Forest Management for Small Landowners

Disease and Insect Damage

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Introduction

Root disease has accounted for a huge amount of wood decay over the years. When all we had was an "old growth" forest we just accepted it as part of the stand. But as companies put more money into early stand development, they also put money into researching the diseases of the forest. A tree's death may be caused by a fungus, but some environmental cause may have first affected the tree prior to the disease attack. These environmental factors may be conditions such as:

- High water table or outright flooding.
- Soil compaction from roads or logging activity.
- Weather conditions such as too hot, too cold or lack of moisture.
- Foreign substances such as oil, fuel, and lubricants spilled near the tree.
- And one of the most common, equipment damage to the roots and trunk of the tree.

Trees that are stressed or weakened are often the first to fall victim to a disease or insect attack.

We often read of insect attacks in the forests of eastern Washington and the huge losses of lodgepole pine in the Canadian and U.S. Rocky Mountains. In western Washington, the only insect that has caused wide-spread damage is the Douglas-fir tussock moth (*Orgyia pseudotsugata),* and that is mostly historical. It has the potential to do severe damage, but has been closely watched and controlled by County, State, and Federal agencies.

Fungal Disease

Phellinus or Laminated Root Rot (*Phellinus weirii*) *[Poria weirii]*

Circle of trees killed by Phellinus weirii

- *Phellinus* is called laminated root rot because in mature trees in very late stages of the disease, the roots and area closest to the ground develop a lamination between the growth rings.
- It is the most damaging disease in forests of western Washington and can live for 50-100 years in the stumps and roots of dead trees because it is a parasitic fungus that lives on both live and dead wood.
- It can infect all conifer species but mostly affects Douglas-fir, mountain hemlock, and grand fir.
- Intermediately susceptible species include western hemlock, Pacific silver fir, subalpine fir, and noble fir. Pines and cedars are considered to be tolerant or resistant. Only hardwoods are immune to the disease.
- The disease spreads out by wood-to-wood contact (not through the soil) in an uneven circle with dying trees along the edges. The disease mycelium grows from the infected trees into the nearby healthy trees.
- Signs and identification
    - Branch dieback on lateral branches.
    - Crown needles thinning out much more than non-affected trees nearby.
    - Distress cone crop (*more cones than normal and smaller than normal size*).
    - Chlorosis (*yellowing*) of tree needles.
    - White mycelium mats of fungi growth show when you chop into the base. 70% of the infected trees can be identified by stain or decay in stump cross sections.
    - Trees affected by both *Phellinus* and *Armillaria* can be pulled over easily in young plantations and most frequently are found as blow down trees.
- Treatment
    - In live stands, cut all infected trees plus an additional 50-foot buffer.
    - At final harvest, pull (remove) the stumps if possible, or plant a less susceptible tree species like cedar or hardwoods.

In the Morton area of western Washington, Champion Company did a lot of stump removal because of the high level of Phellinus weirii. A forester who knows the area told me that the company that now owns the land is not finding any Phellinus weirii in their post-stump removal plantations. This is unconfirmed information but if true would mean that the Phellinus weirii does not last in the soil as long as many have stated when stumps and roots are removed.

***Armillaria* or Shoe String Root Rot (*Armillaria*)**

- *Armillaria* is the most common and widely distributed forest root disease in western Washington, and spores for this root rot are found worldwide.
- It can be found on hardwoods (*angiosperms*) and softwoods (*gymnosperms*).
- Signs and identification
    - Branch dieback and crown thinning.
    - Distress cone crop.
    - Chlorosis (*yellowing*) of needles.
    - Look under the bark of roots and root collars for mycelia fans, white mats of fungus that can be peeled off like latex paint.
    - In resinous species like Douglas-fir, resin or pitch deposits may be visible near the roots. It looks very similar to *Phellinus* but the mycelium mats are different.
    - It causes a white rot in wood. Wood will have a whitish appearance.
    - The affected tree can easily be pulled over.
    - It is often found as a saprophyte on trees that died from something else.

Black Stain Root Disease [BSRD] (*Ceraocystis wageneri*)

- BSRD is a vascular wilt disease rather than a root rot and primarily affects Douglas-fir. The name comes from the black or purple stain in the water conductive vessels.
- It was not known to exist in the Pacific Northwest until the early 1970s. Jim Sund, Washington Department of Natural Resources employee, was the first to find it in southwest Washington in the foothills just south of Oakville.

Black stain root disease

- It plugs the water conductive tissue, limiting the ability of the tree to take up water. In a short period of time, the tree suffers from moisture stress, declining rapidly until death.
- The most common vector of spread is root-feeding beetles and weevils. While flying over a stand of trees, the insects sense pheromones given off by stressed trees, which are easier for the beetle to bore into.
- The beetles bore into the tree trunk to lay their eggs, leaving the black stain spores which will ultimately kill the tree.
- The disease moves root-to-root, spreading fast like an octopus rather than a gradually spreading circle like *Phellinus*.
- Identification
    - A dead tree cannot be pulled over, which differentiates it from root rots.
    - Chop into the base of the tree and see the black stains in the water conductive vessels.

