

# Pine tree pests and their management

The Grand Tree Pests Review  
ISA Southern Annual Conference  
Myrtle Beach, SC  
24 February 2026



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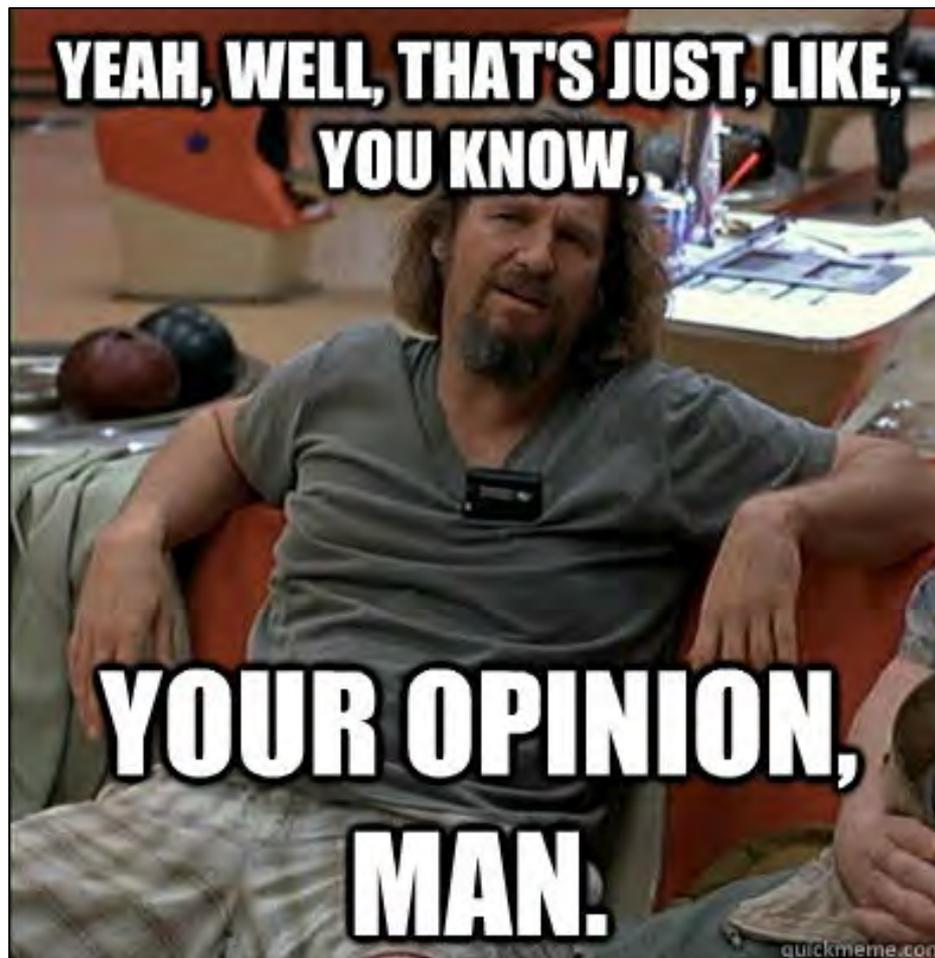


**COOPERATIVE EXTENSION**  
*College of Agriculture, Forestry and Life Sciences*



*Department of*  
**FORESTRY AND ENVIRONMENTAL  
CONSERVATION**

But first...a disclaimer...



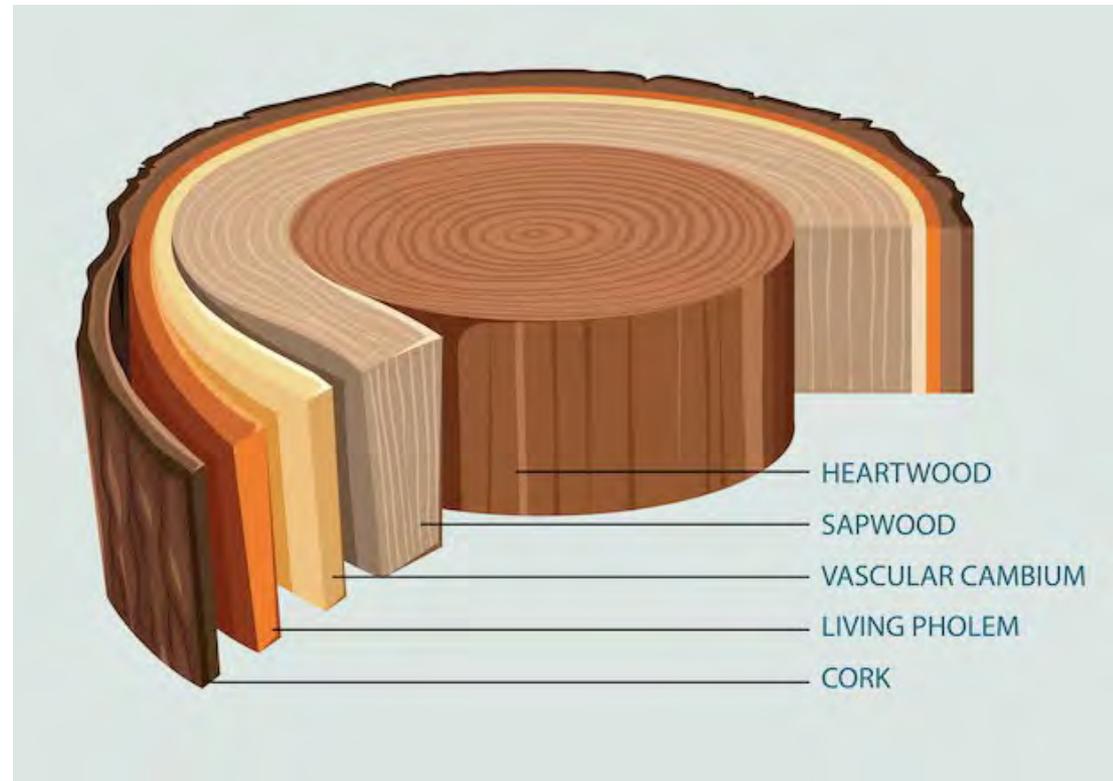
And second...a closer look at trees



# How trees work

Think of a tree as a support pole surrounded by two straws surrounded by a tube that's protected by a coat.

Support pole  
Straw 1  
Straw 2  
Tube  
Coat

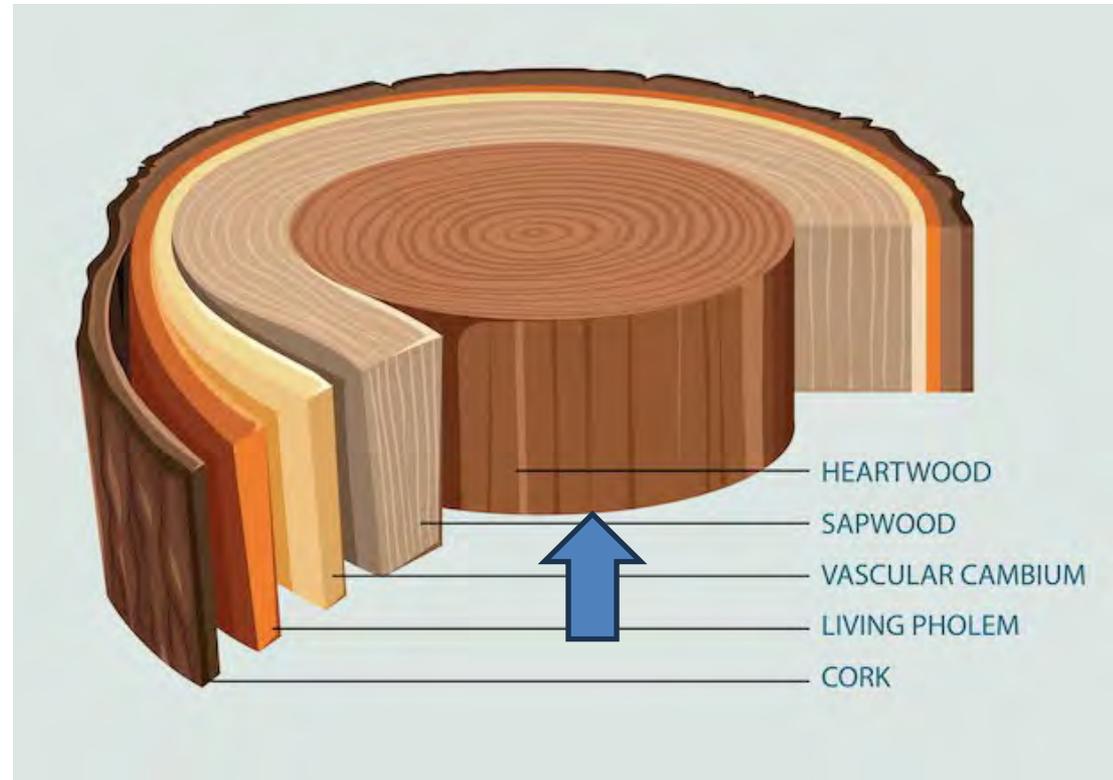


# How trees work

Think of a tree as a support pole surrounded by two straws surrounded by a tube that's protected by a coat.

Support pole  
(heartwood)

Dead cells  
Structure



# How trees work

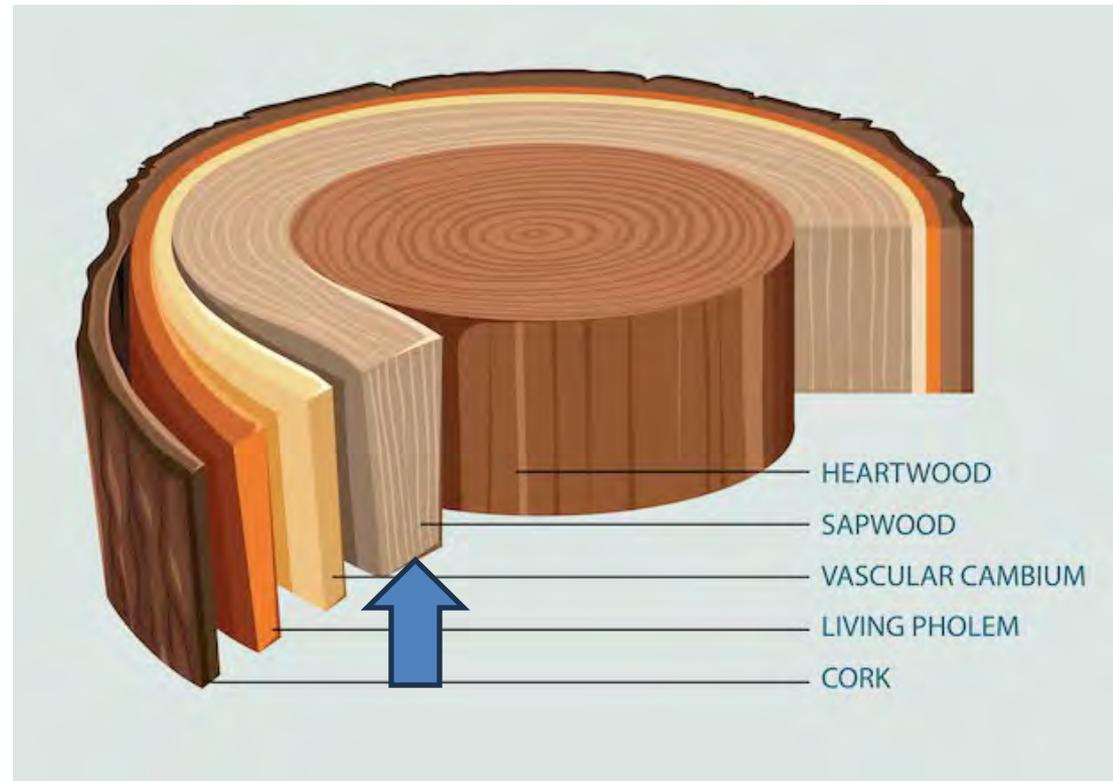
Think of a tree as a support pole surrounded by two straws surrounded by a tube that's protected by a coat.

Straw 1

(sapwood)

Living cells

Water transport



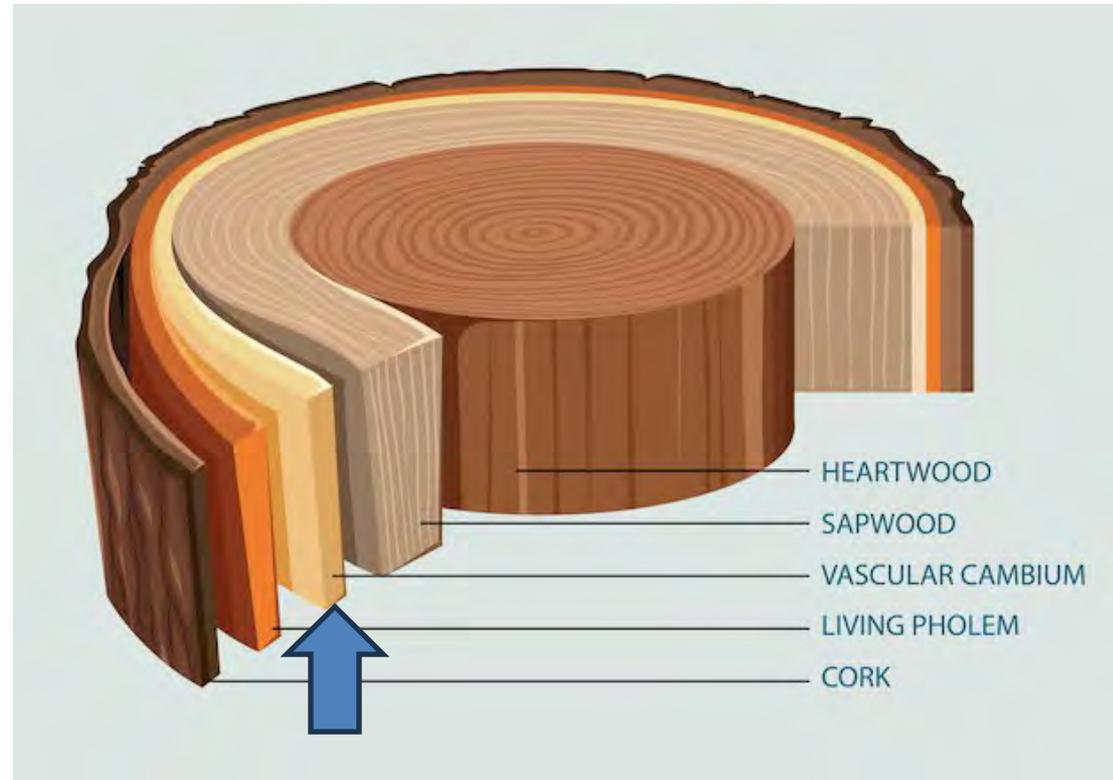
# How trees work

Think of a tree as a support pole surrounded by two straws surrounded by a tube that's protected by a coat.

Straw 2

(vascular cambium)

Makes cells  
Xylem in  
Phloem out



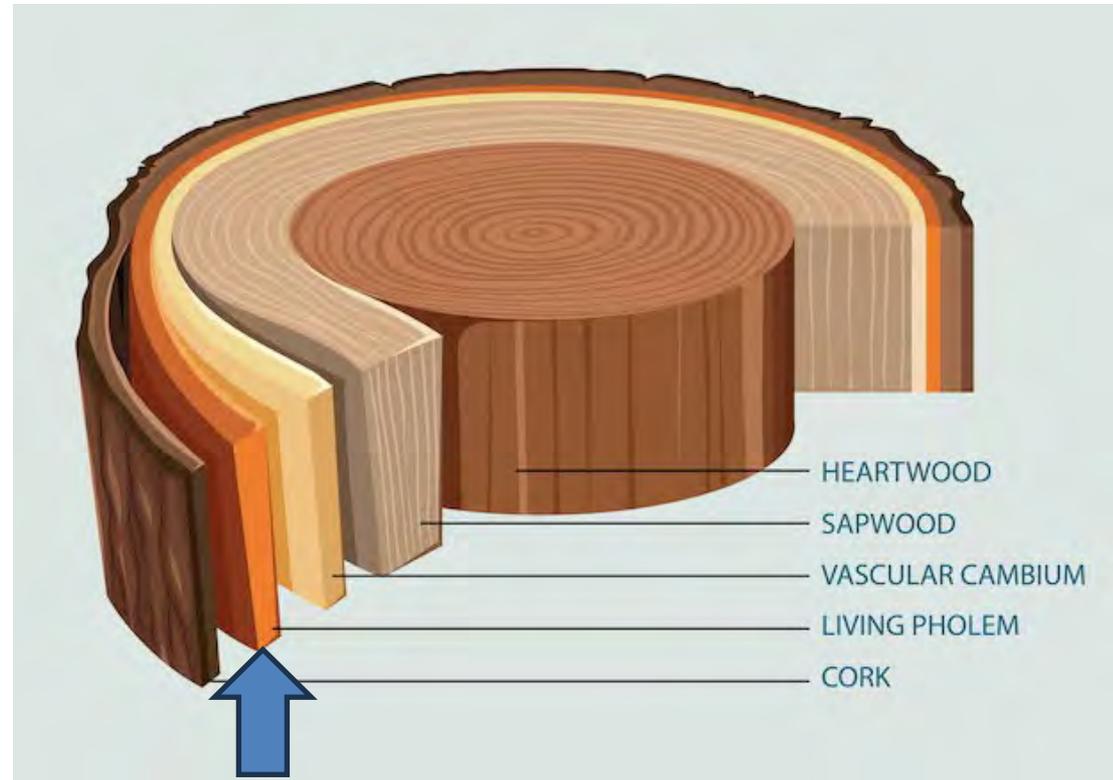
# How trees work

Think of a tree as a support pole surrounded by two straws surrounded by a tube that's protected by a coat.

