

# Management of Westside Washington Conifer Stands Infected with *Heterobasidion annosum*<sup>1</sup>

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**Abstract:** Timber stands in western Washington are managed for many purposes. Such stands yield commodity and noncommodity outputs, such as recreation, wildlife, visual resources, or watershed benefits, and often from the same stands. Annosus root disease is widespread in many mixed conifer stands within the western hemlock, mountain hemlock, and Pacific silver fir zones west of the Cascades. In stands managed on commercial (commodity output) rotations, annosus root disease is not considered a major management concern. This is not true of stands managed principally for noncommodity outputs such as recreation, wildlife habitat, visual resource, or watershed benefits. Such stands are typically on rotations in excess of 140 years. For this reason, experimental stump treatment with borax was considered for the reduction of potential future inoculum. This paper describes one technique for the application of borax to treat stumps in two units of a commercial timber sale in the westside Washington Cascades.

Heterobasidion annosum is commonly spread by airborne spores that land on open tree wounds or on freshly cut stump surfaces. Infection by spores occurs soon after woody tissue is first exposed. Infection of freshly cut stumps by hyphae that develop from spores of H. annosum is the major avenue by which new annosus root disease foci are initiated. Mycelia from germinating spores grow into stumps, and after colonizing them, spread out in the roots. Spread of infection to neighboring trees occurs via root to root contact. (5)(10)

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<sup>1</sup>Presented at the Symposium on Research and Management of Annosus Root Disease (*Heterobasidion annosum*) in Western North America, April 18-21, 1989, Monterey, California.

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Annosus root disease appears to be rather widespread in old-growth western hemlock, mountain hemlock, and Pacific silver fir stands west of the Cascades. This accounts for the often significant levels of butt defect in harvested timber and collapse or failure in severely decayed trees. Before multiple-use management, annosus root disease was never considered a threat to any westside timber resource. That has changed. As other nontimber resources have increased in importance, so has awareness that tree diseases such as annosus root disease should be carefully evaluated and their impacts considered when proposing silvicultural prescriptions for long-rotation forest stand management. In western Washington, commercial rotations for western hemlock, mountain hemlock, and Pacific silver fir rarely exceed 100 years. In contrast, rotations for hemlocks and Pacific silver fir in stands that feature nontimber benefits (that is, recreation, wildlife, watershed, and visual benefits) typically are maintained for 150-200 or more years. Levels of infection by H. annosum are often high in young, immature hemlock or Pacific silver fir stands, and damage severity is typically low or insignificant. Stands that have progressed beyond maturity, however, have similarly high infection levels, but damage severity may be great and it continuously increases with advancing stand age. For this reason, it is important, when considering long rotation silviculture of western hemlock, mountain hemlock, or Pacific silver fir, that management of annosus root disease be integrated into the overall prescription.

A good example of the need to manage tree species susceptible to damage by annosus root disease is illustrated in management of mountain goat habitat. Good mountain goat habitat typically consists of large contiguous areas of mature or old-growth timber at elevations ranging from 2800 to 5500 feet in western Washington. Most often these stands are of Pacific silver fir and mountain hemlock, both of these species are susceptible to serious butt defect caused by H. annosum, once they are overmature. A commercial rotation length for stands in the same mountain goat management area would range in length from 90 to 110 years, and annosus root disease would cause only minor damage.

Long rotations are most often selected to meet specific recreation, visual wildlife, or

watershed needs. Keeping the timber resource healthy to meet the other resource management objectives can be difficult. On the western side of the Cascades there is little site-specific information on the distribution of *H. annosum* and how it will affect timber stands in the future. It is known to be widespread and numerous severely damaged stands have been found.

#### METHODS

On the Packwood Ranger District, Gifford Pinchot National Forest, Washington State, two severely infected stands were identified during timber sale reconnaissance. The silvicultural prescription for the stand featured a rotation length of 140 years, to increase locally the areas of available mountain goat habitat. The infected stands are high-elevation stands at altitudes ranging from 3800 feet to 4400 feet, and both have a species composition that includes Pacific silver fir, Douglas-fir, noble fir, western and mountain hemlock. In order of decreasing susceptibility to damage by *H. annosum* they are: western hemlock, mountain hemlock, and Pacific silver fir, all severely damaged; noble fir, which is moderately damaged; and Douglas-fir which is seldom damaged. These stands have been identified for low-intensity management in the Forest Plan, which means wider spacing at initial planting (14 feet by 14 feet), no precommercial thinning, one commercial thinning entry, and a final harvest. To reach the desired future condition for mountain goat habitat, reduction of potential stump inoculum was considered important. Consultation with one of the Regional Office forest pathologists led to the decision to use borax on freshly cut stumps in the harvest units to prevent further spread of annosus root disease. District personnel had previously used borax to treat stumps in campgrounds to prevent spread of annosus root disease.

To accomplish this objective, a special contract provision was added to the timber sale contract:

C6.412# (OPTION 2) - TREATMENT OF STUMPS. (5/88) Unless otherwise agreed to in writing, in areas shown on Sale Area Map, Purchaser shall treat the stumps of all live \_\_\_\_\_ trees cut by Purchaser that have a stump diameter larger than \_\_\_\_\_ inches. Treatment shall consist of removing sawdust and other loose debris from the cut surface of the stump including exposed wood surfaces on all sides, and shaking a light coat of borax powder uniformly over the entire cut surface of the stump, including exposed wood surfaces of the sides, the same day such cutting occurs. Forest Service shall furnish borax powder for Purchaser's use without charge.

The first blank should be filled in with the name of the tree species needing treatment.

