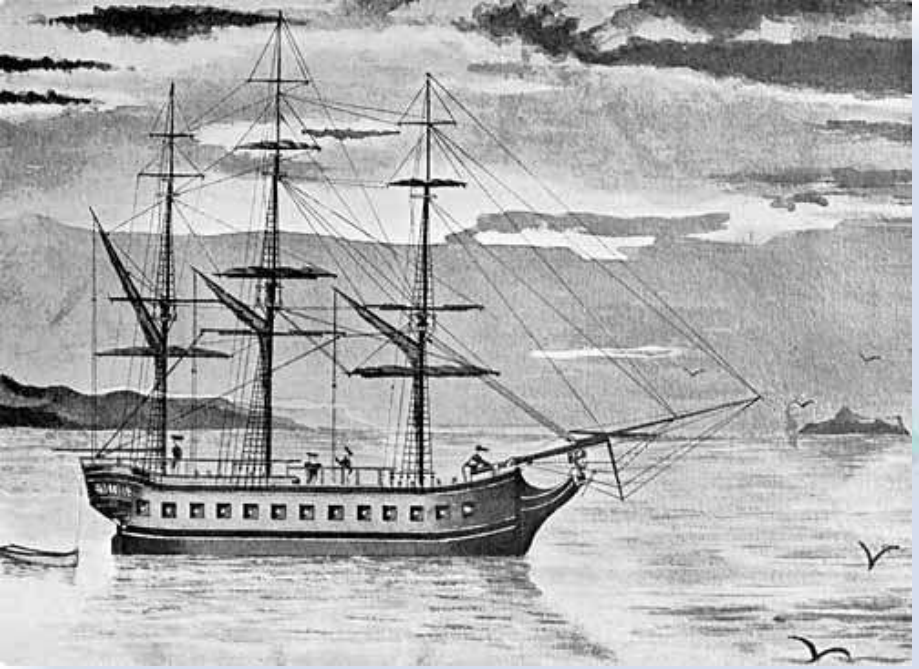
1500 Years Ago

Rats Changed the Landscape

- O‘ahu’s Ewa Plains used to be a loulu palm forest. Introduced rats are responsible for the decline of the native palm forest that used to cover the area.
- Two of the most common plant species of early Hawai‘i were the loulu or Pritchardia palm, and the kanaloa, a legume of which only one individual survives in the wild—on a sea stack off Kaho‘olawe. It isn’t a coincidence that these two species only thrive where no rats are present.

USFWS/Chris Swenson

Christine Bacon



Whalers & Missionaries

- More landuse changes
- Land ownership
- More non-native species = 500?

Ungulates
Mosquitoes
Diseases
(And more)

226 Years Ago

Global Economy

- Climate change
- Expanding population
- Fast, easy transport of non-native species

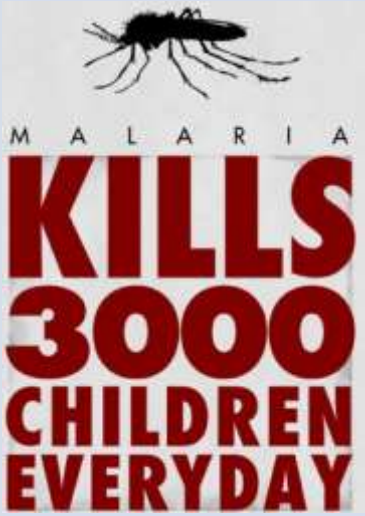
- 343 new marine/brackish water species
- Hawaii went from 0 to 40 land reptiles
- 0 to 6 amphibians (including coqui)
- 20+ insects/year
- 10,000+ plant species introduced; 1,200 spread to natural areas; 200+ damaging ecosystems and natural resources

2 Years Ago

Climate Change and Invasive Species: two proven issues that will forever change (harm) our

