



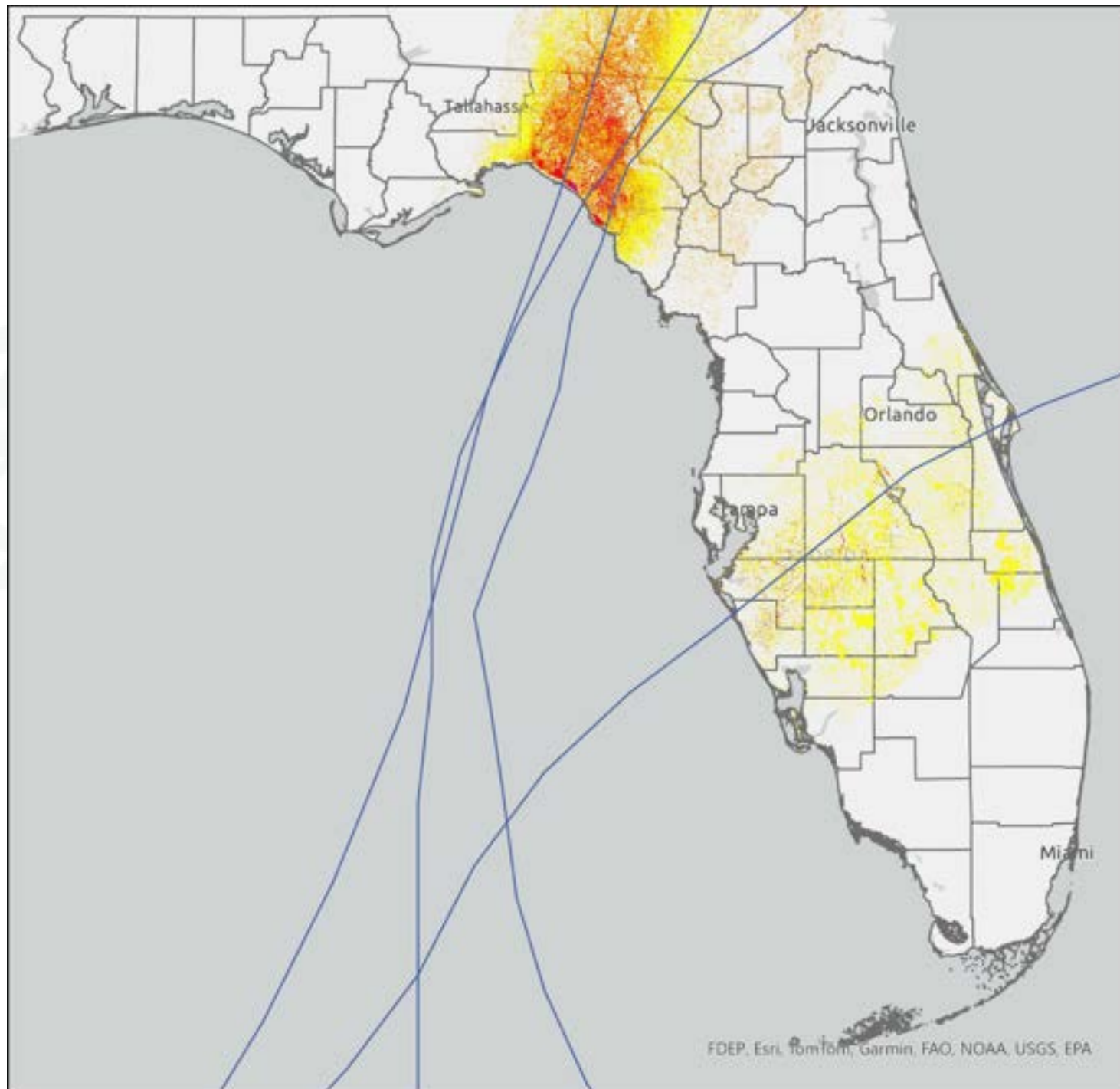
## Post-hurricane Pine Pest Issues



Jeff Eickwort, Entomologist & Supervisor  
FFS Forest Health Section

# 2023-24 Hurricanes

- September 2023: Idalia
  - August 2024: Debby
  - September 2024: Helene
  - October 2024: Milton
- 
- What are we seeing with regard to forest pests & diseases?
  - What should we expect?





# In General: Storm-related Disorders

**Immediate impacts**, primarily from **wind or coastal storm surge**:

- **Obvious direct effects:** Broken trunks and branches, lifted or broken roots.
- Storms often reveal long-term structural problems (cankers, heart rot, root disease, codominant stems with bark inclusions, etc.)





# Often hidden within the “survivors”...

- Internal damage to vascular system.
- Underground damage to the root systems.
- Leaves them vulnerable to **opportunistic pests and diseases** in the years following the storm.





The calls are coming in: "Help, I've got pine beetles!"





# The calls are coming in: "Help, I've got pine beetles!"

Which ones? These species are all found in dead pines.

What if we removed the species that only infest pines after they're already dead?



**Southern Pine Beetle (SPB)**

*D. frontalis*



**Black Turpentine Beetle (BTB)**

*D. terebrans*



The 5 “important”  
pine bark beetle  
species in Florida:

