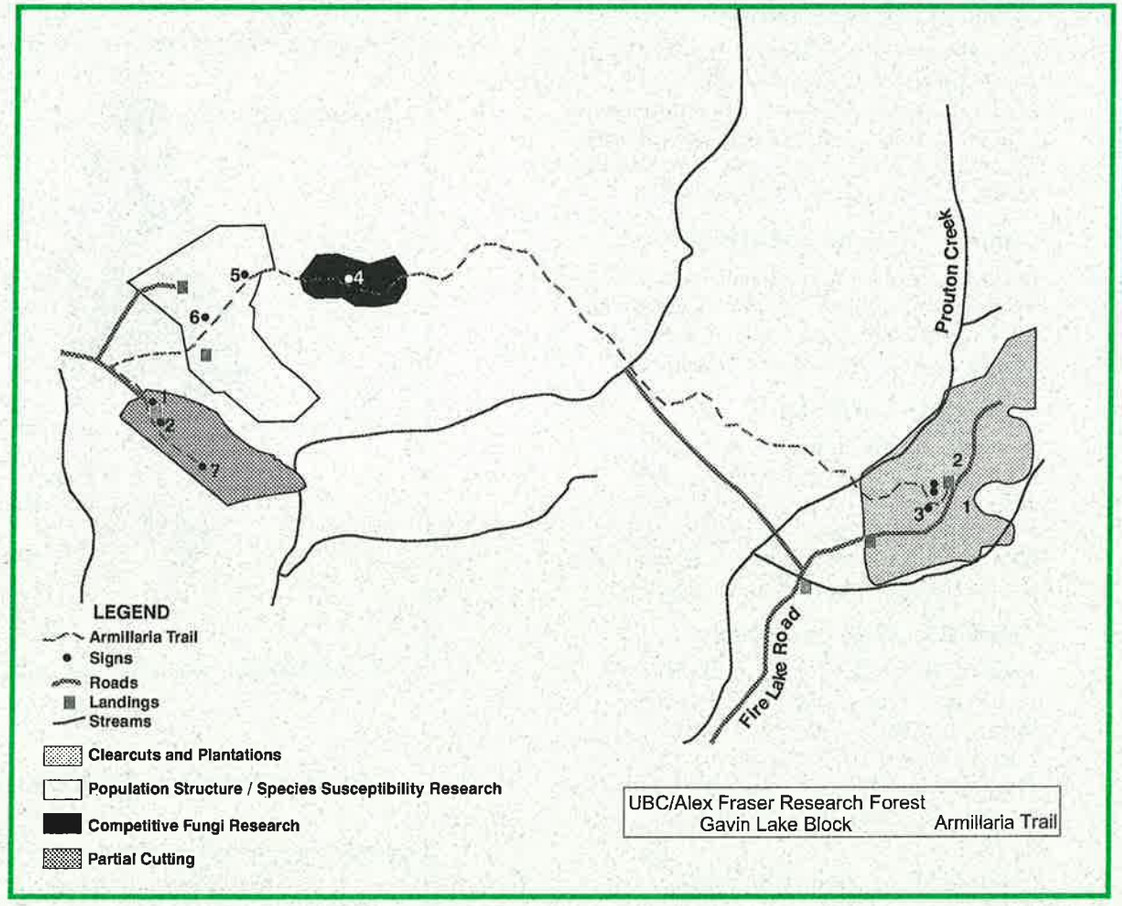

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Signs

1 Armillaria Root Disease
2 Identification of Armillaria Root Disease
3 Clearcuts and Plantation
4 Competitive Fungi Research
5 Population Structure Research
6 Species Susceptibility Research
7 Partial Cutting

In British Columbia, Armillaria root disease is primarily caused by the fungus *Armillaria ostoyae.*

This pathogen mainly attacks conifers and obtains its energy by decaying the wood within the host's roots. Infected areas have reduced timber production due to decreased tree growth, decreased tree stability, and tree death.

Most reports suggest that Armillaria rarely spreads via spores, rather it spreads slowly underground along the roots of one susceptible host to another. Due to this manner of spread, infected trees are not found scattered within a forest but are clumped together in patches called infection centers.

The objective of this trail is to demonstrate:

1. The symptoms that indicate Armillaria root disease,
2. The management implications of Armillaria root disease, and
3. Some Armillaria research projects currently in progress within the Research Forest.

The Armillaria Root Disease Trail is located within the Gavin Lake Block of the UBC Alex Fraser Research Forest. The trail is approximately 2.5 kms long and passes through four sites which are infected by Armillaria root disease. Along the trail are signs which demonstrate the symptoms of the disease, its management implications, and describe related research projects.