- Fresh water supply
- Ability to produce food
- Local economy
- Health and lifestyle
- Native Hawaiian species & ecosystems

invasive species harm ʻōhiʻa = no water



malaria also repels visitors

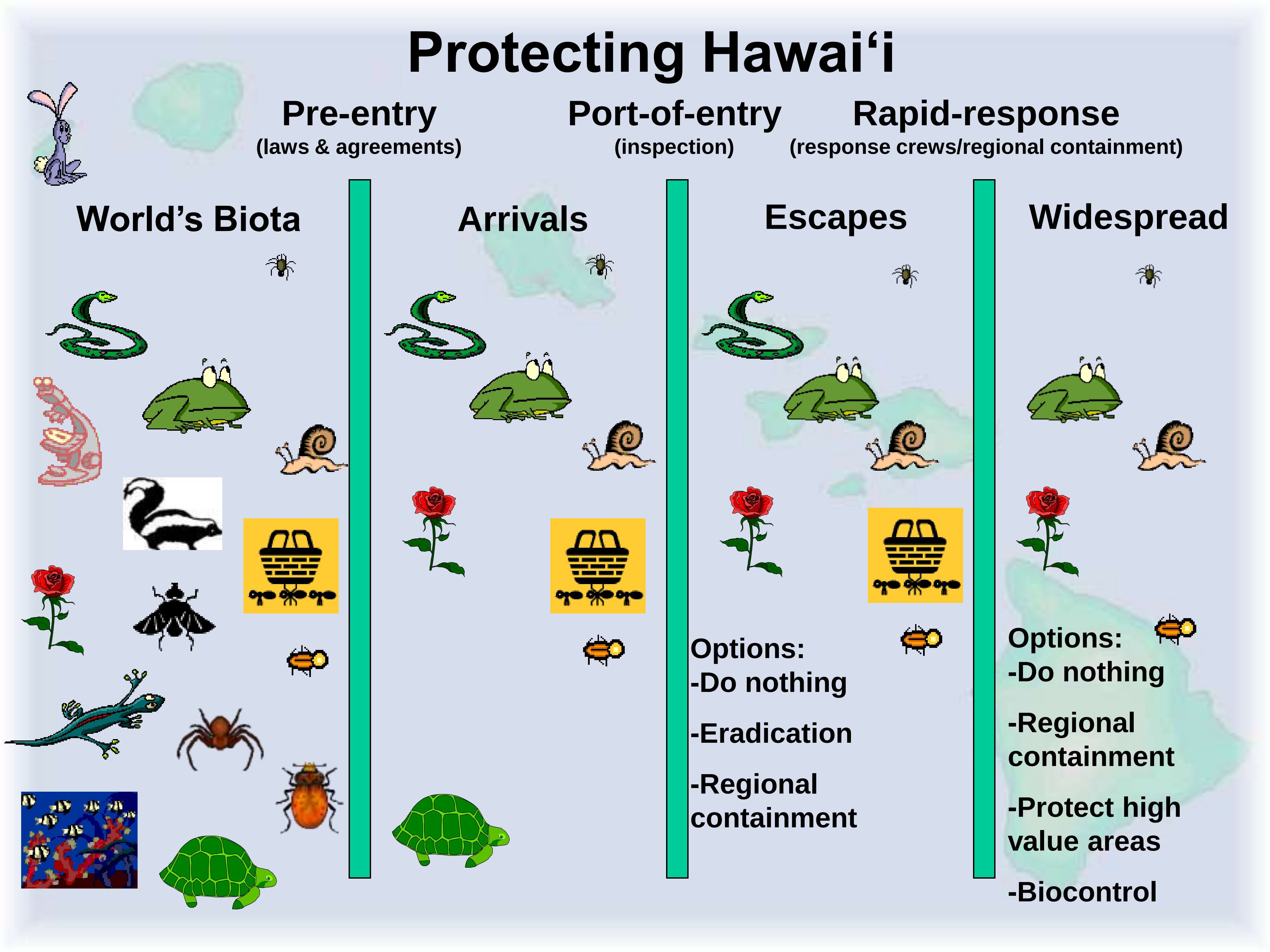
snakes = bad for birds & us

fireweed = no grass-fed beef

I'll just focus on invasive species.

Invasive species are…

An alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health (President Clinton Exec. Order 13112)



Protecting Hawai‘i
Pre-entry
(laws & agreements)
Port-of-entry
(inspection)
Rapid-response
(response crews/regional containment)
World’s Biota
Arrivals
Escapes
Widespread
Options:
-Do nothing
-Eradication
-Regional containment
Options:
-Do nothing
-Regional containment
-Protect high value areas
-Biocontrol

Snakes

Although it is illegal to bring snakes into Hawai‘i, or to have them as pets, consider this:

- 236 credible snake sightings between 1990 and 2000
- 63 were either captured roaming free or found dead; 74 were surrendered pets
- Where are the other 99+ snakes?
- Some reptiles can reproduce via parthenogenisis

Data from: Kraus & Cravalho, 2001, “The Risk to Hawai‘i from Snakes”

How can you help?

