

Stem Decay:

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A Field Guide to Diseases & Insect Pests of Northern & Central Rocky Mountain Conifers



Cedar Laminated Butt Rot From page 26

Phellinus weirii (Murr.) Gilbertson
[*Poria weirii* (Murr.) Murr.]

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Hosts-- Western redcedar. (See discussion of Laminated Root and Butt Rot of other species.)

Distribution-- Range of host in Idaho and Montana.

Damage-- Heartrot of stem. Originates in the butt and extends upward; often resulting in total cull. Decay extent increases with age; 6 to 10 feet up from the butt is common.

Identification-- The disease begins as a yellow-brown stain forming crescents in the sapwood, following annual rings. In later stages, the rot forms concentric rings of variously rotted heart-wood (figure 3). These concentric rings separate easily into thin sheets (figure 4). The sheets are pitted with tiny (1/16 in.) holes. Patches of brown, fuzzy mycelium are often found in the decay; when magnified they resemble tiny spears (called setal hyphae).

Fruiting bodies are rare and usually formed between roots at the root crown, just above ground. They are inconspicuous, rusty-brown pored conks. They are resupinate (produced flat on the outer bark) and vary greatly in size, from about 2 to 10 inches in both length and width. Setal hyphae (minute hairlike hyphae) project from the pored surface of the conks.

Similar damages-- Cedar brown pocket rot is most often confused with this damage. The decay types are distinctive when examined closely.

References-- [2](#), [5](#), [25](#), [33](#)

[Management Guide For Cedar Laminated Butt Rot](#)



Department of Agriculture
Forest Service

State and Private Forestry

Northern Region
P.O. Box 7669
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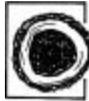
Intermountain Region
324 25th Street
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Figure 3. Laminated butt rot in western red cedar log forms concentric rings of decay.



Figure 4. Examined longitudinally, wood decayed by *Phellinus weirii* separates easily into thin concentric sheets.



Cedar Brown Pocket Rot From page 27

Postia sericeomollis (Rom.) Julich
[*Poria sericeomollis* (Rom.) Egel.]
[*Oligoporus sericeomollis* (Rom) Pouz.]
[*Poria asiatica* (Pilat) Overh.]

Hosts-- Living western red cedar. Other conifers are decayed by this fungus after they have died.

Distribution-- Range of the host in Idaho and Montana.

Damage-- Heartrot of the stem which occurs in large pockets; often resulting in total cull. This is probably the most common heartrot of cedar and accounts for much of the volume loss in this species. There are no outward indicators of this decay in live trees. The decay pockets are used extensively by cavity-nesting birds and animals in some areas.

Identification-- The rot occurs in irregular, large patches several inches to several feet in length throughout the stem. Each patch may be one to several inches in diameter (figure 5a). In the early stages of development, the patches of decay are yellow to light brown and often vague, but in late stages they become distinctly brown with cubical cracking (figure 5b). Conks of this species are rare. They are indistinct, thin, white pore layers produced directly on the bark of dead trees. They have a pronounced bitter taste.

Similar damages-- *Phaeolus schweinitzii* produces a brown cubical rot of cedar heartwood. It is a butt rot which usually occurs in a single, tapering column in the center of the butt. *Phellinus weirii* produces a brown laminated butt rot with tiny pits in the decayed wood.

References-- [2](#), [5](#), [25](#), [33](#)

[Management Guide For Cedar Brown Pocket Rot](#)



Figure 5. Cedar brown pocket rot occurs in isolated large pockets of brown cubical decay. Seen in longitudinal (a) and cross section (b).



Red Belt Fungus From page 28

Fomitopsis pinicola (Swartz:Fr.) Karst.
[*Fomes pinicola* (Swartz:Fr.) Cooke]

Hosts-- Dead conifers and occasionally even some hardwoods.

Distribution-- Range of hosts.