2 species of *Dendroctonus*

3 species if *Ips*



*I. calligraphus*

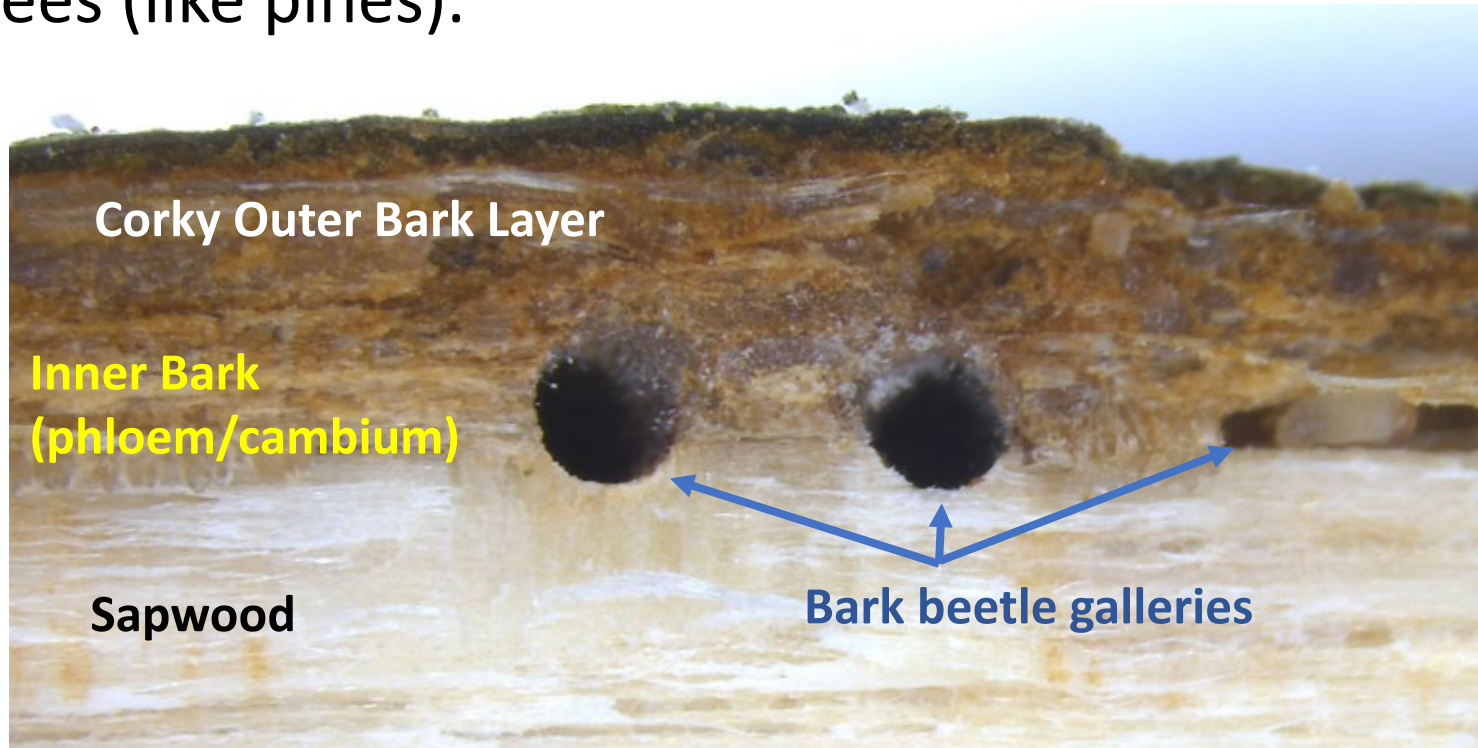
*I. grandicollis*

*I. avulsus*



# What are bark beetles?

- Tiny beetles that feed and breed in tunnels (galleries) in the thin, living inner bark layers of trees.
- Spend most of their life cycles within the tree
- ~3,000 species globally, but most are not serious pests
- Includes some of the most important pests of conifer trees (like pines).





# *Ips* Pine Engraver Beetles

- Three species in most of the Southeast
- Commonly attack stressed, declining, dying, or recently dead trees
- Largest species mostly attack lower stem, smaller species attack higher up.



*Ips avulsus*, 2.3-2.8 mm long

*Ips grandicollis*, 2.8-4.7 mm

*Ips calligraphus*, 3.5-6.5 mm





# Black Turpentine Beetle (BTB)

*Dendroctonus terebrans*

- Largest of SE pine bark beetles
- Infests stressed, injured, and dying/dead trees
- Attacks near base of tree, bottom 8-12 ft.



Larva



Pupa



Adult



On millimeter grid paper

5-8 mm

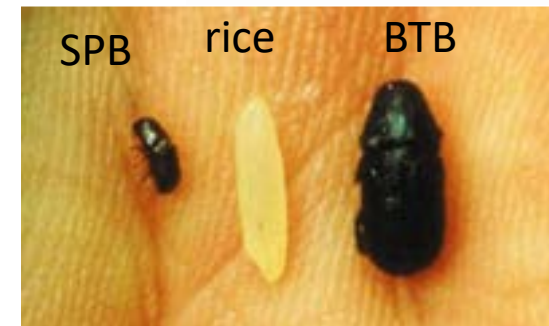
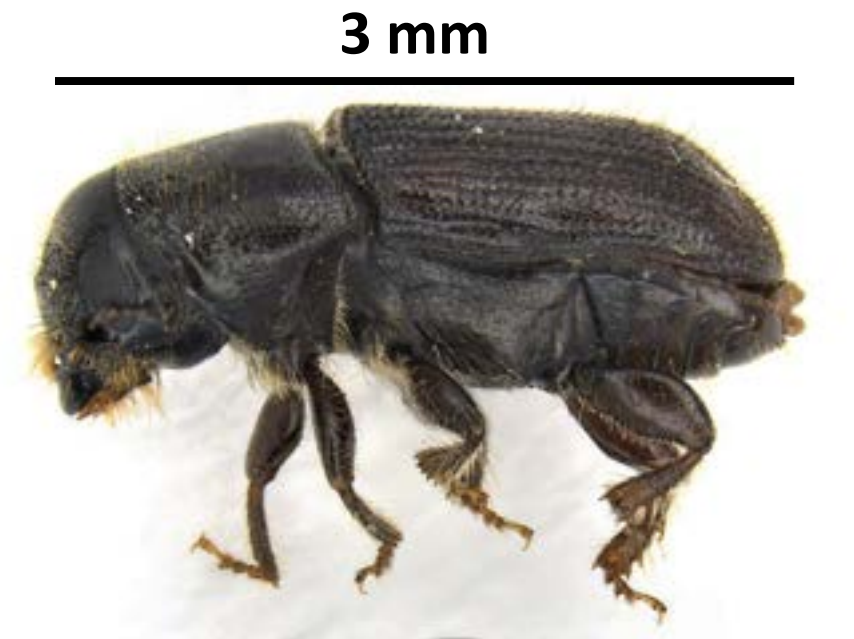




# Southern Pine Beetle (SPB)

*Dendroctonus frontalis*

- Highly aggressive during outbreaks
- Can “mass attack” to kill healthy trees when population is high.
- Feeds in very weak (e.g. lightning-struck) trees when population is low
- Preferred hosts: loblolly, shortleaf, pond, pitch, Virginia, and spruce pines
- Attacks at any height on main stem
- Shape and color is very similar to BTB, but much smaller





# More useful groupings for most management purposes:

## SPB

The periodic outbreak tree-killer



Southern Pine Beetle (SPB)  
*Dendroctonus frontalis*

VS.

## *Ips* & BTB

The ever-present “stress-responders”

Black Turpentine Beetle (BTB)  
*D. terebrans*

*Ips avulsus*



*Ips grandicollis*



*Ips calligraphus*





# Interpretations & Responses: The “Stress Responders” vs. SPB

## *Ips* and BTB

- Small infestations are common and widespread every year, anywhere with pines.
- When a pine tree dies anywhere, they will probably infest it (especially *Ips*).
- Respond to “stressed pine” odors, regardless of species.
- Best understood as an indicator of some other problem.
- Common following major disturbances and disasters (hurricanes, droughts, floods, fires)
- Control measures are usually not called for.
- Should prompt you to ask: “Why are the trees so stressed that they are being infested with *Ips*/BTB?”

## SPB

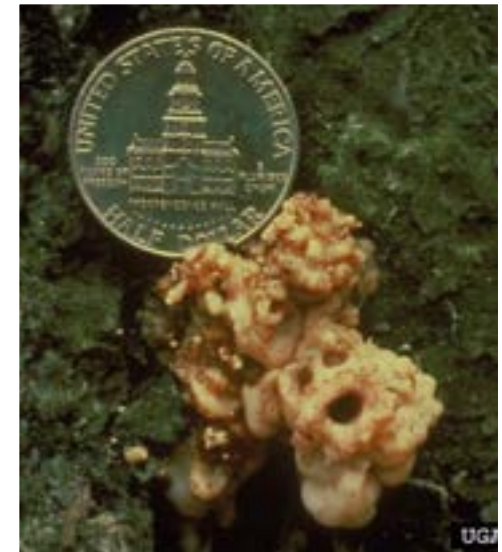
- In most years, SPB is rare.
  - Some years (like 2020-21, 2024) with zero SPB infestations statewide.
- Very little response to stressed pine odors in the absence of its own pheromones.
- Shows a preference for certain pine species over others (but will attack any pines during an outbreak).
- In an outbreak, SPB is the primary problem.
- Not associated with disturbances; outbreak triggers are poorly understood.
- Control measures are important to reduce further losses.
- If an active infestation is found, should prompt you to consider responding quickly.



# Why is tree stress so important?

Because healthy pines fight back!

- Primary defense: “resin canals” (or ducts) running through inner bark and sapwood.
- Disrupted as the adult beetle tunnels into the living tissues.
- If the tree wins, the beetle is smothered and flushed out.
- If the beetle succeeds, it creates a “pitch tube” with a hole in the center.
- Often the first visible sign of pine bark beetle attack.





# If you see insect holes on pines with no resin flow...

It means either that:

- The holes are from one of the species that harmlessly tunnel in the corky outer bark, or...
- The tree was already dead (or near death) when the hole was made.

