

How a tree works

Curriculum for Excellence Level **Second, Third**

Time needed for activity **20 - 30 minutes**

Location **Indoors or outdoors**

Context

This activity plan highlights the importance of sustainably managing our natural resources focussing on trees and their systems function.

Curriculum links

Sciences: Biodiversity and interdependence

Second

- I can identify and classify examples of living things, past and present, to help me appreciate their diversity. I can relate physical and behavioral characteristics to their survival or extinction.

SCN 2-01a

Third

- I have collaborated on investigations into the process of photosynthesis and I can demonstrate my understanding of why plants are vital to sustaining life on Earth.

SCN 3-02a

Objectives

By the end of this activity learners will be able to:

- name different parts of a tree
 - describe the functions of different parts of a tree
 - explain what a tree needs to grow and survive
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Equipment and resources

- Poster: How a tree works (optional)
 - Cross section of a tree (optional)
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What to do

Discuss with your group what they know about trees.

Ask the group to name as many parts of a tree as they can.

The activity involves making a 'human model' of a tree to help understand how it works.

The number of learners needed for each tree part is listed below, however you can increase or decrease these numbers depending on the size of your group.

- **heartwood = 1**
- **taproot = 1**
- **lateral roots = 2 to 3**
- **xylem = 3 to 4**
- **phloem = 3 to 4**
- **cambium = 5 to 6**
- **outer bark = 6 to 8**

Heartwood

Most of the wood within a trunk of a mature tree is dead wood called heartwood.

The heartwood is old xylem that no longer transports water and minerals up the tree.

After a few years the sapwood in most trees gets filled in with resin like material and slowly changes into heartwood.

The new xylem is the only part of the wood that works as a transport system.

The heartwood is often much darker in colour than the sapwood.

The heartwood gives the tree support, strength and is the centre of the tree, but sometimes it rots away leaving a hollow, living tree.

Action

Choose one learner to stand in the middle, acting strong and tall, and flexing their arm muscles, chanting 'I am the heartwood, I am now inactive but give strength to the tree! Roar!'

Roots

A tree's roots spread out underground to help anchor the tree and absorb water and nutrients from the soil.

Some trees have long taproots that reach straight down for 4 metres or more, anchoring the tree and finding deep water supplies.

Other trees have more shallow root systems (lateral roots) that lie closer to the surface of the ground. Large taproots and lateral roots branch into smaller and smaller roots.

An average tree has millions of these small rootlets, each covered with thousands of fine root hairs which soak up water and dissolved minerals.

Action

Choose 1 learner to act as the taproot. To avoid the risk of the roots being accidentally stood on ask the heartwood to stand on a piece of string or rope which is run from under their foot to the taproot and on to the lateral roots.

The taproot should sit or lie on on the floor, holding onto the string and make a sucking noise to represent the taproot taking in water.

The lateral roots lie down on their backs spreading out from the taproot with their arms and legs outspread, making slurping sounds.



Xylem

The tree layer next to the heartwood is called the xylem.

Each year the heartwood adds new layers of woody tissue; the xylem is made up of the youngest layers of wood.

The xylem is a network of thick-walled cells and forms a pipeline, carrying water and minerals up the trunk from the roots to the branches, leaves and other parts of the tree.

Action

Acting as the xylem learners join hands to make a ring around the heartwood facing inwards. Representing the drawing up of water from the roots the xylem should raise their joined hands up and down chanting 'We are the tree's xylem. We carry water and minerals up from the roots to the branches and leaves. Whoosh, whoosh!'

Phloem

The phloem acts as a food supply line from the leaves to the rest of the tree. The phloem moves food substances that the tree has produced by photosynthesis through its channels both up and down the trunk to where they are needed for example, to support processes such as developing seeds.

If you were to cut a band around the trunk through the bark and phloem, the tree would probably die as the phloem would be severed and food would no longer flow to the lower trunk and roots.

Action

The phloem needs to be opposite the xylem. They should bend to the floor before standing tall with their arms up straight in the air again, repeating this action. The phloem should chant 'We are phloem, we transport food substances both up and down the trunk to where ever the tree needs them. Swish, swish!'

Cambium

Next to bark is a very thin layer called the cambium.

It is often only one or two cells thick and can only be seen by microscope.

The cambium is a growth layer of the tree making new cells during the growing season that become part of the phloem, part of the xylem or more cambium.

The cambium is what makes the trunk, branches and roots grow thicker.

Action

Learners stand outside of the xylem and phloem group and pretend to hold a hammer and a chisel. The cambium should chant 'This is the cambium layer. This is where new cells are formed and growth occurs.' Ask them to make 'banging' noises to go with the process of building new cells.

Bark

Bark is the outer covering of a tree's trunk and branches. Its purpose is to conserve water and protect the tree's internal functions from temperature extremes as well as attacks from tree pests and diseases, animals and humans (lawnmowers, strimmers etc).

Action

Learners form a circle around the entire "tree", facing outward and holding hands.

Acting as guards of the tree, stand with folded arms looking fierce, saying 'You are not coming in! Grrrr!'

The group leader, or any remaining group members can act as pests or diseases that endanger the tree, such as beetles trying to lay larvae inside the tree, or woodpeckers trying to peck their way through the bark, etc.

Once the "human model" is complete, the group leader can read out the parts of the tree with the participants acting out the functions through motions and sounds.

HEARTWOOD

Stands in the middle, acting strong and tall, and flexing their arm muscles, chanting 'I am the heartwood, I am now inactive but give strength to the tree! Roar!'