Damage-- This is one of the most common wood decay fungi in the northwestern United States. *Fomitopsis pinicola* is almost exclusively a saprophyte, rotting dead trees and stumps. It is considered important for nutrient recycling in forests. A crumbly brown cubical decay is produced. Both sapwood and heartwood are readily decayed. Rarely, *Fomes pinicola* causes a heartrot of living conifers where a large wound has allowed entry of this very weak pathogen into the heartwood.

Identification-- Both sapwood and heartwood of dead trees are decayed by this fungus. The wood becomes yellowish to pale brown, dry and crumbly in the early stages of decay. Later the rot becomes red-brown and cubically cracked with white felts of mycelium in some of the cracks. Conks are variable in form and may range up to a foot or more in diameter. Hoof-shaped conks have a tan to dark brown upper surface with a red band near the margin (figure 6). The lower surface is white with minute pores. Young conks start as thick mounds of white or cream-colored tissue without visible pores. At all stages of development, conks are tough and corky, a characteristic which distinguishes this species from most common wood-rotting fungi.

Similar damages-- Numerous other fungi cause brown rot of dead trees. The fruiting body distinguishes this fungus. In the case of a brown cubical heartrot, *Postia sericeomollis* on western redcedar, and *Phaeolus schweinitzii* in other conifers are far more likely causes.

References-- [5. 25. 33](#)

[Management Guide For Red Belt Fungus](#)

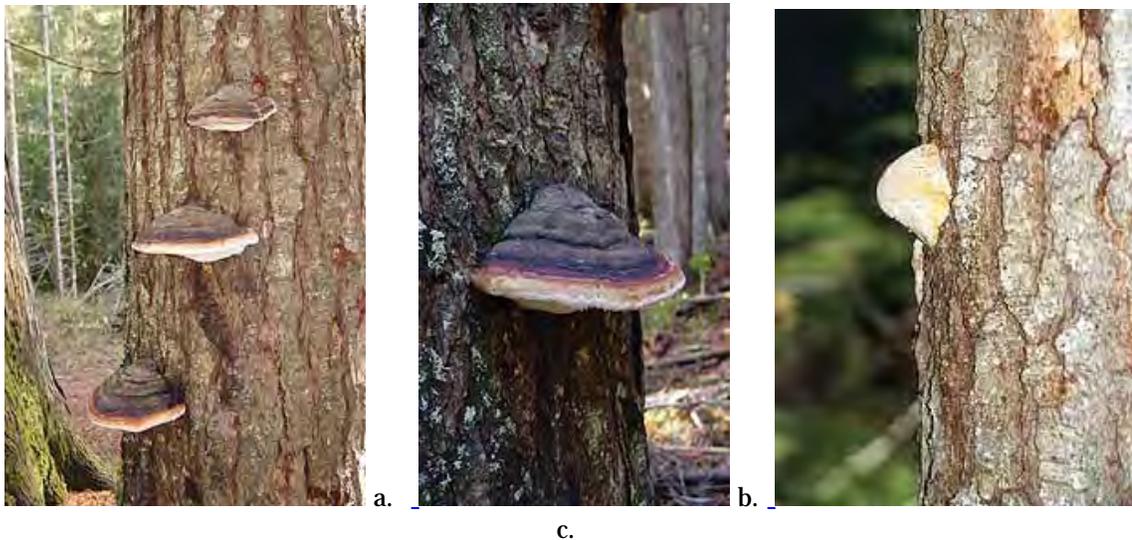


Figure 6. Red belt fungus conks has a distinctive red band along the perimeter when mature and fresh (a and b) but are often seen in the immature stage as in 6c.



Quinine Conk From page 29

Fomitopsis officinalis (Vill.:Fr.) Bond. et Singer

Hosts-- Western larch, ponderosa pine, and Douglas-fir are the most common hosts. Engelmann spruce, true firs, western white pine, lodgepole pine and western hemlock are also known to be infected.

