

Insects as Conservation Tools and Challenges

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Invertebrate Conservation – Not Just Insects!

- Terrestrial Arthropods
 - Insects
 - Arachnids: Spiders, Mites, Ticks, etc.
 - Millipedes, Centipedes and Isopods
- Other Invertebrates
 - Worms
 - Gastropods
 - Mussels



Ecosystem Services

- **Provisioning Services** – Any benefit that can be extracted from nature.
 - Cochineal dye
 - Silk
 - Medicinal extracts
- **Regulating Services** – Natural processes that provide benefit.
 - Pollination
 - Nutrient cycling
 - Soil aeration
 - Pest control
- **Cultural Services** – Non-material benefits that contribute to the cultural heritage of local communities
 - Art
 - Story-telling



Plant-Insect Ecology: Goldenrods (*Solidago spp.*)

Generalist herbivores



Pollinators



Pathogens



Generalist Predators



Specialist Herbivores



Parasites



Specialist Predators & parasitoids Mutualism

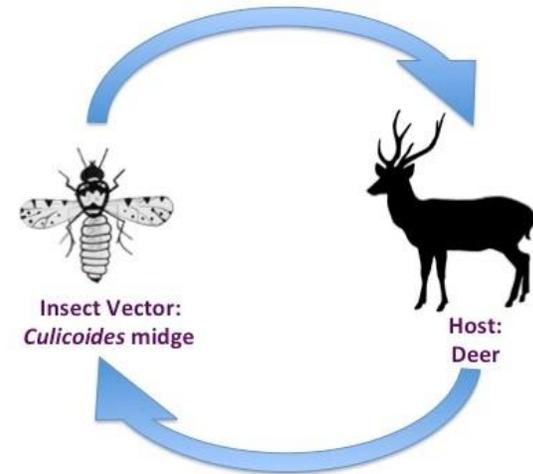


Insects as Pests

- Nuisance insects
- Disease vectors
- Crop pests



Disease Transmission Cycle of Epizootic Hemorrhagic Disease (EHD)



Epizootic hemorrhagic disease (EHD) is caused by a virus that primarily affects white-tailed deer and can also affect mule deer, pronghorn antelope, and rarely cattle. The virus is picked up by tiny *Culicoides* midges, also known as "no-see-ums" or gnats, when the midges bite an infected host. The midges transmit the virus to another host through a subsequent bite, continuing the disease cycle.



Integrated Pest Management

- Minimize the use of pesticides by implementing the following principles:
 - *Setting action thresholds*: Only treat when pest populations exceed a predetermined size, as correlated with damage potential.
 - *Mitigating pest population*: Using cultural control methods (crop rotation, crop sanitation, etc.) to reduce the risk of pest populations reaching thresholds
 - *Using non-chemical controls*: Biological control, trap crops, or other methods to manage pests without the use of pesticides.