Tube

(phloem)

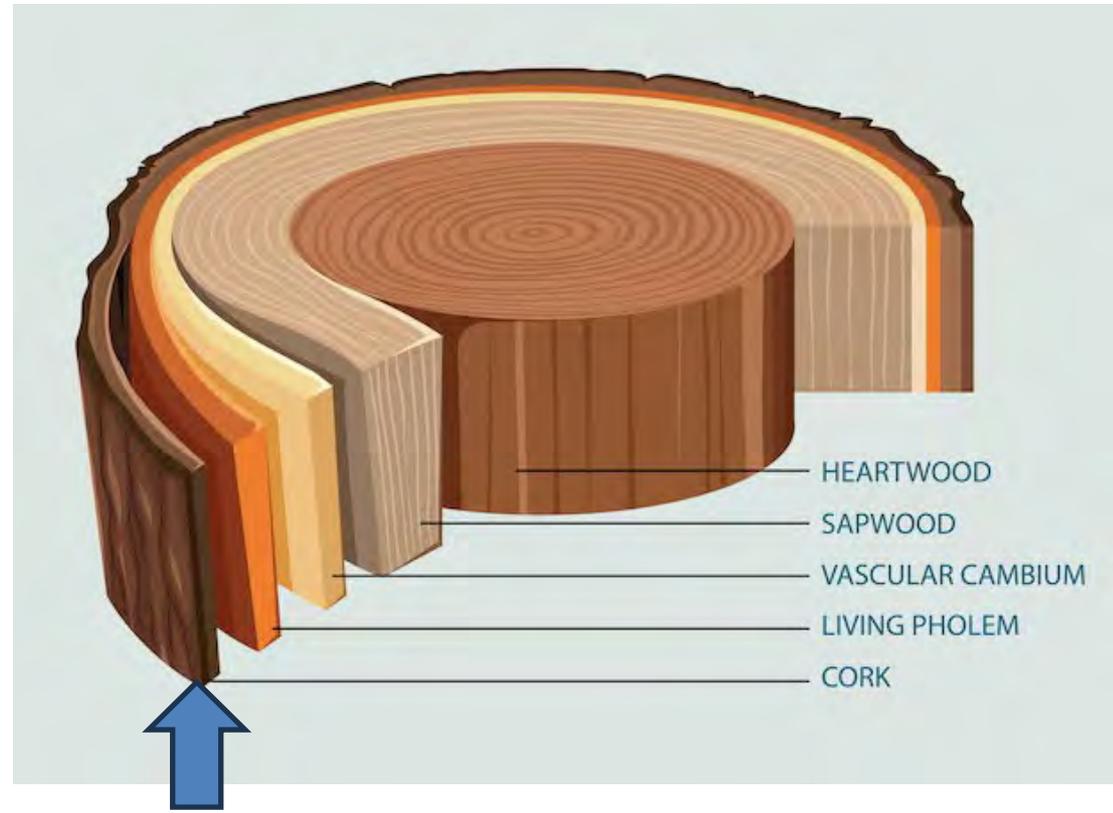
Living cells  
Moves food



# How trees work

Think of a tree as a support pole surrounded by two straws surrounded by a tube that's protected by a coat.

Coat  
(bark/cork)  
Dead cells  
Protection

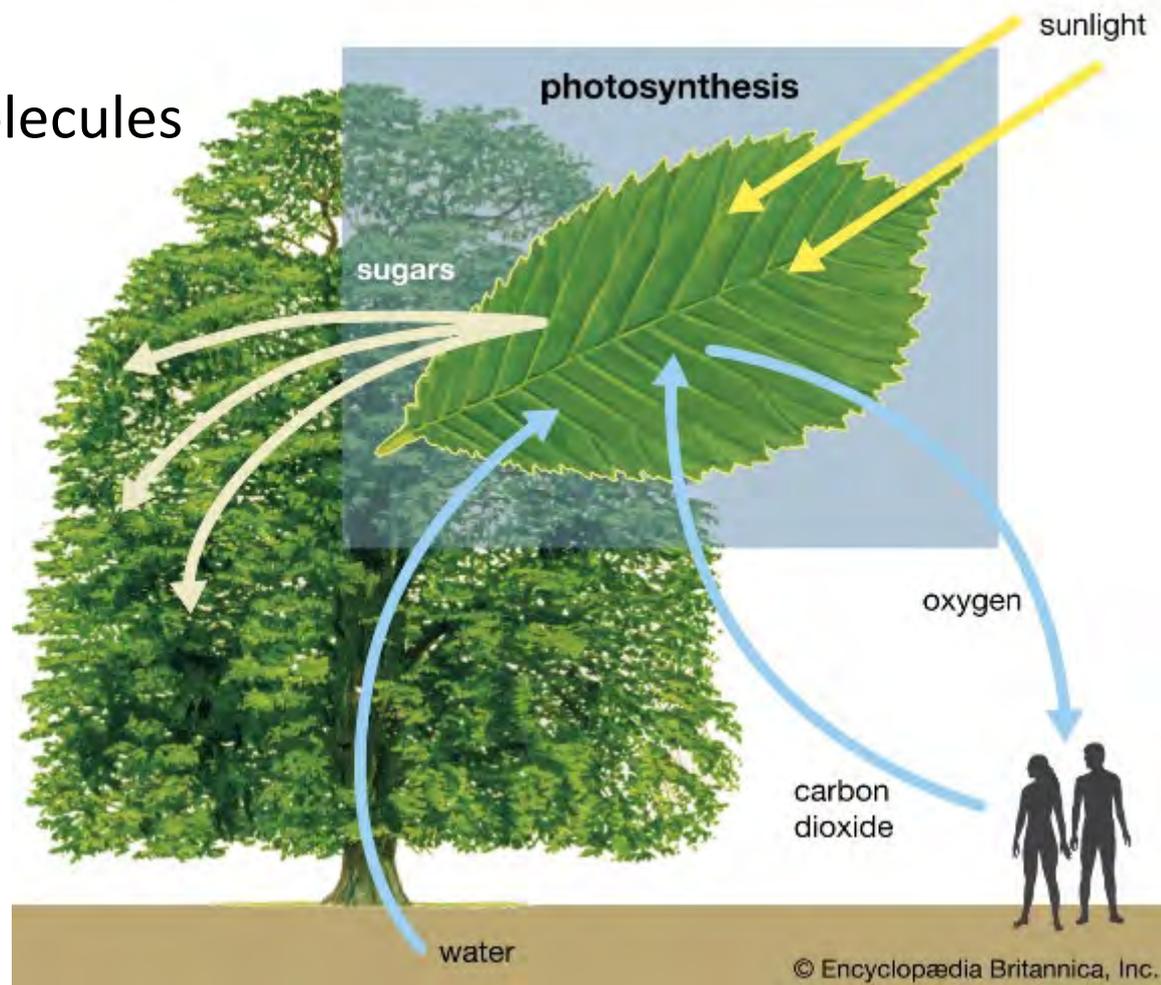


# How trees work

## Three phases in tree growth:

### 1. Photosynthesis

Creation of the sugar molecules



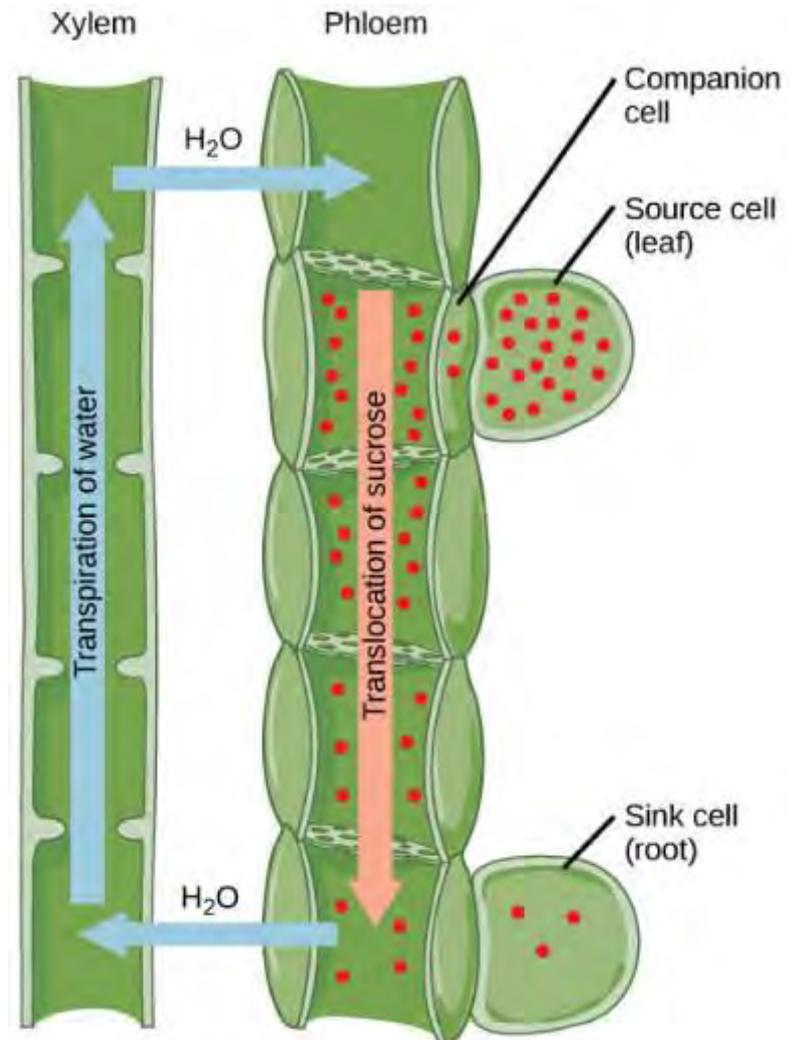
# How trees work

## Three phases in tree growth:

1. Photosynthesis

2. Transport

Move these compounds to the sites where cell division (new cells added) occurs

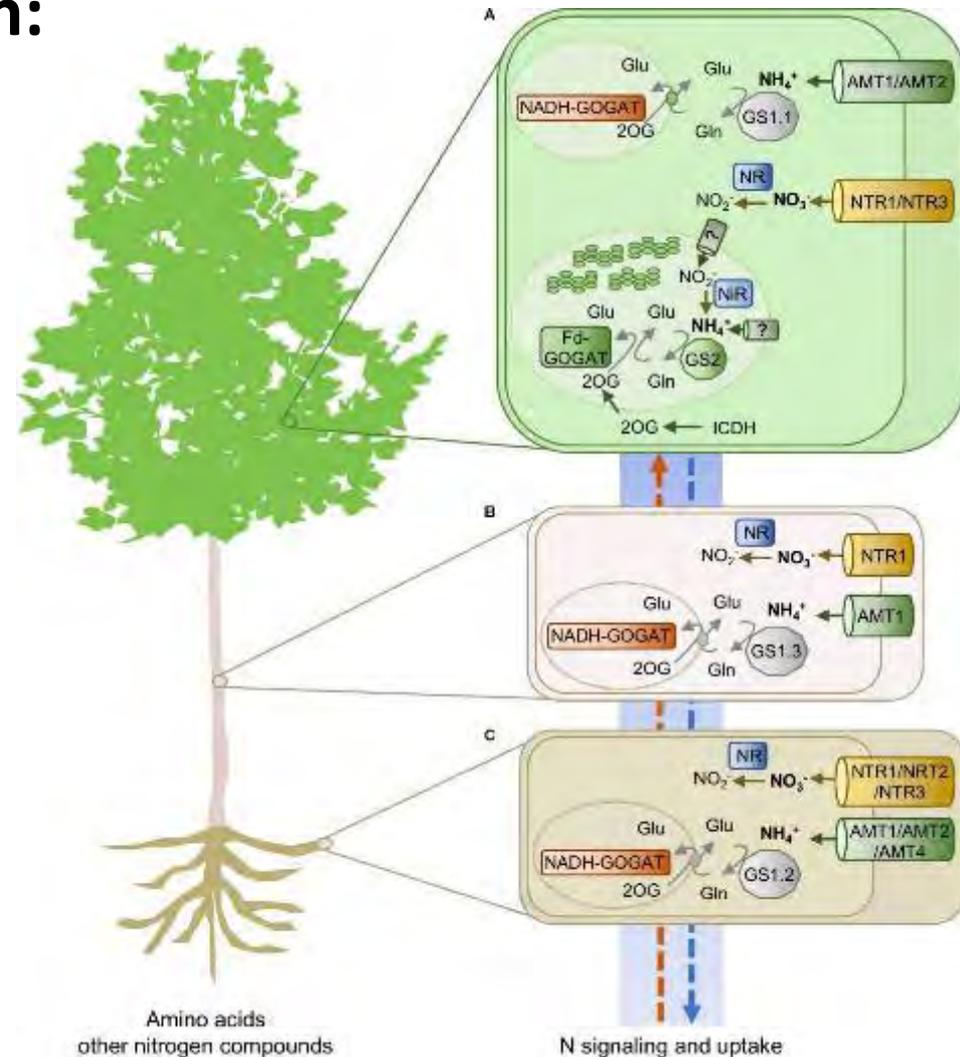


# How trees work

## Three phases in tree growth:

1. Photosynthesis
2. Transport
3. Metabolism

Assemble into long chain molecules in cell components



# How trees work

## **Allocation of energy (priorities) during plant growth**

1. Maintain respiration
2. Produce fine roots and leaves
3. Produce flowers and seeds
4. Extend branches
5. Store energy rich chemicals
6. Add wood to stems, roots, and branches
7. Create anti-pest chemicals for defense

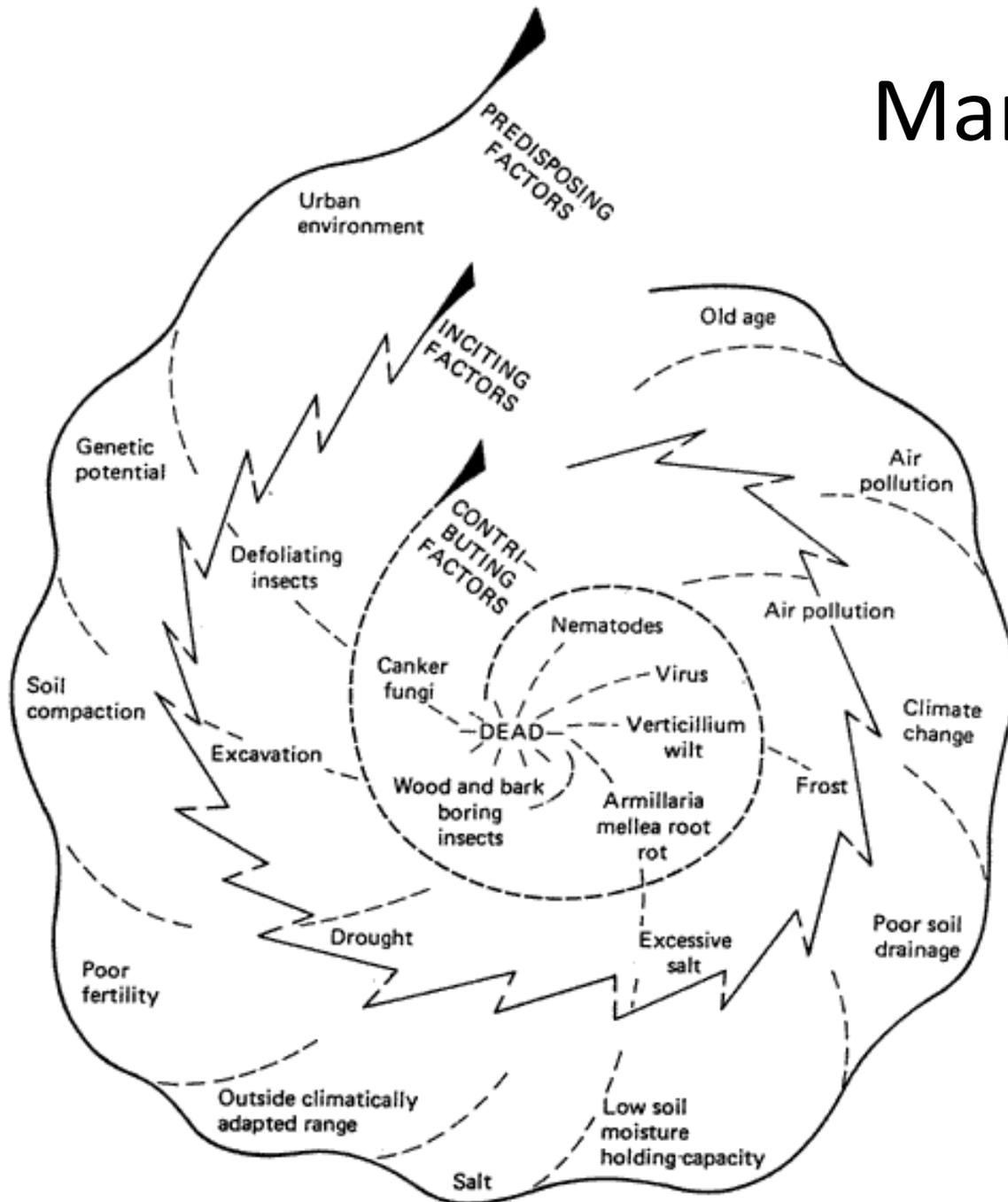
**Occurs at a rate determined by availability of resources**

Invasive pests are  
primary pests.

