

## 37. Perennial Woodrotting Fungi that Cause Stem Decays of Hardwoods

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A number of perennial polypore fungi other than those of the genus *Phellinus* cause stem decays. Most species that attack hardwood trees and shrubs in the Great Plains are classed either as white-rot or brown-rot fungi. White-rot fungi degrade cellulose and lignin, have extracellular phenol oxidases, and generally give positive oxidase tests with gallic and tannic acid media or with gum guaiac. Brown-rot fungi degrade cellulose and generally give negative oxidase tests.

### Hosts and Distribution

Eleven species of polypores with perennial sporocarps are important decay fungi on hardwood tree and shrub species in the Great Plains. They have been classified in

the genus *Fomes* in older literature. Five common species are discussed in this paper. Characteristics and distribution of these species are given in table 37-1. *Perenniporia fraxinophila* (fig. 37-1) is the most commonly reported stem decay fungus on live green and white ash in the Great Plains; it has been found on many other tree species, including bur oak and boxelder. *Perenniporia ellisiana* (fig. 37-2) is the most commonly reported stem decay fungus on live individuals of the genus *Shepherdia*. *Ganoderma applanatum* (fig. 37-3) and *Fomitopsis melliae* attack both live and dead hardwoods, including poplar, maple, honeylocust, and ash. *Fomes fomentarius* occurs principally on dead hardwoods, especially birch. Other, less-common species in the Great Plains include *Oxyporus populinus*, *Ganoderma lobatum*, *Perenniporia ohienne*, *Datronia scutellata*, and *Fomitopsis cajanderi*.



Figure 37-1. Sporocarps of *Perenniporia fraxinophila* on bole of a green ash.

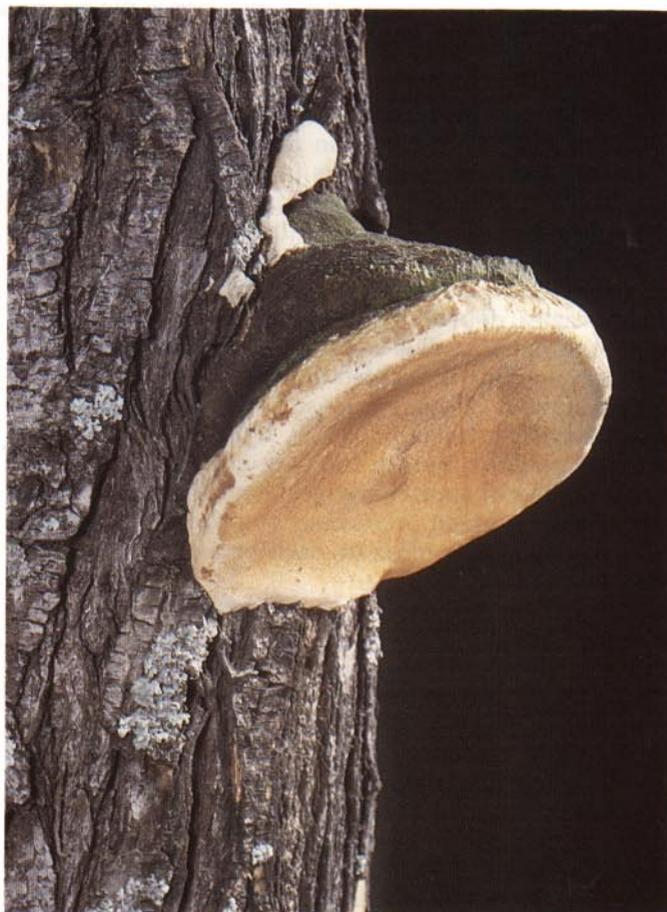


Figure 37-2. Sporocarp of *P. ellisiana* on stem of buffaloberry.

Figure 37-3. Sporocarps of *Ganoderma applanatum* on dead cottonwood.

## Symptoms and Signs

Sporocarps (fruiting bodies) of decay fungi develop on boles or major branches of trees with extensive wood decay. Sporocarps of these polypores are perennial, hard and woody when mature, typically shelf- to hoof-shaped, sessile, and have well-developed tubes seen in a vertical section through the sporocarps. More than one layer of tubes can be seen in vertical cuts through the center of sporocarps that have sporulated more than 1 year.

Some macroscopic characteristics of sporocarps useful in identifying species of perennial polypores are the size, shape, and color of sporocarps, size of pores, and color and texture of the context (table 37-1). Microscopic characteristics of hyphal and hymenial elements also are useful for identification of species.

Most species of perennial polypores that infect live hardwood trees in the Great Plains eventually produce a white-mottled decay of the wood. Decay caused by *P. fraxinophila* on green ash is characterized by a wide, brown zone surrounding the advanced decay (fig. 37-4). Invaded tissues become light brown and later dark brown; decayed wood is then bleached until it becomes straw color to white. Finally, white spots appear in the wood and decayed wood becomes soft and crumbly. *G. applanatum* and *F. fomentarius* also produce a white or straw-colored wood decay. Wood decayed by *P. ellisiana* is brown, with small, irregular white flecks scattered

