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Branching Out
from the Canadian Forest Service - Laurentian Forestry Centre

Detection of an Invisible Foe: Annosus Root and Butt Rot

Annosus root and butt rot was first reported in Quebec in 1989. The causal fungus enters a pine stand by colonizing the surface of freshly cut stumps. The disease spreads through contact between the roots of infected stumps and the roots of healthy trees. After a few years, this radial spread, which occurs at a rate of about 1 m per year, results in a roughly circular patch of dead trees. The French common name of the disease, "maladie du rond," comes from the circular areas of mortality. Annosus root and butt rot is spreading northward in Quebec at a rate of 10 km/year. Canadian Forest Service (CFS) researchers are working on methods to protect pines, the pathogen's preferred host species, against this threat.

English Name
Annosus root and butt rot.

Pathogen
Heterobasidion irregulare.

Hosts
All pines, but red pines especially.

Disease cycle
- Spores are produced year-round, but are especially abundant in the fall.
- The fungal spores are dispersed by the wind.
- The spores germinate on the stumps of a host species.
- The fungus colonizes the stump roots and then spreads to the roots of adjacent trees.

Signs
- Root rot.
- Fruiting bodies, or conks (visible part of fungus), form at the base of infected trees and stumps.
- Windthrow caused by decay in the structural roots.

Symptoms
- Crown mortality (reddening of needles).
- Root decay.
- Progressive tree decline and reduced growth.
- Circular areas of dead trees.

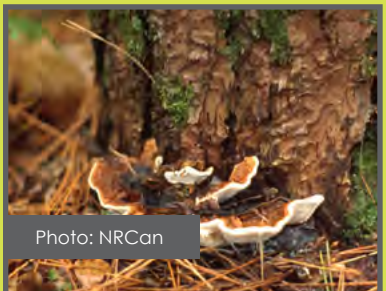
Photo: NRCan

A constant threat

In Quebec, approximately 1 million red pines are planted annually. At present, a number of plantations are due to undergo thinning. Silvicultural operations of this type or damage caused to trees during these operations can exacerbate the problem of annosus root and butt rot. CFS researchers have estimated that the disease kills trees within 5 to 8 years after a thinning operation is carried out in a plantation. Since disease spread is greater in late summer and in fall, silvicultural operations should be carried out in the winter, when the stumps are covered with snow. When this is not possible, care must be taken to avoid injuring residual trees, as wounds provide points of entry for the causal pathogen.

A persistent pathogen

When silvicultural operations are carried out in plantations infected with annosus root and butt rot, the freshly cut stumps must be treated with a biocontrol agent. If there are only a few infected stumps, they can be extracted and destroyed. Since the stumps are very difficult to burn, it is better to bury them in a location where the water table is high. One way to prevent the spread of annosus root and butt rot is to dig a trench 60 to 80 cm deep around the affected zone.

Since these solutions are costly, they can only be envisaged on a small scale. Consideration should also be given to converting the site to hardwood species, because conifer seedlings succumb rapidly to the disease, which is ever-present on the site.

Looking for signs of the pathogen

When inspecting a red pine plantation for annosus root and butt rot, the first thing to look for is crown dieback (red or short needles) or thin foliage in the crown. This monitoring effort should be carried out in September, October or November, when the most obvious signs of the disease—the fruiting bodies—are present. It is important to check for fruiting bodies at the base of dead or declining trees or nearby stumps; they may be concealed in the litter.


Photo: NRCan

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Innovating for disease prevention

Once annosus root and butt rot becomes established in a stand, it is very difficult to eradicate it because the fungus can persist in the roots for decades. Furthermore, in the first 2 weeks after a tree is felled, *Heterobasidion irregulare* has free reign to colonize the stump because very few competing fungal species seek to do so. Treating stumps with a protective product immediately after cutting is recommended as a routine practice to prevent stump infection by the causal pathogen. This treatment should become a standard practice to slow the spread of the disease.

Infected standing red pine.
Photo: NRCan

Circular area of dead trees.
Photo: NRCan

At present, there are no products registered specifically for the control of annosus root and butt rot in Canada. In several European countries, pines have been successfully protected by spraying an aqueous solution of *Phlebiopsis gigantea* spores onto stumps. CFS researchers have been working with *P. gigantea* spores harvested in Canada to ensure they are better able to withstand environmental conditions and are better adapted to the host species. An application for the registration of this product is currently being processed by the Pest Management Regulatory Agency; it can be sprayed manually or applied mechanically during forestry operations by means of a distributor attached to the tree feller.

Useful links

Control of annosus root and butt rot:
http://www.exoticpests.gc.ca/control-details/disease/7

Maladies des arbres du Québec (in French only):
http://arbres.ccdmd.qc.ca

Trees, Insects and Diseases of Canada's Forests:
http://tidcf.nrcan.gc.ca/diseases/factsheet/19

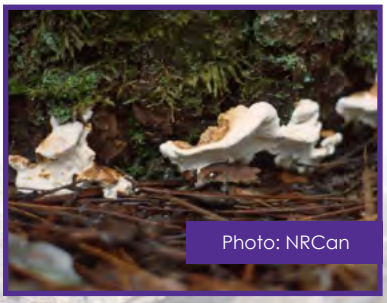

Photo: NRCan

Infected red pine stump.
Photo: NRCan

For more information, please contact:
Gaston Laflamme
Natural Resources Canada
Canadian Forest Service
Laurentian Forestry Centre
1055 du P.E.P.S. P.O. Box 10380, Stn. Sainte-Foy
Quebec City, Quebec G1V 4C7
Phone: 418 648-4149
Fax: 418 648-5849
E-mail: gaston.laflamme@nrcan.gc.ca
Website: cfs.nrcan.gc.ca