Most native pests are  
secondary pests.

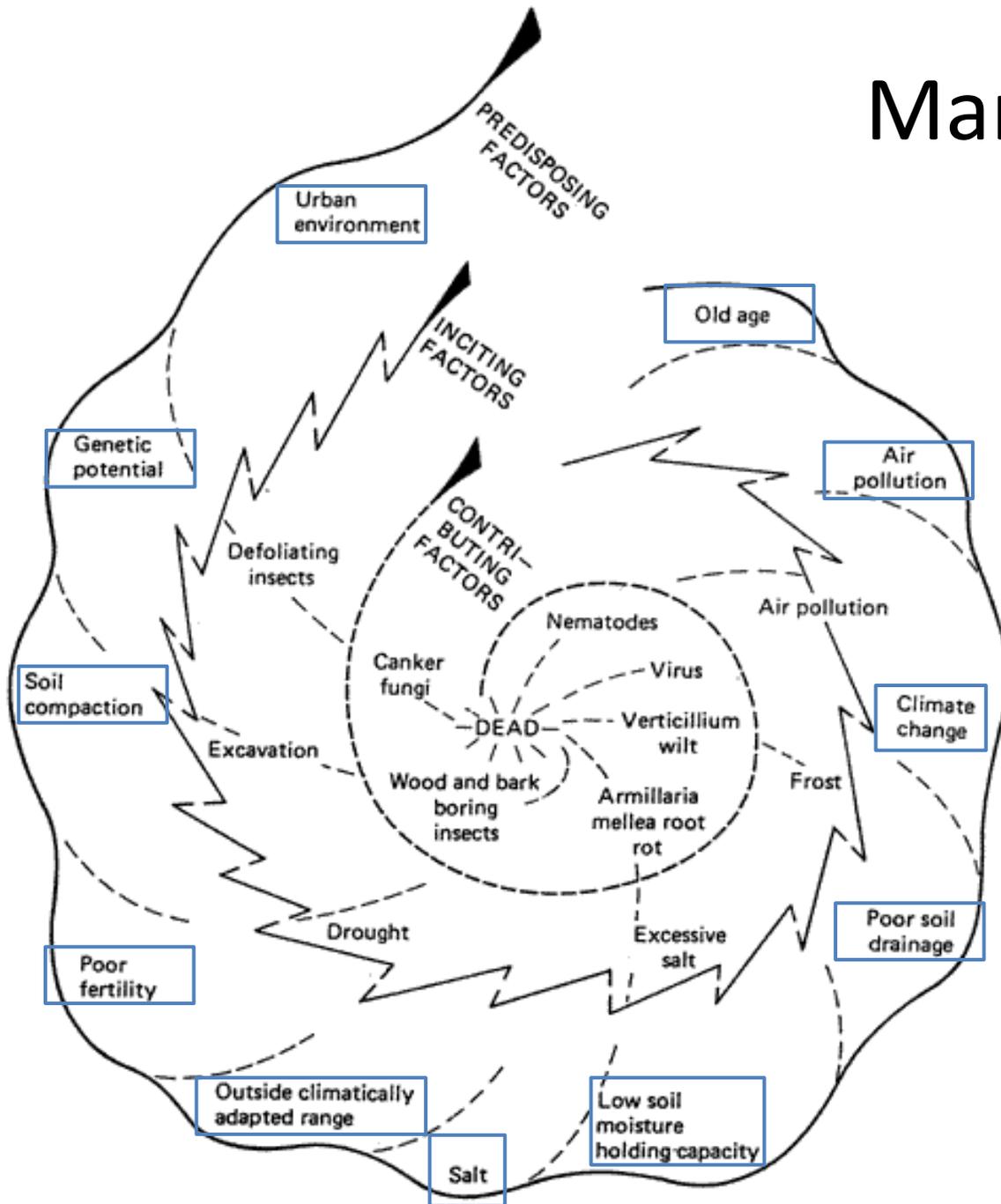
Secondary pests  
respond to stressed  
trees.

# Manion's Decline Spiral



Manion, P.D. 1981. Tree disease concepts. Prentice-Hall Inc., Englewood Cliffs, N.J. 399 p.

# Manion's Decline Spiral



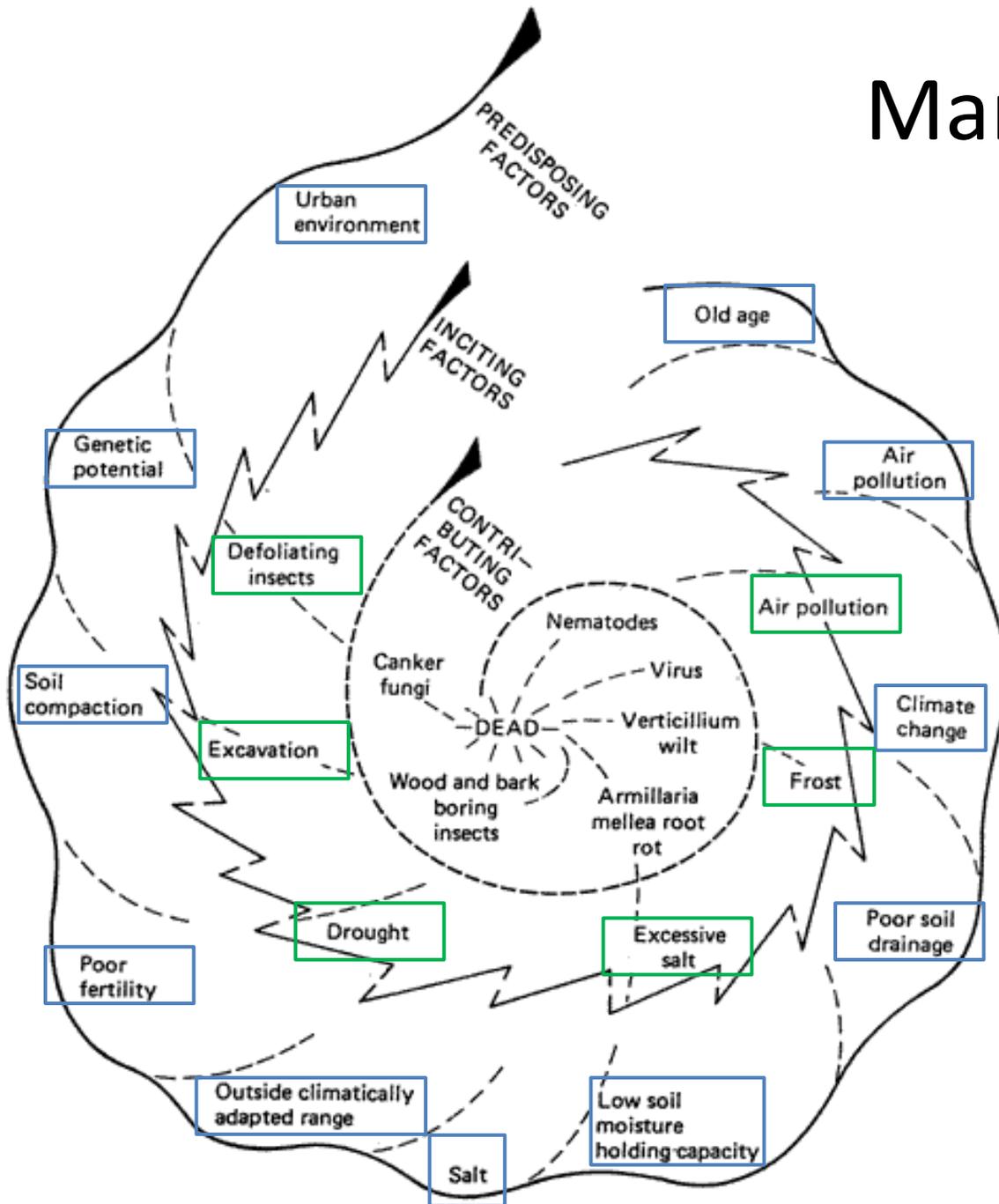
Predisposing factors

Chronic factors that, by themselves, don't noticeably harm a tree

# Manion's Decline Spiral

## Inciting factors

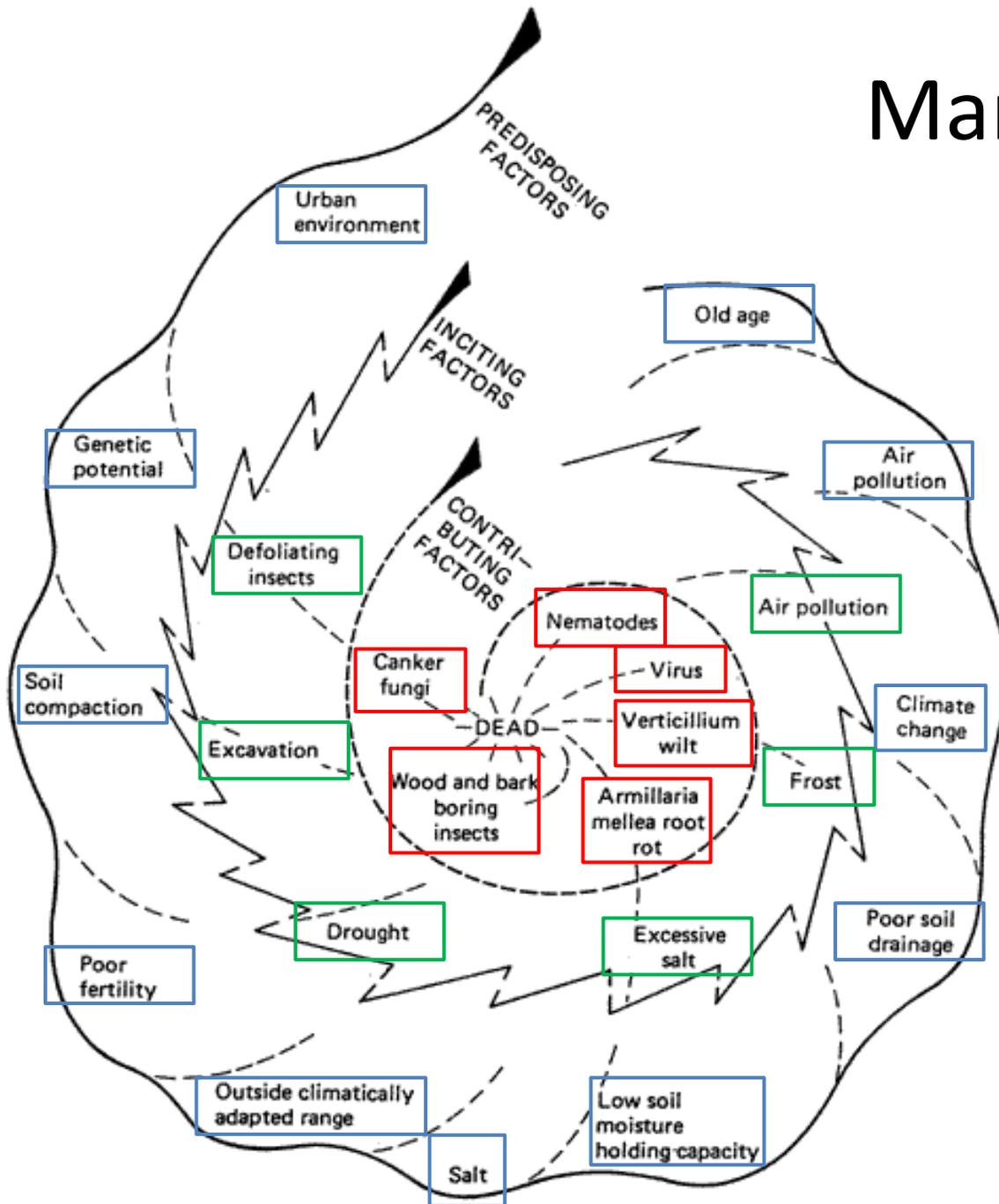
Acute factors that harm (but don't kill) a tree



# Manion's Decline Spiral

## Contributing factors

Factors that contribute to a tree's death – but wouldn't be there if the tree wasn't already on the way out



# Bark beetles

All in the Southeast are native

Most attack stressed trees

Exception = southern pine beetle

Feed on phloem

Phloem = “the sleeve of life”

Feeding (girdling) consumes phloem

Trees die from lack of nutrition

# Native bark beetles

*Ips calligraphus*



*Ips pini*



*Ips grandicollis*



*Ips avulsus*



*Dendroctonus terebrans*



*Dendroctonus valens*



*Dendroctonus frontalis*



# Southern pine beetle

*Ips calligraphus*



*Ips pini*



*Ips grandicollis*



*Ips avulsus*



*Dendroctonus terebrans*



*Dendroctonus valens*



*Dendroctonus frontalis*



# Southern pine beetle

(*Dendroctonus frontalis*)

Native to North & Central America



UGA2108092

You may be thinking  
“isn't SPB just a  
forest issue?”

Remember: pests don't care where the trees are.