Pine bark carpenterworm holes – common on mature living pines



Post-death *Ips* beetle infestation – no resin flow, just boring dust!

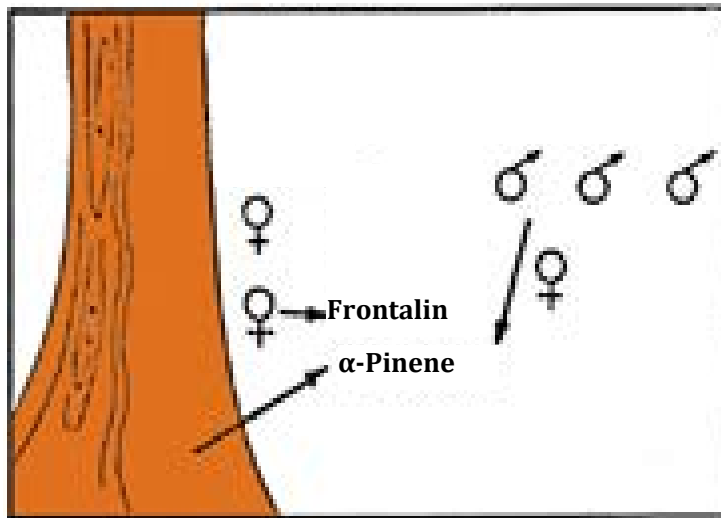


# How SPB can kill healthy trees in an outbreak...

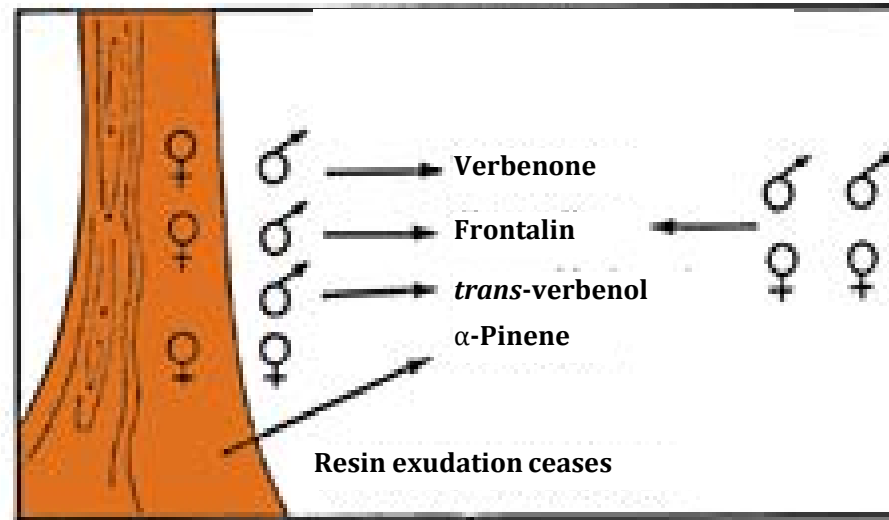


1. Initial Attack

**“Pull” pheromone released to attract more beetles to the tree.**



2. Mass Attack

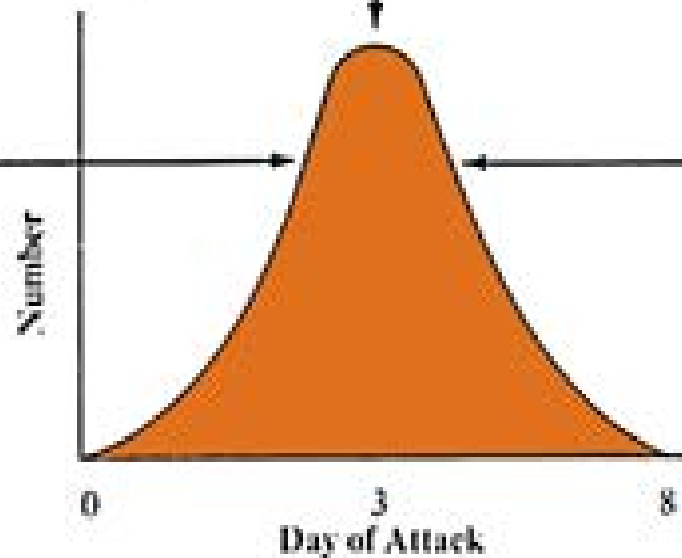
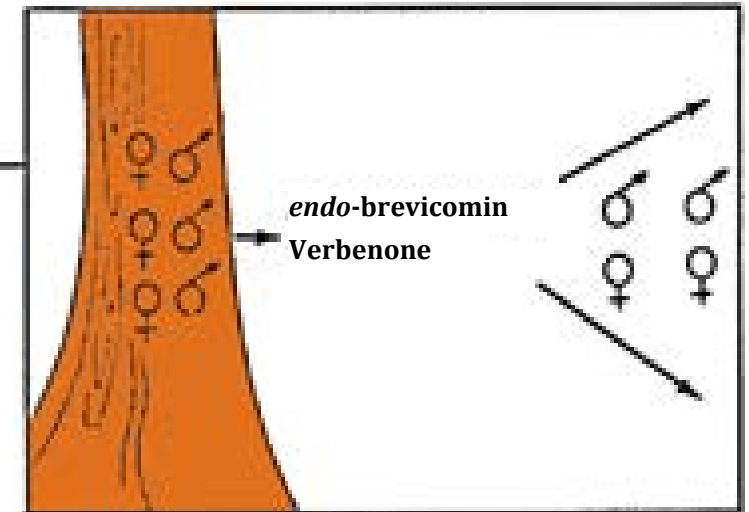


**“Mass attack”!**

Hundreds of beetles swarm the same tree, overwhelming the resin defense system even if the tree is healthy