Distribution-- Idaho and Montana west of the Continental Divide.

Damage-- Brown heartrot of the stem. A single conk (figure 7) usually indicates complete cull. Infected trees can be very good habitat for snag-nesting species.

Identification-- The decay is common only in a few old-growth stands. The conks were once collected extensively for production of medicinal quinine. These distinctive conks can be large, as much as two feet long, hoof-shaped or columnar (figure 8). They are soft, yellow-white when young, soon becoming white and chalky throughout. The decay is brown, cubically cracked, with thick white felts in large cracks. The taste of both conks and felts is bitter and distinct for this species.

Similar damages-- *Phaeolus schweinitzii* also produces a brown cubical decay in these tree species. Mycelium felts, when present, are very thin and resinous. *Fomitopsis pinicola* also produces a brown cubical decay but the mycelium felts are thinner than those of *Fomitopsis officinalis* and lack the bitter taste. *Fomitopsis pinicola* decay seldom occurs in live trees.

References-- [2, 5, 25, 33](#)

[Management Guide For Quinine Conk](#)



Figure 7. Typical quinine conk fruiting high on the stem of a tree.



Figure 8. Close-up of conk showing the pore layer on the underside.



Indian Paint Fungus From page 30

Echinodontium tinctorium (Ell. & Ev.) Ell. & Ev.

Hosts-- Grand fir, western hemlock, white fir and, occasionally, subalpine fir and red fir.

Distribution-- Range of hosts.

Damage-- A very common heartrot of mature and overmature trees. Decay extends about 16 feet in either direction from a conk on the stem. Three to four punk knots or two to three conks scattered along the stem indicate complete cull. Stem wounds can greatly increase the extent of decay.

Identification-- The rot is tan and water soaked at first, becoming yellow to orange and stringy (figure 9). Stems are often almost completely hollowed by this decay. Conks, which can reach sizes of a foot in diameter, develop under branches or branch stubs. They are woody, hoof-shaped, and toothed on the underside (figure 10). The upper surface is dark brown or black, lower surface is gray, and context is brick red. Punk knots have brick red tissue within.

Similar damages-- *Phellinus pini* also causes a stem rot in these species, but both the rot and conk appearances are sufficiently different from *Echinodontium tinctorium* to make confusion unlikely. Butt rot resulting from laminated root rot causes a similar decay but the laminated a pitted appearance of laminated root rot is distinct.



Figure 10. Indian paint fungus conks have an orange-red context and gray teeth projecting down. They form beneath branches.



a.

Figure 9. Indian paint fungus decay is yellow to brown and slightly stringy in the early stages. Concentric rings of lighter and darker heartwood are seen in cross section (a). In late stages the decay is somewhat laminate and distinctly stringy (b).



b.

References.-- [2](#), [5](#), [25](#), [33](#)

[Management Guide For Indian Paint Fungus](#)



Pouch Fungus From page 31

Cryptoporus volvatus (Pk.) Shear

Hosts-- Dead conifers which have been attacked by bark beetles.

Distribution-- Range of hosts.

Damage-- Causes a rapid decay of sapwood in bark beetle-attacked trees (figure 13). Minimal volume loss usually results because most of the decay is removed in cutting the cant.

Identification-- Rounded, white or tan conks which are about one inch in diameter form on the outer bark of infected trees (figure 11). The conks emerge through holes in the bark produced by bark beetles within 1 to 3 years of the bark beetle attack. The conks are leathery at first and totally scaled with an air space and a pink pore layer inside (figure 12). At maturity the conks have a hole in the underside about one-eighth to one-fourth of an inch in diameter. New conks may be produced on a dead tree each year for up to 3 years. Conks live only one summer and deteriorate on the tree within a year or two.

