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# Why do trees bleed?

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# What is a bleed?

There is no scientific definition of a tree 'bleed'

They frequently include a wide range of overlapping symptoms:



Water soaked lesions



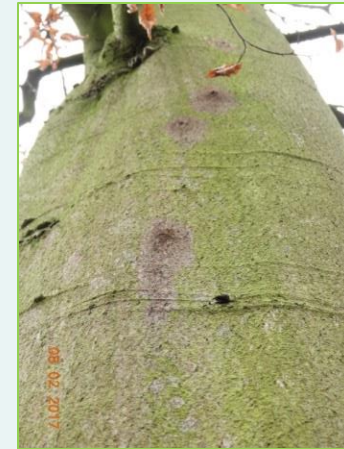
Watery slime flux



Water soaked canker

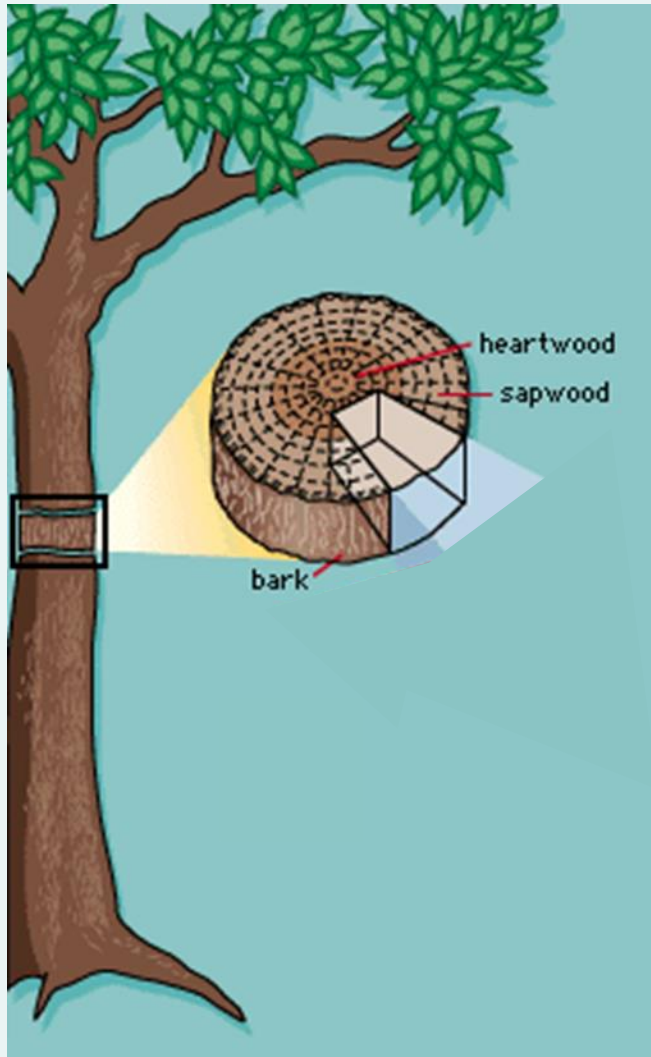


Water staining



Discrete 'tar spots'

# Why do trees bleed?



To understand why trees bleed, you first need to understand the structure of a tree:

- Bark – dead tissue
- Sapwood – living tissue
  - Phloem – sugar transport
  - Xylem – water transport
- Heartwood – dead tissue

Trees bleed to protect the heartwood and sapwood against disease and decay

# Why do trees bleed?

## Sapwood

Contains the vascular tissue (xylem and phloem)

- Important to maintain the functions of the tree
- Disease or decay of sapwood can hamper the functions of the tree
- Can lead to 'girdling' the tree, i.e. stopping the movement of sugars and water, which will eventually kill the tree





# Why do trees bleed?

## Heartwood

There is no active chemical defence mechanism in hardwood. It is therefore vulnerable to specialised decay organisms that can digest:

