May 2004
13.6

Aspen Heart Rot

Phellinus tremulae (Bondartsev) Bondartsev and Borisov in Bondartzev

(= *Phellinus igniarius* [Linnaeus: Frie]
Quellet, *Fomes ignarius* [Linnaeus: Fries]
J. Kickx fil. *F. tremulae* Bondartsev)
(=*Fomes igniarius* var. *populinus* (Neuman) Camp.)

Aspen heart rot caused by *Phellinus tremulae* is distributed throughout the range of quaking aspen in Regions 1 and 4. Advanced decay results in tree defects and cull and widespread infection causes extensive aspen damage.

Host:

Quaking Aspen

Topics

Key Points

- Aspen heart rot decays the heartwood of infected trees.
- Tree wounding constitutes the main avenue of fungal entry.
- In advance infections the heartwood decomposes and the tree loses structural strength.
- Aspen heart rot benefits ecosystems by creating gaps in forest canopies.

Damage

Aspen heart rot decays the heartwood of infected trees. In early stages of disease development (incipient decay), the heartwood begins to show patterns of discoloration, but remains hard and firm. As the decay advances, the heartwood decomposes and the tree loses structural strength. Trees with advanced decay are often predisposed to windsnap, blowdown, and other damaging agents. This damage may lead to tree mortality. Undesirable levels of damage may conflict with some recreation, wildlife, economic, and other resource management objectives. The loss of trees in recreation settings reduces shade, screening, and aesthetics thus compromising visitor experiences (Helm and Johnson 1995). Although heart rot does not affect all uses of aspen, decayed wood has undesirable pulping qualities and stained wood is not suitable for veneers. *Phellinus tremu1ae* may continue in logs after trees are dead, decay will cease once wood has been milled. Aspen heart rot benefits ecosystems by creating gaps in forest canopies that enhance species succession and biodiversity, by providing critical habitat for cavity nesting birds, and by facilitating nutrient cycling.

Susceptibility

Younger age classes comprised of fast-growing trees are least susceptible to infection by this disease and typically experience only minor decay. The percentage of decay increases as trees age with the greatest amount of damage present in old-growth stands (> 120 years). Resilience to decay has also been linked to the genetic differences of aspen clones. Site characteristics have not been correlated to decay, although generally less volume is lost in vigorous stands on good sites. Tree wounding constitutes the main avenue of fungal entry in the heartwood of aspen and primarily contributes to increased rates of infection. Successful germination of the fungus only occurs in fresh wounds (< 2 days old) during the summer. Spores will not typically germinate in wounds older than one week.

The presence of conks is indicative of significant stem decay.

Life History

Phellinus tremulae produces perennial fruiting bodies (conks) at branch stubs or wounds on the bole of the tree. Sporulation probably begins in late winter or early spring and may continue throughout the summer and fall when moist weather prevails. Airborne spores typically infect dead branch stubs and fresh wounds. Fungal growth results in the development of decay columns that enlarge in both vertical directions, and radially until live wood (sapwood) is reached. Conks are produced at intervals along decay columns, emerging through branch stubs or wounds.

Identification

Figure 1. A large *Phellinus tremulae* conk on an aspen.

A yellow-white rot is produced with brown or black zone lines traversing decayed wood (Fig.2). A brown or yellow-brown stain is produced irregularly throughout decayed heartwood. Conks are hoof-shaped with a gray, or brown upper surface and tan to white lower pore surface (Fig. 1). Because conks are perennial they also bares concentric growth rings on upper surface. The interior of the conk is brown or gold with white flecks and appears layered. Most trees with large amounts of decay have conks.

Figure 2. Discoloration and patterns of decay associated with infection by *Phellinus tremulae* in aspen.

Management

Historically, aspen was a major component of western forests. Lower elevation, drier stands tended to burn more frequently serving to rejuvenate aspen stands and reduce the incidence and extent of fungal diseases, wood borers, and other damaging agents throughout the type (Bartos and Campbell 1998). As a consequence of fire suppression, many aspen stands have exceeded their pathological rotation age with trees losing as much volume to decay as they gain from incremental growth. In western forests, aspen stands begin to deteriorate between 80-120 years, particularly if trees are stressed by other environmental factors such as drought. Decay pathogens, however, are an integral part of forest ecosystems and can be both beneficial and detrimental to the health, proper function and productivity of forests.

Managing for aspen heart rot should begin by assessing the percentages of decay within a project area and developing a vegetation management plan with prescriptions written to meet resource objectives. Crown symptoms of heart rot may not be apparent during site evaluations. Conks, cavities, cracks, wounds, and exposed decay are good indications of heart rot, but are not always visible.

Recreation Sites

No direct control strategies (i.e. fungicides) are available to protect high value aspen in recreation sites from infection by heart rot. Pruning dead branches does not reduce infection rates of heart rot. Maintaining vigorous aspen can be accomplished by removing all trees exceeding 5 inches diameter at breast height and

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those with wounds or other indications of poor health. This treatment would also encourage the growth of new aspen suckers while providing some shading and screening. Measures to avoid tree wounding can reduce infection rates. Protecting aspen regeneration from animal damage may require erecting enclosures until suckers have reached a sufficient height to escape ungulate grazing. Depending upon site conditions, this could require 2 to 5 years. Tree removal could occur in stages, treating portions of the recreation site over a number of years.

A second alternative for aspen management in recreation areas would include selectively removing severely decayed trees and leaving any healthy aspen on site to meet recreational needs. Decayed and dead trees directly threaten picnic areas, structures, and trails and pose a potential hazard to public safety requiring routine tree hazard inspections and maintenance (Johnson 1981). The presence of a conk on the bole of a tree indicates high failure potential warranting consideration for removal. In the absence of conks, or other defects, consider removing trees with less than 20% circumference of sound wood. Although hazard tree assessments and costs associated with hazard tree removal are high, the money lost in tort claims due to accidents is even greater (Johnson 1981). This treatment may encourage aspen regeneration, improve the vigor of residual trees and reduce hazards, but would not be as effective with respect to the management of decay and other damaging agents.

Stand Treatments

In stands outside of recreation areas, aspen heart rot can be managed using silvicultural methods (Hinds and Shepperd 1987). It is important to consider that harvesting, regeneration and stand management activities can affect the competitive behavior of decay pathogens in ecosystems. Thus, the management objectives of the prescription should determine how decay fungi are managed in the stand.

Regenerating stands every 80 to 100 years is the most effective method to minimize losses due to heart rot. Clearcutting systems that remove all trees within a clone result in the growth of healthy and vigorous root suckers. Treatments should occur prior to spring flush to achieve the greatest amount of suckering. Because decay fungi do not spread via root-to-root contact, heart rot poses little threat to regeneration. With no damage to residual trees, the potential of infection through wounds is low. Managing aspen in uniform well-stocked stands to encourage natural pruning will also reduce the number of infection sites. Harvest stands damaged by fire, wind, and other stands earlier in the rotation. Where management objectives necessitate retaining trees such as in riparian areas, or for some wildlife habitat, cut the best trees to propagate the next crop. Leave some decayed trees if the objective is for nesting birds.

Managing aspen heart rot in stands where thinning and partial cutting systems will be used requires good planning and logging practices, experience and well-trained personnel. Stands should be managed on short rotations. Harvest operations should not occur the in spring and early summer. During this period, the sap is flowing and the bark is not tight. Thus, trees wound more easily and the injuries are often larger. Wounding can also be minimized by matching the size and type of logging equipment to the size and type of topography, tree size, soil type and soil condition.

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