- Smuggling is a problem, but the good news is that the detector dog program was just reinstated by the legislature. Support expanding this program
- Encourage the use of the State Pest Hotline to report snakes or other suspicious/illegal creatures, 643-PEST
- Encourage people to use the amnesty program--surrender illegal pets to 643-PEST before someone turns them in

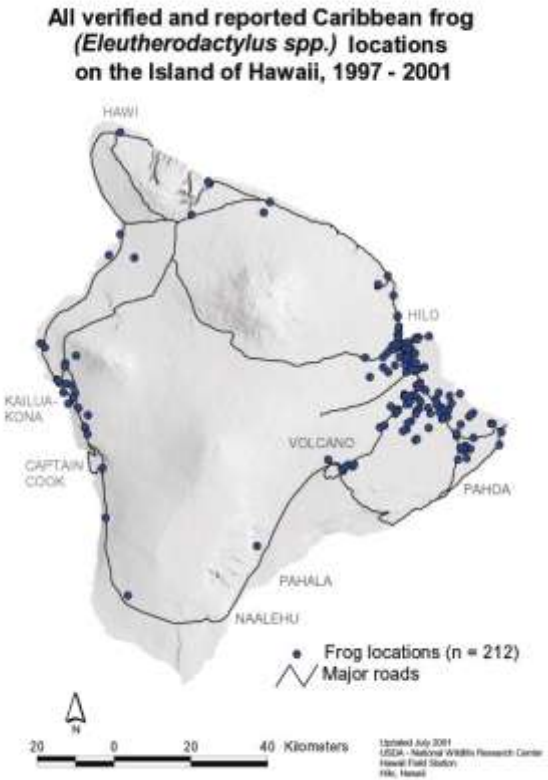
Brown treesnake photo by USDA Wildlife Services

Tegu lizard

Coqui Frogs

Eleutherodactylus coqui

- Native to Puerto Rico, arrived in the late 1980s
- Can reach 10,000 frogs/acre, eat 40,000 insects/night (now confirmed that densities have reached 224,000 frogs/acre, eating 1.7 million insects/night in some natural areas
- Eat native insects; 27% decrease in forest floor insects
- Loud (70-90 decibels). Reduces property values; affects visitor industry; health impacts (noise exposure correlated to increase in cardiovascular disease)



How can you help?

- Still moving on or with plants
- After buying or before selling, quarantine potted plants for a few days in a contained area, listen at night for bird-like calls. Treat w/citric acid or 5-min hot water shower
- Also moving on vehicles and other items that have been sitting in coqui-infested areas
- Continue to treat or support treatment of coqui w/ citric acid to keep populations down

Little Fire Ant (LFA)

Wasmannia auropunctata

- Small stinging ants native to Central and South America, accidentally introduced on imported nursery plants
- Infests yards, agricultural fields, and nurseries, where they damage crops, and sting people.
- Also known to sting eyes of pets and other animals, causing blindness
- Infestations known on the windward side of the Big Island. One small infestation on Kaua‘i and Maui (recent)


Lori Oberhofer/USDA NRC

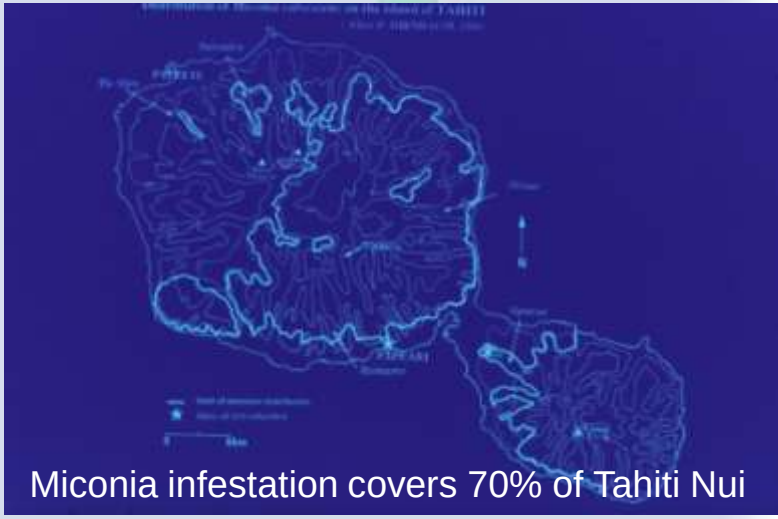
How can you help?