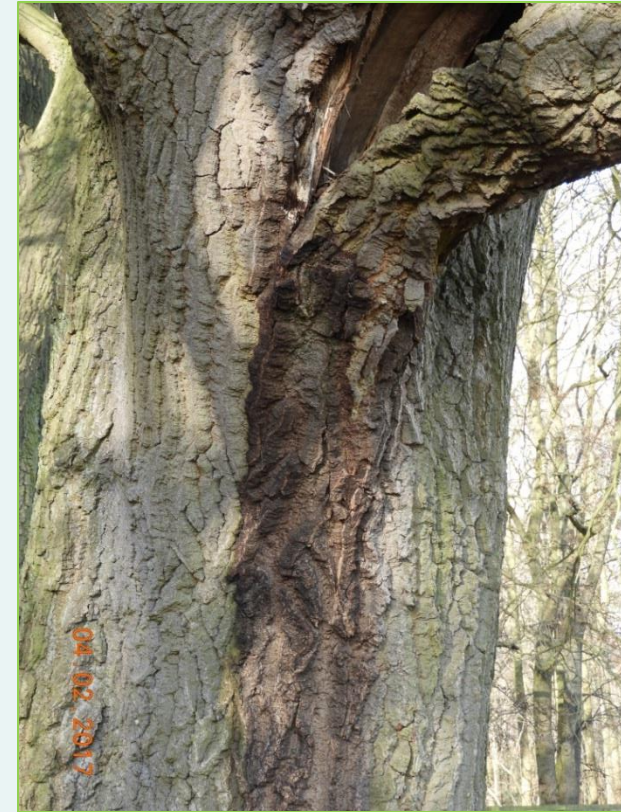
- Cellulose – e.g. soft rot fungi
- Cellulose and hemicellulose - e.g. brown rot fungi
- Lignin, hemicellulose, cellulose – e.g. white rot fungi
- Disease or decay in heartwood affects its structural integrity
- Trees can remain standing with 30-70% decay. However, this makes them very vulnerable to extreme weather



# Disease & decay

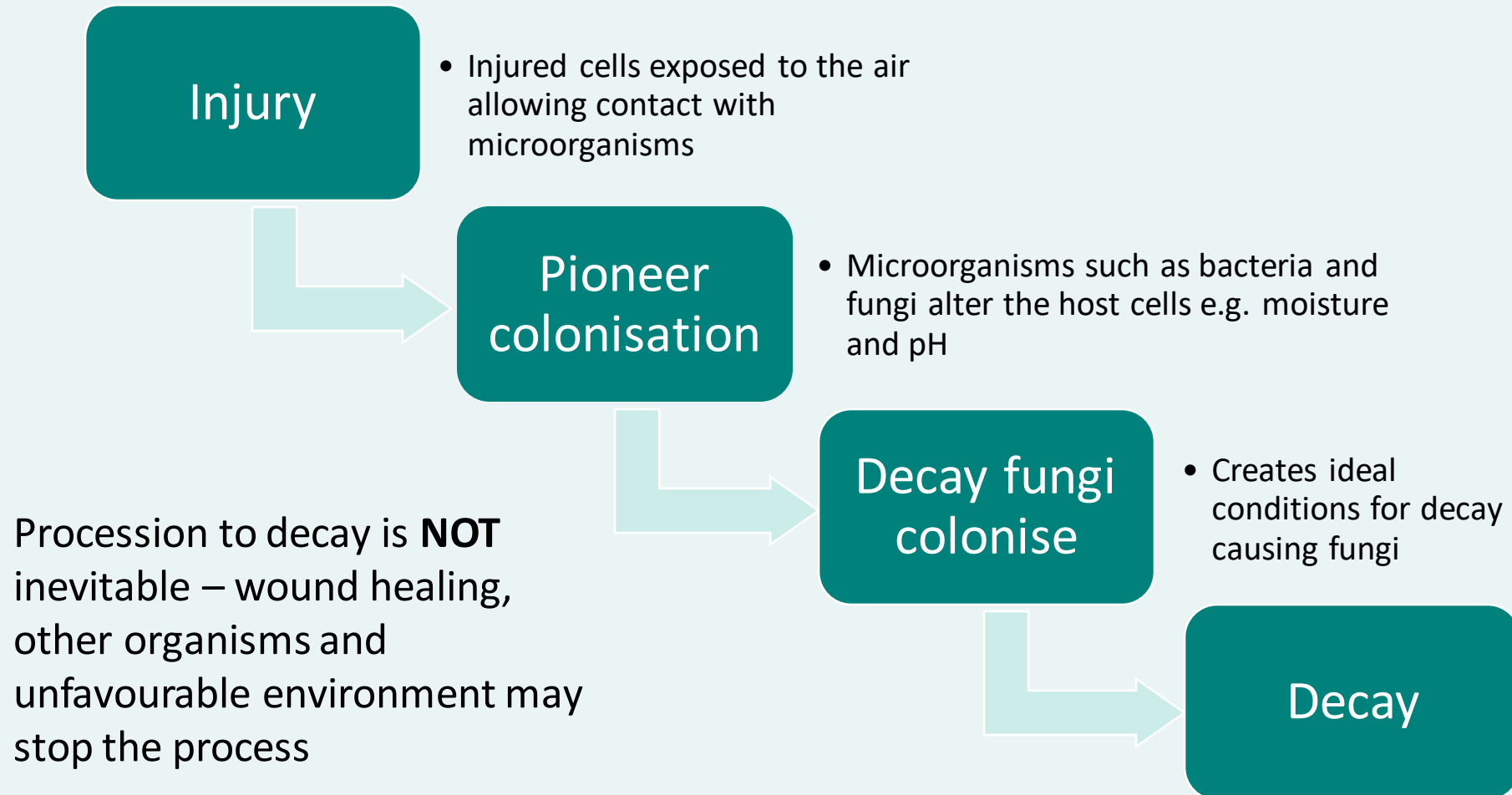
Disease and decay are caused by microorganisms – the main groups are bacteria and fungi

