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Class Handout Notes
Tree Disease and Risk Assessment Implications.

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Class Handout Notes
Tree Disease and Risk Assessment Implications.

One of the most important skills in tree risk assessment is the ability to recognise diseases and understand the implications for the structural integrity of the tree. That means that you must:

Know what you are looking for
and
Know what you are looking at.

Tree diseases are caused by fungi which are classified in two broad phyla: The basidiomycota and the ascomycota. Most tree diseases are basidiomycetes with a few exceptions. These diseases mainly spread by means of windblown spores (termed basidiospores), but a few spread by root grafting and tree to tree inoculation. The fruiting bodies are called sporophores (conks) and are either annual - they appear and die away each year, or they are perennial - they appear and last many years with new annual growth on the outer edges.

The sporophores can also be separated into gilled and polypore forms. These features appear on the underside.

You also need to know how each fungus attacks wood. Either it will attack and kill live wood (pathogenic) or, it will only be found on dead wood (saprotrophic). Some fungi have both forms. That is important because if you see a known saprotroph on a live tree, you know right away that there is already some dead tissue and possible areas of decay present but, the extent of decay and degree of pathogenicity vary considerably. The tree and fungi interactions are affected by species of fungi and the age, condition, and vigour of the tree, its CODIT capabilities, as well as site and climate factors. There will be considerable variation across geographic regions, so be sure you know if the features and implications fit your area. Some fungi can switch modes from saprotrophic to pathogenic, especially if the tree becomes stressed by droughts, and insect attacks.

Many tree diseases are described in the forestry literature. The focus will usually be on the implications for harvestable timber volume and tree stability in forestry settings. Urban foresters seldom need to worry about harvest issues, but do need to be aware of the fungal implications for stability.

Tree decays are usually classified as root rots, butt rots, heart rots, and sap rots. Some root rots can also be butt or trunk rots. For example *Phaeolus schweinitzii* is often described as a root rot. In the Pacific Northwest it is commonly found as extensive columns of heartwood decay, and stem failure is more common than root failure.

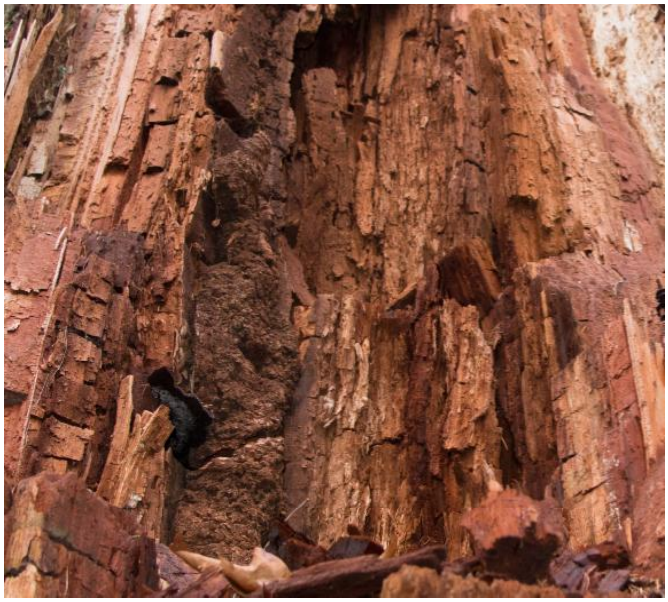
The true heart rots decay the heartwood first of all, but may decay the sapwood later on. Heartrots may be less important in the early stages of decay since we know from biomechanics that tree trunks can easily withstand loss of heartwood and still stay standing with a healthy outer rind of sapwood. But, saprots may be really important, since they decay the outer rind of wood first of all, and that is the area of critical mechanical support.

Fungi are also classified by the way they decay wood. The stages of decay range from early incipient, incipient, to advanced decay. The wood strength decreases as the decay advances. You need to know some basic wood characteristics. All wood cells have cellulose (white in colour) and lignin (brown in colour). Cellulose provides flexibility, while lignin provides load bearing and structural support under compression.

The two main forms of decay are white rot and brown rot. White rots decay all cell wall polymers, but start primarily with the lignin and then moves to the cellulose component (varies by fungus). The decayed wood will be white or bleached in appearance, and is often fibrous or spongy but retains some flexibility. It has less ability to support loads in compression. Brown rots decay cellulose and hemicellulose preferentially, leading to the characteristic dark brown, crumbly wood. The wood will have quite good abilities to support loads in compression, but virtually no ability to withstand flexing.

A third form of decay are the soft rots, which tend to break down pockets of wood by digesting cellulose. They inhabit areas of wood where white or brown rots don't function, and are often considered to be less aggressive than the white or brown rots. Examples of soft rots include *Ceratocystis* (wilts), and *Kretzschmaria deusta.*

White rot. *Heterobasidion occidentale*



Brown rot. *Phaeolus schweinitzii*

Things to consider:

1 Just because there is a sporophore present does not automatically mean likelihood of failure is high. You have to correctly identify the fungus and know its specific implications for that tree species. You also need to consider the age, vigour, and condition of the affected tree part, as well as site factors.

2 It is often important to conduct further investigation before condemning the tree. How aggressive is the fungus? Which part of the tree is mainly affected? The roots, the main trunk, branch attachments, or just branches? How much wood has been lost and how much remains?

3 Be aware than the nomemclature of fungi is changing rapidly (some days it seems like every month) as a result of DNA research, so what may be the correct name today may be incorrect in the future.

4 In the field take good photographs: in focus, well exposed, and clearly showing the main features such as size, top and bottom of the sporophore.

5 Learn the signs and symptoms of fungi. Signs are the fungal fruiting bodies and associated decay patterns. Symptoms are the visual evidence of the tree reacting to the presence of the fungi. Crown dieback, thinning, chlorosis, necrosis, and abnormal growth patterns would all be considered as symptoms that decay may be present.

6 It takes a lot of practice and experience to learn tree disease identification and implications. The internet has a lot of useful information, and there are many forum sites where these issues can be discussed. The best way to learn is to spend time in the field, and learn which species of fungi are most likely to affect the trees in your area.

Below are some images to illustrate variation in size, look alike fungi, and other commonly seen fungi of interest.

NOTE: If you insist on eating them ..... be sure you know the edible ones. Some are tasty, others are fatal, and in between is a lot of time in the washroom and / or hospital!

Left: *Coprinus* (Inky cap) sometimes mistaken for *Armillaria* (right image). *Coprinus* gives a noticeable black stain when crushed. *Armillaria* has the definitive high annulus at the top of the stalk.

Armillaria rhizomorphs

Cryptoporus volvatus.
A sure sign the tree is dead as this is always a saprotroph.

There may be considerable variation in the morphology of the sporophore.
These are all *Fomitopsis pinicola.*

Ganoderma applanatum. White rot on broadleaves (left=Oak) and conifers (right = hemlock). Easy to tell from *Fomitopsis* because *Ganoderma* can be etched but that won't work on *Fomitopsis*.

Hericeum erinaceus. Saprotroph. May be on dead parts of live tree, or dead wood on ground.

Heterobasidion occidentale.
Root rot, seen here on Western hemlock.

Laetiporus conerificola. Sulphur fungus. Brown rot.