

Draft Guidelines Damage Causes

Ad hoc group Biotic Damage

Examples and Definitions of causal agents

1. INSECTS

Defoliator: an agent that damages trees by destroying leaves or needles.

Leaf chewers: Organisms that eat most of the leaf material (succulent tissues, veins, midrib). They include the defoliators that destroy the *entire leaf blade*, only tougher midvein remains and those that eat *distinct portions of leaf* such distinct notches or circular holes cut from leaf margin, small randomly scattered holes.



Fig. 1 – Leaf chewers: left entire leaf blade destroyed; right distinct portions eaten

Skeletonizer: Organisms that devour all the leaf tissue except the veins and midrib

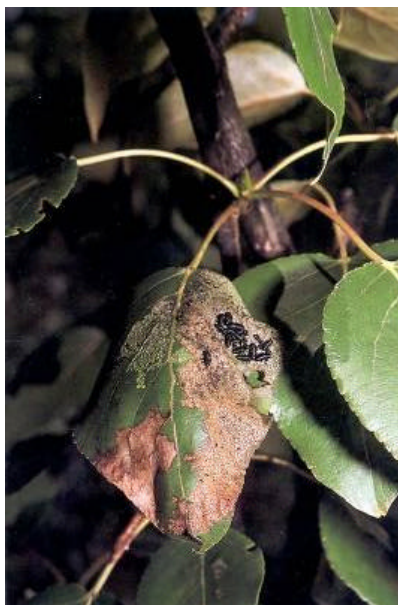


Fig. 2: Examples of skeletonized leaves

Leaf "roller" s.l. Organisms that construct feeding shelters by tying several leaves together with silken threads or rolled into a tube often harbour. This class includes the **Leaf tiers** = Organism that ties two or more leaves or needles together with silk threads, forming a tube in which to hide and feed; the **Leafroller** = Organism that hides and feeds inside a leaf or the tip of a leaf that it has rolled-up into a cigar-shaped tube; the **Leaf folder** = Insect that folds a leaf in two to make a shelter for hiding or feeding.



Fig. 3: Examples of rolled leaf: left folded leaf; right leaf rolled

Stem, branch & twig borers: "Bark beetle" is a taxonomical concept that is referred to Scolitidae. Indeed they are both "wood boring" and "shoot boring" as well because, in different phases of their life cycle, they attack both bark (larvae) and shoots (adults). We better avoid that definition and indicate only the *location of the attack at the moment of the survey*

Shoot borer: Organism that bores into and feeds under the bark in the cambium tissue.
NOTE: in our assessment this class includes also the **Bud or shoot miner** Organism that bores into and feeds under the bark in the solid wood or xylem tissue



Fig. 4: Example of shoot miner

Bark-boring: Organism that bores into and feeds in the bark



Fig. 5: Examples of bark boring

Wood boring: Organism that bores into and feeds under the bark in the solid wood or xylem tissue. Damage is often recognized by a general decline of the plant or a specific branch. Close examination will often reveal the presence of holes in the bark, accumulation of frass or sawdust-like material or pitch. **NOTE:** in our assessment this class includes also including **Twig Girdlers and Pruners** organisms that circle and cut through a stem or the bark and outer few rings of wood, disrupting the phloem and xylem



Fig. 6 – Examples of galleries made by wood boring insects

Leaf/needle Miners: Organisms that feed upon the succulent tissues while tunneling. In broadleaves Leaf Miners feed between the upper and lower leaf surfaces: If the leaf is held up to the light, one can see either the insect or frass in the damaged area (discolored or swollen leaf tissue area). **NOTE:** in our assessment this class includes also the **Petiole and Leaf Stalk Borers** organisms that burrow into the petiole near the blade or near the base of the leaf. Tissues are weakened and leaf falls in early summer. Sectioning petiole reveals insect larva.



Fig. 7: Examples of mined leaf

Gallmaker: organism that induces the formation of galls and feeds on their tissues



Fig. 8 – Examples of galls

Sucking and Sap-feeding insects: Organism that has specialized mouthparts for sucking the fluids from plants, thereby causing deformities or killing the affected plant sections.



Fig. 9: Examples of sucking insects

2. Fungi

CONIFER DISEASES

Needle cast: is a premature loss of leaves by conifers caused by fungal attack. The fungi cause a reddening or browning of current-year or older needles, often regular, and subsequent death. In some cases, needles retain short green basal portions. Not all needles are affected, very often, there are both healthy and infected needles on the same twig. The irregular distribution of affected needles within a year may help in distinguishing needle casts from abiotic diseases that affect needles. Needle cast can be recognized by the presence of black lines or spots on the underside of the needles, or occasionally on their upper surface. These black lines and dots are the sexual fruiting bodies of the causal pathogen. The infection cycles vary from one pathogen to another and can last one or two years. Needle casts have only one infection period per year and per generation (needle blights, in contrast, typically can infect multiple times whenever temperature and moisture are favourable).



Fig.10 – Examples of needle cast

Rust: Disease caused by fungi, that are parasitic on higher plants and may go through different developmental stages, usually involves hosts. Following infection, orange pustules appear, possibly followed by premature shedding of foliage, witches' brooms or cankers on the branches or bole.