- Microorganisms require oxygen for growth (aerobic conditions)
- Tree sapwood is saturate with fluid (creating anaerobic conditions) that are not suitable for microorganisms
- **However**, damage creates an aerobic region which is favourable for growth of microorganisms which cause decay



# Disease & decay

## Process of discolouration and decay





# What are a tree's defences?

First line of defence = bark



Prevents access to sapwood and heartwood

# What are a tree's defences?

## First line of defence = bark



Bark provides a protective layer (much like skin) against:

- Physical damage
- Vertebrate pests
- Birds (e.g. woodpeckers)
- Pests (e.g. bark-boring)
- Diseases
- Decay



# What are a tree's defences?

Second line = sealing off invaders



## CODIT

Compartmentalisation

of

Decay (Disease)

In

Trees

‘Trees don’t heal  
they seal’

Shigo, 1969



# What are a tree's defences?

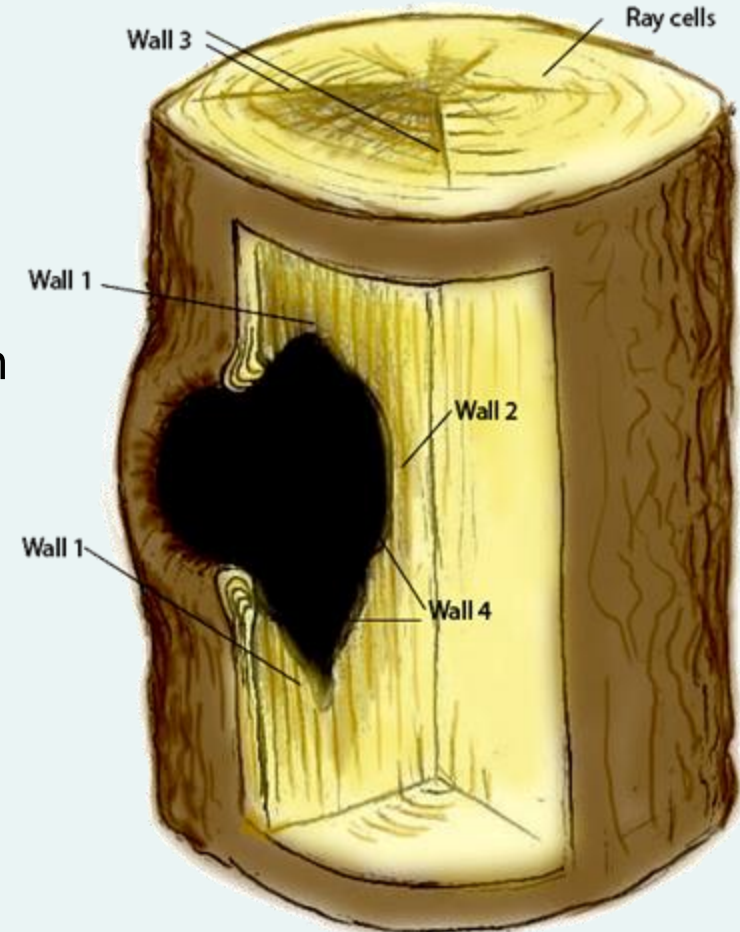
## Second line of defence = host response to a wound

