

# Laminated Root Rot – Natural Enemy of the Forest

By Karen Sjoquist

*Editor’s note:* In early 2006, the Lake Wilderness Arboretum Foundation (LWAF) Board approved a Forest Stewardship Plan for the Arboretum forest, which occupies 29 acres of the northern border of the Arboretum. This forest, managed by LWAF, is infected with pockets of laminated root rot, a naturally occurring fungus. In order to address the impact of this disease and to improve the overall health of the forest, the Stewardship Plan recommended an *ecological thinning* of the forest. The Stewardship Plan and more details about ecological thinning can be found on the LWAF website’s “Forest” page. The article below provides a detailed look at laminated root rot and its impact and reviews commonly used approaches to the disease.

## *Phellinus weirii*

*Phellinus weirii*, commonly known as laminated root rot, is a native root pathogen of conifers in the Pacific Northwest. This root disease limits a tree’s ability to take up water and nutrients, eventually killing it or causing it to be windthrown due to weakened roots. Infected trees often experience significant growth loss before death and are much more susceptible to bark beetle

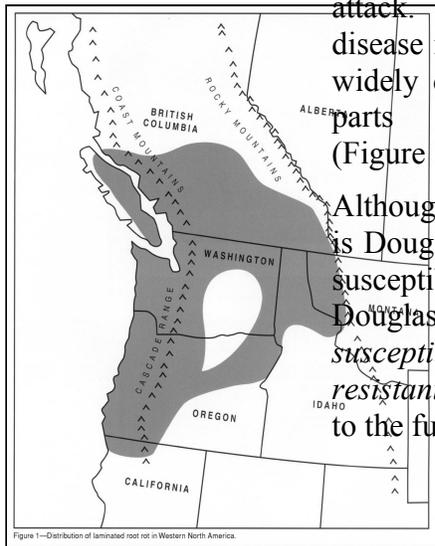


Figure 1: *Phellinus* distribution(Thies 1995)

attack. This disease is considered to be the most damaging root disease in this region due to significant losses in timber volume. It is widely distributed throughout the western United States as well as parts of British Columbia (Figure 1).

Although root rot affects many conifers in this area, its principle host is Douglas-fir. Table 1 shows a list of western tree species and their susceptibility to laminated root rot. *Highly susceptible* hosts, such as Douglas-fir, are readily infected and killed by root rot. *Intermediately susceptible* species are often infected, but rarely killed. *Tolerant* or *resistant* trees are seldom infected or killed. Hardwoods are immune to the fungus.

Laminated root rot is considered to be highly damaging to conifers in the west because it reduces tree growth and increases mortality causing potential economic losses in timber harvest. Root rot can also be dangerous in urban forests due to windthrow. On the other hand, root rot is a native pathogen that can improve a forest’s overall ecological health by increasing plant species diversity and improving wildlife habitat. Regardless of its effects, laminated root rot is a significant natural force to be considered by resource managers. Understanding and properly managing this disease is essential to achieving desired management objectives.

Root rot is hard to identify during early infection. Usually, it is first detected in a stand when canopy openings containing standing dead and fallen trees are observed (Figure 2). These canopy gaps will typically have unhealthy host trees at their margin. In most cases, a

Laminated root rot is considered to be highly damaging to

conifers in the west because it

reduces tree growth and

increases mortality causing potential

economic losses in timber

harvest. Root rot can also be dangerous

in urban forests due to windthrow.

On the other hand, root rot is a native

pathogen that can improve a forest’s

overall ecological health by increasing

plant species diversity and improving

wildlife habitat. Regardless of its

Level of susceptibility	Species
High	Douglas-fir Mountain hemlock Grand fir Pacific silver fir
Intermediate	Engelmann spruce Western hemlock Noble fir Pacific yew Sitka spruce Subalpine fir Western larch
Tolerant/Resistant	Lodgepole pine Western white pine Ponderosa pine Western redcedar
Immune	Hardwoods

tree develops crown symptoms when at least half of its root system is affected by rot. These above ground signs of infection include: reduced height and stem growth, thinning and discoloration of foliage, loss of foliage, and reduced cone crop.

### Identifying Root Rot

Laminated root rot is distinguished from other types of root rot by its underground signs of infection. Figure 2 illustrates the various signs of laminated root rot. Uprooted trees will typically have broken roots close to the root collar leaving only short stubs.

Also, decayed wood characteristically separates readily into sheets at the annual rings; hence the name “laminated” root rot. Another indicator is that under the soil, the root collar and lateral roots will have a grey-white to light purple sheath around their outer surface, often binding soil particles to the roots. Upon close inspection, the presence of small, wiry, reddish-brown hairs known as *seta hyphae* is a key diagnostic indicator of laminated root rot. Accurate disease identification is extremely important. When signs of root rot are detected, it is always a good idea to have an expert confirm identification.