- Many pests move on or with plants.
- After buying or before selling, quarantine your plants for a few days in a contained area.
- Test for little fire ants by placing a chopstick dipped in a little peanut butter in and around the plants.
- Visit www.littlefireants.com to help you ID the ants, and to learn about a newly-registered control technique for homeowners

Miconia calvescens

- 30-50 ft. tall tree native to Central America
- Each tree can produce millions sand-grain sized seeds per year, spread by birds
- Grows close together forming dense, 100% Miconia forests
- Introduced as an ornamental to Tahiti Nui in 1937 to two locations, now nearly 70% of forests overwhelmed by miconia
- Introduced and spread around Hawai‘i as an ornamental. Hawai‘i island must now rely on finding a natural enemy (biocontrol) to keep populations in check


TNC Photo


Miconia infestation covers 70% of Tahiti Nui

Strawberry guava

(Psidium cattleianum

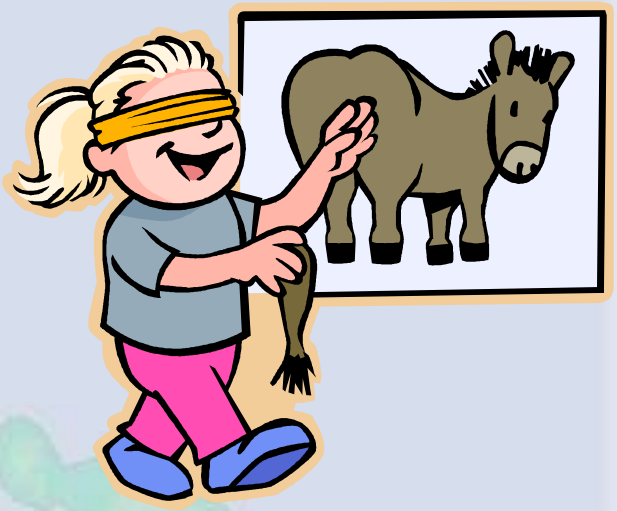
Photo courtesy of Carnegie Airborne Observatory


OISC Photo

- Shrub or tree up to 60' tall, introduced as an ornamental
- Outcompetes and replaces other vegetation
- Spread by animals
- Compared with native ʻōhiʻa forests, strawberry guava-infested forests lose 27% more water, with the difference rising to 53% during dry periods.

How can you help?