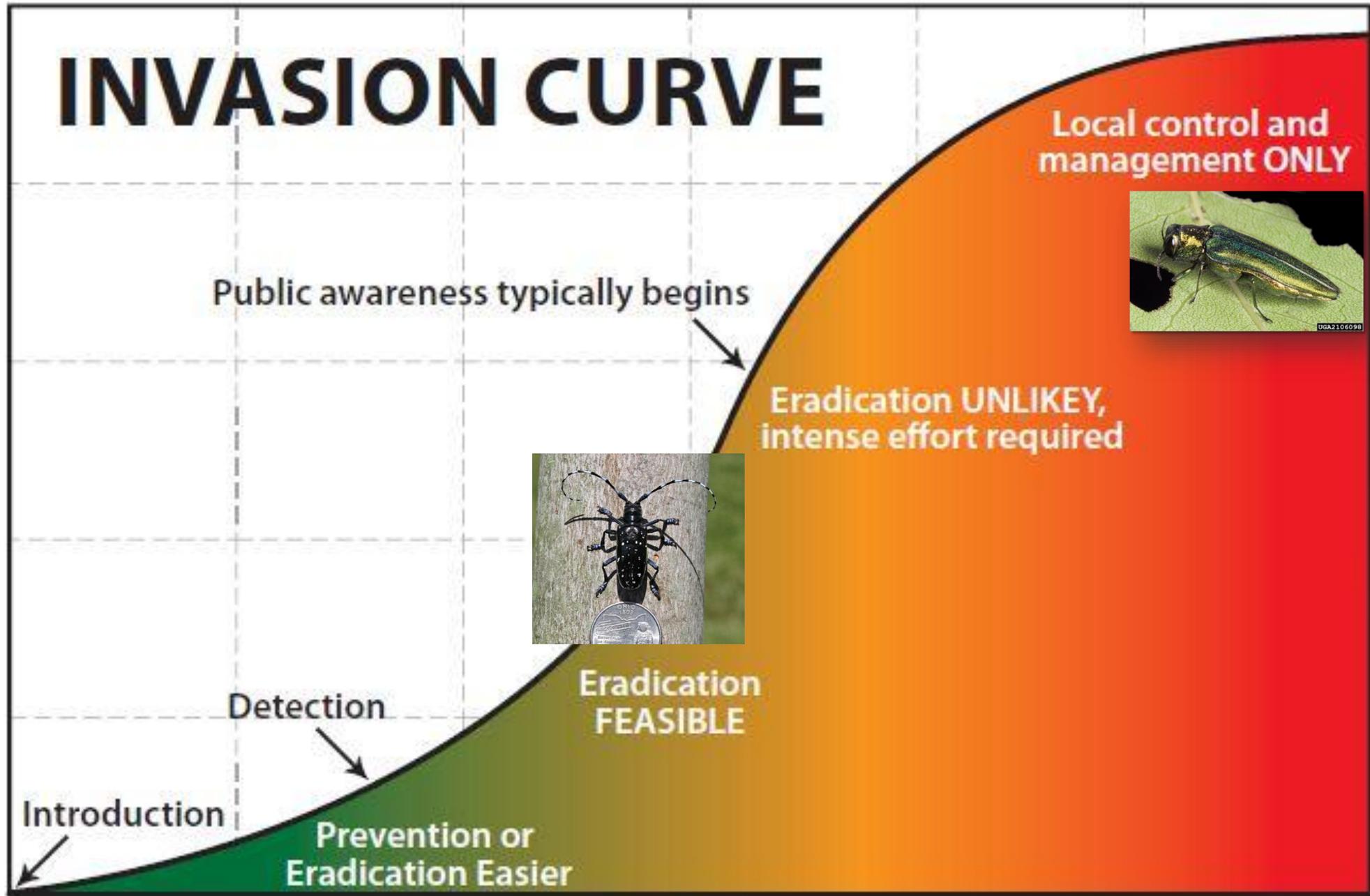
Invasive Pests of Concern

- Spongy Moth (formerly “Gypsy”)
- Emerald Ash Borer
- Laurel Wilt and Redbay Ambrosia Beetle
- Asian Longhorned Beetle
- Thousand Cankers Disease and Walnut Twig Beetle
- Sirex Woodwasp
- Spotted Lanternfly
- Elm zigzag sawfly