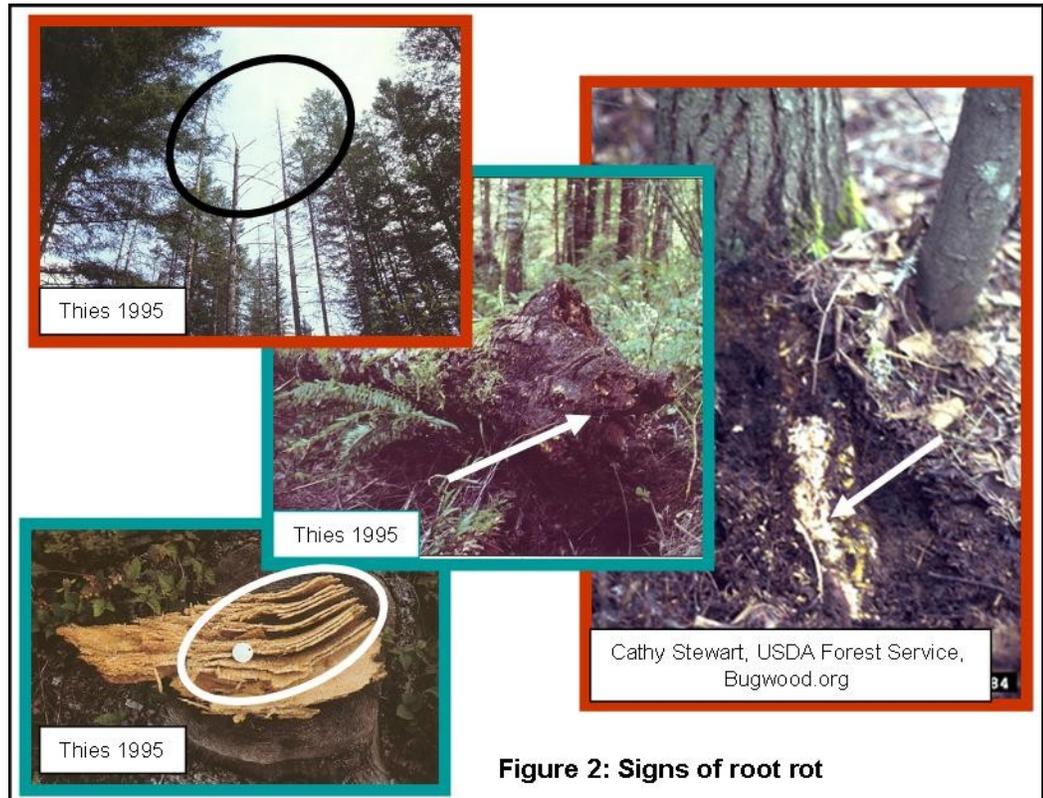


Figure 2: Signs of root rot

Root rot is found in roots and stumps in the soil and slowly spreads by root contact between a healthy and infected individual. The fungus does not survive in the soil and windblown spores are considered unimportant in initiating new infections. This fungus remains viable in host roots and stumps for up to 50 years, thus its high infection potential to susceptible hosts. The fungus does not spread to dead, uninfected roots.

### Dealing with Root Rot

No totally effective strategy has yet been proposed to eliminate laminated root rot although managers have several options to consider when dealing with the disease. Outlined below are the pros and cons of the most commonly used management alternatives for dealing with laminated root rot. In addition to the alternatives listed below, fumigation has been tried; however, research results are discouraging and therefore not employed by managers to treat laminated root rot.

“No treatment” option:

- Improve wildlife habitat
- Enhance visibility
- Increase stand/vegetation diversity
- Reduced timber volume
- Safety concerns (falling trees)
- Continued spread of laminated root rot

Clearcut infected and nearby areas and replant with tolerant/resistant species:

- Most cost-effective
- One 50 year rotation to eliminate disease
- Public acceptance
- Requires periodic maintenance

Clearcut infected and nearby areas and remove stumps

- Can replant with susceptible species
- Decreased disease incidence
- Public acceptance
- Expensive
- Can cause soil damage

Whatever treatment alternative is employed to address laminated root rot, monitoring and management subsequent to treatment will likely be needed. In addition to treating areas infected by root rot, thinning is recommended in areas surrounding root rot pockets. Thinning can increase the health and vigor of remaining healthy trees, thus reducing their risk of infection. Furthermore, thinning increases the distance between roots, which acts to sever disease pathway s– thus slowing or eliminating the spread of laminated root rot.

#### **Sources used:**

Hadfield, J.S., D.J. Goheen, G.M. Filip, C.L. Schmitt, and R.D. Harvey. 1986. Root diseases in Oregon and Washington conifers. <http://www.fs.fed.us/r6/nr/fid/pubsweb/rootdiseases.shtml>

Hadfield, J.S. and D.W. Johnson. 1977. Laminated Root Rot. USDA Forest Service -Pacific Northwest Region.

WSU Forest Health Notes

<http://ext.nrs.wsu.edu/forestryext/foresthealth/notes/laminatedrootrot.htm>

Thies, W.G. and R. N. Sturrock. 1995. Laminated root rot in western North America.

<http://www.fs.fed.us/pnw/pubs/gtr349/gtr349a.pdf>

Special thanks to Rob Sjogren-Green River Community College, Dan Omdal and Amy Kroll-Washington Department of Natural Resources Forest Pathologists, and Dr. Ron Mahoney-University of Idaho Extension Forestry for their suggestions and expertise.