Similar damages-- Immature conks of *Fomitopsis pinicola* sometimes resemble *Cryptoporus volvatus* conks; however, *Fomitopsis pinicola* conks are hard or corky and solid throughout. Numerous other saprots occur in dead conifers. They will generally not be discernible from *Cryptoporus volvatus* rot unless conks are present.

References-- [2. 5. 25](#)

[Management Guide For Pouch Fungus](#)



Figure 11. Pouch fungus fruits through bark beetle emergence holes on boles (a): close-up (b).



Figure 12. Conk cut away to show pore layer and air space inside.



Figure 13. Saprot caused by pouch fungus in a tree attacked by Douglas-fir beetle.



Pini or Red Ring Rot From pages 32-33

Phellinus pini (Thore:Fr.) A.Ames
[*Fomes pini* Thore:Fr. Karst.]

Hosts-- Douglas-fir, western larch, Engelmann spruce, and pines are the most common hosts, although it is reported to infect all conifers in the region.

Distribution-- Range of hosts.

Damage-- Heartrot of stem. Decay generally extends 2 to 3 feet above and 3 to 5 feet below each conk or punk knot. Presence of several conks or punk knots indicates complete cull. Decay is most common in middle and upper portions although it can occur anywhere in the stem. Decay increases with age.

Identification-- Conks are woody with a dark, ridged upper surface and a tan or cinnamon pore layer on the underside. They vary from hoof-shaped to appressed on the bark with little or no upper surface, referred to as resupinate (figure 14). They are usually 2-4 inches in diameter. The context is tan or brown. The rot first appears as a red or brown stain in the heartwood. The stain often forms concentric rings or crescents in cross section. In later stages, white pockets are distinct from the surrounding dark red or brown wood (figure 15). In late stages the decay is stringy and mostly white. Swollen knots may be the only outward sign of infection (figure 16a). These knots (punk knots) have a spongy texture and are filled with brown mycelium (figure 16b).

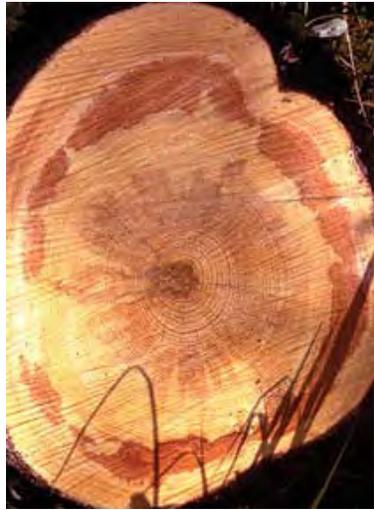
Similar damages-- In true firs or hemlock, *Echinodontium tinctorium* also causes a common heartrot (Tables 1 and 2). In other species, *Inonotus tomentosus* (Tomentosus root disease) produces a decay that is very similar in appearance to *Phellinus pini* decay.

References-- [2, 5, 25, 33](#)

[Management Guide For Red Ring Rot](#)



Figure 14. Pini conks are woody and shelving or nearly resupinate with a tan to cinnamon colored pore layer.



a.



b.

Figure 15. In cross section pini rot forms concentric rings in the heartwood (a). Advanced decay has solid brown wood between white, spindle-shaped pockets (b).



a.



b.

Figure 16. Pini rot is often indicated by swollen knots on the stem (a) which have a brown, punky interior (b).