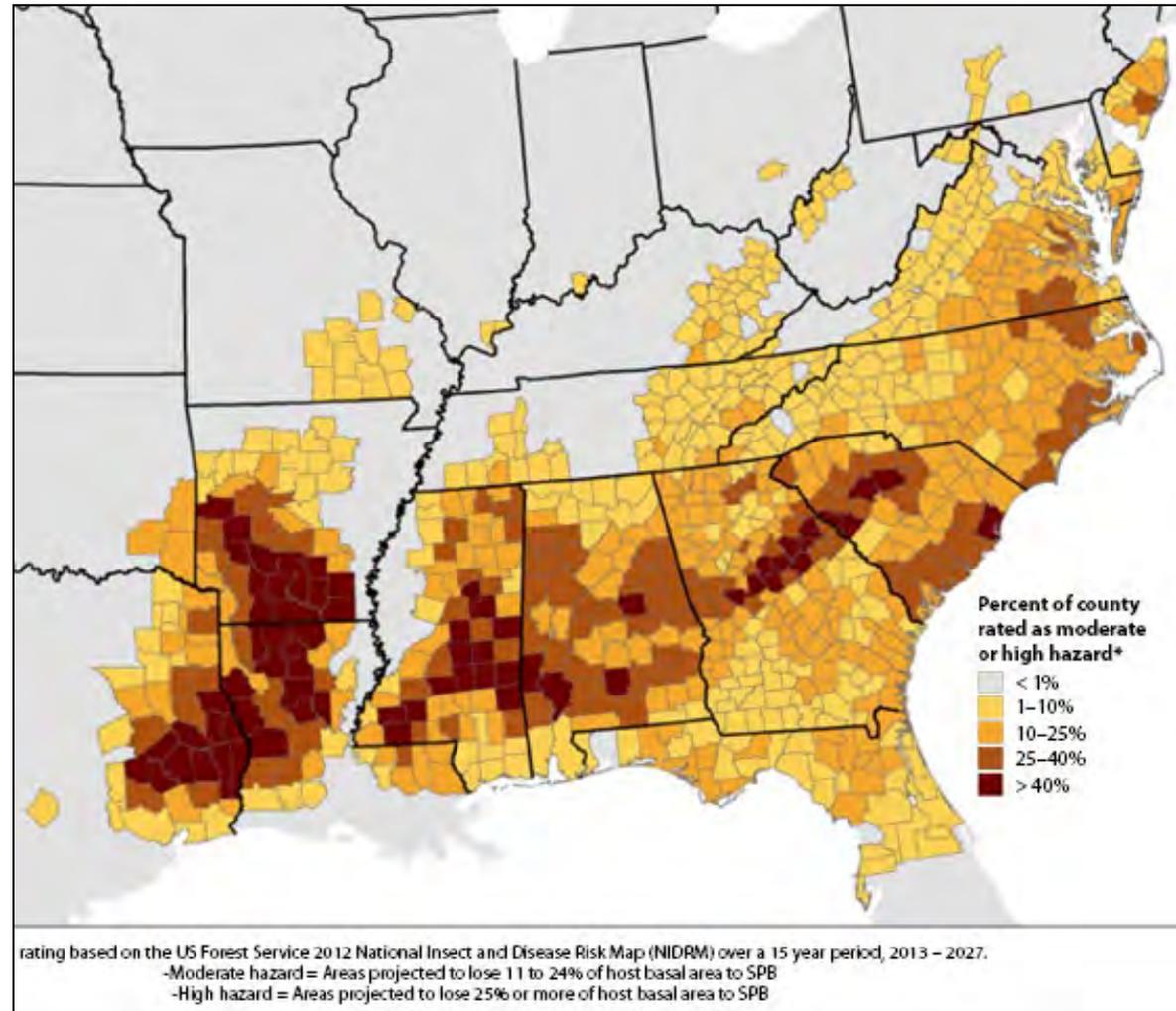


# Southern pine beetle

Attack weakened, damaged, or dying trees

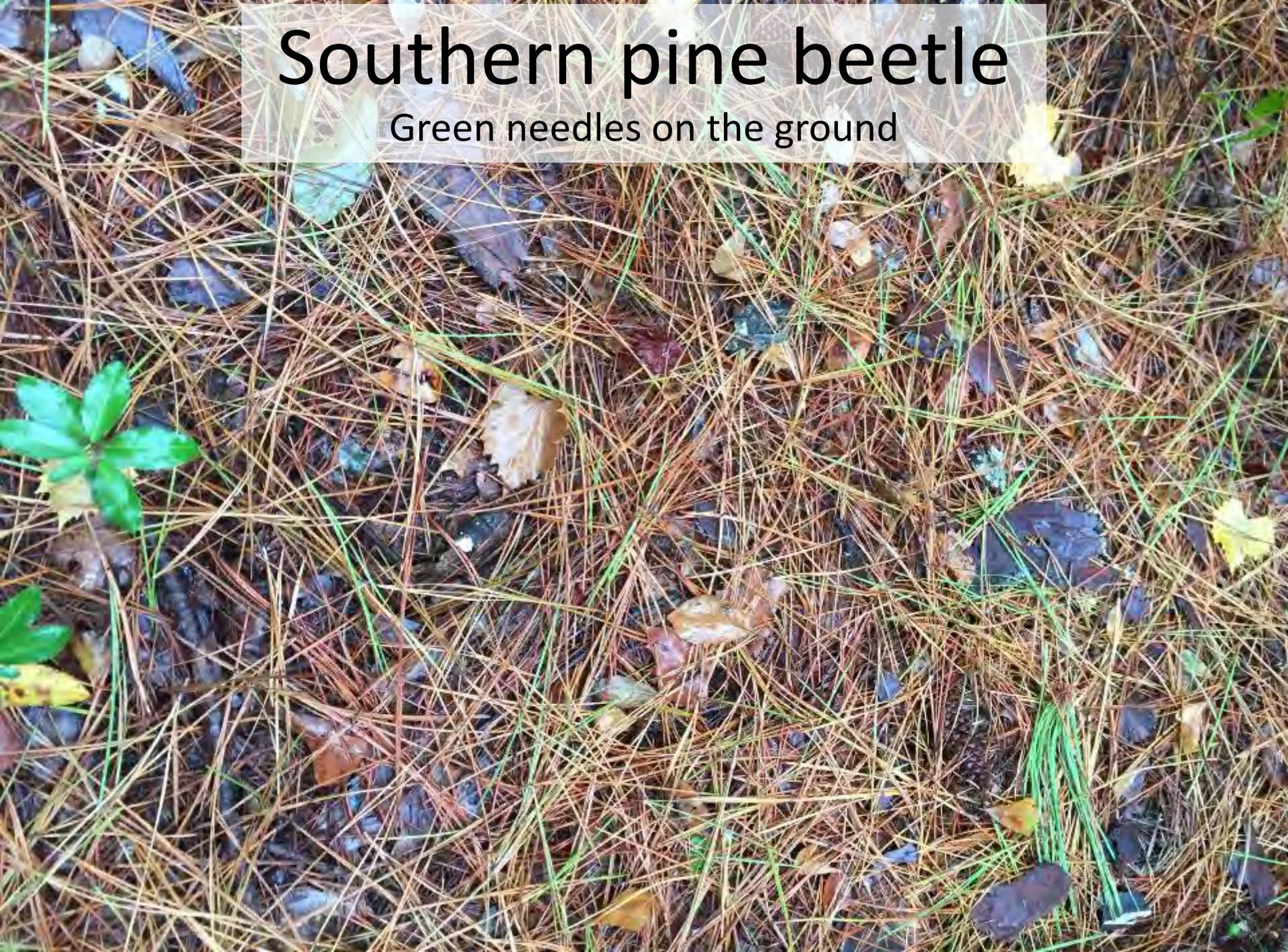
SPB populations oscillate (i.e. can “disappear” and then explode)

Outbreaks usually coincide with droughts



# Southern pine beetle

Green needles on the ground



# Southern pine beetle

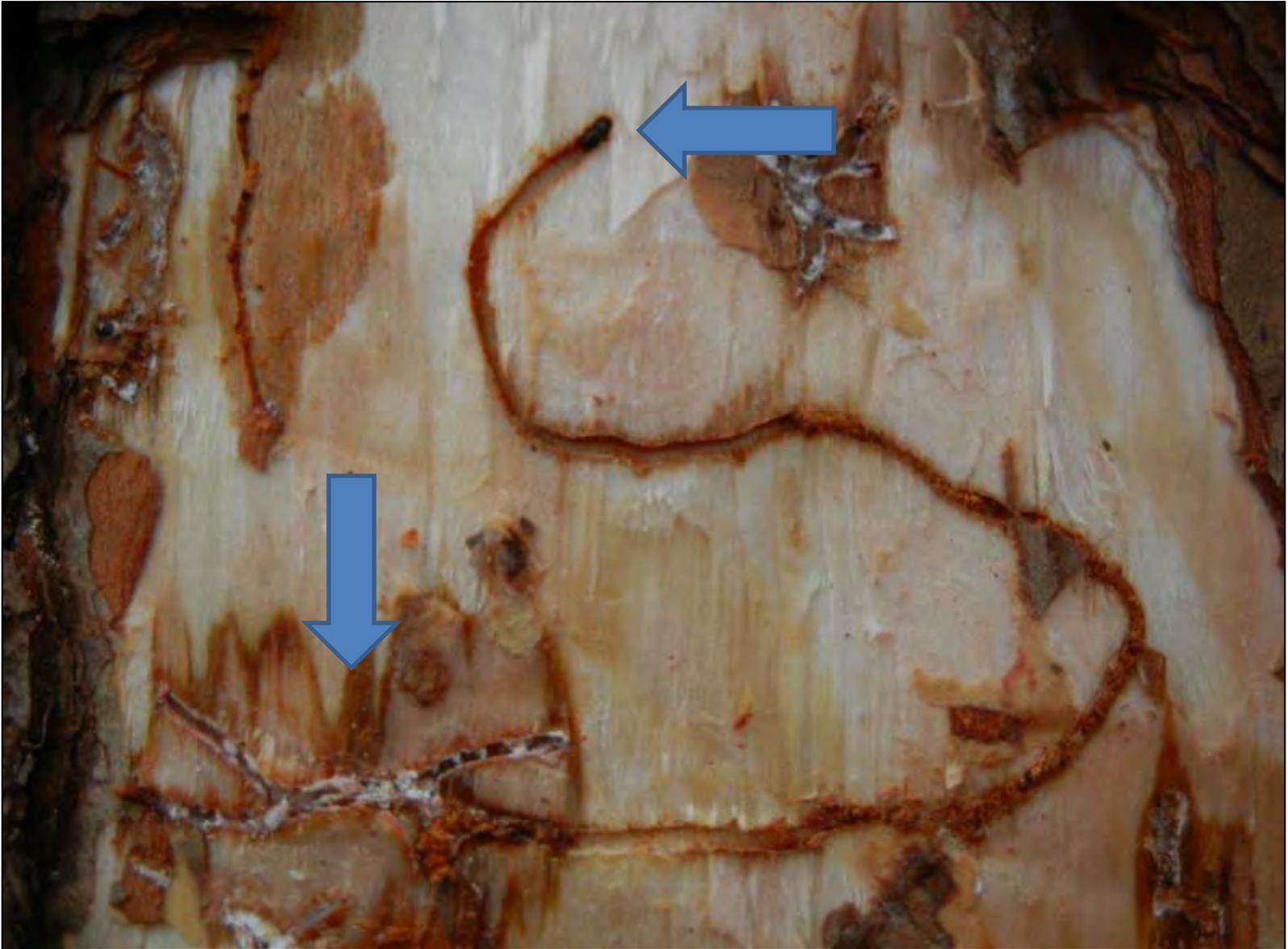


**Adult attacks tree**

**Mass attack &  
Pitch tubes**



# Southern pine beetle



# Southern pine beetle



S-shaped galleries

Larvae feed on phloem

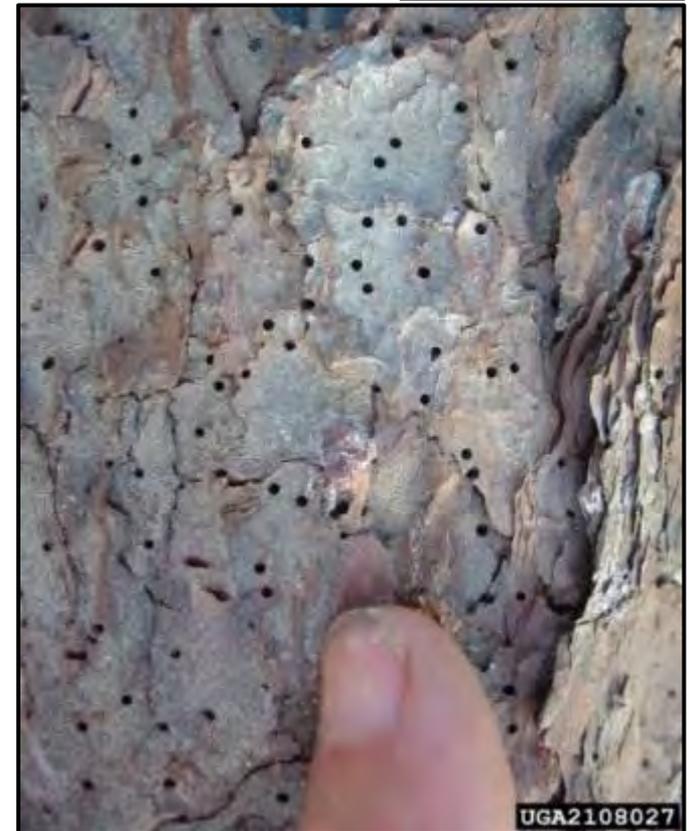


# Southern pine beetle



Blue stain fungi

Tiny circular  
exit holes



# Southern pine beetle management



Trapping



Salvage



Predators



Buffer



Debark



Proper management

# High hazard stand



# Low hazard stand



# Southern Pine Beetle Mississippi Outbreak, 2012

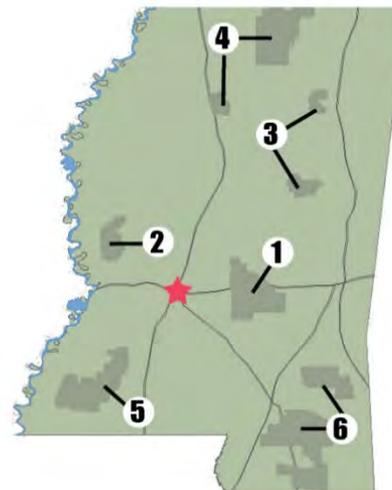
Total spots = 910

Bienville NF, MS: 100% of spots in unthinned

Homochitto NF: 99.7% spots in unthinned

## National Forests

in  
Mississippi



- 1 - Bienville
- 2 - Delta
- 3 - Tombigbee
- 4 - Holly Springs
- 5 - Homochitto
- 6 - De Soto

entomology & pathology

Southern Pine Beetle Infestations in Relation to Forest Stand Conditions, Previous Thinning, and Prescribed Burning: Evaluation of the Southern Pine Beetle Prevention Program

John T. Nowak, James R. Meeker, David R. Coyle,  
Chris A. Steiner, and Cavell Brownie

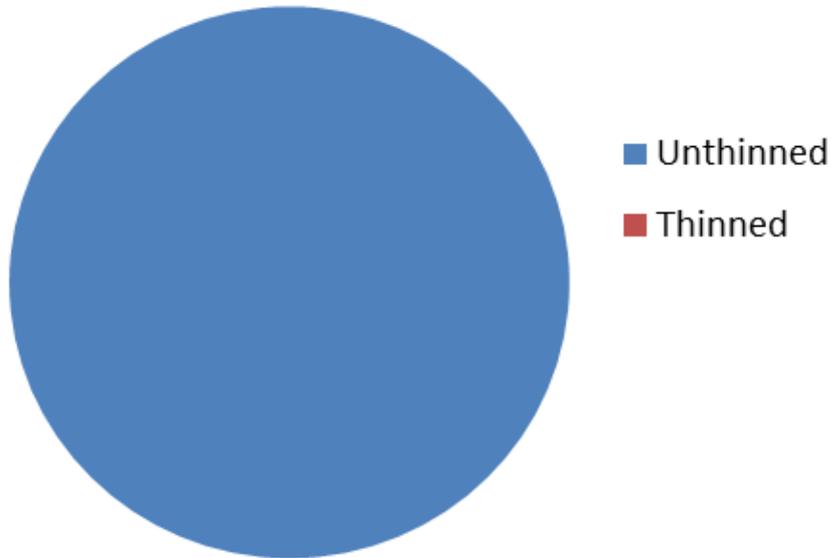
2015, Journal of Forestry 113: 454-462.

SPB spots were more common in unthinned stands at BNF and HNF

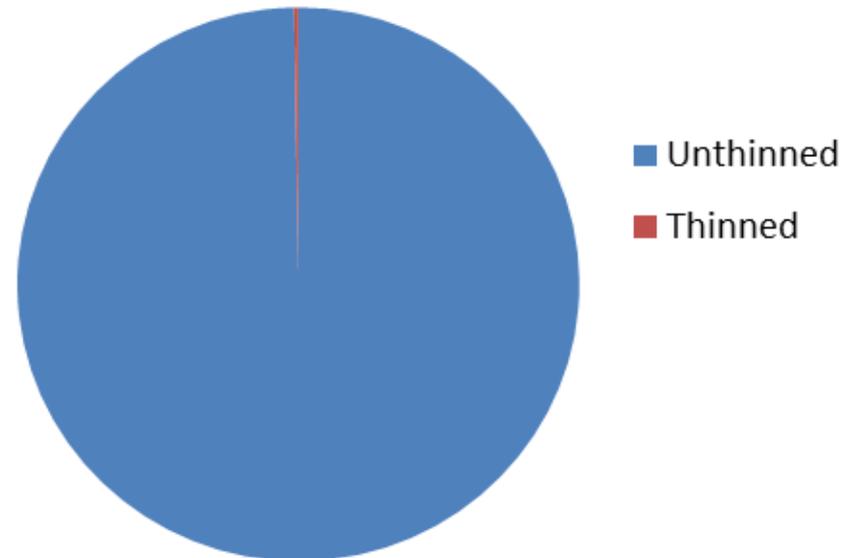


# SPB spots were more common in unthinned stands at BNF and HNF

**SPB spots (n=76)  
Bienville NF**



**SPB spots (n=834)  
Homochitto NF**



11/14/2012

2012 SPB Spot

After thinning (2011) and  
southern pine beetle (2012)



# Why does thinning work?

Improved tree vigor of residual trees =  
Increased resin flow, potential pitch out



# Why does thinning work?

Changes the physical environment within stands:

Microclimate, pheromone plumes, inter-tree spacing



# Prescribed burning

Keeps understory vegetation low

Hopefully done in conjunction with thinning

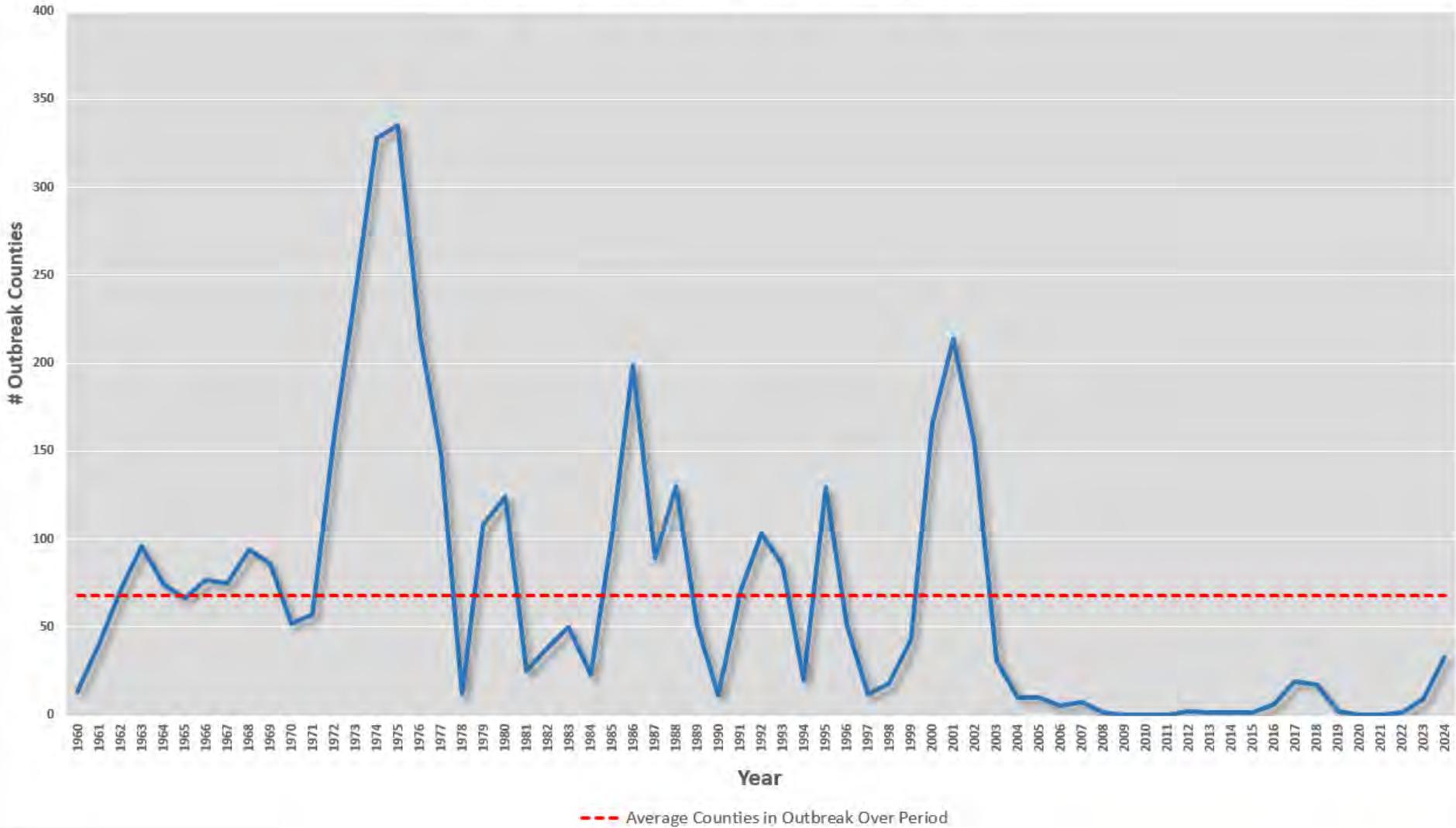


Even in unthinned stands:

Burned more recently, burned more often =  
LESS likely to have SPB



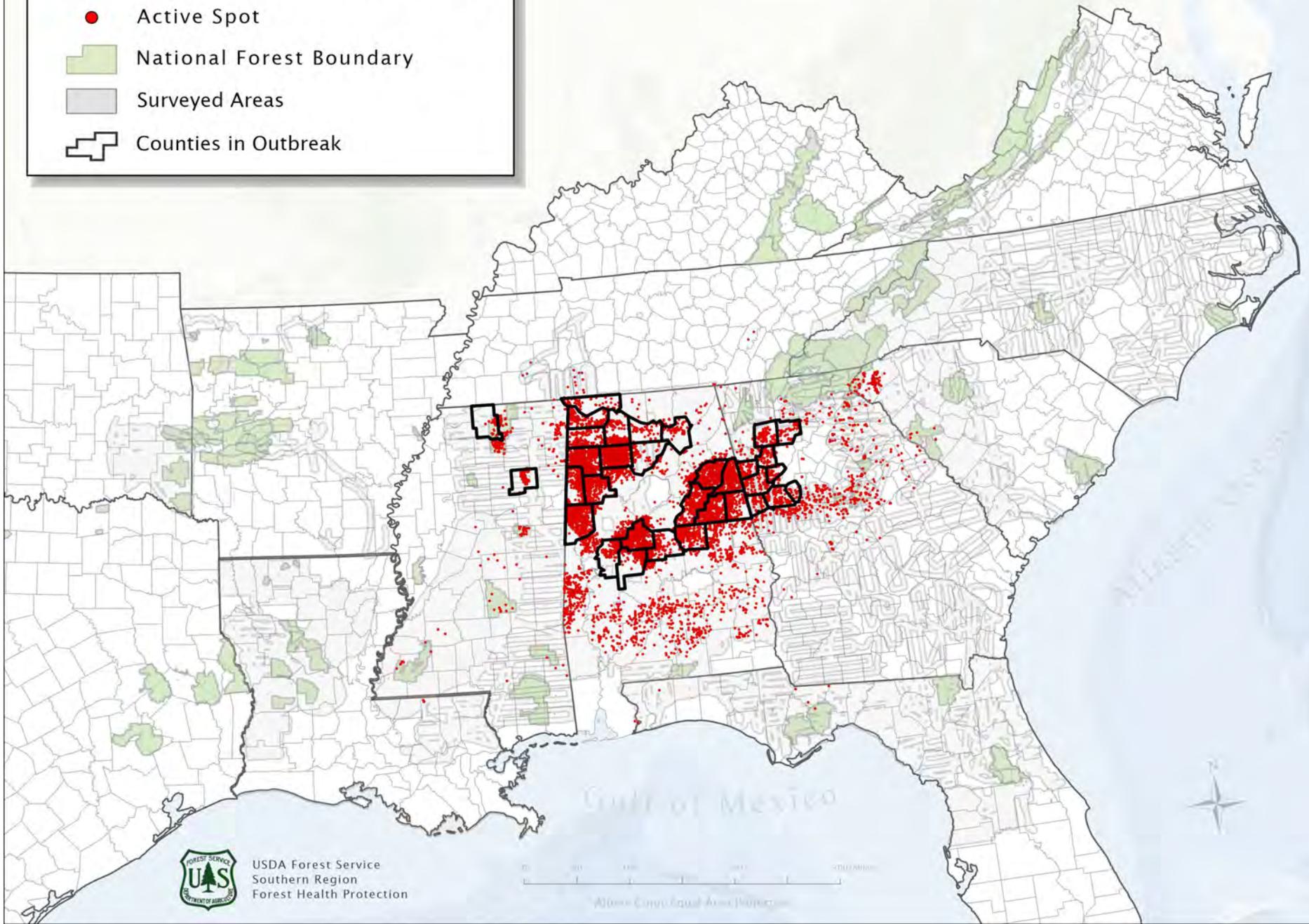
## SPB Outbreak History - Southern Region





# Southern Pine Beetle Spots 2024

- Active Spot
- National Forest Boundary
- Surveyed Areas
- ▭ Counties in Outbreak



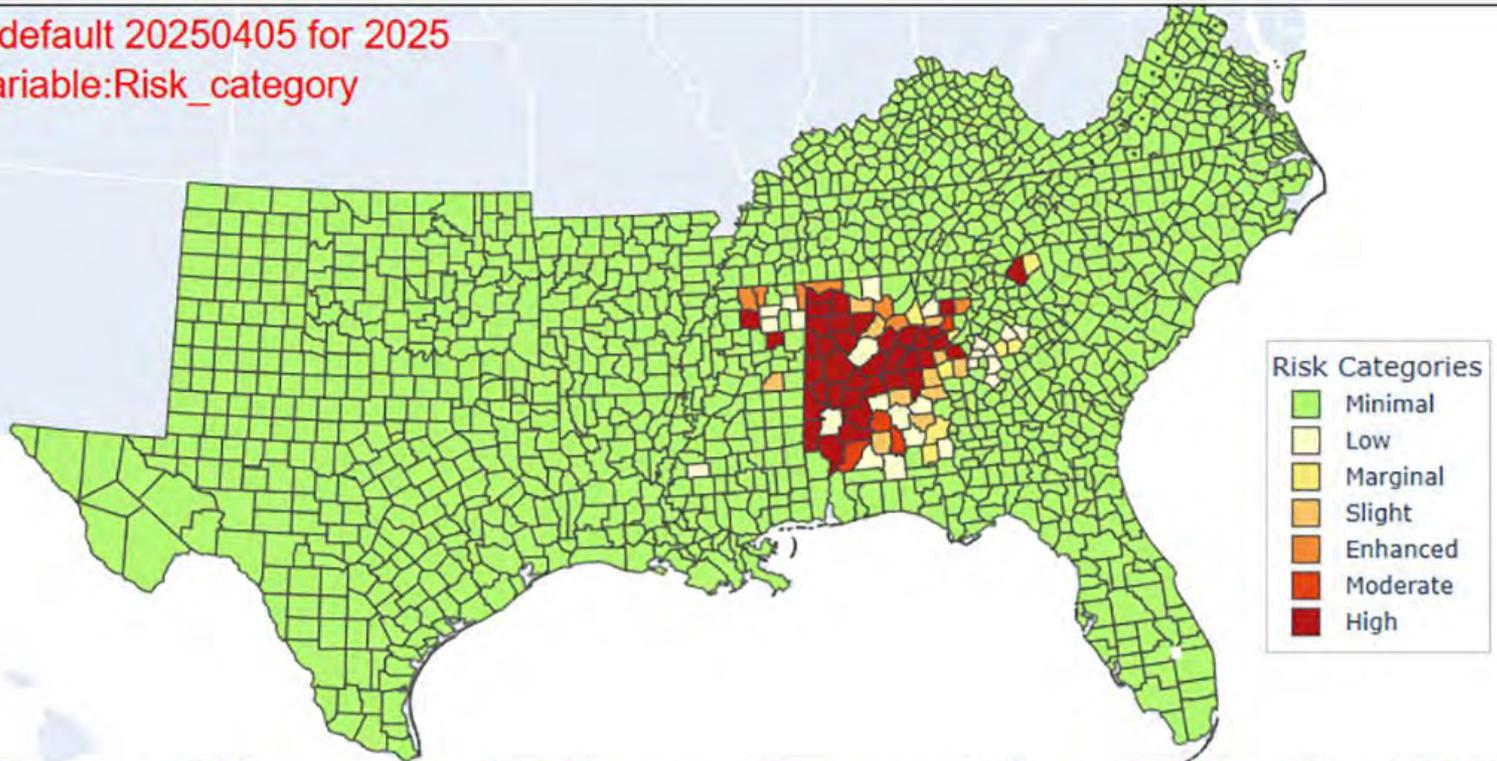
USDA Forest Service  
Southern Region  
Forest Health Protection



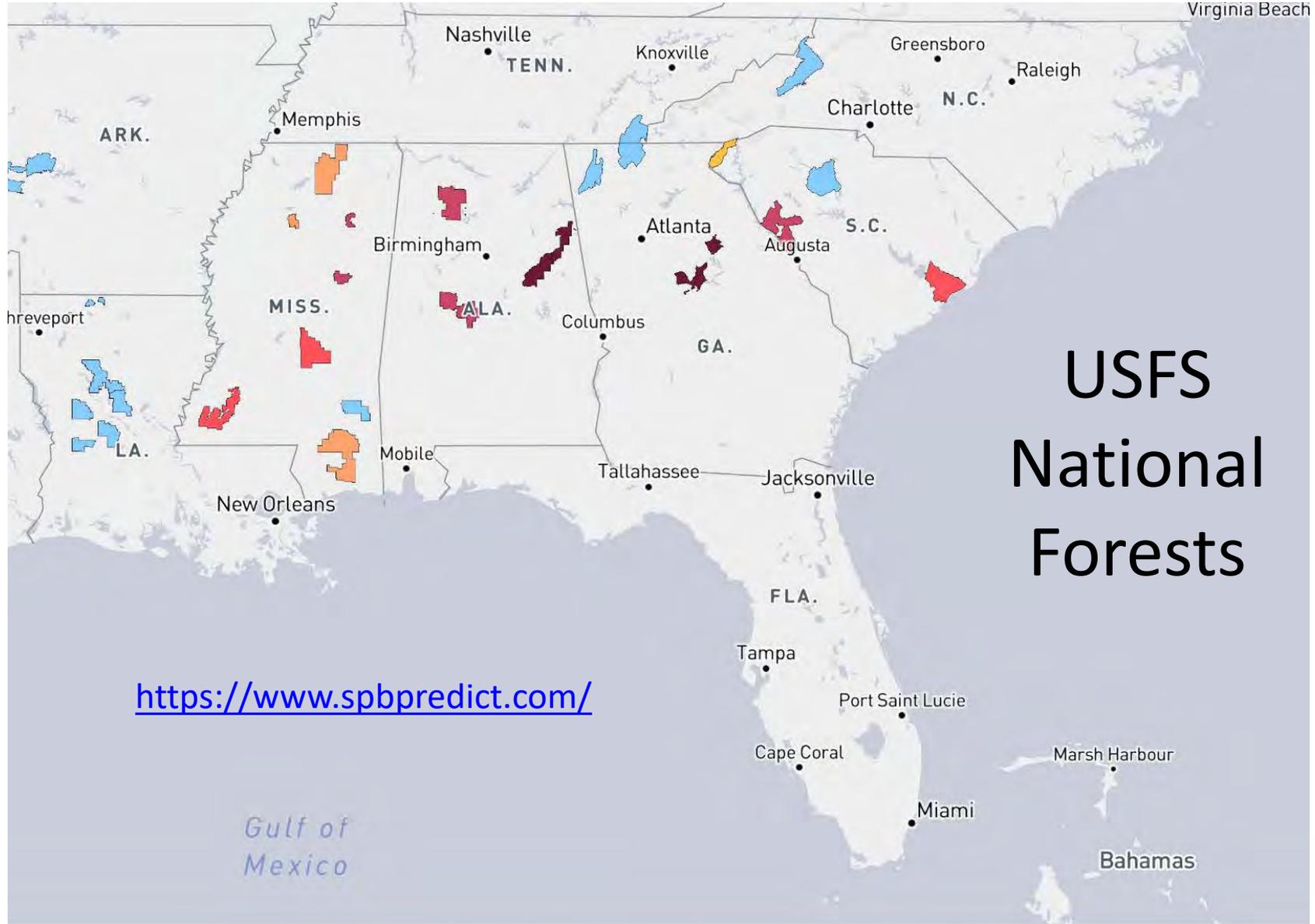
Allison Curry Equal Area Projection

# Southern pine beetle outbreak model (SPBOM)

revision:default 20250405 for 2025  
variable:Risk\_category



## Southern Pine Beetle Risk 2025



Note: Color ramp ascends with a constant factor of increase in the probability of outcome.

# SPB Prevention Program

Program started in 2003

Designed to take a proactive approach to reducing the impact of SPB

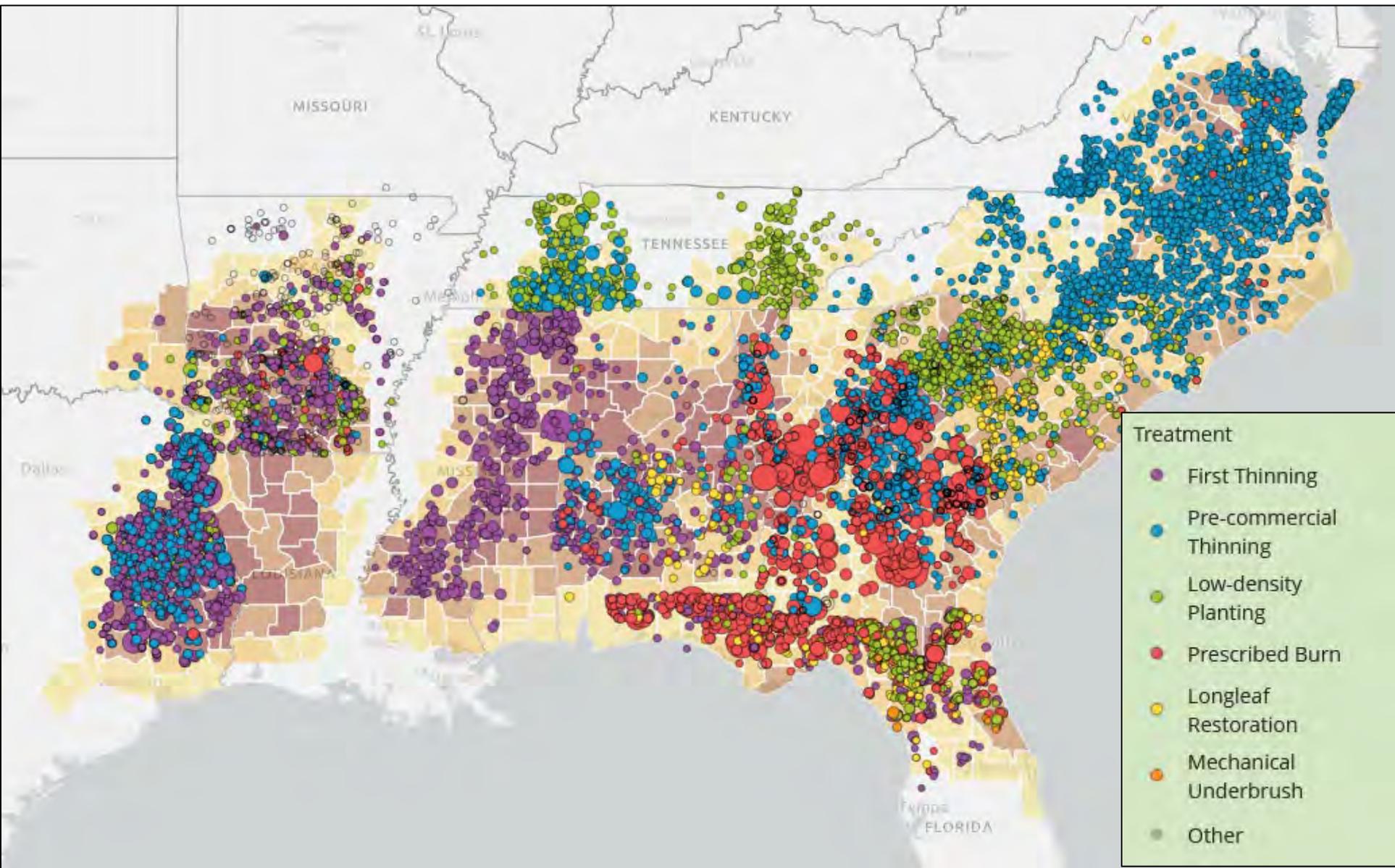
Cost-share provided to thin pine stands

Administered by USFS FHP but implemented in 12 National Forests and 11 States

Treated more than 1.2 million acres

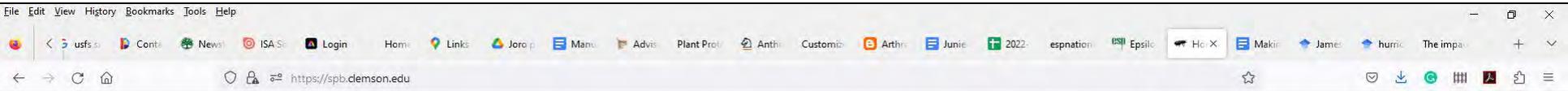


# Google: "southern pine beetle prevention program arcGIS"



# Southern Pine Beetle Information Center

<https://spb.clemson.edu/>



Current Status Around the Globe Data Publications Contacts

## Southern Pine Beetle Information Center



Welcome to the Southern Pine Beetle Information Center. The southern pine beetle (SPB) is a pest of pine trees most commonly associated with the southern United States. More information about this insect's native range, biology, and preferred hosts can be found in the Publications section.