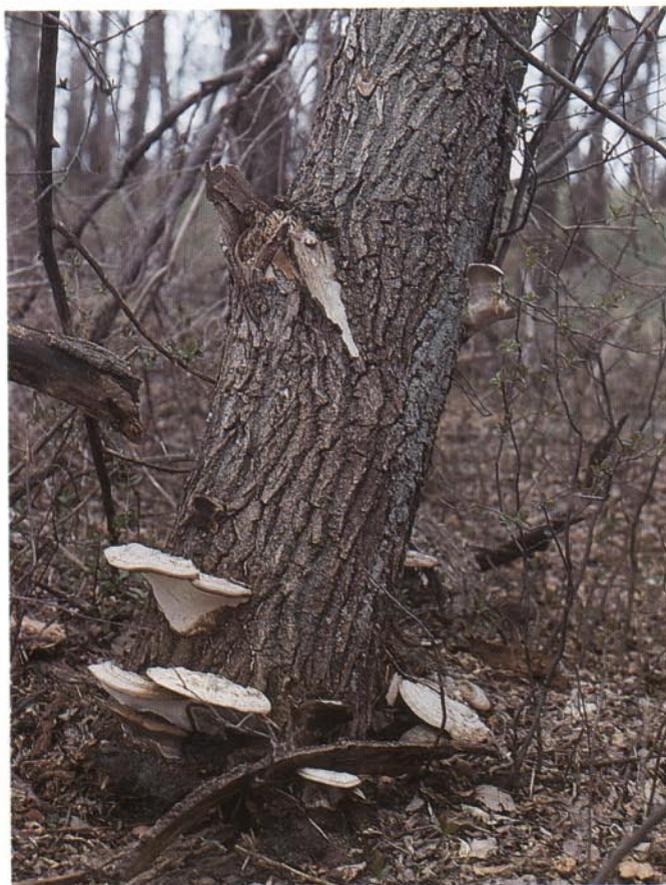


Table 37-1. Geographical distribution, and sporocarp and basidiospore characteristics of five species of perennial polypores that decay wood of hardwood trees and shrubs in the Great Plains.

Decay fungus <sup>1</sup>	Geographical distribution	Sporocarps					Basidiospores	
		Size, cm <sup>2</sup>	Shape	Pores per mm hymenium	Context color	Pore surface color	Size, μm <sup>3</sup>	Shape
<i>Ganoderma applanatum</i>	ND,NE,KS,MT,CO, NM,MAN.	3x5x1-30x50x10	Sessile, pileus plane or convex	4-6	brown, occas. white	white	5x4-9x6	ovoid, truncate at one end appearing ornamented
<i>Perenniporia ellisiana</i>	MT,WY,CO,NM, ND,SD,SASK.	3x3x1-10x15x8	Sessile, pileus convex to unguulate	2-3	pallid to wood-colored	white to isabelline	4x3-8x6	oblong-ellipsoid to broadly ellipsoid, truncate at apex
<i>Perenniporia fraxinophila</i>	MT,WY,CO,NM,ND, SD,NE,KS,OK,MAN.	2x3x1-25x40x10	Sessile or decurrent, pileus convex to unguulate	2-3	pale wood to yellow brown	white to brownish	6x5-9x6	ellipsoid to ovoid, truncate at end
<i>Fomitopsis melliae</i>	NE, TX	1x3x1-5x10x5	Sessile or decurrent pileus convex or plane, usually imbricate	4-5	cinereous to pale wood	isabelline	6x2-8x3	cylindric
<i>Fomes fomentarius</i>	MT,ND,SD,NE,MAN.	3x6x2-15x20x15	Sessile, pileus convex to unguulate	3-4	dark tan or brown	gray to brown	12x4-18x5	cylindric-ellipsoid

<sup>1</sup>*F. melliae* is a brown-rot fungus; the remaining four species are white-rot fungi.

<sup>2</sup>length x width x height

<sup>3</sup>length x width



Figure 37-4. Cross section of green ash stem with white mottled decay caused by *P. fraxinophila*.



Figure 37-5. Cross section of buffaloberry stem with wood decayed by *P. ellisiana*.

throughout (fig. 37-5). *F. melliae* causes an extensive brown crumbly decay of sapwood of hardwoods.

### Disease Cycle

Decay in trees is a complex process that begins at wounds, branch stubs, or other openings in the bark of boles or branches of trees. Many microorganisms, including bacteria, yeasts, and other nonhymenomycetous fungi, invade these openings in succession. Physical and chemical changes caused by these microorganisms in the invaded wood make it possible for wood decay fungi to become established. After growth and subsequent wood decay, sporocarps are produced to complete the life cycle. Discoloration and decay of wood by microorganisms are limited to wood present at the time of wounding by a barrier zone formed by the cambium. Additional wounding of stems may result in multiple infections.

### Damage

Damage to hardwood trees by stem decay fungi becomes increasingly serious when trees reach the age at which tree vigor declines. These fungi seldom kill trees, but infected stems are more vulnerable to breakage during windstorms, and affected wood is not suitable for wood products.

Buffaloberry has been severely damaged by *P. ellisiana* in the northern Great Plains. This fungus may destroy windbreak plantings that are only 20 to 25 years old. Buffaloberry is so susceptible that its extensive use in the northern Great Plains is not encouraged.

At least 2 million of the 20 million living green ash in Nebraska woodlands are infected by *P. fraxinophila*. Incidence of green ash with sporocarps increases in a straight line relationship with diameter of the tree stem.

### Control

Because the decay process begins with wounds, prevention of wounds—particularly basal wounds caused by grazing livestock and cultivating too close with machinery, removal of trees, or fires—will reduce development of decay in plantings and woodlands.

Landscape trees in urban areas and in recreational plantings occasionally are pruned to remove dead or diseased branches. It is advisable to cut small branches; do not cut through the callus collar at the base of the branches. Where it is impractical to prune trees, regulate tree spacing so that natural pruning will reduce the number and size of potential infection sites. When removing trees from plantings during thinning, removal of defective and diseased trees will help reduce storm damage and sources of inoculum.

### Selected References

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