Table 1. Comparison of Common Heartwood Rots

From page 34

| FUNGUS | HOSTS | CONKS | | | |
|--|-----------------------------|--|---------------------------------------|---|---|
| | | Shape | Upper surface | Lower surface | Context |
| Ecinodontium tinctorum Indian paint | GF, WH, SAF | Hoof, under branch | Brown, woody | Tan, teeth projecting downward | Orange |
| Phellinus pini Pini rot | DF, LPP, WL, Other conifers | Hoof or flat on bark | Dark brown | Cinnamon to tan | Cinnamon |
| Inonotus tomentosus Tomentosus root rot | ES, LPP, Other conifers | Mushroom-like with leathery cap with central stalk; on ground | Gold to brown, velvety. 1-4 in. diam. | Tan to gold, brown with age, pores | Gold, brown with age |
| Phaeolus schweinitzii Root and butt rot | DF, Other conifers | Non-woody; thick shelf or on ground | Brown, velvety | Green when fresh, brown with age, large pores | Brown |
| Fomitopsis officinalis Brown heartrot | WL, PP, Other conifers | Very common, thick shelf or hoof. | Yellow, white or cream | Yellow or white, pored | Yellow-white, chalky consistency |
| Fomitopsis pinicola Redbelt fungus | All dead conifers | Very common, thick shelf or hoof | Brown, gray, red band at margin | Cream, small pores. | Crea, corky consistency |
| Heterobasidion annosum Annosus root rot | GF, ES, WH, WP, SAF, DF, PP | Thin hoof or flat on bark, inside hollow stumps or on roots. | Gray or brown | Cream, small pores, margin brown with age | Leathery when fresh, woody with age |
| Phellinus weirii Laminated root rot | GF, DF, WH, SAF | Conks very rare; thin, flat on bark, light weight, brittle with age. | none | Tan; brown with age. Fuzzy setal hyphae | Brown or yellow-tan |
| Phellinus weirii Cedar laminated butt rot | WRC | Conks are uncommon. They appear as described above. The form of P. weirii on western redcedar is generally believed to be distinct from that which infest other species. The two forms are differentiated mostly on the basis of host, although there are microscopic differences in conks and cultural characteristics. | | | |
| Postia sericeomollis Cedar brown pocket rot | WRC | Conks rare; very thin, flat on bark or decayed wood, bitter | none | White or cream, small pores | White or cream, very thin, brittle with age |

DF=Douglas-fir, ES=Engelmann spruce, GF=grand fir, LPP=lodgepole pine, PP=ponderosa pine, SAF=subalpine fir, WF=white fir, WH=western hemlock, WL=western larch, WP=white pine, WRC=western redcedar.

Table 2. Decays of Common Heartwood Rots

From page 35

| FUNGUS | DECAY | NOTES |
|--------------------------|---|---|
| Echinodontium tinctorium | Yellow to orange, stringy. Confined to heartwood. | Conks common. |
| Phellinus pini | Red brown discoloration in heartwood. Pronounced white, spindle-shaped pockets with firm brown wood between becoming stringy, white decay in most advanced stages | Punk knots and conks common. |
| Inonotus tomentosus | Pronounced white or hollow pockets, honeycomb appearance in cross section. | Root disease. Fruiting bodies leathery, mushroom-like, and rare in this region. |
| Phaeolus schweinitzii | Brown cubical decay of stem and root heartwood. Thin, resinous felts may be present in shrinkage cracks of decay. | Root disease. Conks common on ground, occasional on butt. Dark red-brown heart in small roots. |
| Fomitopsis officinalis | Brown cubical decay of stem heartwood only. Thick white felts in shrinkage cracks. | Conks rare. Infections generally high in tree-not originating from roots. |
| Fomitopsis pinicola | Brown cubical decay of both sapwood and heartwood. Forms crumbly decay with firm cubes. | Dead trees and stumps. Decay not restricted to heartwood. Conks common. |
| Heterobasidion annosum | White rot; somewhat laminating, stringy, with irregular white pockets and small black flecks. | Root disease. Butt heartrot common in old grand fir, hemlock, spruce, cedar and ponderosa pine. |
| Phellinus weirii | Decay is distinctly laminating along the annual rings. Tiny white pocket or hollow pits throughout; often filled with cinnamon brown setal hyphal. | Root disease. Butt heartrot common in live grand fir, hemlock, white pine and cedar. Comments in Table 1. |
| Postia sericeomollis | Brown cubical decay in large pockets (several inches to several feet in length). | Heartrot very common in western redcedar. |