**When that tree is full, SPB releases a “push” pheromone to direct incoming beetles to attack nearby trees.**

3. Switching





# Common statement from landowners/homeowners about attacks by the “stress-responding” bark beetles:

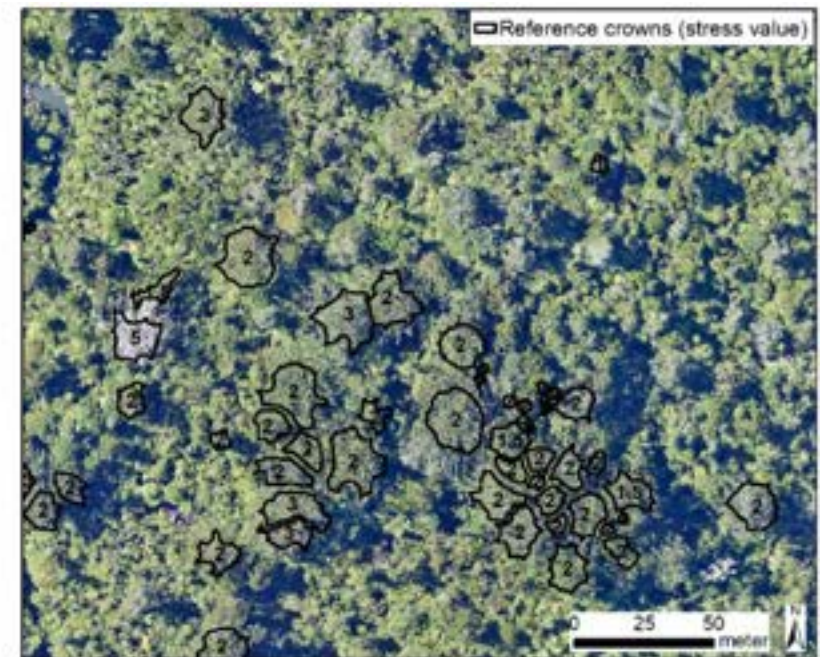
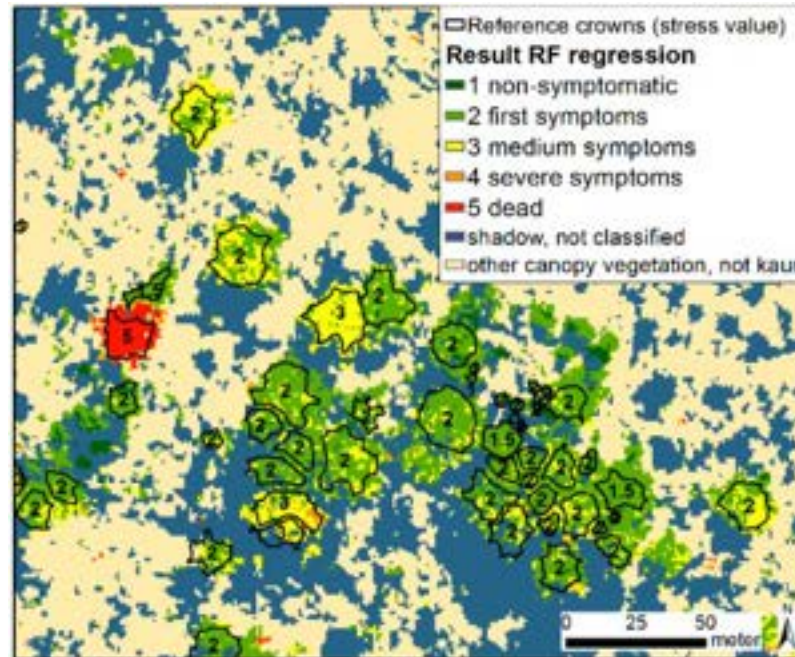
But those trees looked perfectly healthy!

However:

- Stress often does not cause visible symptoms (such as crown wilt) until after the tree is functionally dead.
- Bark beetles are able to detect the scent of a stressed tree long before we can see symptoms.

## Possible future tool for forest managers:

Hyperspectral imagery from UAVs (drones) to automatically identify tree species and detect tree stress.





# Indicators of an Infested Tree: Crown Wilting

- Often the first symptom noticed, but almost the last to happen.
- Gradually fading to yellowish, then brown, then bare.
- Bark beetles have often finished & left before crowns fade.
- Can indicate whether or not it's an active outbreak, which direction(s) it's spreading, etc.





# Distinguishing between *Ips* and SPB attacks...

- Often involves peeling the bark to examine the shapes of their tunnels (“galleries”).



Southern pine beetle – winding, S-shaped galleries



*Ips* engraver beetles – linear/vertical galleries



# Stand-level Behavior

## The “stress-responders” (*Ips* & BTB):

- Infestations usually in single trees, scattered, or clumped
- Will be self-limiting
- Infesting stressed trees, mostly leaving healthy ones alone.
- When many trees are attacked, it’s usually due to large-scale stress factors:
  - Drought
  - Flood
  - Fire
  - Storms
  - Site disturbance
  - Root disease





# SPB Outbreak Behavior

- Infestations develop in spreading “spots”
- Mass attack mediated by pheromone signals
- Tree stress is a risk factor, but healthy trees are also killed!
- Stand density is the most important risk factor.
- In outbreak conditions, SPB can kill apparently healthy pines across large areas
- Spread can be very rapid (up to 75 ft/day)







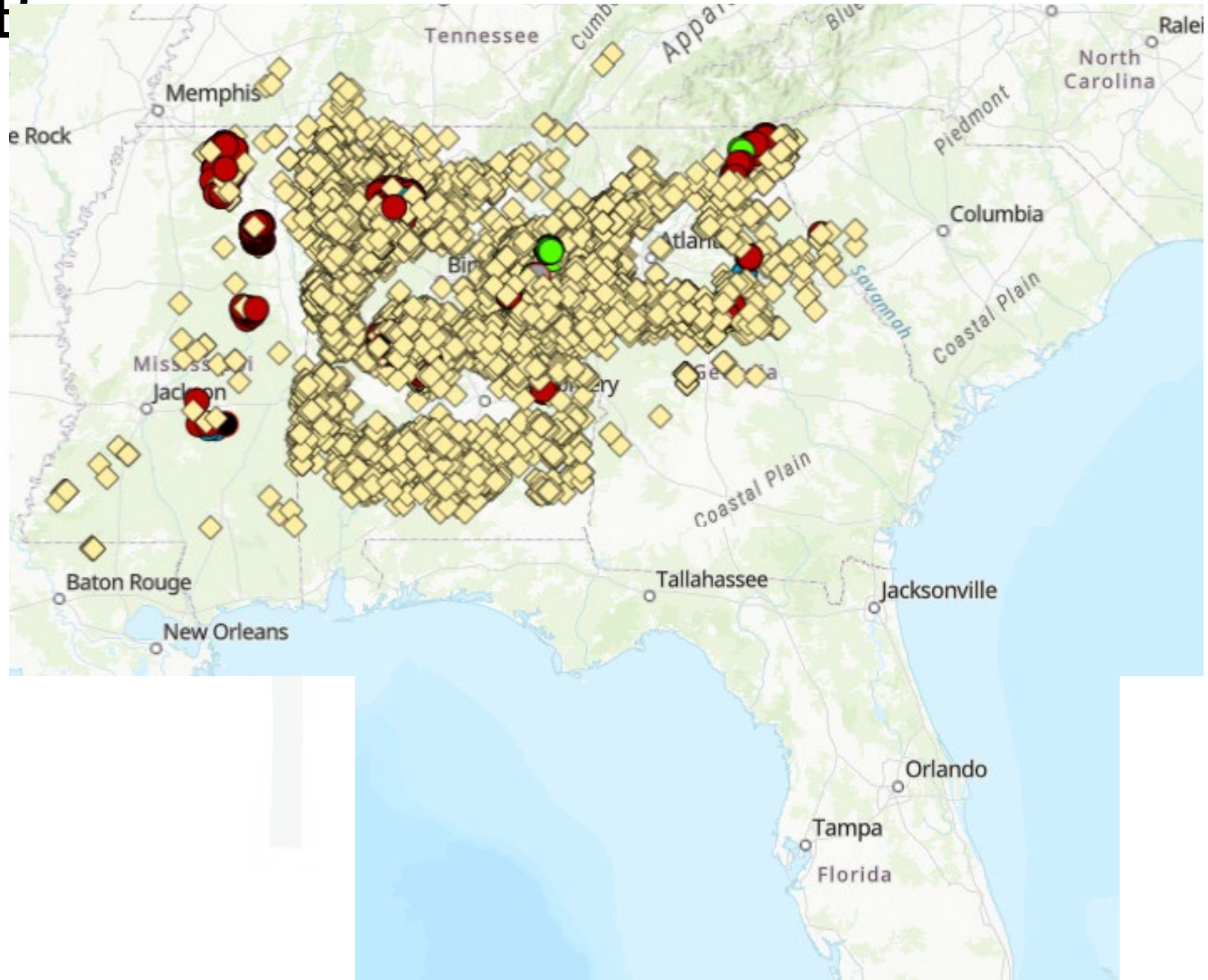
Indian Mounds Wilderness, Texas, 1993 (Ron Billings)

IIGA0284012



# Massive Regional SPB outbreak in 2024

- Over 13,000 infestations recorded in Alabama, Georgia, and neighboring states.
- ZERO confirmed SPB infestations in Florida!!

