Appendix 5 – Tree Diseases

Here is some basic information about a few of the most common diseases that attack commercially harvested species in western Canada.

Western Gall Rust (*Endocronartium harknessii*) – Western gall rust is a fungal disease that attacks pine trees. It's also known as pine-pine gall rust. Interestingly, it only seems to attack two-needle and three-needle pines, but not five-needle pines. The visible signs of infection range from small growths on branches, to hip cankers or large galls on the trunks of young trees that are the size of melons. The smaller galls on branches are often discovered to be pear-shaped. The formation of these galls results from the overproduction of xylem tissue stimulated by the fungus. Eventually, the bark on most of the larger galls will fall off, showing off the bare wood beneath. Unfortunately, the galls typically don't appear until the tree has been infected for more than a year, which makes early detection and treatment quite difficult. Many rust fungi are "heteroecious" parasites, which means that they needs to have two hosts. In those species, the primary host is where the parasite spends its adult life, and the secondary host is where it renews. By contrast, western gall rust is an autoecious parasite, which can complete its entire life cycle on a single host species. This is why it is referred to as pine-pine gall rust (as opposed to a heteroecious fungi such as cedar-apple rust). Lightly infected stands can be controlled by the application of copper and manganese based fungicides. Pruning is also somewhat effective. For heavily infected stands, the best solution may be to burn the infected stems.

Dwarf Mistletoe (*Arceuthobium* sp) – There appear to be approximately two dozen different species of dwarf mistletoes. This genus attacks pine and cypress trees (cypress includes cedars, juniper, sequoias, redwoods, and more). Dwarf mistletoes are basically small parasitic plants where the bulk of the parasite lives under the host's bark. A mistletoe infection results in a reduction in growth, reduced cone and seed development, reduced wood quality, increased susceptibility to other pests or pathogens, and increased mortality. It is common to notice young pine plantations (especially in central BC) where all of the seedlings are twisted, stunted, or deformed. This is typically due to dwarf mistletoe, and the common management approach is to implement a mistletoe eradication program where a crew comes into the block with brush saws and kills all of the trees, so the block can be planted again. An interesting note about dwarf mistletoe is that the fruit of the organism builds up an internal pressure when it becomes ripe, and eventually shoots a single sticky seed out at speeds of up to 80 km/hr. Needless to say, these seeds shooting out of infected trees do an effective job of furthering the spread of the parasite.

Armillaria Root Rot (*Armillaria* sp) – There are a number of different species of the genus Armillaria which cause fungal root rots. Hundreds of different species, from shrubs to trees, are susceptible to the root rots. Symptoms of these root rots vary considerably, from chlorotic needles to dieback of twigs and branches.

The symptoms are the same as for trees that are infected by white rotting fungi. The roots of the infected host will also become coated by a layer of resin, debris, and fungal tissue. This is a relatively easy disease to identify. If a tree is suspected to be a host, a forester can remove some of the bark. There will be an obvious visible white mycelial mat, and it's also possible that mushrooms will grow at the base of an infected tree. Root rots spread through direct contact, when the root tips of one tree eventually reach out and contact the roots of a nearby healthy tree. The best management response to eliminate root rot from a stand includes logging, then use heavy equipment to pull the stumps out of the ground, then either take them away for biomass, burn them, or flip them upside down to dry them out and kill the fungus.

Red Flagging (on cedar) – Red flagging is not a disease, it is just a symptom of drought. Flagging is a defense mechanism that reduces water loss by eliminating older or low productivity foliage from the tree. It is an "auto-pruning" technique that the tree does, to conserve resources for the most productive foliage on its branches. Flagging is more common and obvious during certain seasons (end of summer, early fall). Eventually, the red needles will fall off, then once the tree receives more moisture, it will look very green and healthy again.

White Pine Blister Rust (*Cronartium ribicola*) – Blister rust is an invasive fungus, native to Asia, that arrived in Canada in 1914. When it attacks a tree, the lower branches are more prone to infection, and younger trees are at a greater risk of mortality. This fungus first attacks the tree's needles in the Fall, and many tiny yellow dots appear on the needles the following spring. Over the next year or two, the fungus the spreads toward the branches and trunk. In mid-summer, orange pustules develop on the bole and exude a liquid containing a first type of spores. The following spring, these spores cause white blisters to form on the bark. The white fruiting bodies give rise to a canker that keeps growing. The foliage above the canker yellows and then turns reddish brown. The mortality of the infected upper part causes the branch or stem to break, thus providing a point of entry for the decay fungus. The white fruiting bodies in turn produce orange spores that will be spread by wind and infect red currant, black currant, and gooseberry plants. Finally, in late summer or early Fall, some filamentous fruiting bodies develop on the plants. A final type of spore is produced, and that spore transmits the disease to other white pine trees. Note that white pine blister rust is the only stem rust of white pine. Basal stem cankers producing resin might, however, be confused with symptoms of Armillaria. Most foresters believe that pruning of low branches, regardless of whether or not infection is present, can help control the spread of this rust.

Gray Mold (*Botrytis cinereal*) – Botrytis (also known as bud rot) is a necrotrophic fungus that can affect a lot of different types of plants and trees. It typically targets needles on seedlings. For a mature tree, you might notice brown spots on trees. For seedlings, you may see a fuzzy gray growth on affected areas. This fungus thrives in cool, wet conditions, and spores can spread quickly through wind or water. Botrytis is particularly problematic for container-grown conifers in nursery settings, with spruce, hemlock, larch, and Douglas fir being especially susceptible.

See the previous appendix about insects for information about the mountain pine beetle, spruce beetle, sawyer beetle, and pitch blister moths, all of which cause various types of damage to commercial conifer species in Canada.

For more photo and video resources associated with this appendix, visit:
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