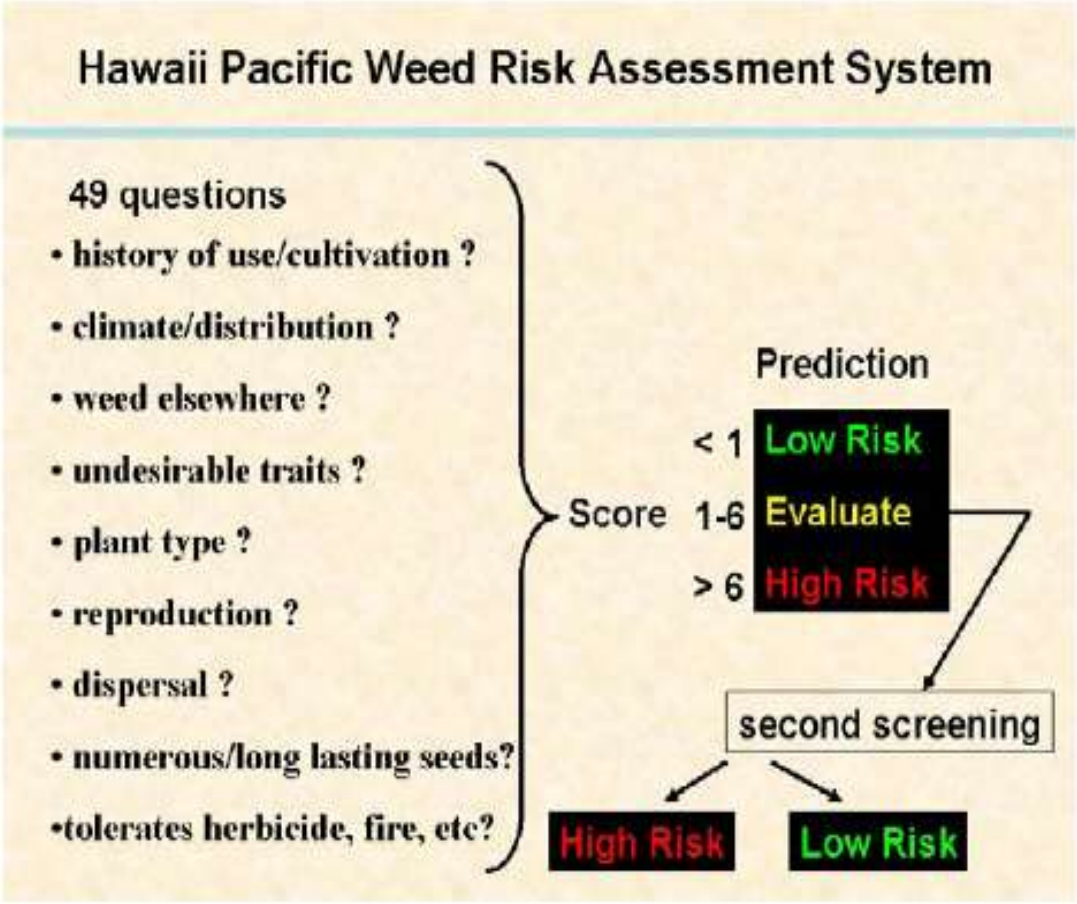
- Although these plants are already here, we must take care to not import and use new invasive plants.
- It is LEGAL to import 99.9% of the plants on Earth, even if they are known to be invasive (the federal Plant Protection Act preempts the state from being more restrictive).
- Until legal mechanisms can be fixed, we must be careful which plants we import, promote, and plant.
- Instead of guessing which plants will be invasive in Hawai‘i, use the Hawai‘i Pacific Weed Risk Assessment (HPWRA)



Temporary website:
www.hpwra.org

What is the Hawai‘i Pacific Weed Risk Assessment (HPWRA)?

LOW RISK



HIGH RISK

- The HPWRA technician uses published information to answer 49 questions about a plant, which results in a prediction.
- Correctly flags 95% of invasive (high risk) plants

Example: HPWRA for Miconia (*Miconia calvescens)*

Score: 14
Designation: High Risk

Why did it score a 14?

- Invading elsewhere (Tahiti, etc.)
- Broad range (0-6000 ft elev.)
- Grows well in shade
- Re-grows after mutilation
- Self-compatible
- Prolific: >1000 seeds per m^2
- Spread by birds, other animals; accidental spread by people

Example: HPWRA for Plumeria (*Plumeria rubra*)