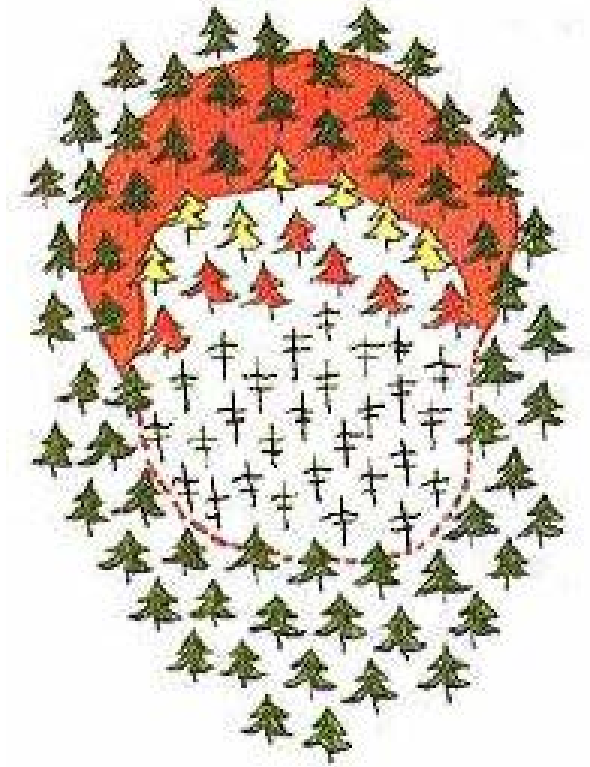




# Southern Pine Beetle

## Suppression

- At earliest detection of an active, spreading infestation (spot), **Cut and Remove:**
  - Cut a buffer of un-infested trees in direction of spot spread (do this first)
  - Cut down & haul out all infested trees
  - Disrupts pheromone signaling for “mass attack”
  - Leave dead, vacated trees (for natural enemy development)





- Delineate & establish buffer at time that suppression harvest begins
- Remove buffer ahead of leading edge
- 40-70 feet wide, or equal to height of trees



Photo: Ron Billings



## For the “stress responders,” *Ips* and BTB:

- **Selective removal of infested trees is not critical for pest management!**
- Selectively removing infested trees from a pine stand can often **worsen and prolong** bark beetle activity in the remaining trees.
- If the other pines are stressed enough, the beetles will fly from far away to find them.
- If they're healthy, the beetles nearby will ignore them.
- **Removal decisions should be based on the desire to:**
  - **salvage timber value**
  - **reduce the risk of dead trees falling on people/property.**



# Chemical Control

## Cut-and-spray of infested trees

### Bark sprays

- **Lindane, Dursban** no longer registered for bark beetles
- **Prevention only**: nothing on the market for cut-and-spray
- **Permethrin, bifenthrin**: not registered for forests; ornamental settings only
- **Carbaryl**: registered for forests, but not effective for SPB
- **Generally not worth the money for forestry purposes.**



**NO LONGER DONE**

**Preventative spray of un-infested trees: of some limited utility**





# Chemical Control

## Systemic Insecticides

- Emamectin benzoate (TREE-äge) can be effective at protecting un-infested trees.
- Benefits:
  - Long activity (~3 years)
  - Low non-target effects, safer for workers.
- Negatives:
  - Difficulty, expense (current options are stem injection only).
  - Delay of about 2-4 weeks before it reaches full effect.
- An option to protect individual high-value trees





A satellite image of Hurricane Michael, showing a well-defined eye and a dense, swirling cloud structure. The hurricane is positioned over the Gulf of Mexico, with the coastline of the United States visible on the left and the Gulf of Mexico on the right. The colors of the clouds range from green and yellow to red and white, indicating varying intensities of precipitation and cloud height. The eye of the hurricane is a small, dark, circular feature in the center of the storm.

WEATHER  
ON THE 1S

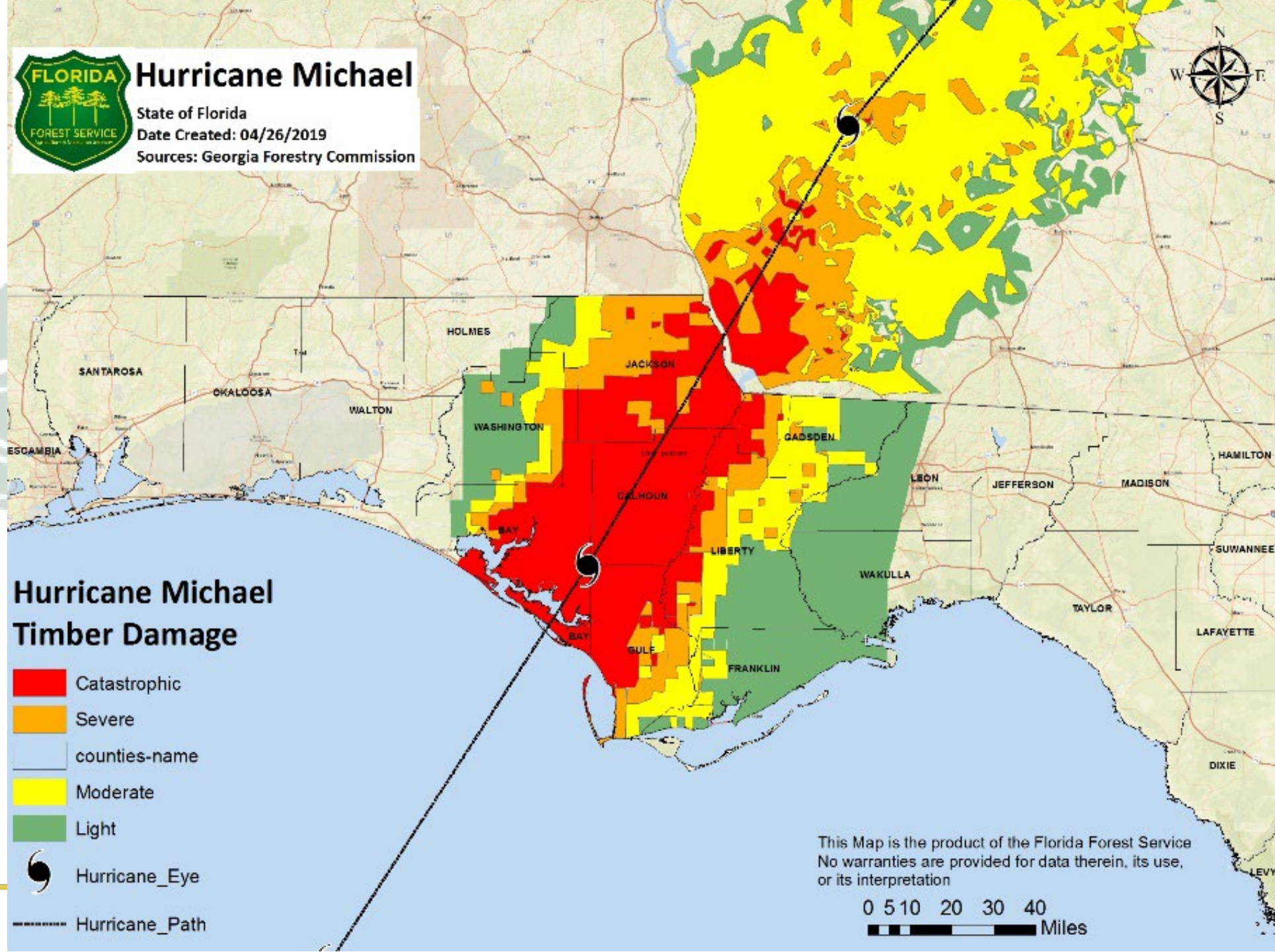
# HURRICANE MICHAEL

**What to expect with pine bark beetles after hurricanes?**

Lessons from Hurricane Michael (2018)



# Initial Wind Damage Assessment









## Early Summer 2019 – After Hurricane Michael (October 2018)

- Widespread pine mortality with *Ips* infestations reported in trees that had initially survived the storm.
- Hidden damage to stem & roots from wind, in trees that bent, rather than breaking.