### Latest Publications

#### Biosystematics of the *Dendroctonus frontalis* (Coleoptera: Scolytidae) Complex

Jun 17, 2022

Abstract The validity of *Dendroctonus frontalis* Zimmerman, *D. brevicomis* Leconte, *D. mexicanus* Hopkins, *D. vitei* Wood, *D. approximatus* Dietz, and *D. adjunctus* Blandford as distinct species is supported by breeding experiments, karyology, male genitalia, and external...

#### Life Cycle of *Dendrolaelaps*

# *Ips* bark beetles

*Ips  
calligraphus*



*Ips  
pini*



*Ips  
grandicollis*



*Ips  
avulsus*



*Dendroctonus  
terebrans*



*Dendroctonus  
valens*



*Dendroctonus  
frontalis*



# *Ips* bark beetles

Common in SE US

Generally attack weakened or stressed trees

Male starts gallery, calls female using odors (pheromones)

Can cause mortality during droughts



A.



B.



C.



D.



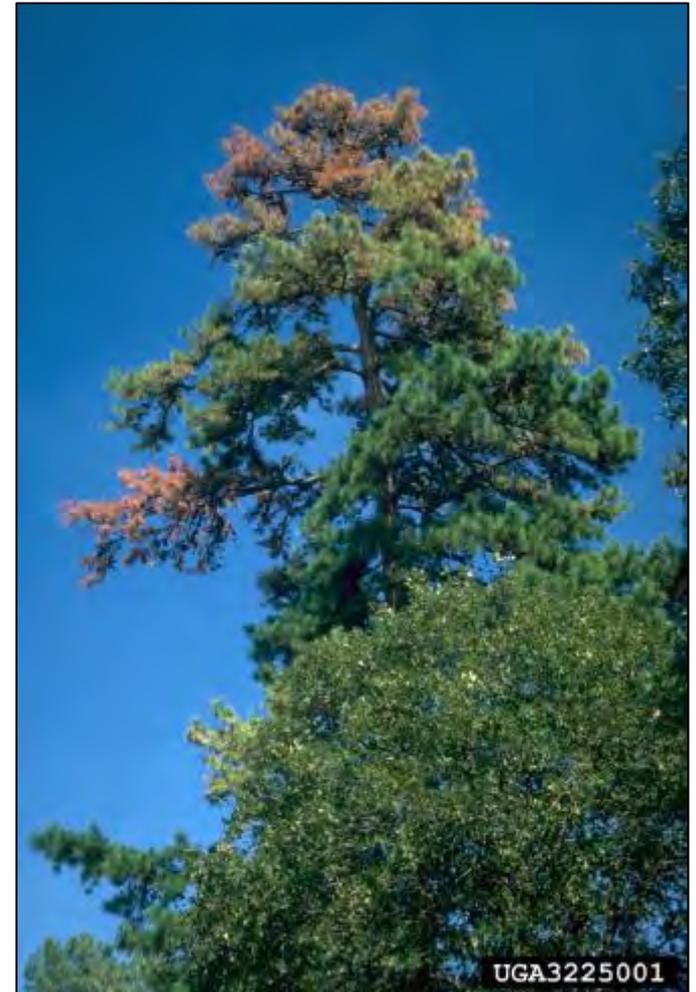


# Identifying *Ips* attacked trees

Branch flagging

Fading crown

Yellow/red needle coloration



# Identifying *Ips* attacked trees

Pitch tubes

Boring dust

*Ips* galleries



# *Ips* biology

Many overlapping generations per year

*Ips avulsus* can complete development in two weeks and have 10 or more generations per year

High threshold for heat

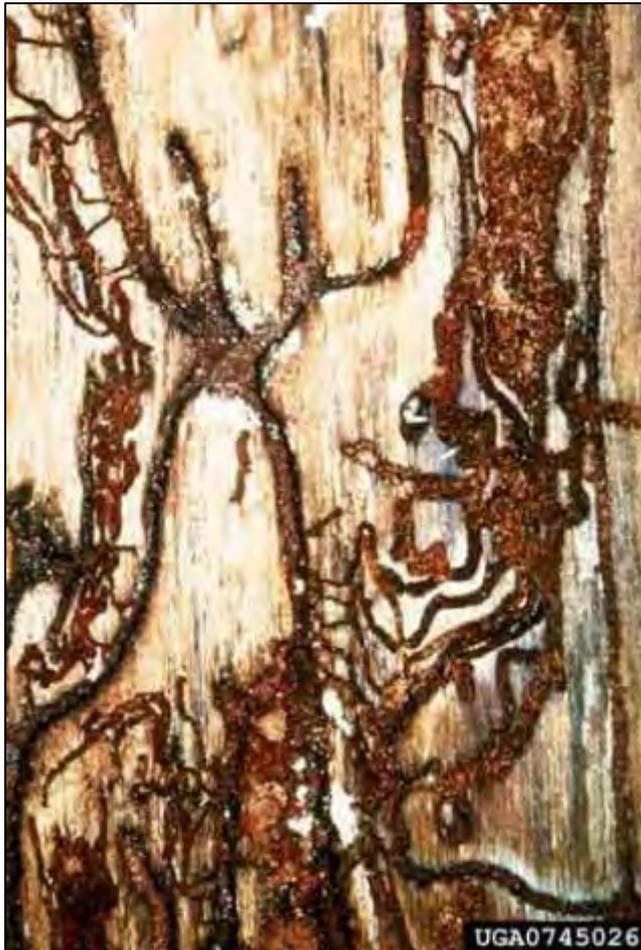
# *Ips* identification

*Ips avulsus*



# *Ips* identification

*Ips grandicollis*



*Ips calligraphus*



# Tree susceptibility

Attacks occur on stressed and injured trees

Tree stress caused by:

Storms, including hurricanes and tornados

Wind damage

Lightning

Fire damage

Mechanical damage

Drought

Biotic agents:

Vegetative competition

Pathogens



# How *Ips* contribute to tree mortality

Consumption of phloem

Galleries girdle the tree

Introduction of antagonistic fungi

Blue-stain fungi



# *Ips* bark beetles



UGA0013087

# *Ips* outbreak characteristics



Sporadic mortality  
throughout the  
stand

Small clusters of  
attacked trees

Short-lived

Due to heavy natural  
pressures against the  
population

# *Ips* monitoring

Trapping does not occur specifically for *Ips*  
Monitoring is mostly visual assessments on the  
ground



# *lps* monitoring

Aerial survey is  
useful



Loblolly mortality caused by drought and *Ips*, Polk Co. Arkansas, October 2015



An aerial photograph of a dense forest. The majority of the trees are a vibrant green, but a large, irregularly shaped section in the center of the image is a stark, brownish-tan color, indicating a significant die-off or mortality event. The surrounding forest appears healthy and dense. In the upper left corner, a small white building with a dark roof is partially visible through the trees. The overall scene suggests a localized environmental impact within a larger, otherwise healthy forest.

What is this?

*Ips* bark beetles

Lunenburg Co., VA



# Turpentine beetles

*Ips calligraphus*



*Ips pini*



*Ips grandicollis*



*Ips avulsus*



*Dendroctonus terebrans*



*Dendroctonus valens*



*Dendroctonus frontalis*



# Black turpentine beetle

(*Dendroctonus terebrans*)



Attack weakened or stressed trees

Can cause mortality during droughts



# Black turpentine beetle pupae and larva

photo by @forestpathology & @jirihulcr



# Black turpentine beetle



# Black turpentine beetle



# Field identification

How can I distinguish an SPB infestation from mortality associated with other bark beetles?

Southern pine beetle

*Dendroctonus frontalis*



Other pine bark beetles

*Ips* engraver beetles

*Ips avulsus*

*Ips grandicollis*

*Ips pini*

*Ips calligraphus*

Turpentine beetles

*Dendroctonus terebrans*

*Dendroctonus valens*

# Field ID: Tree mortality patterns

## Southern pine beetle

Mortality progresses in rapidly expanding “spots”



## Other pine bark beetles

Mortality often more limited, scattered, associated with stress



# Field ID: Pitch tubes

## Southern pine beetle

Often located in bark crevices



## Other pine bark beetles

*Ips* engravers: Often on flat face of bark plate

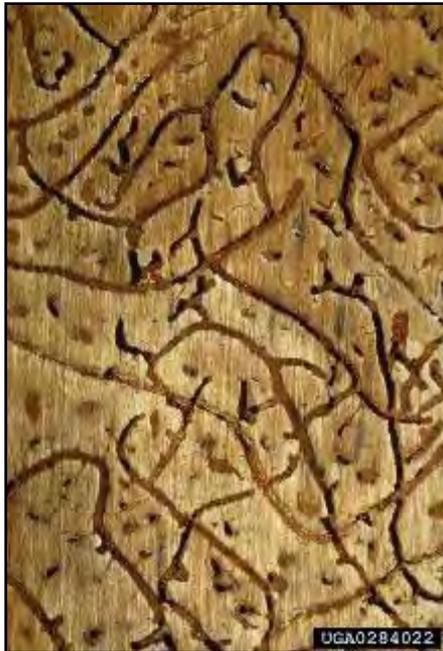
Turpentine beetles: large, limited to lower trunk



# Field ID: Galleries

## Southern pine beetle

Winding “S”-shaped galleries  
packed with frass



## Other pine bark beetles

*Ips* engravers: H, Y, or I-shaped  
Turpentine: large, low



# Control of SPB infestations

First confirm that the infestation is SPB and is “active”  
forester assistance

Decide on best control option for the given situation:

**Cut and Remove**

**Cut and Leave**

Cut, Pile and Burn (limited use)

Cut and Spray (limited use)



Generally speaking, if you take care of your pines for SPB, you'll take care of them for *lps* and BTB.

# Pine sawyer beetles



# Pine sawyer beetle egg site



Pine sawyer  
egg site

Ips pitch tube

# Pine sawyer beetle damage



*Platypus* spp. = most common pine  
ambrosia beetle



# Pine sawflies (*Neodiprion* spp.)

Most impactful defoliators of southern pine

All southern pines are susceptible

Native, several species in the Southeast

Damage is usually spotty, but large  
infestations can occur

Usually more damage in single-species plantations

Most common on younger trees

Repeated defoliation can reduce growth and  
potentially cause tree mortality

# Visual guide to pine sawfly larvae in Eastern North America, showcasing variation in larval coloration



# Redheaded pine sawfly (*Neodiprion lecontei*)



UGA0284087

UGA4060074



# Pine sawfly damage



5383259



# Pine sawfly damage



# Pine sawfly damage



Photo by M. Daniels, LDAF

# Pine sawfly management

Control usually not recommended or necessary

If defoliation persists multiple years chemical control may be used

Natural enemies generally take care of populations

Urban environments: manual/chemical removal

# Pine coneworms (*Dioryctria* spp.)

Well-known for damage in seed orchards

Also attacks other parts of tree

Buds

Flowers

Shoots

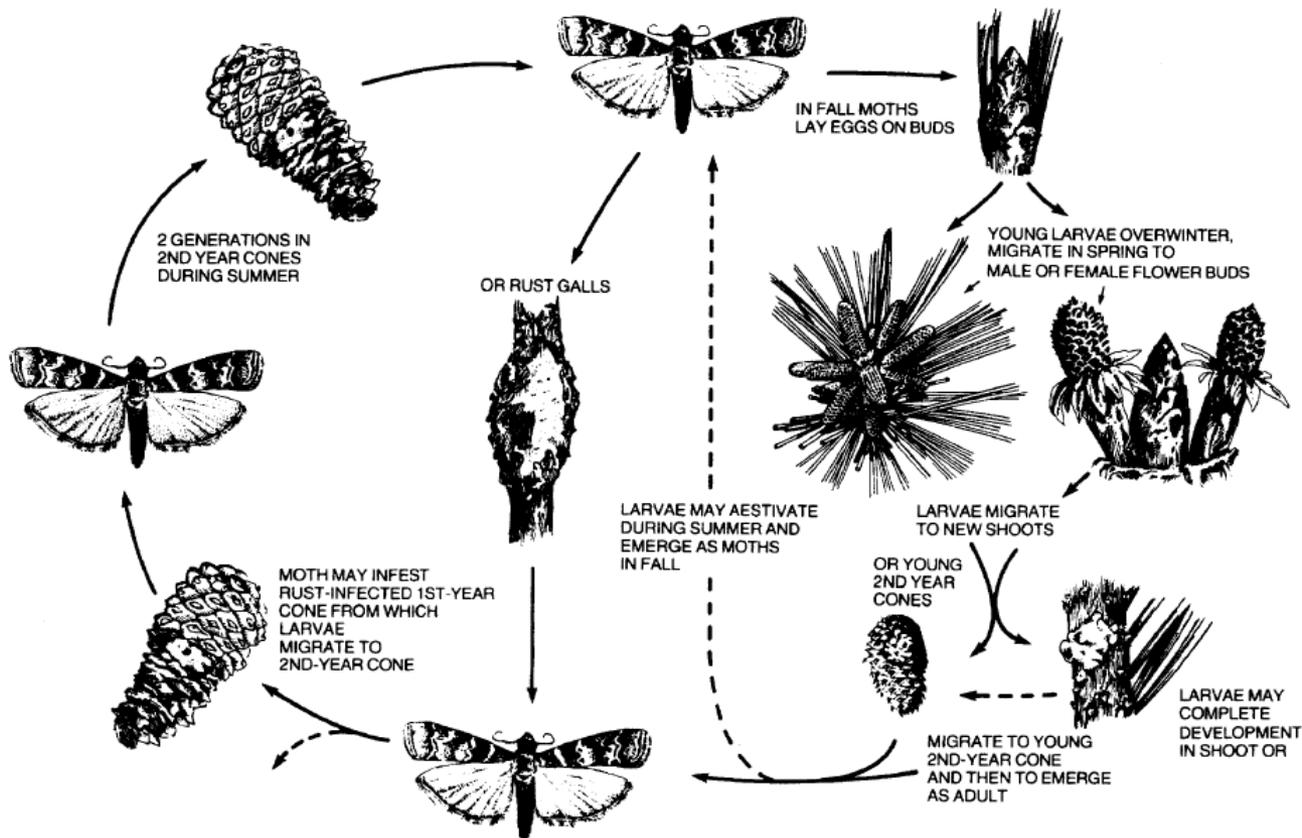
Branches

Stems



# Southern pine coneworm (*Dioryctria amatella*)

Present throughout the southeastern U.S.  
Complex, multivoltine life cycle



# Southern pine coneworm

All native species of pine used as hosts

Except white pine (*P. strobus*)