INVASION CURVE

AREA INFESTED



Public awareness typically begins

Local control and management ONLY



Eradication UNLIKELY, intense effort required



Detection

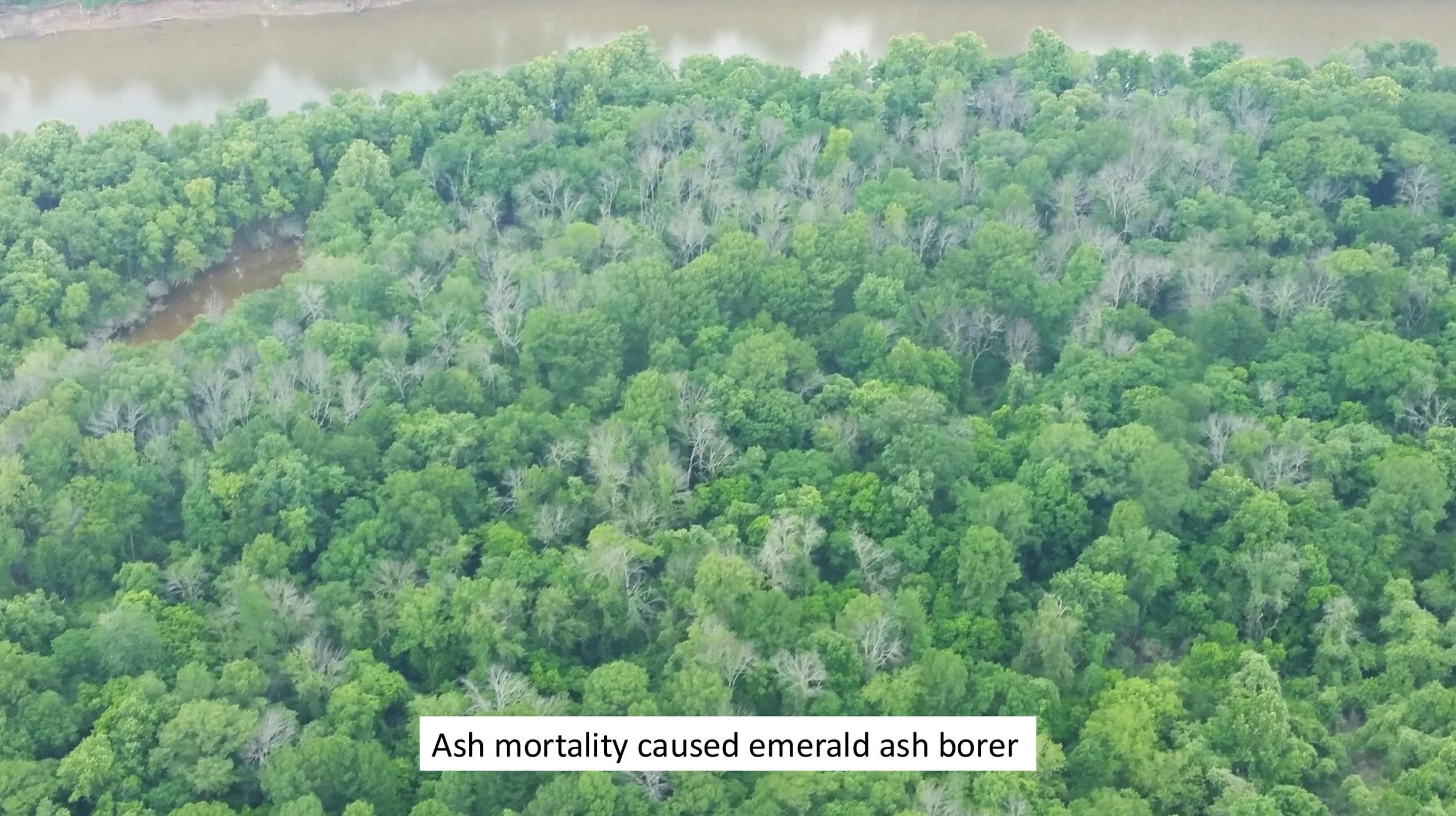
Eradication FEASIBLE

Introduction

Prevention or Eradication Easier

CONTROL COSTS →





Ash mortality caused emerald ash borer

EAB Future

- APHIS PPQ has moved past containment strategy
- Biocontrol introductions on going



Redbay Ambrosia Beetle & Laurel Wilt

- Transmitted by *Xyleborus glabratus*, the redbay ambrosia beetle
- A disease caused by a fungal pathogen, *Raffaelea lauricola*



Marc Hughes, UF

Ambrosia Beetles

- Scolytinae or Platypodinae that reproduce within woody plants
- Native species are not tree killers (and many nonnative species also...)
- Larvae graze on fungal gardens



Jiri Hulcr, UF



Jiri Hulcr, UF



Ambrosia Beetle Mating

- Sibling-mating is common
- Males less abundant
 - Often flightless
- Haplodiploidy
 - Sex-determination where unfertilized eggs become haploid males and fertilized become diploid females