# Often involving younger stands

- More flexible, bent rather than breaking in wind.
- Resin bleeding from stem, resin-soaked tissues indicating mechanical injury prior to beetle infestation.



DEPARTMENT OF AGRICULTURE & CONSUMER SERVICES



Some species (e.g. sand pine) clearly more susceptible to wind damage than others.



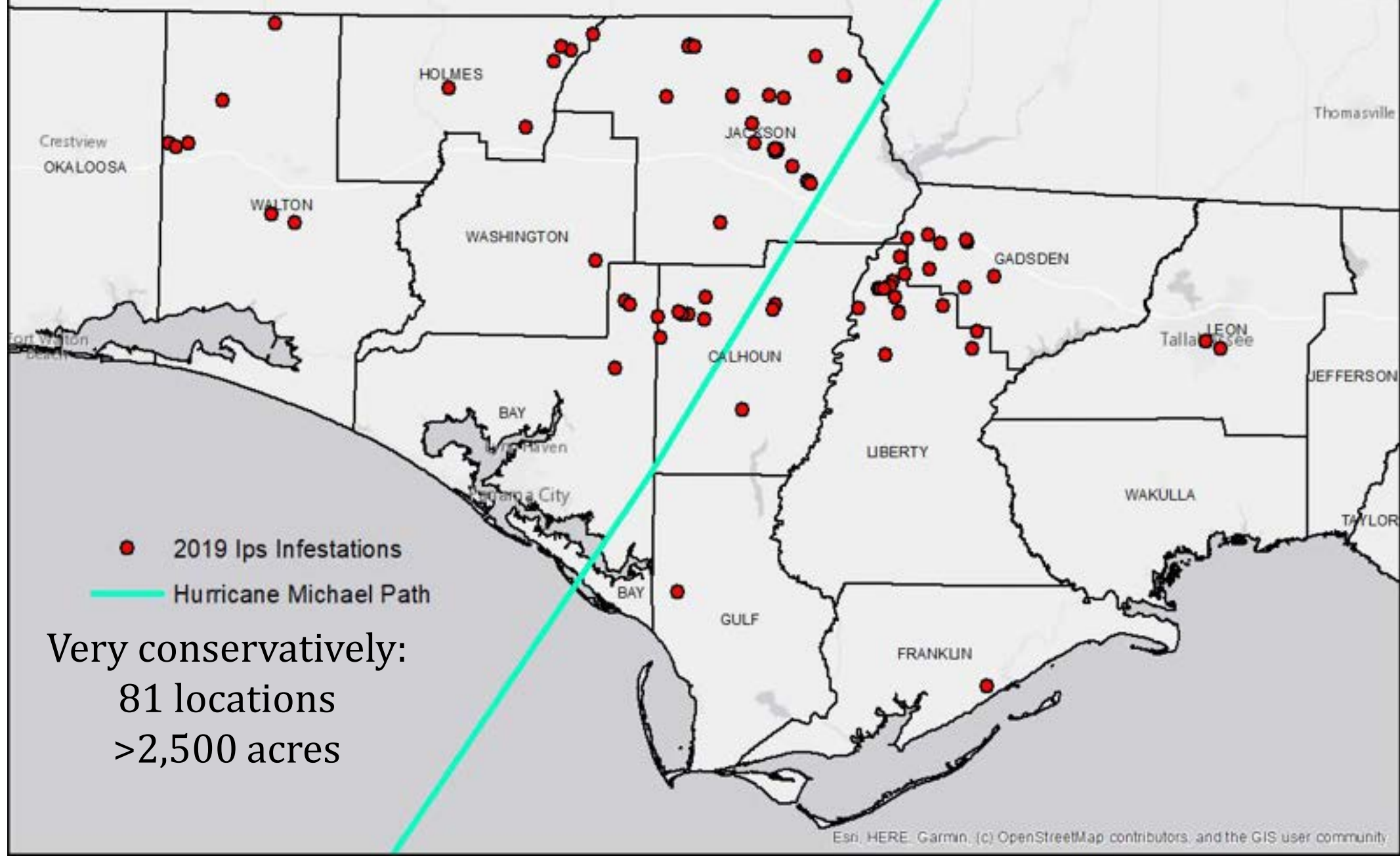


- Primary bark beetles at work: *Ips calligraphus* and *I. grandicollis*





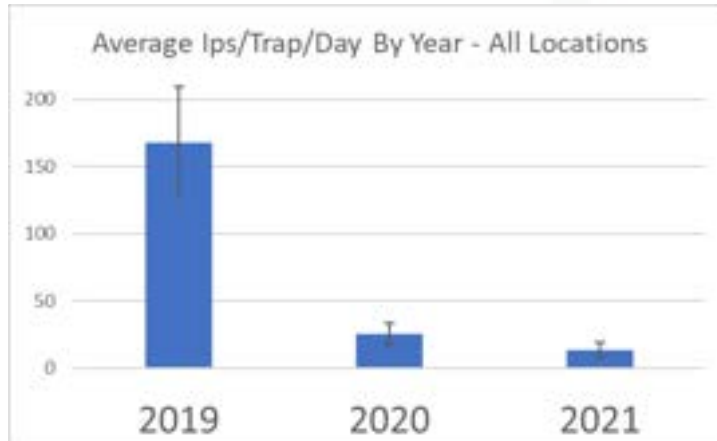
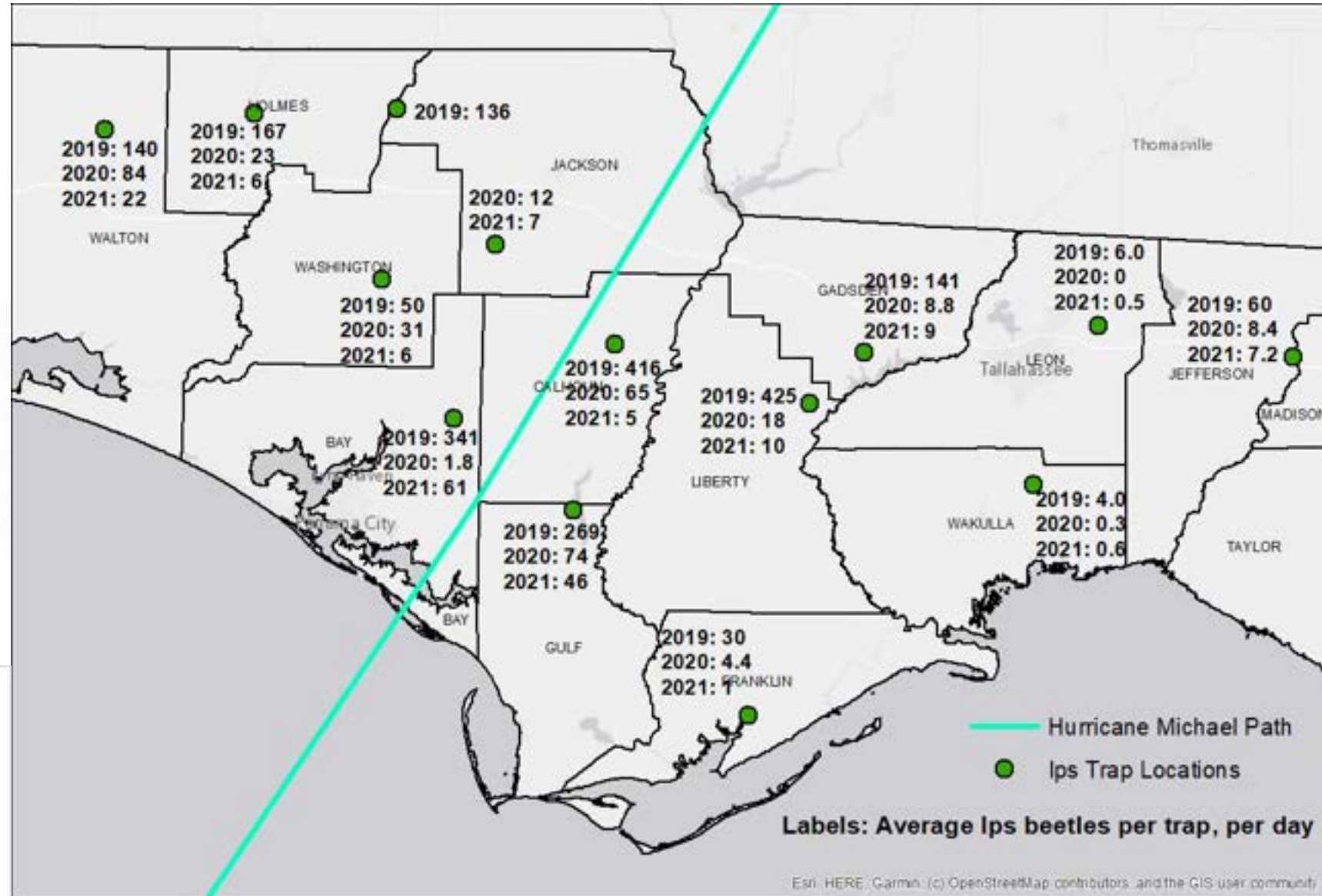
# June-Oct 2019: *Ips* infestations in Hurricane Michael Zone