Score: -5
Designation: Low Risk

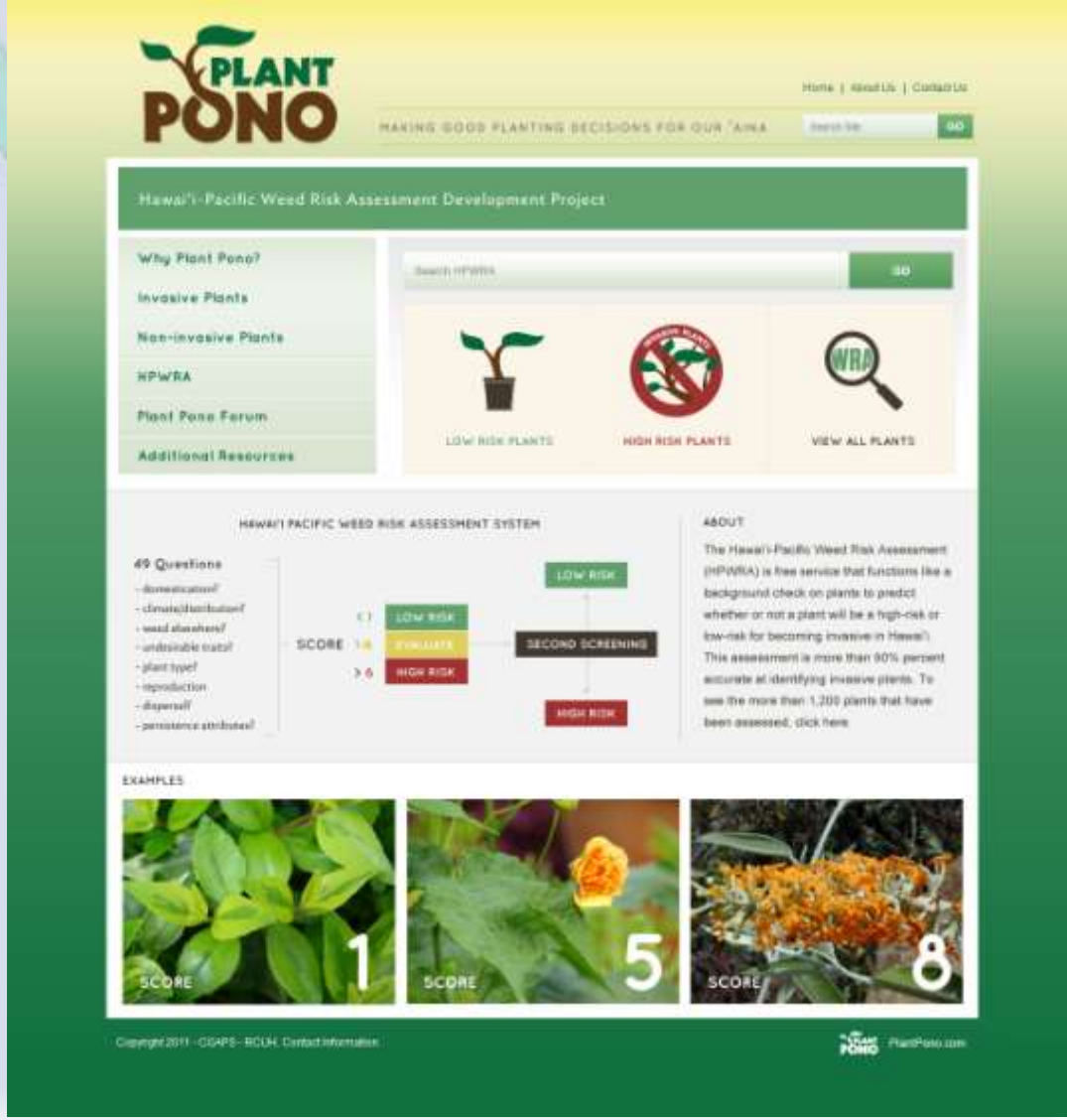
Why did it score a -5?

- Not invasive elsewhere
- Toxic/allergenic sap (+1)
- Grows in a wide range of soil conditions
- Doesn’t grow well in shade
- Does not form dense thickets
- Needs a specialist pollinator
- Lacks natural vegetative spread