ALEX FRASER RESEARCH FOREST
UBC

AN EXTENSION STRATEGY FOR UBC/ALEX FRASER RESEARCH FOREST

ARMILLARIA TRAIL

FOREST SERVICE · BRITISH COLUMBIA

FOREST RENEWAL BC

Please Do Not Disturb Symptomatic Trees Or Research Installations

Along the trail are small signs with a single letter on them. These stations correspond with the following descriptions:

Station A - Stand Level Symptoms

Look north into the mature stand for examples of stand level symptoms. To the left there is a patch of red and dead trees. To the right there is a patch of hardwoods amongst the conifers. Remember that these stand level symptoms may be caused by other factors (i.e. insects or a different root disease). Tree and tissue level symptoms that are specific to Armillaria must be observed before a final diagnosis can be made.

Station B - Shoot Growth Reduction

Conifers that are younger than 15 years old are much more susceptible to Armillaria than mature trees and may die within a few years of infection. Sometimes, younger trees may die within a year, and before reduced shoot growth is apparent. Mostly, attacked trees present shorter shoots than healthy trees.

Station C - Thinning Foliage

The older the tree was when it was infected, the longer it will be until the tree dies. Extremely large trees may develop symptoms over a span of decades. Note the thinning foliage of these older trees. Healthy trees usually retain 5-7 years of foliage while infected trees may only carry 2-3 years, thus the "thinned" appearance.

Station D - Basal Resinosis

After a root is infected, the fungal tissue (mycelium) grows underneath the bark and begins to decay the inner bark. The mycelium often spreads upwards towards the root collar at the base of the tree. In response, the tree produces copious amounts of resin which often exudes through the bark at its base.

Station E - Callus Formation

Not all infections lead to tree death. Vigorous trees may produce cork or callus tissue at the point of infection, which prevents the mycelium from spreading up the root. Only the tip of the root will be decayed, and the tree will remain healthy. Note the production of callus tissue (round lesions) on some of the roots of this tree; the other roots were successfully infected.

Station F - Impressions

When the fungus decays the living tissue underneath the bark, it often leaves impressions of its mycelium. Look closely at the base of this tree where the bark has been removed. Note the fan-shaped impressions remaining on the surface of the wood and inner bark.

Station G - Benefits

Armillaria root disease is also beneficial to forest stands in many ways. Canopy openings allow for increased diversity of habitat and understory vegetation. Note the abundance of shrubs and herbs in this opening. Also, the large tree that has a dead top (called a snag) provides habitat for various forms of wildlife.

Station H - Windthrow

Since Armillaria decays roots, the over-all stability of an infected tree is greatly reduced. With a strong gust of wind, the roots may snap and the tree will be "windthrown".

Station I - Age of Centers

It is estimated that the edge of an infection center grows radially outwards, on average, 22 cm per year. This particular infection center is quite large, with a radius of around 250 m. Therefore, this infection center could be over 1000 years old!

Station J- Inoculum Removal

Inoculum sources were removed from some plots in this plantation. The stumps were pulled out of the soil by a backhoe and placed upside-down in their holes.

Station K - Longevity

Many years after harvest, Armillaria can still be found within the stumps. This allows one to determine if a site was infected before it was harvested. It is estimated that the fungus can remain alive in a single stump for up to 50 years.

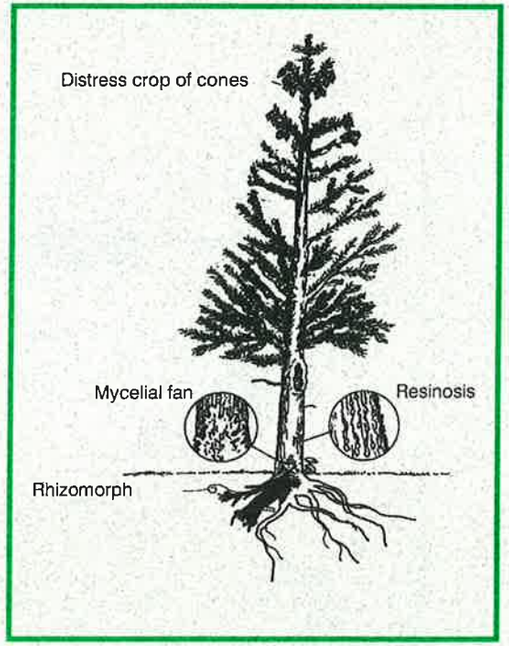
Station L - Distress Cones

Note the crop of distress cones on this dead tree. When stressful conditions arise, such as infection by Armillaria, the tree is induced to reproduce. The cones produced are smaller and more numerous than those produced under normal conditions.

Station M - Competitive Fungi

Several diseased trees were felled in six plots, and the stumps were inoculated with Hypholoma in February, 1995. The following spring, spruce seedlings were planted around each stump. The Hypholoma has established well down in the root system of the inoculated stumps and mushrooms of biocontrol fungus have been found each year since treatment.

The Position of Symptoms on the Tree



Spread of Armillaria Root Disease