

Heterobasidion Root Disease in the South



Heterobasidion Root Disease (annosum root disease)

South USA

Heterobasidion irregulare

Old scientific names:

- *Heterobasidion annosum*
- *Fomes annosus*

Old common names:

- **Annosum** root disease
- **Annosus** root rot
- **Fomes** root rot

Heterobasidion Root Disease (annosum root disease)

- Second most important disease in southern pine plantations
- Greatest occurrence in thinned pine plantations on sandy, well-drained soils
- Common on thinned eastern white pine



Symptoms

Trees with **advanced** stages of infection...



...sometimes show thinned crowns.

Symptoms

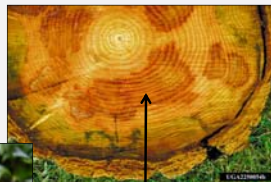
Windthrow



Windthrow in recreation and urban forests = serious hazard

Symptoms

Early stages of decay:



Irregular pinkish, red-brown to dull-violet stain

Pitch soaking of roots and heartwood

Symptoms



Whitish pockets of rot develop
Wood becomes soft and stringy



Signs - Conks



- Develops under wet-cool conditions
- Look in winter for conks
- Often under duff-layer

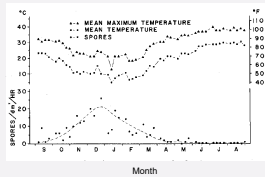


Signs - Conks



Spore Production (below the 34° N Lat)

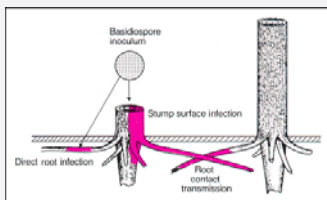
- Conks and spore production is greatest in the winter
- Typically lower spore production
 - June to August
- Summer thinning without stump treatment below 34° N Lat
 - Mean temp > 70° F
- If cool-wet summer, stump treatments may be needed on high hazard soils



Mean numbers of *H. irregulare* spores produced at the nine most southern trapping locations related to min-max and mean maximum stand temperatures.

Infection of a Stand

- Initial infection by spores
- Newly exposed sapwood is selective for *H. irregulare* for up to 2 weeks
- 90% of infection via stumps
- 10% infection via roots
- Spread via root contacts to adjacent living trees



Root Infections



High hazard soils – sandy, well-drained
Greater root contacts
Spores can move through sand to roots
Intact O horizon inhibits spore movement



Low hazard soils – clay
Limit root contact potential
Spores do not move through clay to roots
Avoid exposing roots (as pictured)

Heterobasidion Disease Centers

Outward spreading of infections by root-to-root contact creates circular centers of disease.



Heterobasidion Disease Centers

(annosum root disease)

- Spots or areas of mortality
- Progression of mortality
- Older dead with new mortality occurring on edges of affected area
- Ips beetles, BTB usually present



Not a Root Disease Spot

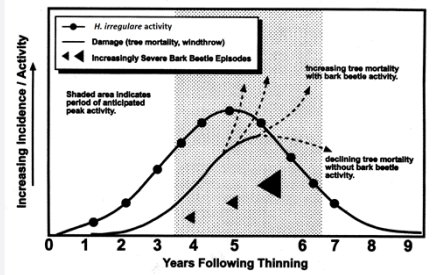
Mortality occurred in the same timeframe

- Insect
- Fire
- Herbicide



Herbicide damage from spraying excess Imazapyr

Model of Heterobasidion Root Disease Development in a Stand



Barnard, E.L. 1999. Annosum root rot of pines in Florida. Plant Path. Circular # 398.

Heterobasidion Root Disease - 4th yr after thin

15% mortality above ground
30% root infection below ground

Site was clear-cut the next year



Heterobasidion Root Disease (annosum root disease)

One spot of HRD per acre + Drought + Ips beetles



5th year after thinning – on medium hazard soil

Heterobasidion Root Disease (annosum root disease)

Eastern white pine is highly susceptible
Soil type is unimportant

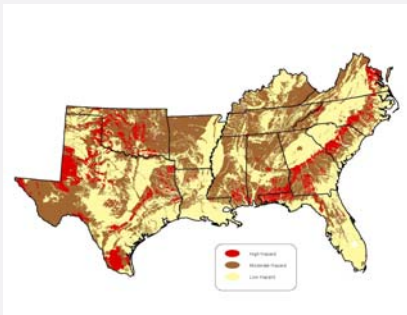


Heterobasidion Root Disease (annosum root disease)

Relative susceptibility of southern pine

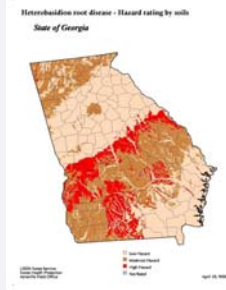
- Loblolly pine
 - 1.3 m/yr pathogen growth rate (max 2 m)
- Slash pine
 - 1.1 m/yr pathogen growth rate
- **Longleaf pine (50% less mortality)**
 - 0.8 m/yr pathogen growth rate

