



Figure 8.
Stump treatment
spray. Photo by
Michelle Cram,
USDA Forest
Service.

the cut stump using a spray applicator (Figure 8). Water-soluble borate powder, such as Cellu-Treat® (disodium octaborate tetrahydrate), has also proven to be successful in thinning operations in pine plantations with a high risk of Heterobasidion root disease. Apply this solution to the stump surface with a spray applicator, to the point of runoff. Sporangin®, and Cellu-Treat® need to be applied within twenty-four hours of harvest.

Summer thinnings below the fall line can reduce the risk from Heterobasidion root disease. Average daily temperatures over 70°F limit spore production and stump surfaces that reach 104°F for 2 hours will kill *H. irregulare*. Summer thinnings may create a bark beetle problem in some areas of the state when beetle populations are high. Be sure to check the status of pine beetle activity in your area before thinning.

Managing Established Stands

Since freshly cut stumps are the primary source of new infections, reducing the number of thinnings in a stand growing on a high-hazard site will reduce the incidence of Heterobasidion root disease.

Pine plantations severely infected with Heterobasidion should be clear-cut and regenerated. Salvage or improvement cuts in severely damaged stands can increase the incidence of Heterobasidion root disease, as well as leave the stand understocked.

Stands with a history of Heterobasidion root disease can be planted with pine immediately after harvesting. Although low percentages of seedlings can become

infected, losses are typically under 10% because diseased roots rot quickly and seedling roots are not yet grafted together. When regenerating high hazard sites, a wider spacing should be used. This will delay the first thinning and ultimately reduce the total number of thinnings made during the rotation. Low hazard sites require no special planting treatments. Although all southern pines are susceptible to Heterobasidion root disease, longleaf pine is less susceptible and should be considered for planting on appropriate high-hazard sites.

References

Forest Insect & Disease Leaflet 76, US Department of Agriculture Forest Service. Annosum Root Rot in Eastern Conifers by Kathryn Robbins

Forest Health Guide for Georgia Foresters, Written by Terry Price, Georgia Forestry Commission

Insects and Diseases of Trees in the South. 1989. USDA Forest Service - Forest Health Protection

Michelle Cram, Plant Pathologist, USDA Forest Service - Forest Health Protection

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Cover photo - Crown symptoms:
Dead and fading trees (left).
Photo by Mark Raines, GFC.



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Heterobasidion Root Disease

Formerly Annosum Root Disease



Introduction

Heterobasidion root disease can be a serious problem in pine plantations that have been thinned one or more times. All southern pines are susceptible, but loblolly and slash pine are the most vulnerable. The disease is caused by a tree root rot fungus *Heterobasidion irregulare* (formerly known as *Heterobasidion annosum*), which causes decay in the root system. This makes them susceptible to butt rot, windthrow, decreased growth, and ultimately death. Failure to identify high risk sites and take appropriate measures to reduce potential root disease could prove costly to a landowner.

Means of Spread

The fungus usually enters a healthy stand by infecting freshly cut stump surfaces. Airborne basidiospores of the fungus land on a stump's surface, germinate, and produce filaments (mycelia), which colonize the stump and its root system. The fungus then spreads to adjacent trees by root grafts or contacts (Figure 1).

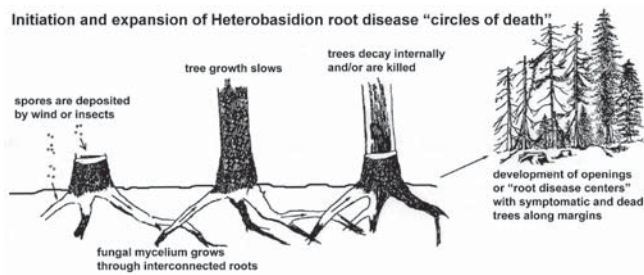


Figure 1. Tree-to-tree spread of *Heterobasidion* by root contact usually results in a more or less circular infection center. After a stand is thinned, the process of infection of stump surfaces, spread through the roots, and death of the remaining, previously healthy trees may occur within 2-3 years.

Source: G. Stanosz, U. Wisc. - Madison.

Symptoms

Damage from *Heterobasidion* root disease may be scattered throughout a stand or occur in pockets of dead and dying pine trees called "infection centers" (Figure 2). Mortality is sometimes preceded by thinning and yellowing of the crown (Figure 3); however, some trees simply turn red and die. Trees in various stages of dying or death may suffer windthrow. Infected roots exhibit resin or pitch-soaking (Figure 4) and stringy root decay (Figure 5). Occasionally the fungus will develop fruiting bodies of

conks (Figure 6) at the base of living and dead trees or stumps. These conks are hard to see because they are frequently formed below the litter layer around the tree or stump base, and are most prevalent during the cool wet winter months.



Figure 2. Pockets of dead trees. Photo by Garland N. Mason, USDA Forest Service.



Figure 3. Thinning and yellowing of crowns. Photo by Mark McClure, Georgia Forestry Commission.



Figure 4. Pitch soaked root. Photo by Mark Raines, Georgia Forestry Commission.



Figure 5. Stringy root decay. Photo by Mark Raines, Georgia Forestry Commission.



Figure 6. Conk at base of tree. Photo by Chip Bates, Georgia Forestry Commission.

Hazard Sites

Heterobasidion root disease is found throughout Georgia on most forested sites; however, the most perilous areas are located on deep, sandy ground along the fall line of the state. It is best to consult with a soil scientist or forester for a more detailed description of a particular site. Figure 7 shows a broad classification of sites for possible root disease occurrence.

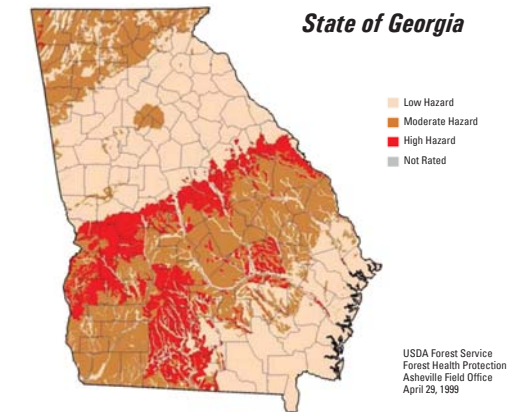


Figure 7. Map of Georgia shows soils with high hazard for *Heterobasidion* root disease.

Control

Before thinning, pine stands should be checked to determine the site's susceptibility to *Heterobasidion* root disease. Soil texture can be evaluated with soil maps or by onsite examination of the soil. The connection between thinning and subsequent infection has focused on treating stumps to prevent or control *Heterobasidion* root disease. The treatment of freshly-cut stumps with dry granular borax powder, such as Sporax®, has proven to be a successful chemical treatment. Sporax® may also be mixed with water and applied to