Adults appear to have a prolonged emergence  
and oviposition period

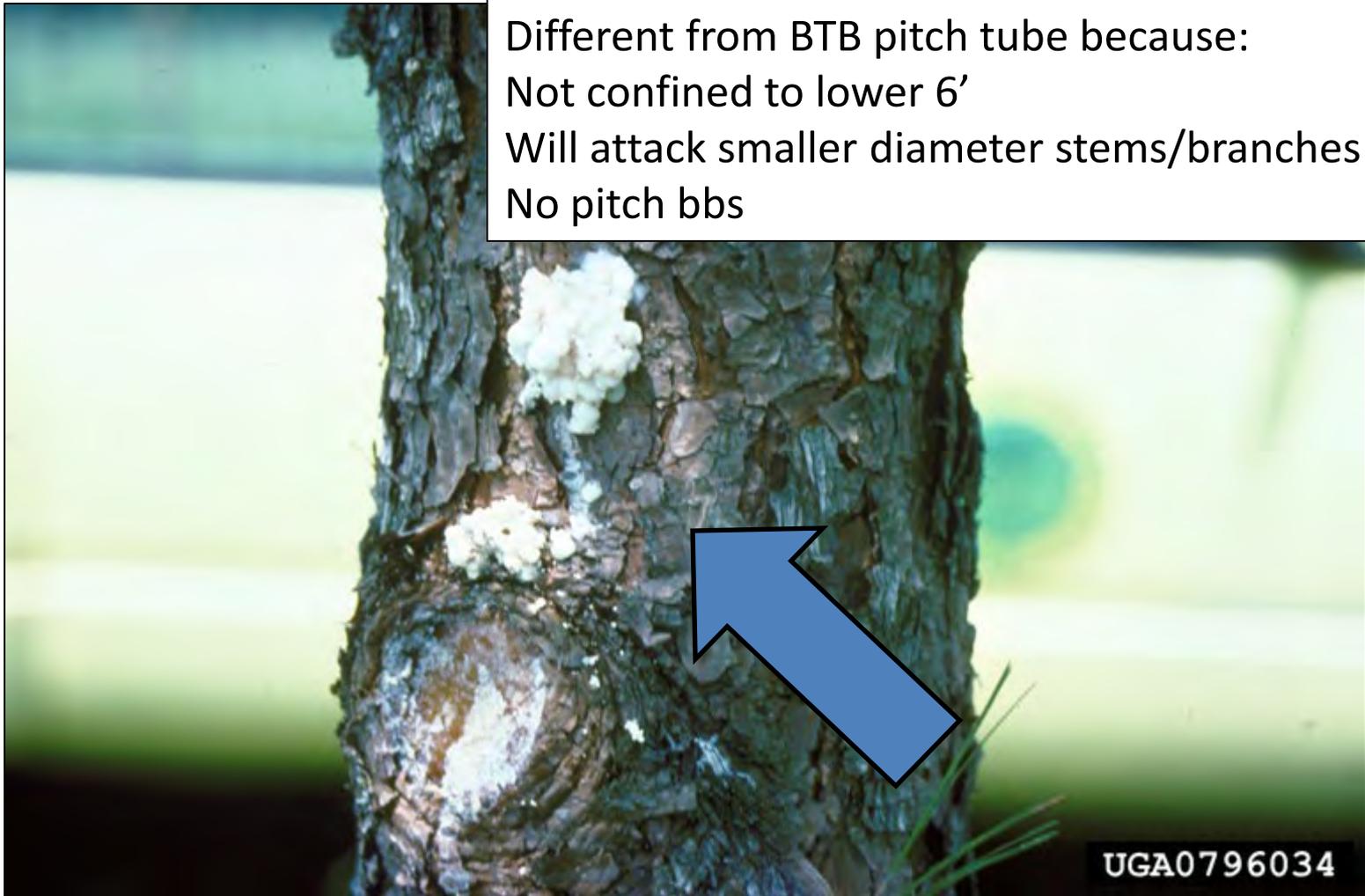


# Southern pine coneworm



# Southern pine coneworm

Different from BTB pitch tube because:  
Not confined to lower 6'  
Will attack smaller diameter stems/branches  
No pitch bbs



UGA0796034

# Southern pine coneworm

You will often see a pitch/frass  
where a larva is feeding



UGA0796030a

# Southern pine coneworm

Young larvae may feed on  
shoots

Glob of pitch usually  
evident

Pitch is usually white



UGA0796031a

# Southern pine coneworm management

Can be great tree to tree variation in  
susceptibility & damage

Maintain tree vigor

Prune off infested branches

Commercially available pheromone lures

Timed pesticide applications

Stem injections

# Pine webworm

(*Pococera robustella*)

Typically damages young trees (1-2 yo)

Rarely economically damaging

Most pines are hosts

Likely 2 gen/yr



# Pitch canker

(*Fusarium circinatum*)

Named for large amount of resin at canker

Can be problem in seed orchards

Occasional outbreaks

Insect association



*Pissodes nemorensis*





Primary symptoms are  
dead needles and  
extremely heavy resin  
flow on the terminal  
leader(s)

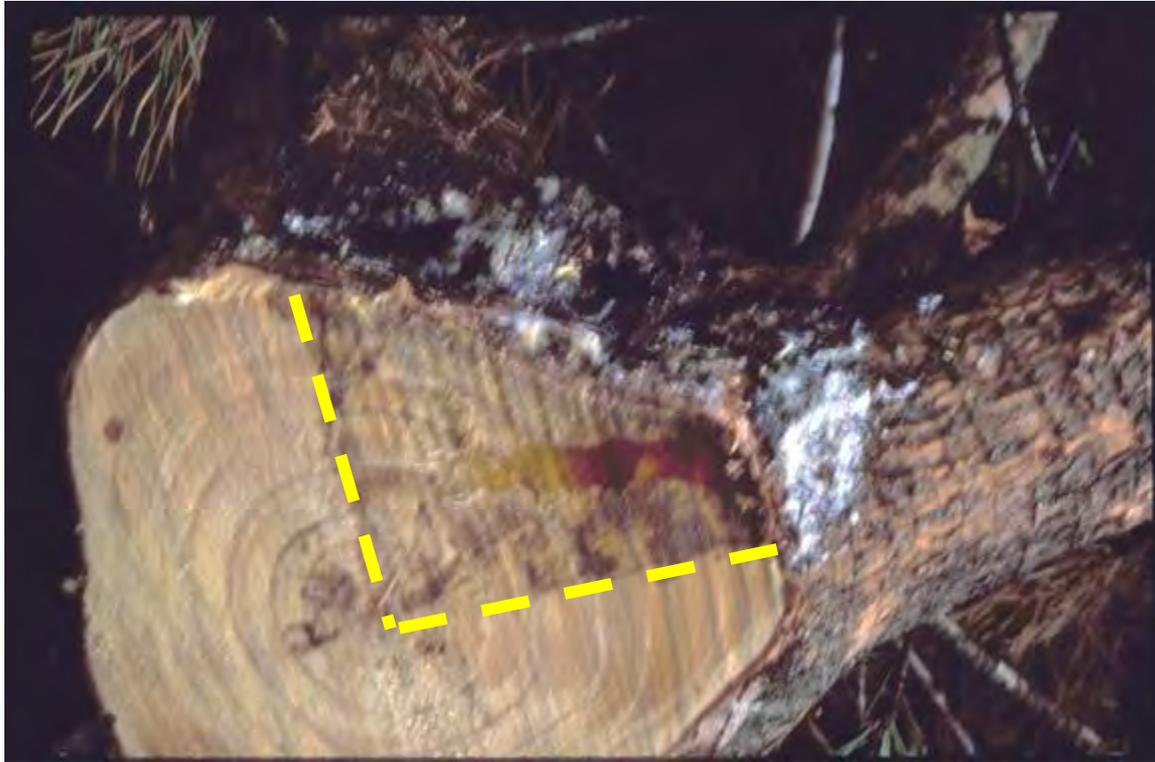


Chief hosts of this disease are slash, shortleaf, Virginia, and longleaf pines



Resin soaking of the  
internal canker on a  
terminal leader

Heavy pitch flow on  
the terminal leader



Cross section of an infected stem showing the typical triangular extension of the canker into the stem

FL seed orchard

June 2016

Pitch canker episode

Damage  $\frac{1}{2}$  way up tree

Trees ~60' tall

20% infected





Severe infection can result in almost 100% of the stems in a stand being infected

Sanitation is the only forestry control measure



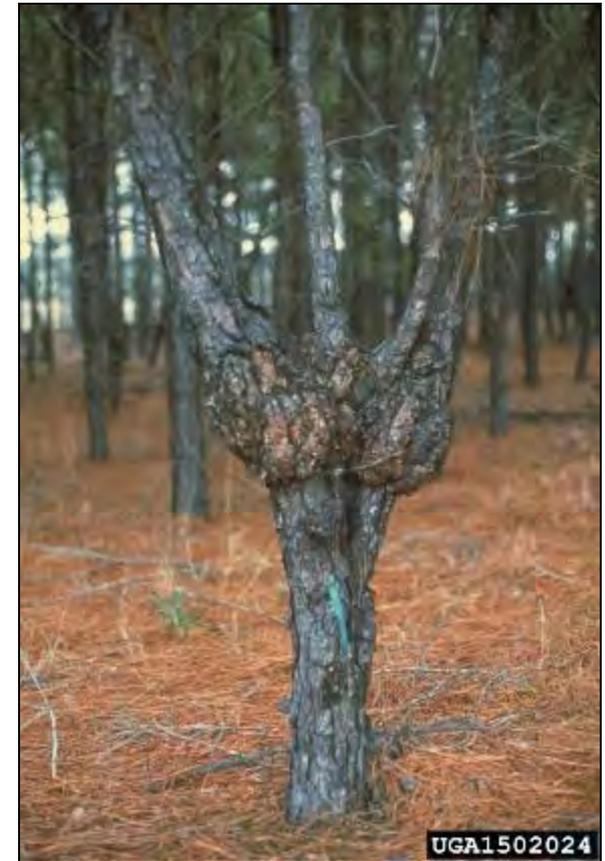
# Fusiform rust

*(Cronartium quercuum f. sp. fusiforme)*

Worst forest disease in SE US

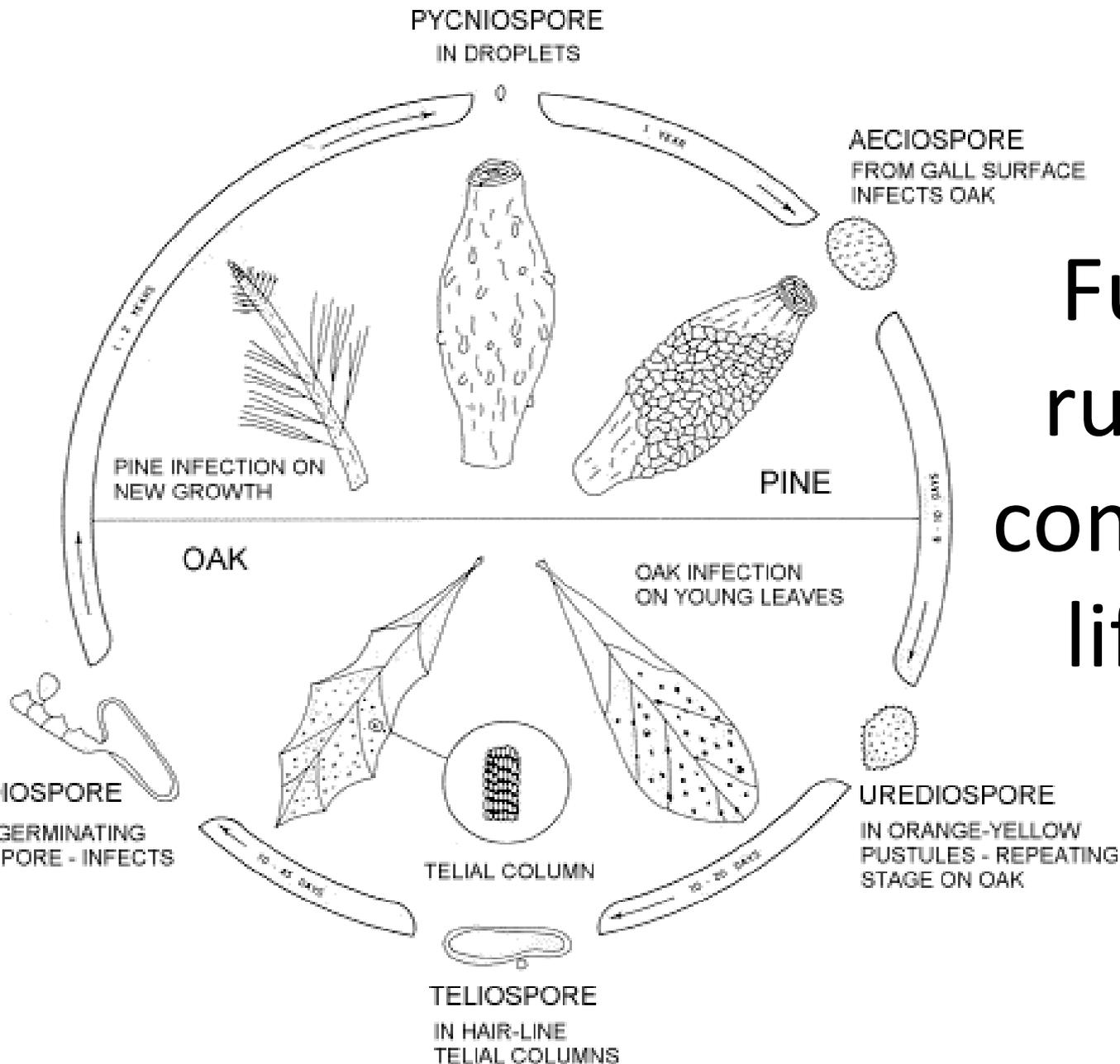
Stem / branch cankers

Nursery and plantation issue



# LIFE CYCLE OF *Cronartium fusiforme*

Fusiform rust has a complicated life cycle





What you really  
need to know is

the fungus  
alternates  
between oak and  
pine hosts



2-yr lifecycle

Susceptibility:

Loblolly/slash  
Longleaf

Black oak group  
most susceptible

# Fusiform rust



# Fusiform rust



# Fusiform rust



# Fusiform rust



# Fusiform rust

**March 5, 2023**  
**Mississippi**



# Fusiform rust

March 4, 2018  
Florida



@forestmycology

March 11, 2023  
South Carolina



@FNRClemson

# Fusiform rust



# Fusiform rust



# Stems often break at canker



UGA1502008

# Fusiform rust impacts growth



# Fusiform rust management

**Chemical treatment in nurseries**

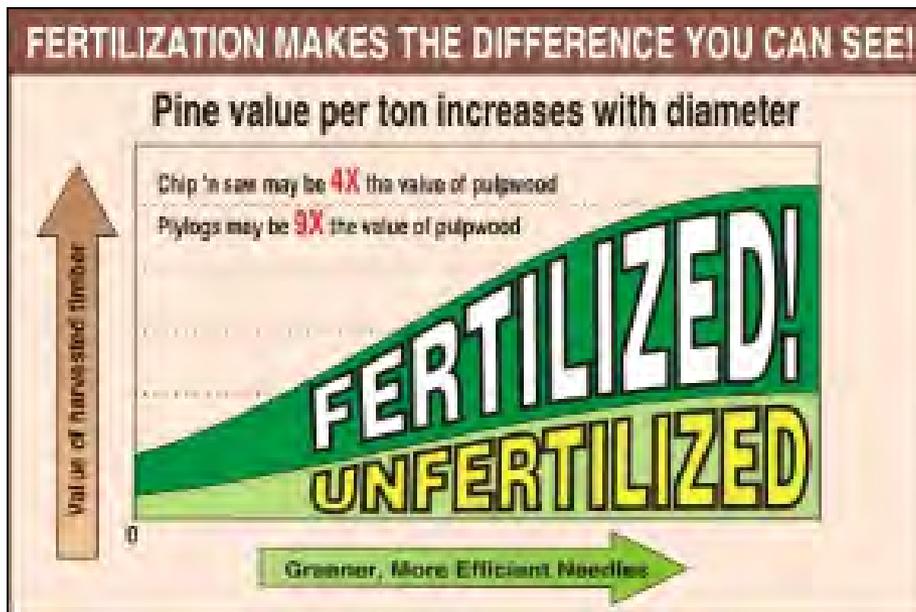


**Plant disease-free material**



# Fusiform rust management

Reduce site prep and fertilize later



Selective harvesting of damaged trees



# Annosum root rot (*Heterobasidion irregulare*)

One of the worst forest diseases in SE US

Invades/degrades root system

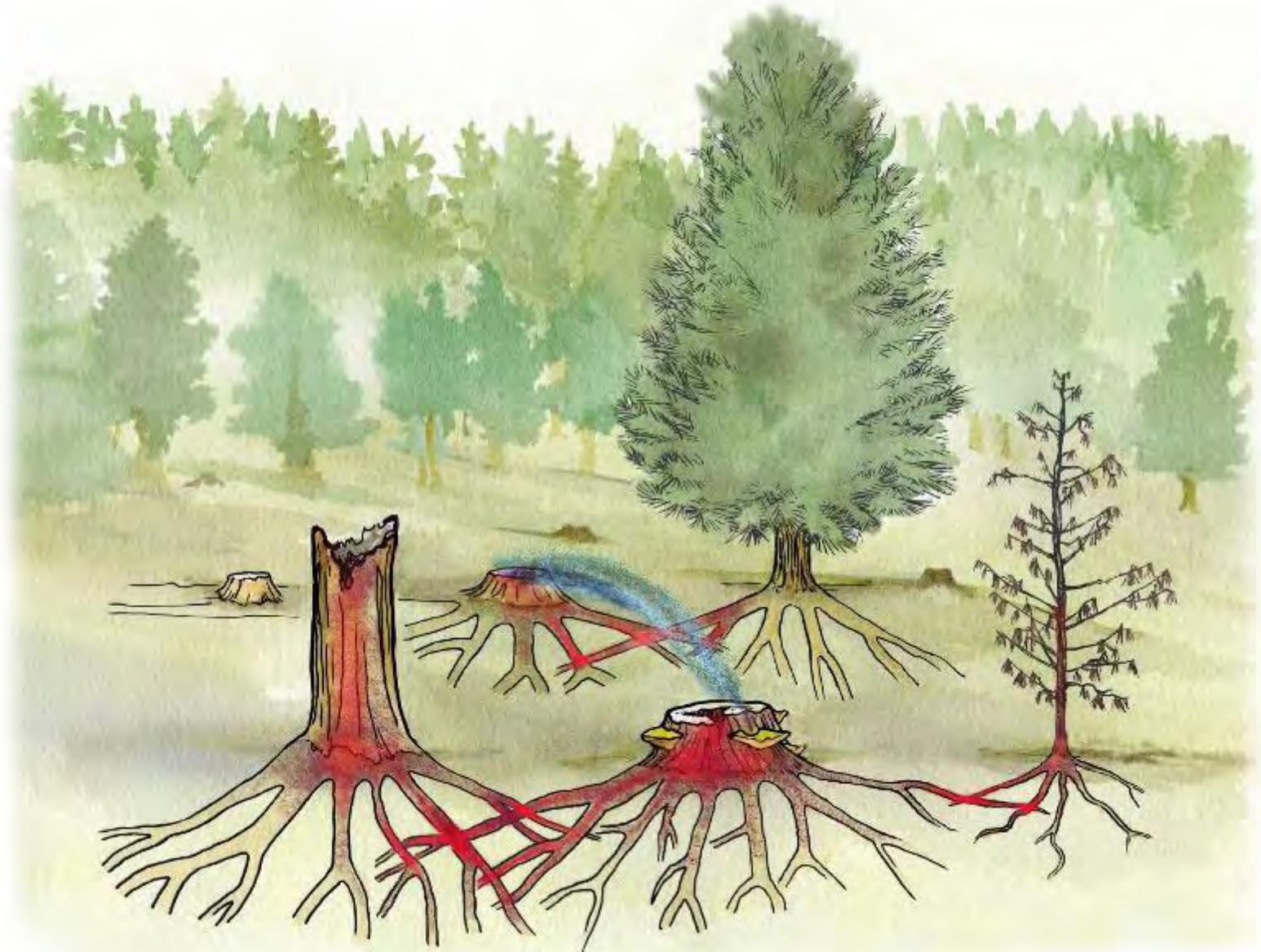
Spores spread by wind



# Annosum root rot



# Annosum root rot infection



# Annosum root rot

Looks like pines just “giving up”  
Similar to early Ips damage,  
BUT more loss of foliage than browning  
Look for pockets, especially on former ag lands  
Trees prone to falling over (this is different than with Ips!!)