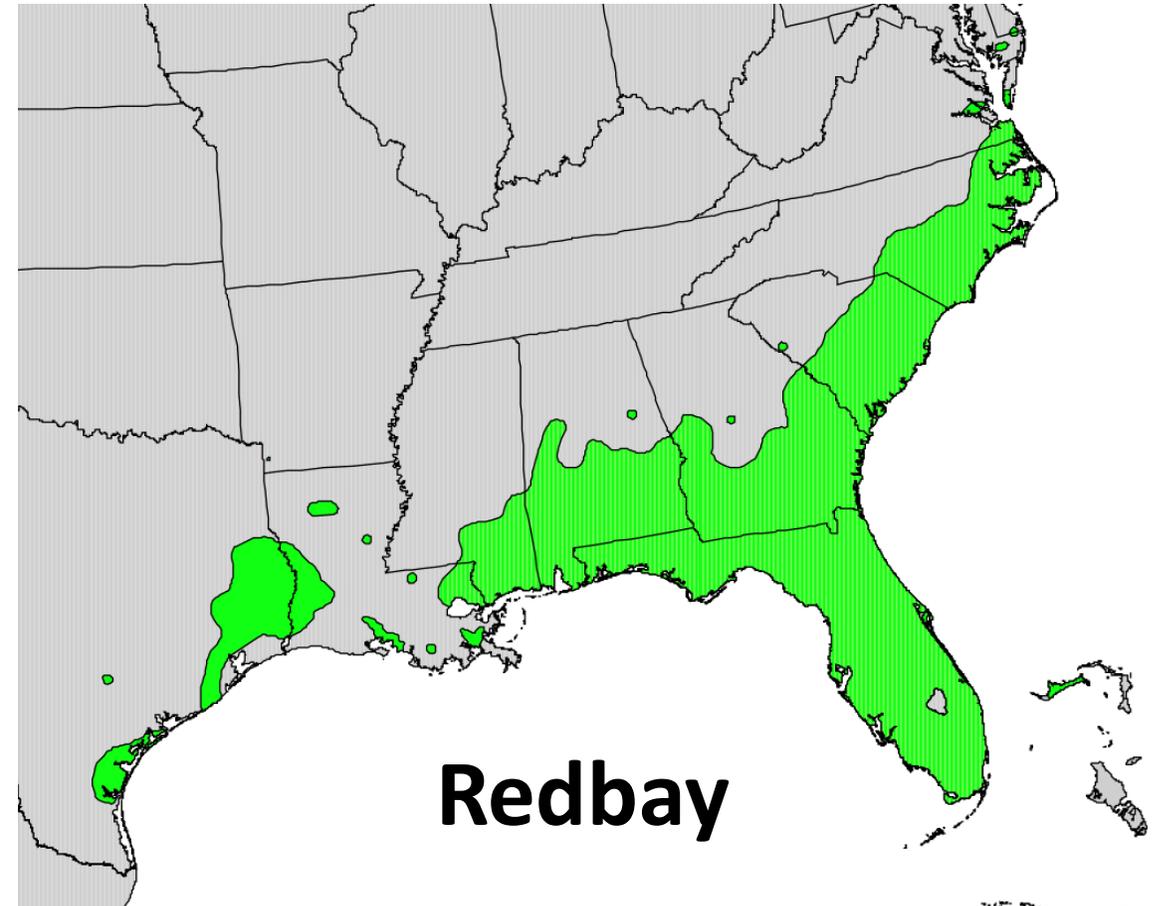
Jiri Hulcr, UF

Host Species of RAB/LWD

- **Redbay (*Persea borbonia*)**
 - Swamp bay (*P. palustris*)
 - Silk bay (*P. humilis*)
 - Avocado (*Persea americana*) – OH NO!
 - **Sassafras (*Sassafras albidum*)**
 - Bay laurel (*Laurus nobilis*)
 - Pondspice (*Litsea aestivalis*) – Threatened species
 - Pondberry (*Lindera melissifolia*) – Threatened species
 - Northern spicebush (*Lindera benzoin*) – artificial inoculation
- 
- Redbay common name