**Wall 1** the tree can 'plug' the sapwood above and below a wound (with antifungal substances, gums, resins etc.)

**Wall 2** wood grown late in the season (latewood) produces a growth ring which prevents the wound from moving deeper into the tree

**Wall 3** specialised cells (ray cells) keep it contained within a segment of the trees

**Wall 4** new specialised woody growth (a barrier zone) coats the exterior of the wound protecting the tree



<http://www.eastsidetreeworks.com/blog/how-to-recognize-a-possible-hazard-tree-1-c-o-d-i-t/codit/>

# What triggers bleeds?

## *Phytophthora*

Phytophthora are a large group of pathogens that cause diseases in plants

- They damage the sapwood
- This can girdle the stem, killing the tree





# What triggers bleeds?

## *Phytophthora*

Common symptoms of *Phytophthora*:

- Water soaked lesions
- Tar spots
- 'Foxy red-brown' discoloration





# What triggers bleeds?

## *Phytophthora*

These bleeds can be seen anywhere on the tree:

- Roots, stem base and stem (up into canopy)



*Phytophthora*  
on beech



*Phytophthora*  
on Norway maple



# What triggers bleeds?

## Other causes: *Armillaria* species

Known as 'honey fungus' is a parasitic fungi which exhibits the following signs:

- Toadstools (as opposite)
- White, vein-like threads know as mycelium which have a mushroom smell
- Black or brown root-like cords 'bootlaces' – fungal rhizomorphs
- Water soaked lesions on the trunk base and where the roots meet the trunk

The fungus can girdle the base – hindering the transportation of water and nutrients





# What triggers bleeds?

## Other causes: bacterial pathogens e.g. acute oak decline

- Acute Oak Decline (AOD) is a disease mainly affecting native oak trees in Britain
- Affected trees have vertical, weeping fissures that seep black fluid
- Some trees die 4/6 years after onset of symptoms





# What triggers bleeds?

## Other causes: pests e.g. great spruce bark beetle



*Resin tubes*



- The great spruce bark beetle (*Dendroctonus micans*)
- Found in forests throughout mainland Europe.
  - It lays its eggs under bark, damaging spruce trees by tunnelling into the bark
  - Developing young (larvae) feed on the inner woody layers
  - This weakens the tree
    - Trees are killed by being completely girdled, at one or more points along the stem (it can take many years, and be the



# What triggers bleeds?

## Other causes: slime flux due to bacterial wetwood

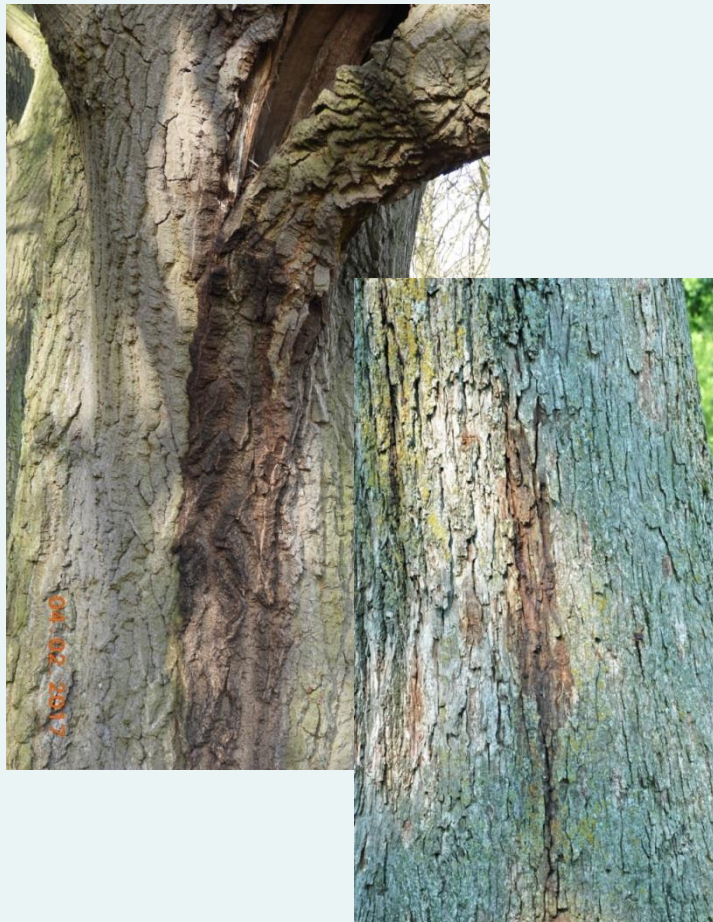
- Bacterial wetwood is when anaerobic bacteria colonise and degrade the heartwood
- Bacteria and yeast causes the process of fermentation
- This process produces liquid which causes pressure to build up within the sapwood
- This liquid will find any wounds, natural openings to relieve the pressure, or it will eventually burst