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# Annosum root rot



# Annosum root rot risk factors

**High**

Sandy / sandy loam soils at least 12”  
deep with good drainage

Former ag lands

**Medium**

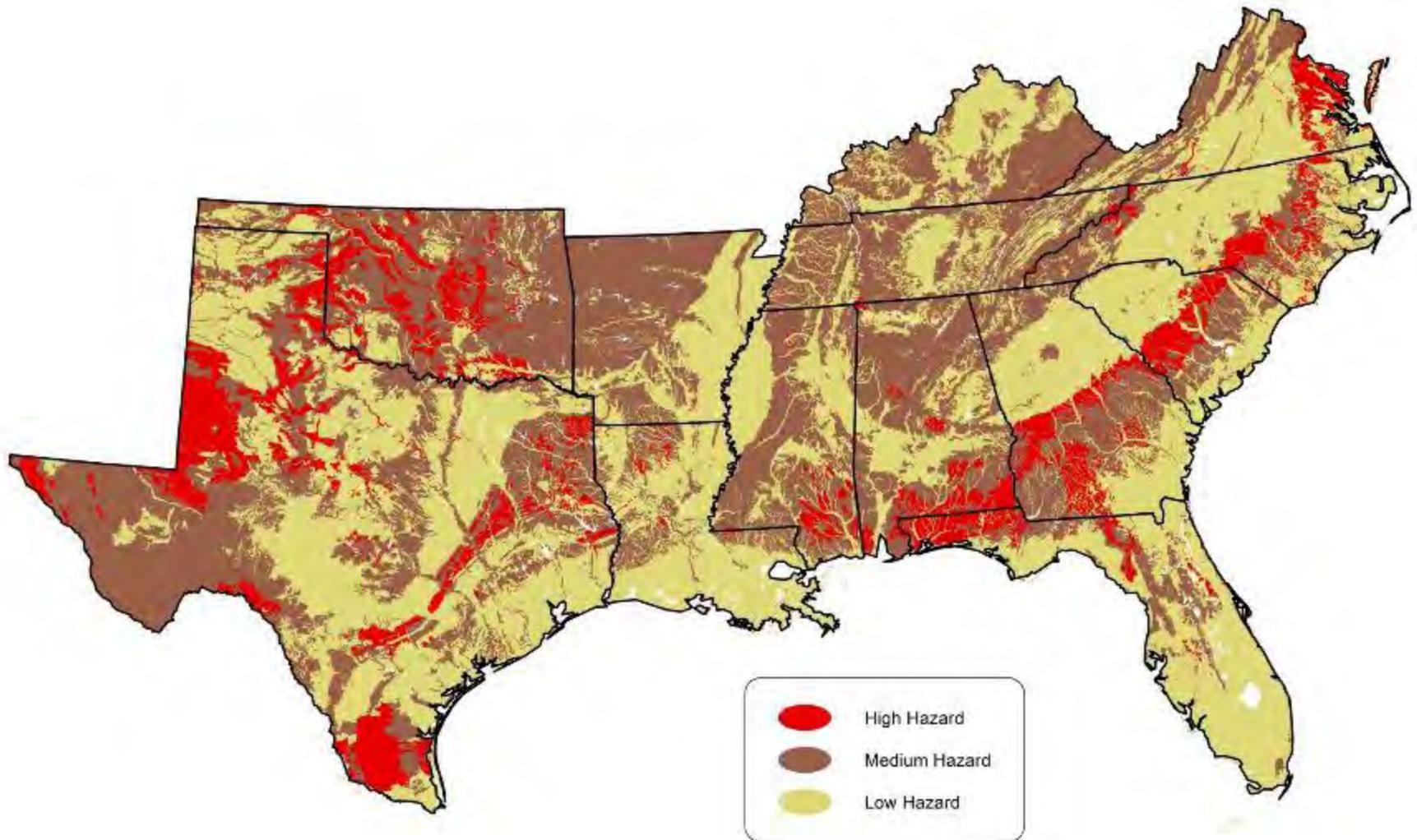
Silt / silt loam soils, 12” deep

**Low**

Poorly drained clay / clay loam

High water table

# Annosum root rot hazard map





Bee Branch, AL  
Bankhead NF quad sheet

Areas of hazard for  
annosum root rot:

- High (red)
- Moderate (yellow)
- Low (green)

USGS 1:24000 scale

# Annosum root rot management



**Clearcuts halt disease progression**



**Thin during summer months**



**Stump treatment**

# Brown spot needle blight (*Mycosphaerella dearnessii*)

Primarily damages longleaf, also loblolly/slash

Delays growth, but rarely kills tree

Spores spread by wind/rain



# Brown spot needle blight



Brown spot  
needle blight  
\*can\* affect  
mature trees



Brown  
spot  
needle  
blight  
\*can\*  
affect  
mature  
trees



# Brown spot needle blight management

Plant resistant seedlings

Promote aeration in young stands

Foliar fungicides

Fire!



Brown spot  
needle blight  
management on  
mature trees?



# Needlecast disease

Several species of fungi

*Lophodermium* spp. are most common

Depending on species, infect current or last year's needles (Lopho => 2-yo needles)

Needles brown, die, fall off

Lopho fruiting bodies look like little footballs

# Needlecast disease

Needle death progresses from tips inward  
Current OR last year's needles



# Needlecast disease



# Needlecast disease



# Needlecast disease look-alikes

Diplodia tip blight (*Sphaeropsis sapinea*)

Needle death all at once



UGA1241526

# Needlecast disease look-alikes

Pine needle rust (*Coleosporium* spp.)

Little “wings” on the needles



# Needlecast disease look-alikes

Normal pine needle senescence

Always older needles



# Littleleaf disease

*Phytophthora cinnamomi*

Water mold

Largely responsible for the decline of shortleaf pine as a timber species



# Littleleaf disease looks like pines just sort of...dying



healthy

littleleaf

early  
littleleaf?

healthy

littleleaf

healthy

# Littleleaf management

Few (good) options

Improve drainage

Fertilization

Plant different species

# Questions?

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*Department of*

**FORESTRY AND ENVIRONMENTAL  
CONSERVATION**



**COOPERATIVE EXTENSION**

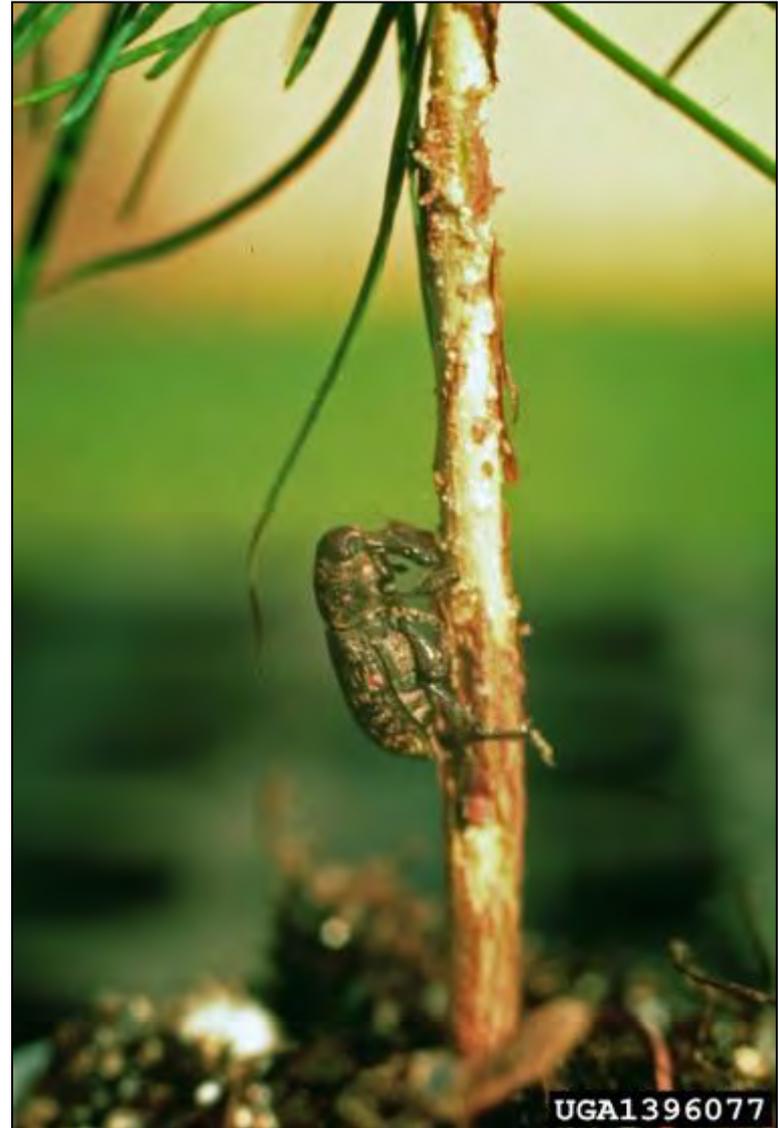
*College of Agriculture, Forestry and Life Sciences*

# Pales weevil (*Hylobius pales*)

Larvae feed in dying/dead pine roots



# Pales weevil



# Pitch-eating weevil (*Pachylobius picivorous*)

Very similar to pales weevil, only bigger



Damage caused by both weevils is very similar.

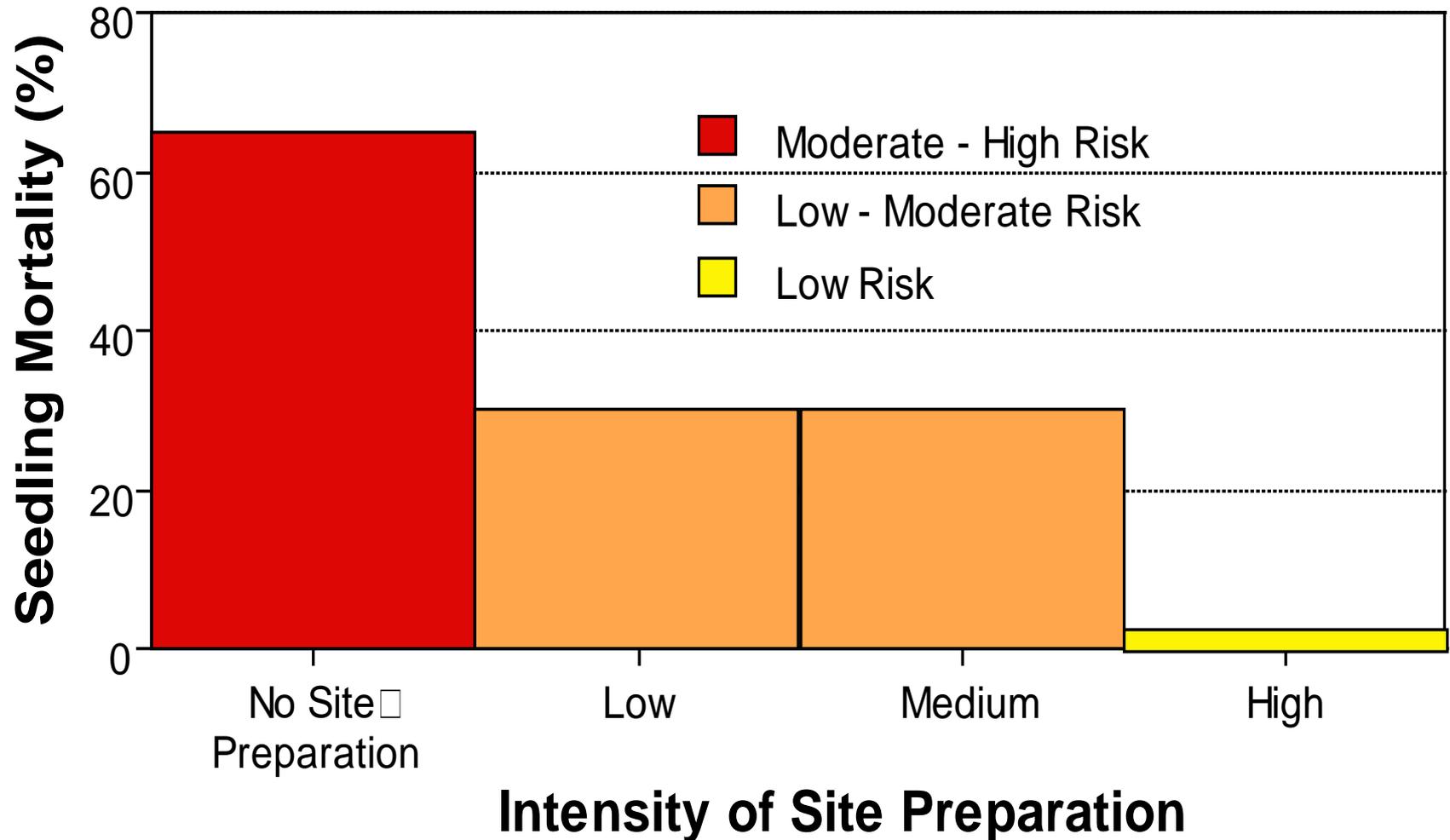


Pales weevil

Pitch-eating weevil



# Potential risk of weevil-caused pine seedling mortality based on intensity of site preparation



# Regeneration weevils

Several options for avoiding weevil problems:

Delay planting to following year (or 9-12 mo)

Intensively prepare sites before planting

Treat seedlings with an insecticide (at nursery)

If harvest to planting interval is less than 6 months, consider planting permethrin-treated seedlings

# Nantucket pine tip moth

(*Rhyacionia frustrana*)

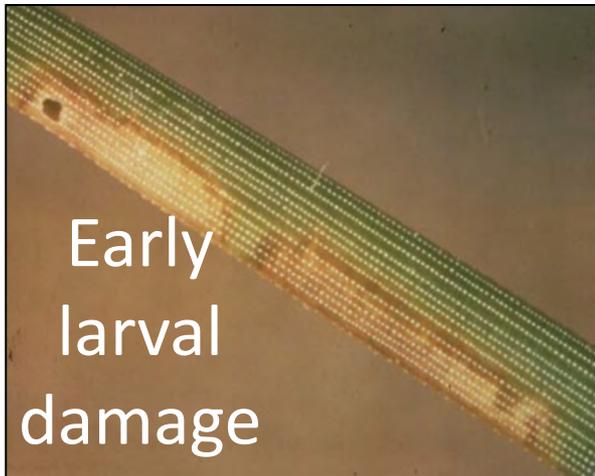
Prefers loblolly, shortleaf, slash, Virginia; rarely attacks longleaf

4-5 generations/year in AL

Causes stunted, bushy trees



# Nantucket pine tip moth



Larva



5445836







UGA1361104

Intensive site preparation tends to result in  
higher tip moth damage



What else looks (ecologically) like an intensively site-prepped area?



# Nantucket pine tip moth management

Preventative – encourage growth

NPTM won't usually attack after trees ~10' tall

Hand pruning infested shoots

Insecticides + pheromone monitoring



# Nantucket pine tip moth management: chemical

Spray applications are effective

At least 18 a.i. & 53 formulations available;

Pounce<sup>®</sup> (permethrin) and Mimic<sup>®</sup>  
(tebufenozide) are effective

Optimal spray periods models reduce number  
of sprays

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