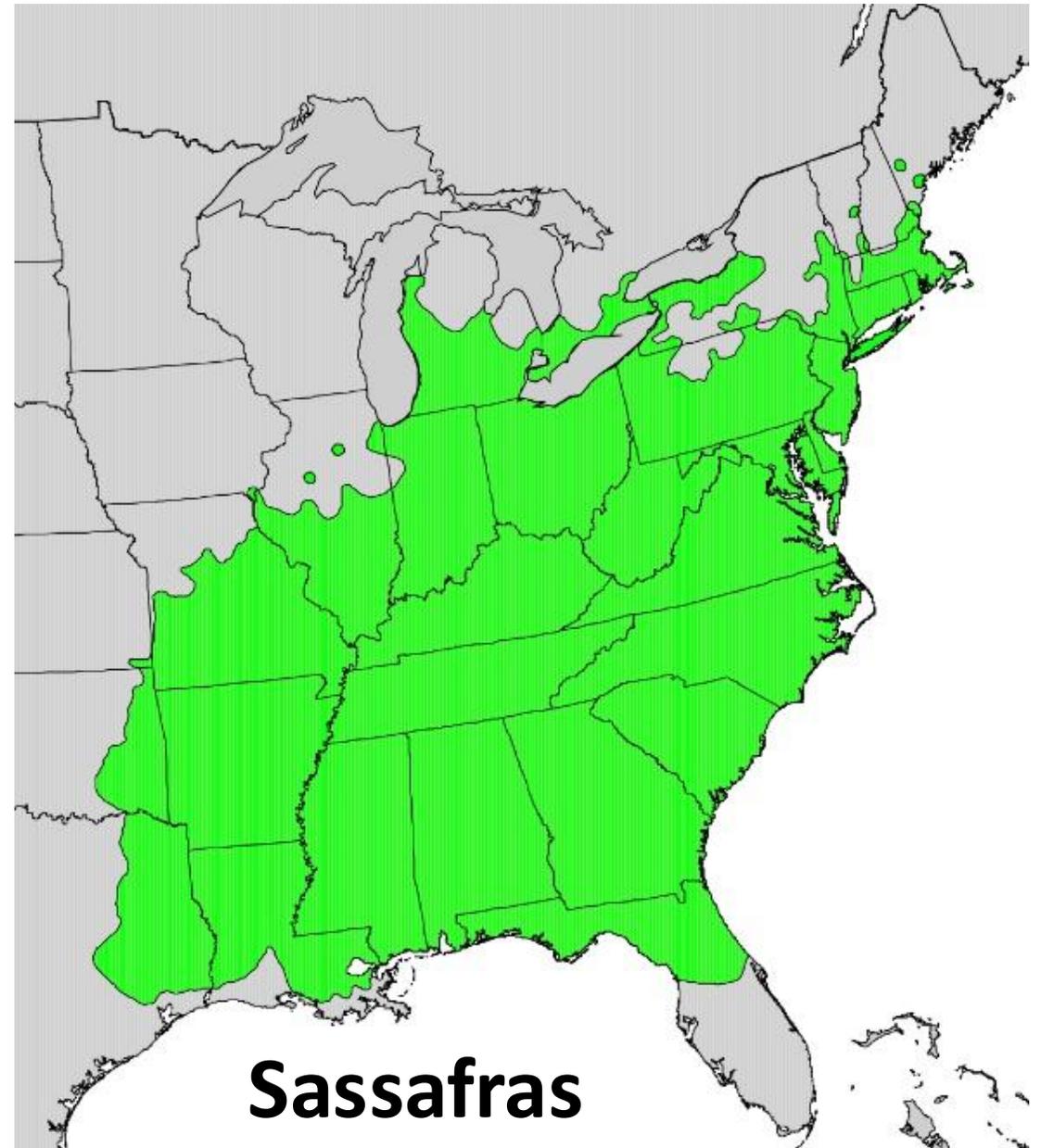
Redbay

- Redbay has been devastated by laurel wilt disease



Laurel Wilt Host Range

- Sassafras has a huge geographic range
- Transmission of disease can occur underground



First Find in Arkansas

- First observed in December 2015
- Started with a call from a logger who observed dying sassafras on his property
- He observed mortality “for several years”