# 2019-21 *Ips* Summer Pheromone Trapping Survey

- Used funnel traps with *Ips* pheromone lures
- 4 weeks, June-July
- Extremely high catches in 2019
- Dropped dramatically in 2020, few infestations detected
- Down to near-background levels in 2021
- Models for interpretation/prediction don't yet exist.





# Is it “*Ips* mortality” or “hurricane wind damage”?

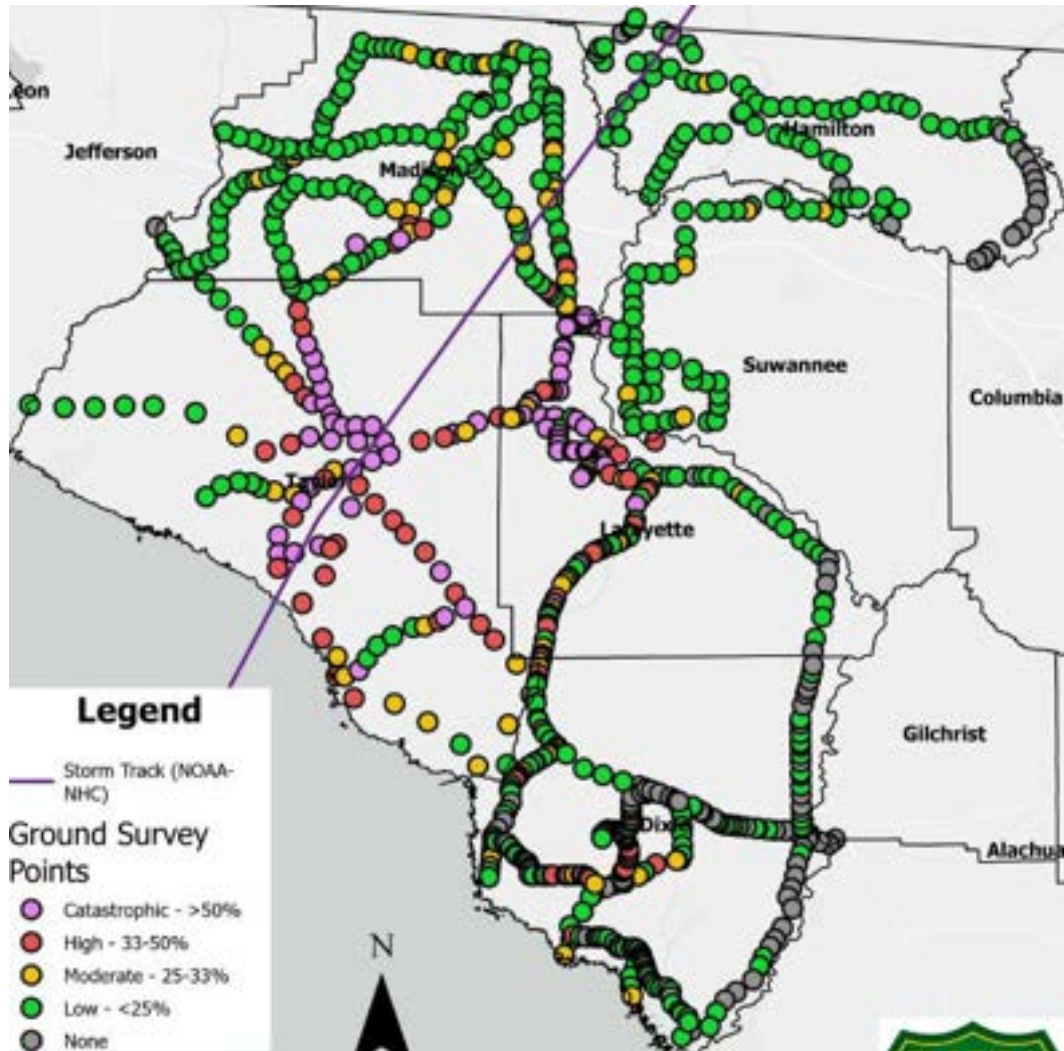
- Example: Apalachicola Bluffs & Ravines Preserve (TNC) in 2019-20
- Thousands of acres of young, low-density longleaf
- Endured heavy winds during Michael
- Much of it >50% mortality
- *Ips* found in dead trees, but **no pitch tubes**