- Cut a tree diagonally and see partial arcs of black stain where the water conductive vessels are plugged.

Annosus Root Disease (*Heterobasidion annosum*) [*Fomes annosus*]

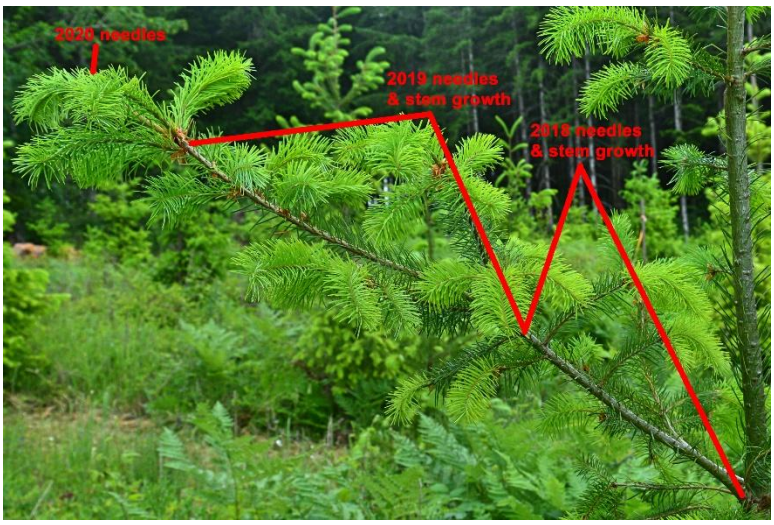
- Douglas-fir is only slightly susceptible to the disease. Western hemlock, mountain hemlock, grand fir and Pacific silver fir are the most highly susceptible species.
- Infected trees suffer root and butt decay, which results in wind throw, predisposition to bark beetles, and mortality.
- *Annosus* spreads by wind-borne spores from freshly cut stumps and by mycelial growth from diseased trees.
- If your land is along the coast and predominately hemlock, then think twice about doing a thinning operation. Most likely it will be better to do no cutting until you do your final harvest because of the high risk of annosus infection.

Swiss Needle Cast *(Nothophaeocryptopus [Phaeocryptopus] gaeumannii)*

- Swiss needle cast is a foliage disease that attacks Douglas-fir throughout its range in the western United States, but it is most serious along the coast where the moisture encourages its growth. It normally does not kill trees, but height and diameter growth are reduced because there are fewer needles.
- Symptoms
  - Overall, the trees will look chlorotic (*yellow*).
  - Dirty little spots on the underside of the needles are the pseudothecia or fruiting bodies of the disease.
  - Affected trees will have fewer needles than normal. A Douglas-fir will generally keep 3- to 4-years of needles. Trees infected with Swiss needle cast will have 1- to 2-years of needles if growing in the interior, and along the coastline, a tree may lose its entire crop of needles prior to the current year's growth.
  - Symptoms will be most obvious just before bud break in the spring and it mostly is observed in young plantations.

Douglas-fir with Swiss needle cast

- Treatment
  - Because Douglas-fir is the only species that is susceptible to Swiss needle cast, alternative species should be considered at time of planting in areas with serious disease issues.
  - The best treatment for an existing stand is to increase the air flow through the crown of the tree, such as by pre-commercial thinning.
  - Fertilization has been tried and may not be appropriate if the site already has high nitrogen levels.
  - Fungicidal control is not feasible except in high-value Christmas tree plantations.
  - By the time the stand is 20-30 years old, the crowns are up high enough to have the necessary air flow and the impact is not so great.



Growth of healthy Douglas-fir tree

Insects

Douglas-fir Tussock Moth (*Orgyia pseudotsugata*)

- Tussock moths are defoliating insects that eat the needles of Douglas-fir, true firs (*Abies*) and spruce (*Picea*), affecting up to 40% of a stand.
- Major outbreaks are infrequent and generally subside in 2-4 years, but during that time tremendous damage can occur. In the early 1970s, over 800,000 acres were affected in Washington, Oregon, and Idaho. Between 2000 and 2002, 45,000 acres were defoliated in Washington State.
- Signs
  - Egg masses, located on the underside of branches, are 1 inch across, round, gray, hairy, with white eggs.
  - Cocoons are 1 inch long, tan, and felt like.
  - Mature caterpillars have distinctive tight tufts of hair (*tussocks*).
  - Defoliation is most severe in the top of the crown, on both old and new foliage.

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