New website in August 2012

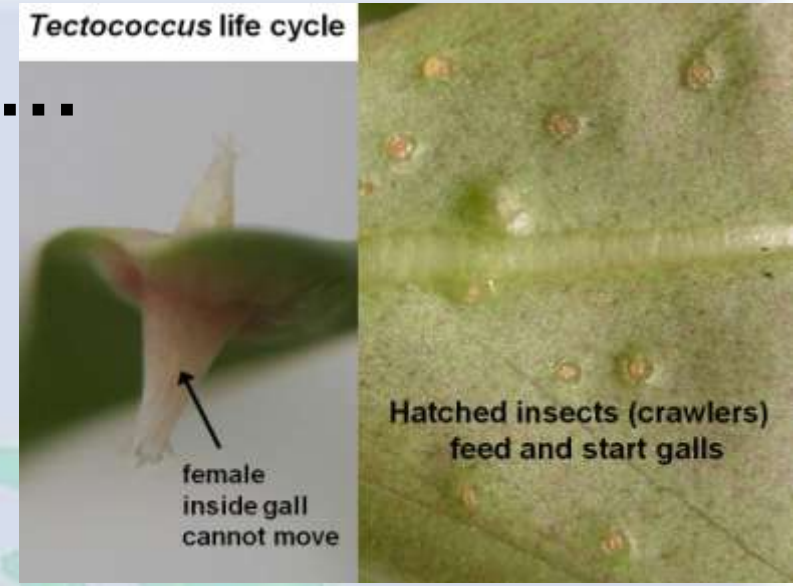
www.plantpono.org

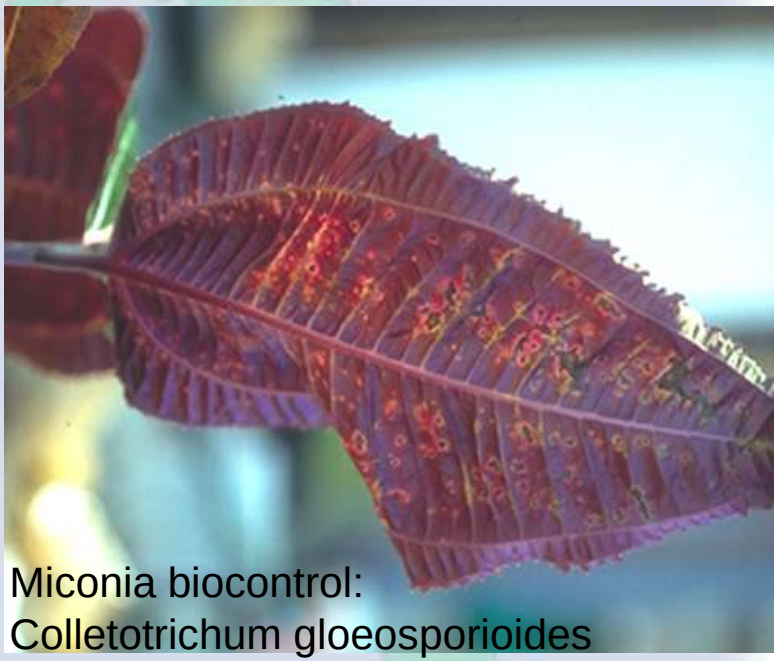
- Will provide easy access to the HPWRA
- Will also provide some good, non-invasive plant choices for yards and landscapes
- Testing of site is planned for this summer…interested in helping?



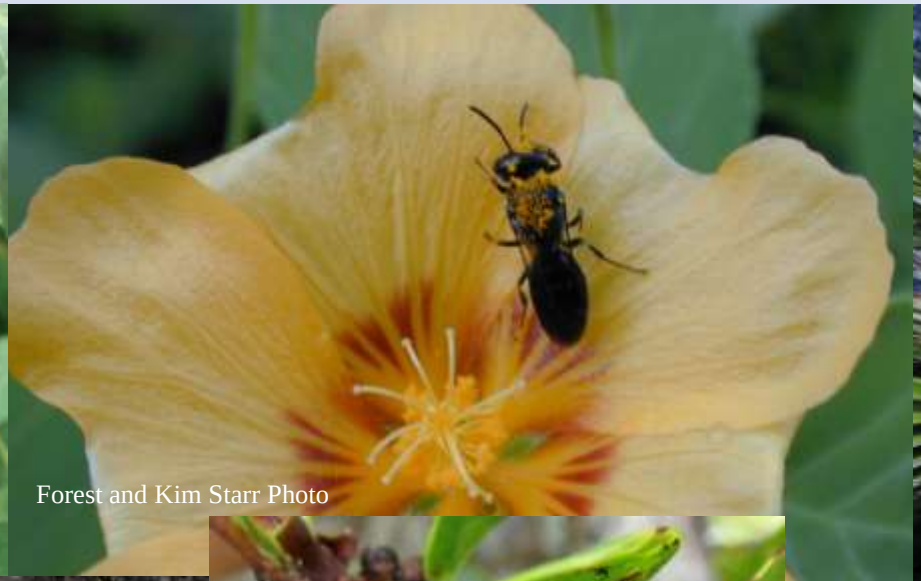
Another way you can help…

- Some plants like strawberry guava, miconia, albizia, and others will continue to spread quickly, overwhelming native plants that grow more slowly. Learn more about the science of biocontrol and the invasive pests they are meant to control; engage in the evaluation of relative risks
- Remind people that since enacting new policies and procedures in the 1970s, over 50 natural predators have been tested and released in Hawai‘i, none have switched hosts or become invasive themselves




Miconia biocontrol:
Colletotrichum gloeosporioides

Is there any good news?



Forest and Kim Starr Photo

Hank Oppenheimer/PEP Photo

Forest and Kim Starr Photo

TNC Photo

Jack Jeffrey Photo

Yes! Hawai‘i still has 50% of its native ecosystems, our watersheds, our health, and a renewed focus on sustainability

Biosecurity Progress

We have a new Hawai‘i Department of Agriculture Biosecurity Plan which calls for building import cargo inspection facilities at each port funded by the new cargo fee.