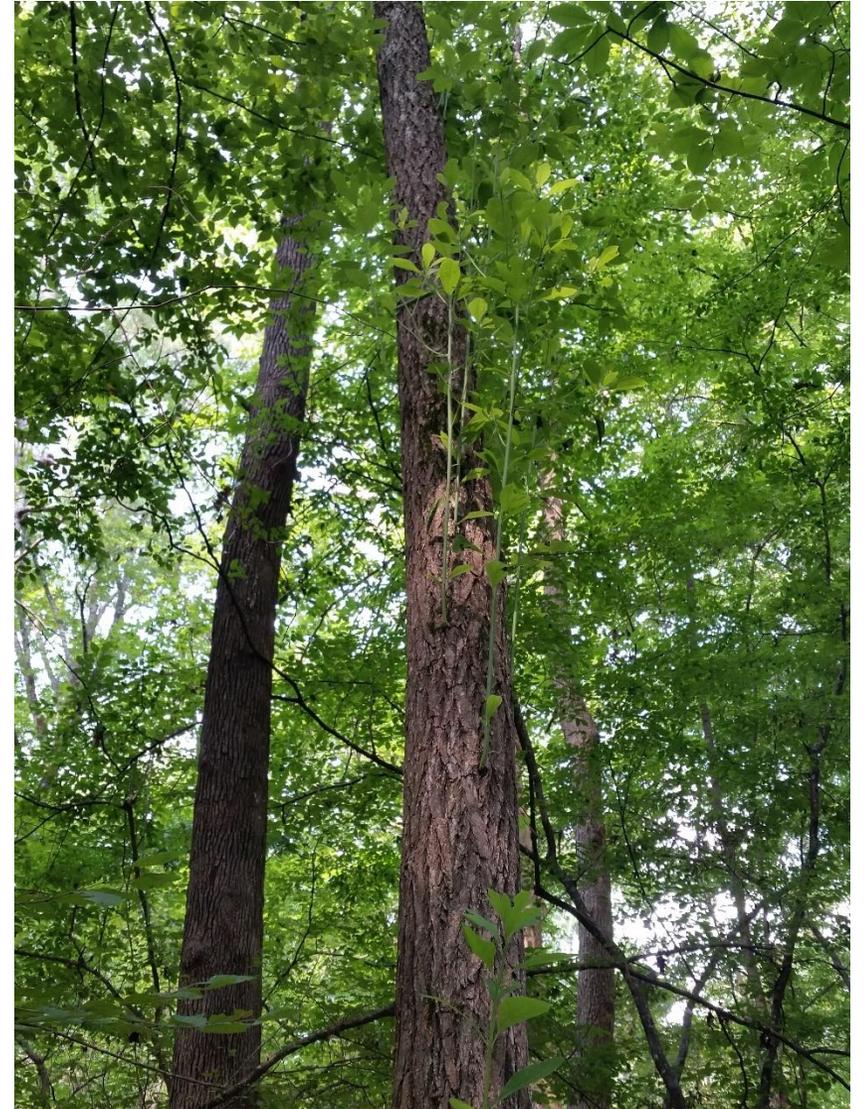


Symptoms Observed



Symptoms Observed

- Lots of sprouting!
- Epicormic sprouts
- Root sprouts sometimes many feet away from mature tree



Collecting Beetles and Wood Samples



Spotted Lanternfly

- extension.psu.edu/spotted-lanternfly
- Discovered in Pennsylvania in 2014
 - Now throughout NE US
- More nuisance than plant killer
- Attracted to tree-of-heaven
 - Also grapes, black walnut, willow, and maple
- Quarantines



Holly Raguzza, PA Dept. of Agri.



Lawrence Barringer, PA Dept. of Agri.

Spotted Lanternfly in the U.S.

State [dropdown arrow]