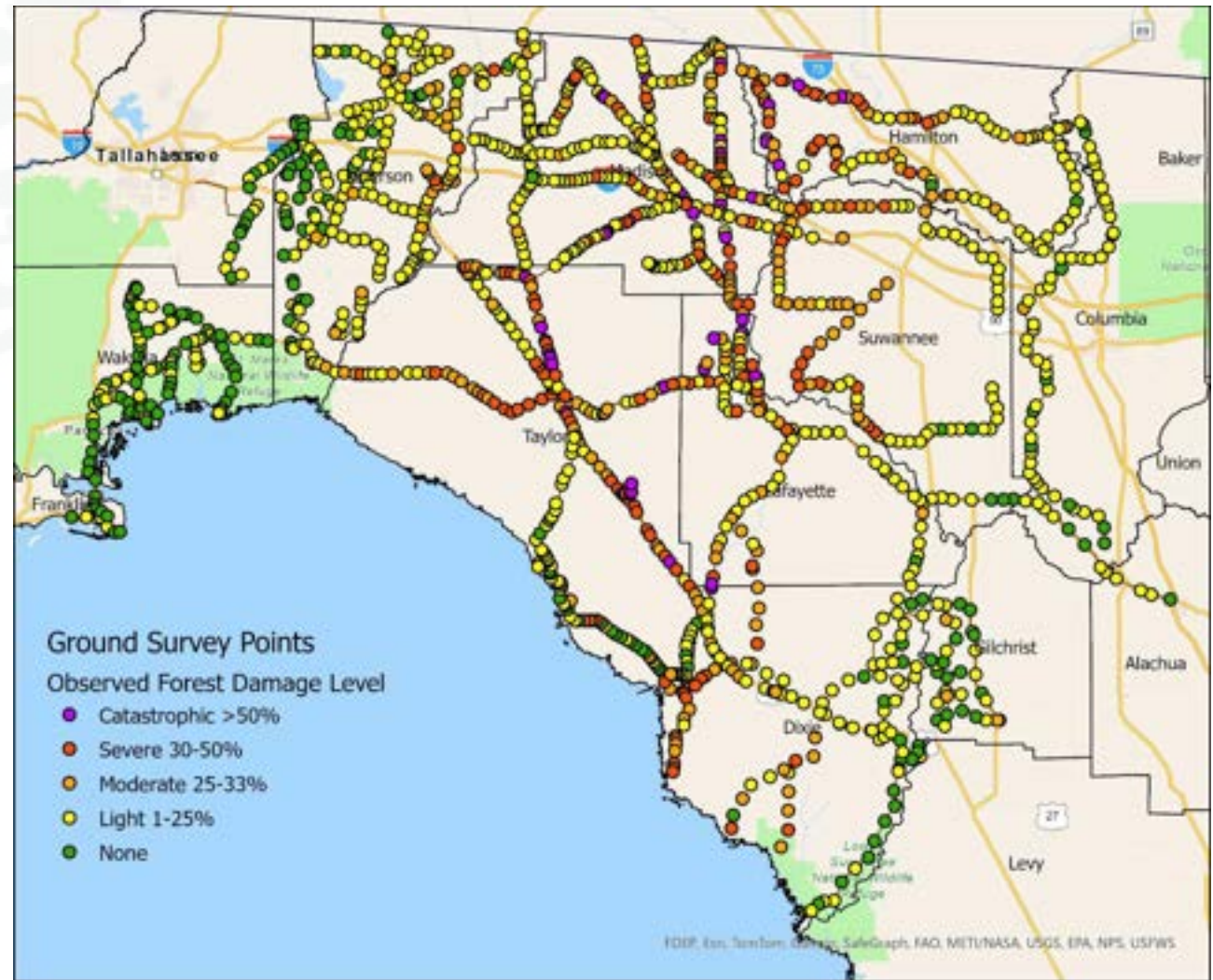


# Observations In the Idalia/Helene Impact Zone

Post-Idalia Forest Damage Survey, October 2023



Post-Helene Forest Damage Survey, October 2024









# Commercial Pine Seed Orchard (Taylor Co.)

Field visit 9/11/2024

(5 weeks after Debby, 2 weeks before Helene)



Trees declining and being infested with *Ips* and post-mortem woodborers – likely due to stress from Idalia in 2023.





## Lafayette Co., May 2025

- Ongoing death of mature pines in an open-grown landscape setting, with *Ips* beetles.
- Inside of some trees: obvious stress cracks from hurricane winds!





# Post-Helene Salvage(?) In I-10 Rest Area (Madison Co.)

- Clearance operations caused heavy site disturbance; fresh tree death (with *Ips* engraver beetles) ongoing at last visit.

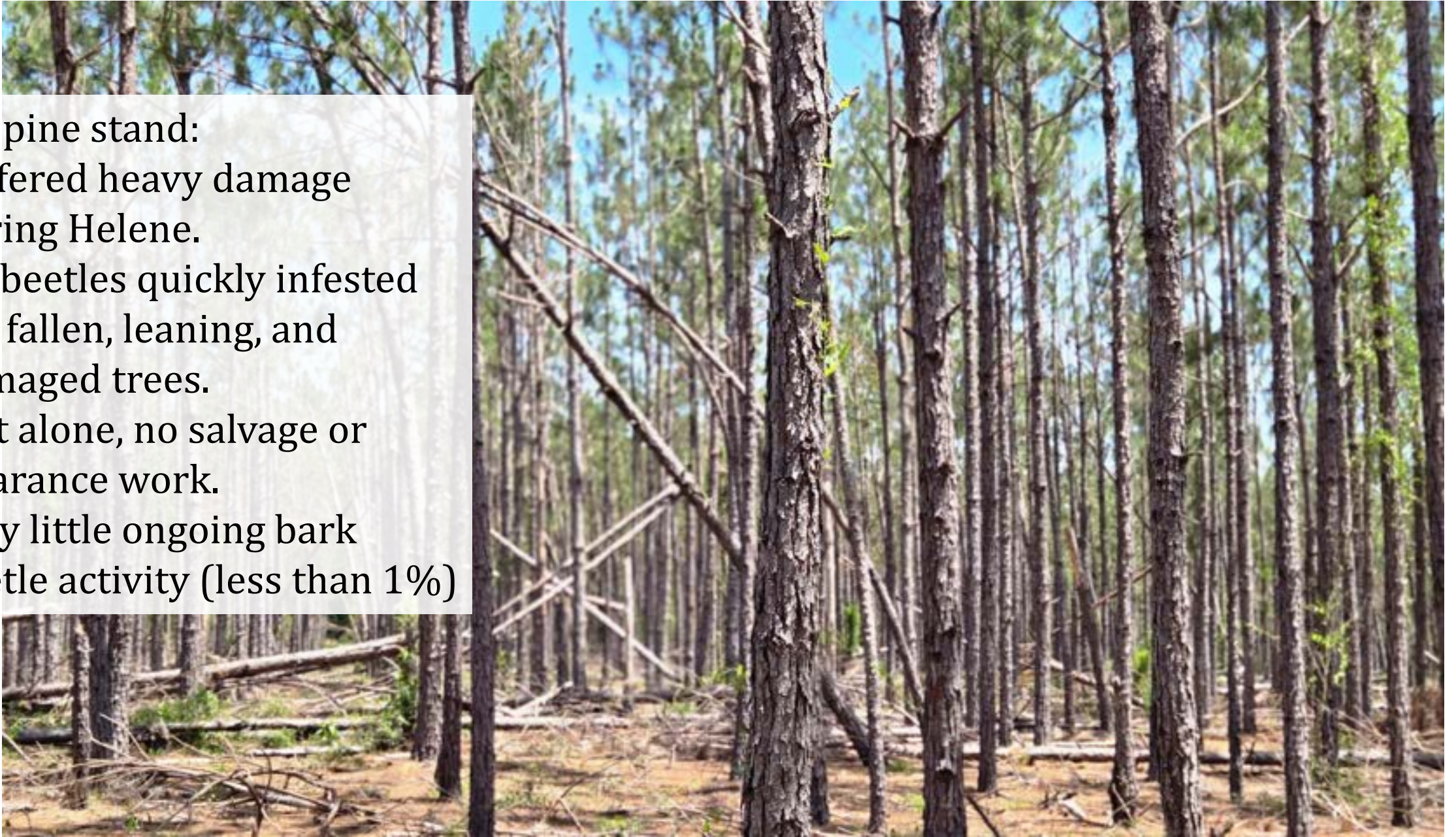




# Lafayette County, Late May 2025

## Slash pine stand:

- Suffered heavy damage during Helene.
- *Ips* beetles quickly infested the fallen, leaning, and damaged trees.
- Left alone, no salvage or clearance work.
- Very little ongoing bark beetle activity (less than 1%)





# The Takeaways

- The immediate effects of hurricane wind damage are usually obvious and easy to understand.
- In the medium term (1 to 3 years after the storm), there is often an increase in opportunistic and stress-responding pests and diseases.
  - Including pine bark beetles, particularly in the year following the storm – directly correlated to the level of tree stress.
  - These issues generally do not aggressively spread to nearby healthy trees.
- Other effects (root diseases, stem decays, etc.) are likely to increase in these areas in the longer term (decades), but this is poorly studied.



# Thanks!

## Questions?

And also join our Facebook group!

