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Heterobasidion root disease (Heterobasidion annosum)

Department of Agriculture, Conservation and Forestry

Maine Forest Service

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Heterobasidion root disease (*Heterobasidion annosum*)

Hosts: Primarily pines (*Pinus* spp.), Spruce (*Picea* spp.); also E. Hemlock (*Tsuga canadensis*) and Firs (*Abies* spp.)

General Information: Heterobasidion root disease (*Heterobasidion* spp., formerly Annosus root disease) is one of the most impactful diseases of conifers in the northern hemisphere. *H. irregulare* is found in the eastern half of the US, including in Maine on white pine and red pine and may occur on other coniferous and deciduous hosts. The fungus typically enters the tree through a wound and grows into the heartwood and roots causing extensive decay. Infection by *H. irregulare* makes trees highly susceptible to windthrow and low stem and root breakage. The fungus easily infects stumps after harvest and requires special forest management practices to prevent serious stand impacts.

Symptoms and Signs: The disease is active in the tree long before symptoms are visible. Infection may not be apparent before as much as 60% of the roots are parasitized. Symptoms typically include discoloration, dieback at the top and branch tips, progressing downward and inward. These symptoms may be seen in groups of trees within the infected area. Yellow to brown streaking and resin-soaking in low areas of trees are symptoms of early infection and white stringy rot at the root collar is typical of advanced infections. Infection is a significant tree stress, so bark beetles may be attracted to and mass attack infected trees. Below-ground symptoms of Heterobasidion root disease are not usually visible, but exposed infected roots may be resin-soaked and also have white-stringy rot. The fruiting body of *H. irregulare* typically forms very low on the tree and can often be found just under the duff layer. Formation of the fruiting body may begin as a mass of white fungus that develops into a leathery brown decay conk with white margins. The underside of the conk is covered with pores in which spores are formed.



Figures: (Left top) A stump with advanced Heterobasidion root rot and decay conk emerging at the soil line; (Left below) A view of the irregular-shaped pores on the underside of the decay conk; (Above) A pine stand with a pocket of mortality and blowdown due to an expanding root rot infection by *H. annosum*, a similarly destructive species encountered in western North America. Images: Joseph OBrien, Bugwood, US Forest Service, Bugwood.

Management: After harvest of an area where Heterobasidion root disease is present, non-susceptible trees must be planted or encouraged to avoid perpetuation of the root rot and the problems it causes. Even after harvest, *H. irregulare* will remain active on the site for several years living on stumps, producing decay conks and spores for disease dispersal. In areas where *H. irregulare* is present, thinning stands should be done during the coldest months of winter when the probability of spore dispersal is lowest. When this is not possible, thinning or harvest must be followed by stump treatment with sodium borate in solution or powder form as soon after cutting as possible. This application will make the stump unsuitable for colonization by *H. irregulare*. In some states, formulations containing the rot fungus *Phlebiopsis gigantea* are applied directly to stumps after trees are cut, but these products are currently not registered for use in Maine. *P. gigantea* is an aggressive rot fungus that is native to North America, and has been shown to be particularly antagonistic to *H. irregulare*, making this a promising potential management tool. Establishment of *P. gigantea* on the stumps prevents establishment of *H. irregulare*, but will not cause harm to other trees on the site.

Figure: (Right above) Heterobasidion root disease infection center in a red pine plantation with peripheral trees succumbing to the disease; (Right below) A forester applying sodium borate to a stump directly after harvest to prevent colonization of *H. irregulare*; (Below) Fruiting bodies of *H. irregulare* at the base of a red pine. Images: US Forest Service, Bugwood; Steven Katovich, Bugwood.



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