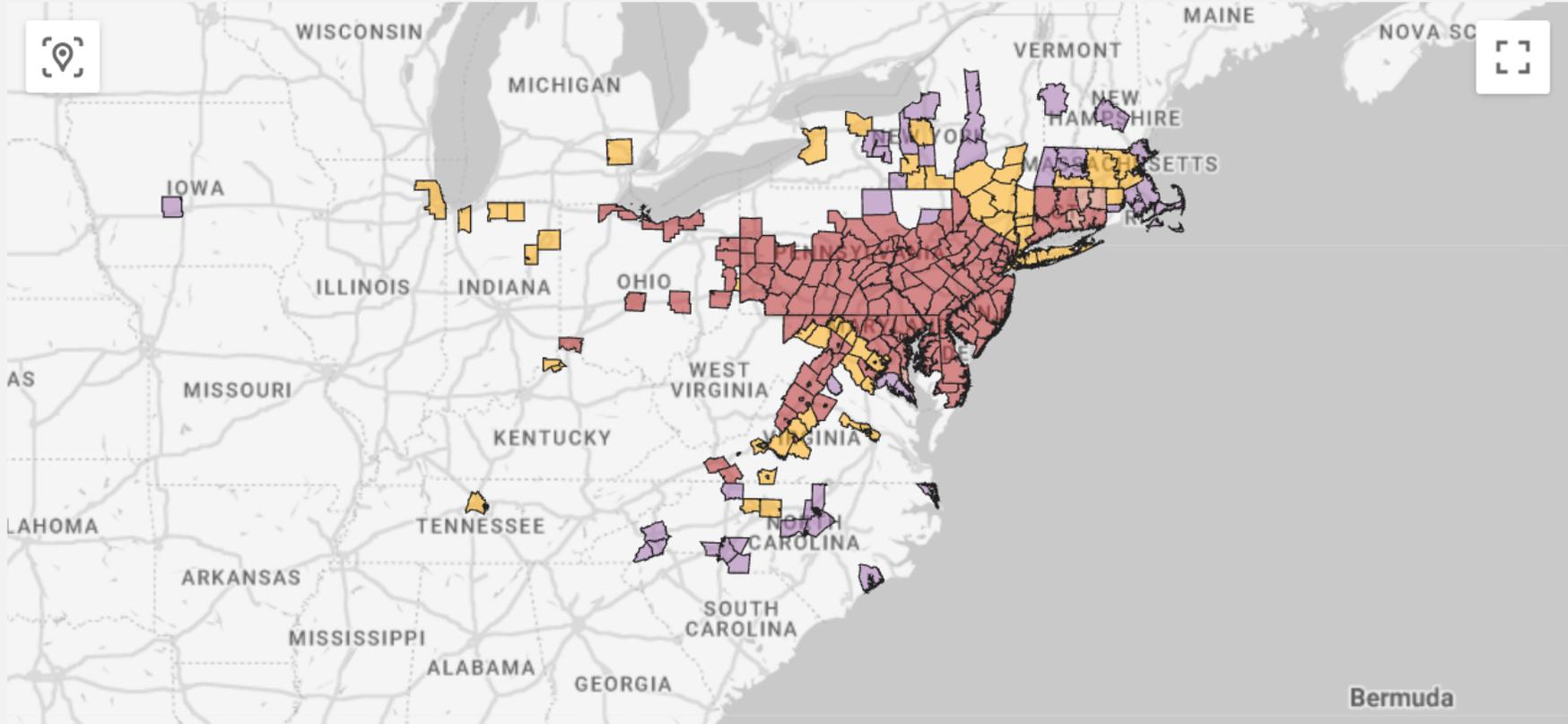
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[New York State Integrated Pest Management](#)