This requires the fallers to apply a thin layer of borax powder on freshly cut surfaces of stumps larger than or equal to 12 inches in diameter. Treatment was to be accomplished within 24 hours after felling. To regulate the granular size and content, the Forest Service provided borax for the fallers. Based on information obtained from Forest Service and Pest Management personnel in California, sodium tetraborate decahydrate, 5-mil particle size, granular type, was the recommended formulation.

#### RESULTS AND DISCUSSION

Stands were to be cut in the summer of 1988 but, because since the purchasers had other timber sales pending closure, and the summer drought was again severe (causing logging shutdown), the subject stands were not cut. I therefore have no data to present on how effective the borax stump treatment was and whether the special contract provision worked satisfactorily. In spite of that, several important categorized questions have been generated that need answering.

Can the special contract provision be effectively administered? Contracting operators can be suspended until the borax is applied correctly, but what about the stumps that are missed during the treatment? What should the quality assurance standard be? How should the quality standard be enforced?

Also, how will falling timber and rolling logs on steep slopes affect treated stumps? Stumps will have to be treated immediately after trees are severed to prevent subsequently felled trees from covering them, thereby making later treatment impossible. Will there be any borax left on stumps once nearby trees are felled?

Another question. How should we determine when enough borax has been applied by the operator without visiting each treated stump? That is, how do we evaluate purchaser compliance with the special contract provision? We are in the process of making a photo card that shows stumps with too little, too much, and just enough borax. The Pacific Northwest Region, Forest Pest Management Division, Portland, Oregon, has produced a similar card for marking laminated root rot (*Phellinus weirii*) affected stumps (Figure 1).



## Recognizing Laminated Root Rot in Freshly-Cut Douglas-Fir Stumps

Laminated root rot, caused by *Phellinus weirii*, is a common root disease of Douglas-fir. Other conifer species, such as grand fir, white fir, Pacific silver fir, larch, and hemlock, may also be infected and have similar patterns of stain or decay in affected wood. This guide will help you identify laminated root rot on freshly cut stumps so they can be distinguished in timber sales requiring marking.

It is important to mark infected stumps so that they can be located following site preparation (burning). When the site is replanted, tree species which are not susceptible to laminated root rot can be used around infected (marked) stumps.

In infected trees, stain and decay of laminated root rot usually extend upward from the roots several feet into the main bole. At the stump surface, stain usually will be seen as 1 to 2 inch wide crescent-shaped bands in the inner sapwood-outer heartwood area (Figure 1). Sometimes stain will also be found in the center of the heartwood (Figure 2). It will range in shade from a slightly darker color than the surrounding wood (Figure 3), to a dark brown, well-developed discoloration (Figure 4). Stumps must be marked soon after tree felling since characteristic stain fades within several days. Stain is the initial stage of wood decay. After several years stained wood will develop into advanced rot. Advanced decay will often be found in the center of stained wood (Figure 5). Advanced decay is characterized by wood separating (delaminating) at the annual growth rings. There are small pits on both sides of the sheets and red brown fuzzy fungal growth on the surface. In infected old growth trees, hollows will often form in the butt after years of decay.

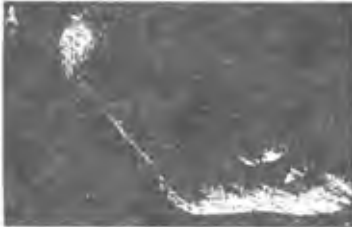


Figure 1. One to two inch-wide, crescent-shaped bands of stained and/or decayed wood in the sapwood/outer heartwood.

The size of laminated root rot disease centers can vary from one tree to hundreds or thousands of trees. Usually if one stained stump is found, stain will be found also in one or more adjacent stumps.

Other stains or decays may be confused with laminated root rot. Old wounds that heal often leave a zone of stain or decay behind the wound face (Figure 6). Other types of root and butt decay may be confused with laminated root rot. A common example is red brown butt rot of Douglas-fir (Figure 7). This damage is common in mature over-mature Douglas-fir. Stumps with that dry crumbly red brown decay should not be marked.

To best meet contract specifications, stumps with laminated root rot stain or decay at the cut surface should be marked with a saw within one hour of felling. Stumps should be marked by making two parallel grooves, 2 inches deep and 6 inches apart (Figure 8).



Figure 2. Stain and decay in the inner heartwood and the sapwood.



Figure 3. Stain appearing as a light shade of discoloration.



Figure 4. Stain appearing as a dark brown discoloration.



Figure 5. Decayed wood surrounded by stain. Decay is laminated, separating at the annual rings.



Figure 6. The stain and decay is the result of an old wound. It is not laminated root rot. Do not mark this stump.

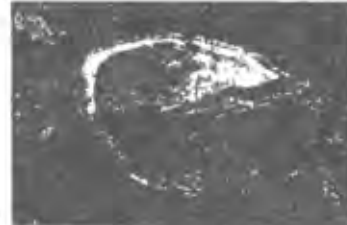


Figure 7. Brown cubical decay, the result of another disease. Do not mark this stump.



Figure 8. Example of marking infected stumps. Two parallel grooves, 2 inches deep, and 6 inches apart.

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by Contacting:**

USDA Forest Service  
Pacific Northwest Region  
Forest Pest Management  
P.O. Box 3623  
Portland, Oregon 97208

Phone: (503) 221-3688 or  
FAX: 427-2727

## CONCLUSION

In conclusion, the plan is to monitor the treatment of the stumps in this pilot effort during summer 1989 and get some of the answers to these questions. The District now plans to use Borax treatment as part of timber sale contracts where the disease has been identified and treatment considered appropriate.

We anticipate that stump treatment with borax will effectively prevent initial colonization of freshly cut stumps by *H. annosum*. Similarly, borax application should be beneficial following commercial thinning entries. What remains to be seen is whether treated stands will be significantly better off at rotation, at whatever age, than those that receive no treatment.

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