CENTRAL HARDWOOD NOTES

Root Rots

Root rots of central hardwoods are diseases caused by fungi that infect and decay woody roots and sometimes also invade the butt portion of the tree. By killing and decaying roots, root rotting fungi reduce growth, decrease tree vigor, and cause windthrow and death. The most common root diseases of central hardwoods are Armillaria root rot, lnonotus root rot, and Ganoderma root rot.

Root rot fungi spread above ground by air-borne spores produced in fruiting bodies that vary in appearance from fleshy mushrooms to rubbery or woody conks. These fruiting bodies are found on or near infected trees or stumps, and are reliable outward signs of disease. Other indications of root rots may be dwarfed off-color foliage, dieback of the crown from the top down, decreased diameter growth, and windthrow. Unlike red oaks infected with oak wilt that rapidly wilt and die, hardwoods with root rot are often found in gradually enlarging groups (pockets) of slowly dying trees.

The fungi spread underground when healthy roots come in contact with decayed roots. Some of these fungi also spread by the growth of specialized fungal strands (rhizomorphs) that develop from decayed roots, stumps, or buried wood and grow through the soil to nearby healthy roots. Infection is more likely in trees that either have been wounded at or below ground, or that are being stressed from such factors as drought or insect defoliation.

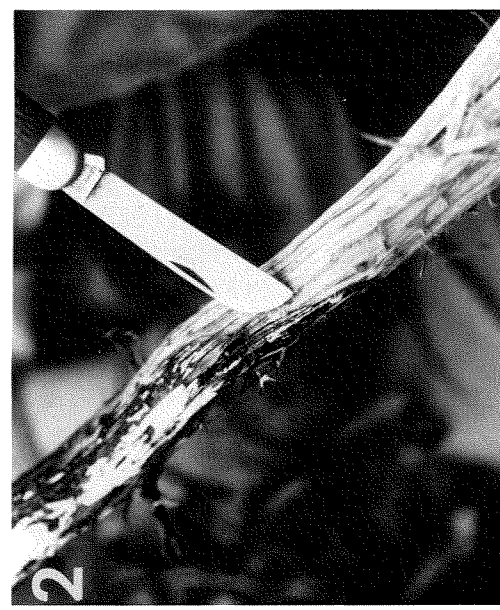
Potential damage from root rots should be considered when you plan intermediate cuttings and stand regeneration.

Intermediate Cuttings

Avoid making intermediate cuttings during seasons when wounding of residual trees is most likely-such as during the spring when bark is easily injured. Also avoid logging when the ground is soggy and equipment is more likely to compact the soil and to injure roots along skid trails and roads.

If a stand has been heavily or repeatedly defoliated or is stressed from prolonged drought, consider postponing intermediate cuttings to see which trees will die in response to the stress, and to avoid causing the additional stress that often occurs when a stand is cut.

When marking trees to be cut, keep in mind that the risk of root rots can be decreased by increasing species diversity, removing wounded and diseased trees, and avoiding soil compaction. Proper log road and skid trail layout will minimize wounding roots and lower boles of residual trees.

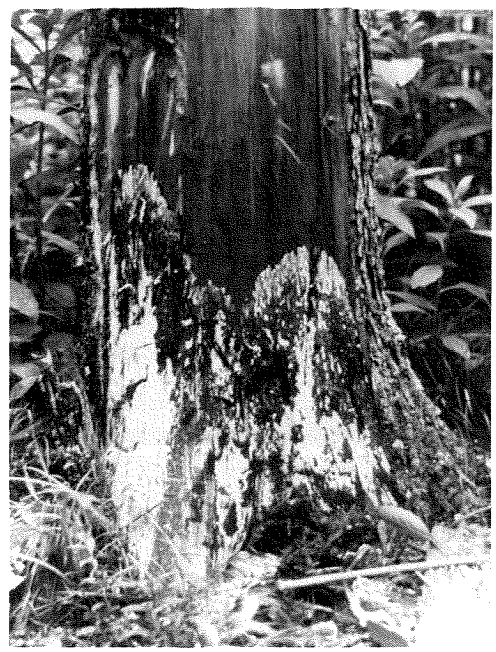


1 .-Removing tree to observe root disease.
2.-Armillaria under the bark on a woody root.
3.-A broken root at the point of Armillaria girdling.
4.-Armillaria at the root collar of a red oak.
(Philip Wargo)

Occasionally, root rot becomes so widespread and severe in a stand (e.g., following repeated severe defoliation by gypsy moth) that the only solution is to cut the entire stand and regenerate it to less susceptible species.

Regeneration

In general, root rots cause more damage to planted than to naturally regenerated stands. With artificial regeneration there is more chance for planting on improper sites, wounding seedlings, and bringing in disease-causing fungi on the planting stock (e.g., walnut root rot). When you select trees to be planted on former hardwood sites, choose species and seed sources that are best suited to that area because stressed trees are more susceptible to infection and damage by root rots. Species diversity, whether due to artificial or natural regeneration, will reduce the risk of losses due to root rots and other diseases and insects.



A white oak with root collar girdled by *Armillaria* (Philip Wargo)

Armillaria root rot often damages conifers planted on cutover hardwood sites. As hardwood stumps die, whether naturally or following herbicide treatments, *Armil-/aria* invades the stumps, uses them as a food base, and spreads via rhizomorphs through the soil to nearby conifer seedlings and saplings. If stumps produce sprouts, colonization of the stumps by *Armillaria* is either reduced or prevented. The greater the size and number of stumps on a site, the greater the risk of mortality to planted conifers. To delay planting after clearcutting is not an effective way to avoid losses since stumps can act as food bases for the fungus for 10 or

more years. If you can justify the costs, intensive site preparation up to or including stump removal reduces the food base for *Armillaria* and decreases the risk of subsequent disease. Whether there is similar risk to hardwood seedlings planted on cutover sites is not known.

References

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Kathryn Robbins
North Central Forest Experiment Station
USDA Forest Service
St. Paul, Minnesota

Philip M. Wargo
Northeastern Forest Experiment Station
USDA Forest Service
Hamden, Connecticut