# What triggers bleeds?

## Other causes: slime flux due to bacterial wetwood



- The liquid that runs out leaves a ‘slime flux’
- Watery, smelly, slimy, long, vertical streaks, associated with wounds
- When it dries out it gives a ‘chalky’ white margin
- Slime flux may inhibit wound healing leading to further decay and dieback
- The internal decay caused by bacterial wetwood within the heartwood can reduce the crown
- It will make the tree structurally unsound

# What triggers bleeds?

## Wounds



Wounds can occur in many ways:

- Branch stubs from pruning or damage
- Branch tears (where the branch meets the trunk or other branches and has ripped)
  - Scars from previous physical damage or pests

This can...

- Make the tree prone to slime flux
- Provide an entry point for ‘secondary infection’ by damaging organisms which could cause ill-health or its death



# What triggers bleeds?

Lookalike: water staining



- Water run off from branch unions or water pockets
- Commonly seen after rainy weather
- Not an indication of ill-health or damage

# What is the prognosis?

## Bad

- Pest or Disease may be present
- Resource allocation to healing can cost the tree
- A potential sign of dieback, decline and decay
- May indicate a wound which is vulnerable to secondary infection
- May indicate structural weakness

## Good

- Shows that the tree is fighting back
- There is an expectation of recovery (trees do not heal, they seal)
- Sometimes actually an indicator of health
- Naturally occurring, and not always an indication of ill-health



# Summary

- There are many causes of bleeds, ranging from the serious (*Phytophthora*) to the harmless (water staining)
- Before assuming the worst, rule out non pest and disease related causes first
- Monitor progression to determine risk and the need for intervention
  - consider targets & hazard (e.g. structurally unsound trees)
  - biosecurity risk (e.g. its potential to spread to other trees)
- Remember: bleeds are not always bad! Sometimes they are a good indication your tree is fighting back



# Additional information

- CODIT - <http://www.eastsidetreeworks.com/blog/how-to-recognize-a-possible-hazard-tree-1-c-o-d-i-t/codit/>
- Discolouration and decay, Alex L. Shigo & Edwin vH. Larson (1969) - [https://www.nrs.fs.fed.us/pubs/rp/rp\\_ne127.pdf](https://www.nrs.fs.fed.us/pubs/rp/rp_ne127.pdf)
- Bleeding canker of horse chestnut - <https://www.forestry.gov.uk/fr/INFD-6KYBSS>
- Biology of *Phytophthora*  
[https://www.forestry.gov.uk/pdf/fcin30.pdf/\\$FILE/fcin30.pdf](https://www.forestry.gov.uk/pdf/fcin30.pdf/$FILE/fcin30.pdf)
- Honey fungus - <https://www.rhs.org.uk/advice/profile?pid=180>
- Acute oak decline <https://www.forestry.gov.uk/fr/acuteoakdecline>
- Great spruce beetle - <https://www.forestry.gov.uk/greatsprucebeetle>
- Bacterial wetwood & slime flux; this resource (like many others) states they are two terms for the same thing, but please note bacterial wetwood **causes** slime flux - <http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/help-for-the-home-gardener/advice-tips-resources/pests-and-problems/diseases/cankers/bacterial-wetwood.aspx>