Fig.11 – Examples of rust

Blight: Blights attack growing tissues and needles of any age on conifers. Blights cause rapid browning or blackening of leaves, which subsequently death. Blighted needle is also cast after spore release. Blight can spread to the buds, annual shoots and the twigs, which droop when infected. Blights remain active anytime there is coincidence of high humidity and spores.



Fig. 12: Examples of blight

Decay: Referring to living trees, decay is loss of density and softening of wood caused by wood rotting fungi

Root rot: Disease that causes the decomposition of root woody tissues. Some root rots also kill the tissues in the root cambium and bark. They can girdle trees at the root collar, eventually killing them. Other root rots cause decay of the lower bole and the trunk. Trees infected by rot organisms often suffer windthrow

BROADLEAVES DISEASES

Leaf spot: Disease that can be recognized by circular or nearly circular, small, limited black lesions that occur on leaf blades; they include a central zone of necrotic tissue (dead, brown-coloured tissue) colonized by a pathogen surrounded by normal-coloured tissue. In the case of major infections, the lesions may coalesce to involve large parts of the leaf. Sometimes the dead tissues dry out and fall off, making the leaves look riddled with holes.



Fig. 13: Examples of leaf spots

Anthracnose The leaf symptoms induced by this disease are:

- reduced growth of some portions of the lobes,
- irregular-shaped necrotic areas,
- dead leaf margins and tips and/or brown dead areas along the leaf veins or large dead blotches between leaf veins;
- premature defoliation.

Necroses (brownish areas of dead tissue) can spread to the entire leaf, the buds (bud killing early in the season resembling frost damage) and, in extreme cases, the twigs. In severe case, anthracnose resembles a blight.



Fig. 14 - Example of Anthracnose

Powdery mildew: So called because they look like a powdery whitish material on the leaf surface. Need a lens to be sure it isn't dust or something. Several different genera of fungi cause powdery mildew. All the powdery mildew fungi are obligate parasites, requiring live tissue to grow and reproduce. Symptoms: White powdery fungus grows on the upper leaf surface of the lower leaves and flower parts; leaves may be twisted, distorted, then wilt and die.



Fig. 15: Powdery mildew on Oak

Wilt: Initially limp or drooping normal-coloured leaves may be observed. Within few days, drying out, change colour to yellow-brown and shape of leaves and die. They may be shed or remain on the trees. Also twigs and branches dry out, caused by a lack of water or the presence of toxins.



Fig. 16: – Initial stage of wilt

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Blight: Blights attack growing tissues and cause rapid browning or blackening of leaves, which subsequently death. Blight can spread to the buds, annual shoots and the twigs, which droop when infected. Blights remain active anytime there is coincidence of high humidity and spores.



Fig. 17 - Example of blight

Canker: Lesion of the cambium and the living bark of stem and branches which results in localized tissue degradation and death. It is possible to distinguish:

- 1) Perennial or target cankers: roughly circular and contain much callus at the face and margin. The fungus is slow growing roughly equally radial growth of the tree. A type or perennial canker are the Diffuse cankers that grow more rapidly than the radial growth of the tree and so contain little or no callus. They usually girdle the tree after several years. If the canker fungus also invades the underlying wood, canker rot is produced.
- 2) Annual cankers develop rapidly for one season only and contain little or no callus. They frequently occur on stressed trees and disappear in the absence of the stress factor

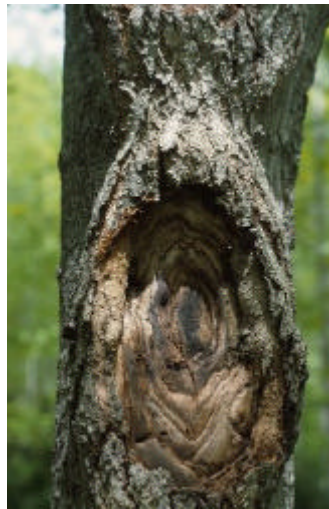
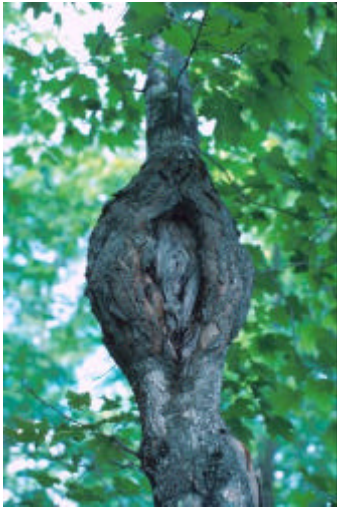


Fig. 18: Examples of cankers

Decay: Referring to living trees, decay is loss of density and softening of wood caused by wood rotting fungi

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Deformations: Leaf blisters and other diseases caused by *Taphrina* spp. They cause the host to overgrow in infected areas. Lead to blister, puckering, curling, expansion. This pathogen is the only member of Hemiascomycetes we will deal with. Naked asci - no ascoma. Asci are produced on leaf surface. The ascospores keep dividing so the asci have lots more than 8 spores.