Updated January 18, 2024



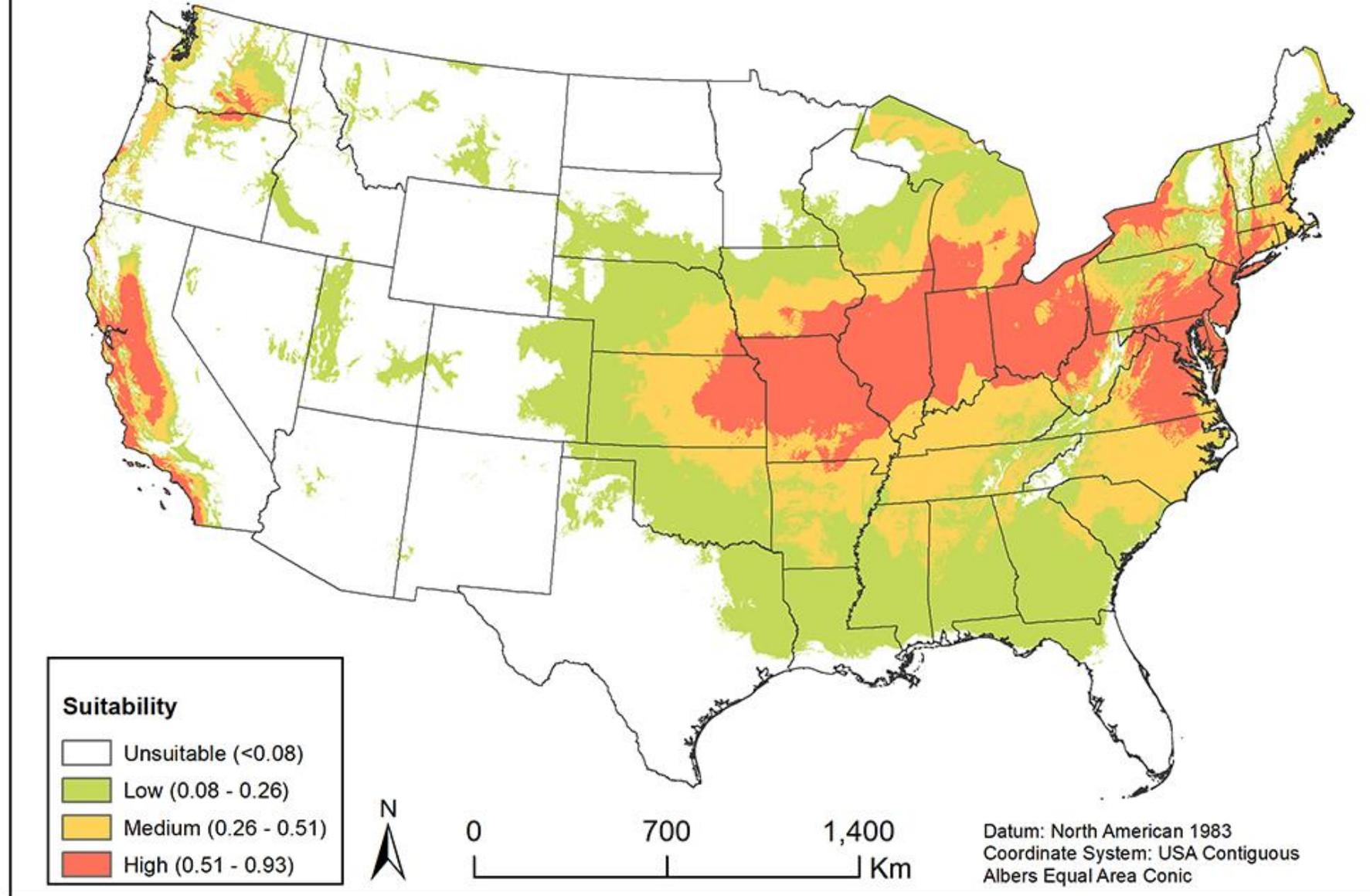
Status ■ Infestation present with quarantine ■ Sighting reported ■ Infestation present ■ Sighting reported with quarantine



[Learn more about spotted lanternfly](#)

This map provides a region-specific look at Spotted Lanternfly distribution. Featured SLF data has been supplied by state regulatory agencies and is intended only for informational purposes. Policy decisions should be based on direct

Potential distribution of spotted lanternfly in the United States



Elm Zigzag Sawfly

- Originated from East Asia
- Invasive in northeastern US
 - Known in Europe since 2003
- Recently discovered in Virginia (2021) and North Carolina (2022)
- Sawflies are wasps that have “caterpillar-like” larvae
- Feeds on all elms (*Ulmus* spp.)



Elm Zigzag Sawfly

- Defoliation is the main concern
- Not expected to kill trees
 - Trees infected with Dutch elm disease may struggle
- Long-term impacts are unknown
- Could be treatable with systemic insecticide



Oten, Bertone, Day et al. 2023. First records of elm zigzag...

Red Imported Fire Ant (*Solenopsis invicta*)

- Introduced in Mobile, AL in 1930s
- Polygynous (multi-queen colonies)
- Large subterranean colonies
- Bite & sting when disturbed