HDOA Photo


HDOA Photo

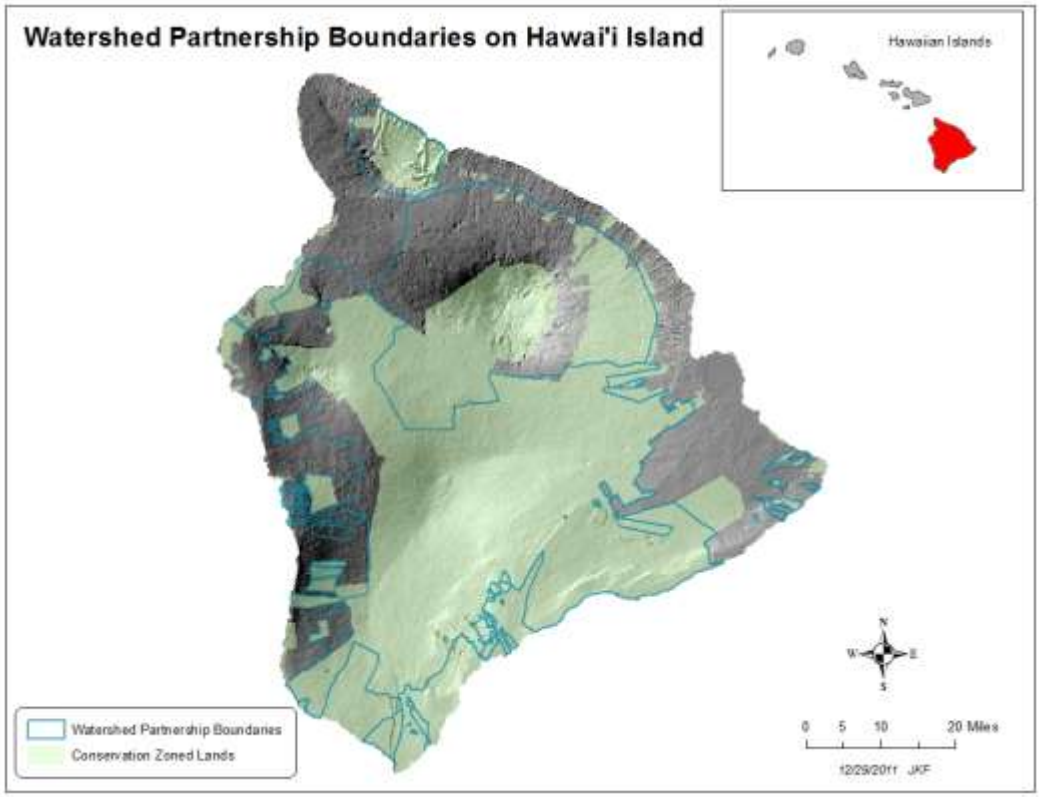
Invasive Species Committees of Hawai‘i

We have the Invasive Species Committees in each county for early detection and rapid response of new invasive plants and pests.

Aquatic Invasive Species Team

- We have an Aquatic Invasive Species Team for rapid response and control
- We have ballast water rules, looking towards hull fouling procedures and rules

Watershed Partnerships



We have public and private landowners working together as Watershed Partnerships to fence out feral ungulates from the very best watershed forests

Results

Projects like the Leeward Haleakala Watershed Restoration Partnership show the value of fencing and outplanting, much of it by volunteers.

Projects

Our first predator proof fence, built to keep cats, mongooses, rats, dogs and mice out of Kaena Point Natural Area Reserve

There is still so much left to protect.

Mahalo!

Mahalo to the following for information, slides and/or photos: NASA; NOAA; Carol Okada (HDOA-PQ), Philip Thomas (HEAR.org), Forest & Kim Starr (PCSU), USDA-NWRC, Jack Jeffrey Photography, Dan Clark (USFWS), The Nature Conservancy of Hawai‘i, HDOA Plant Pest Control, US Forest Service (IPIF), Invasive Species Committees, Watershed Partnerships, Pacific Cooperative Studies Unit, and others where I couldn’t determine the source.

cgaps
STOP THE SILENT INVASION
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