Heterobasidion Hazard Map (annosum root disease)



Heterobasidion Root Disease Hazard Rating by Soils

- Low hazard
 - Clays and clay-loams
 - Any soil with high water table two or more months out of the year
 - 10-20% prob. of severe loss
- Moderate hazard
 - Loams and silt loams
 - Sandy soils underlain by clay horizon less than a foot from the surface
 - 30-40% prob. of severe loss
- High hazard
 - Sand, sandy loams, loamy sands a minimum of 12 inches deep.
 - Well drained
 - 75-85% prob. of severe loss



Other Factors Enhance Damage

- Number of thinning
- Weakened trees
 - Drought, suppression, pollution, etc.
- Neutral to alkaline soil conditions
- Former agricultural sites

Stump Treatments




Stump Treatment

Disodium Octaborate Tetrahydrate


- **Cellu-Treat®**
 - Borate wettable powder
 - 0.5 lb/gallon (5% solution)
 - 1 gal treats 250 six inch stumps
 - 1 gal treats 90 ten inch stumps
 - 1.0 lb/gallon (10% solution)
 - 1 gal treats 500 six inch stump
 - 1 gal treats 180 ten inch stumps



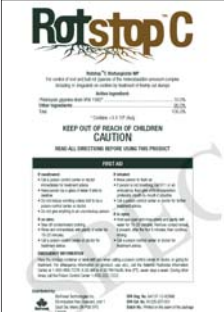


Stump Treatment

*Phlebiopsis gigantea**



- **Rotstop™ C**
 - Wettable powder (spores)
 - 0.13 oz/gallon
 - 1 gal treats 250 six inch stumps
 - Rotstop C stored for:
 - 12 months at below 46°F
 - 18 months at 0°F



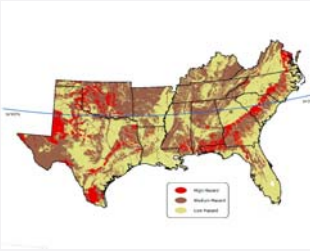
*Available in the South from 1970's-1995 (BioBasic) discontinued in 1995 due to no pesticide label

Summer Thinning Option

High temperatures south of 34° N Lat

Reduced spore production (mean temp $\geq 70^\circ$ F)

Elevating daytime stump surface temp ($\geq 104^\circ$ F)



Heterobasidion Root Disease Management Options

- Prevention (high hazard soils)
 - Plant less susceptible species (e.g. longleaf pine)
 - Reduce need for thinning (wider spacing)
 - Stump treatments
 - Summer thinning (south of 34° N Lat)

Heterobasidion Root Disease Management Options

- Infected stand (regardless of soil hazard)
 - Nothing
 - Treat new stumps - Rotstop C
 - Summer thinning/salvage (south of 34° N Lat)
 - Harvest (clear-cut)
 - Stump removal (recreation, orchards, etc.)

Fertilization?

- Ammonium nitrate or fertilizer that contained nitrogen does **not** decrease the spread of Heterobasidion root disease.
- Mixed results from a few studies with nitrogen-**free** and slow-release compound fertilizer.

Sampling Technique

Cubic Foot Method

Dig up a cubic foot of soil/roots and count disease roots and total roots



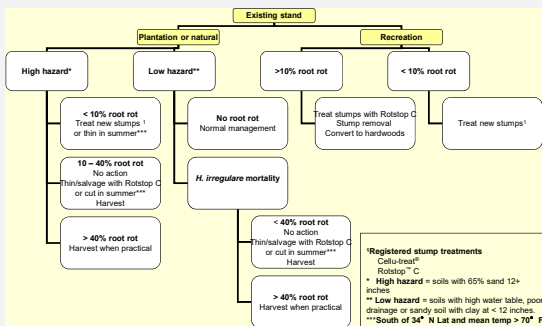
Cubic foot method

- Systematically locate 20 plots in any size forest stand.
- Excavated a 1-cubic-foot soil root sample.
- Remove all the pine root pieces and determine resin soaked or white-stringy rot.
- Divide the number of roots with symptoms by the total number of roots x 100 = % root disease

Plot	Sympt roots	Total roots	Plot	Sympt roots	Total roots
1			11		
2			12		
3			13		
4			14		
5			15		
6			16		
7			17		
8			18		
9			19		
10			20		

Add up columns for all 20 plots. $\frac{\text{Symptomatic roots}}{\text{Total roots}} \times 100 = \% \text{ root disease}$

Decision Key



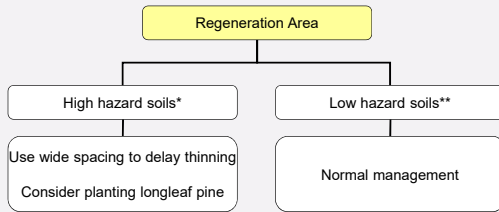
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Regeneration

- Seedling losses under 10% in the South
- No wait to regenerate stands



Decision key



*High hazard = soils with 65% sand 12 inches or deeper and well drained
**Low hazard = All soils with high water tables and poor drainage; sandy soils with clay < 12 inches.



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