ROOTS

Taproot sits or lies on the floor, holding onto the string from the heartwood and makes a sucking noise. The lateral roots lie down on their backs spreading out from the taproot with their arms and legs outspread, making slurping sounds.

XYLEM

The xylem should raise their joined hands up and down chanting 'We are the tree's xylem. We carry water and minerals up from the roots to the branches and leaves. Whoosh, whoosh!'

PHLOEM

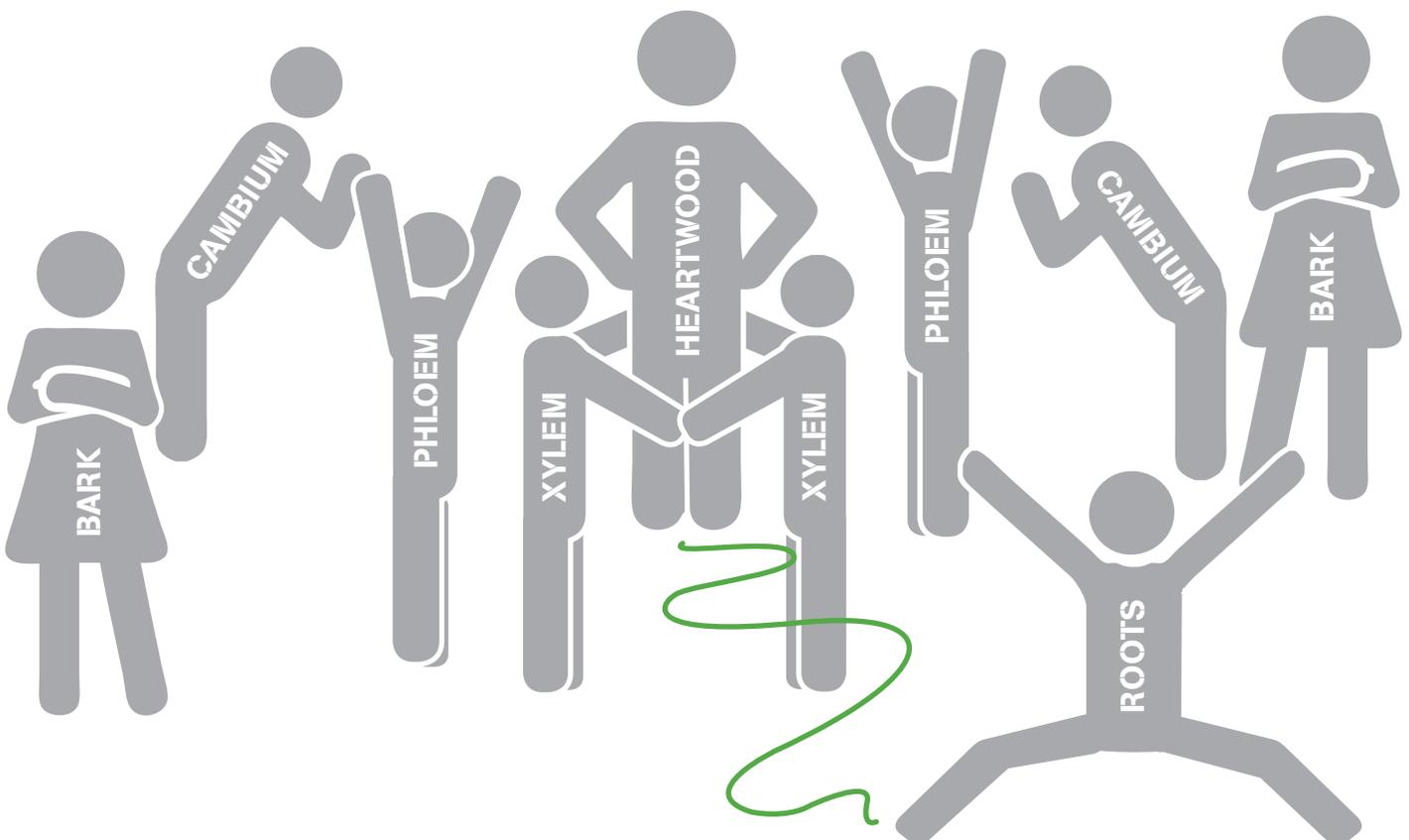
Bend to the floor before standing tall with their arms up straight in the air again, repeating this action. 'We are phloem, we transport food substances both up and down the trunk to where ever the tree needs them. Swish, swish!'

CAMBIUM

Pretend to hold a hammer and a chisel and make building noises. 'This is the cambium layer. This is where new cells are formed and growth occurs.'

BARK

Facing outward and holding hands the bark stand with folded arms looking fierce, saying 'You are not coming in! Grrrr!'





Key questions

- What are the parts of a tree and how do they function?
- What do you think would happen if you cut a tree across the middle of the trunk?
- Why do trees need water, what happens to the water the tree collects?
- What does a tree need to grow?
- What pests and diseases could impact on the health of a tree?
- What happens during photosynthesis?

Adapting for different needs/abilities

Less able

- Show the 'How a tree works' poster to learn about the parts of a tree and their functions before making the model of a tree.
- Repeat each function from the start every time you add a new one to remind the learners of the different roles the tree parts have.

More able

- Show the 'How a tree works' poster and challenge the group to add new parts to their model of a tree. For example, flowers encouraging insects for reproduction, branches to support leaves, leaves catching energy from the sun.
- Investigate further how trees function.

Follow up activity/extension

Try our other tree and woodland learning resources:

- Activities and games - Seed dispersal
- Activity plan - Carbon footprint
- Activity plan - Treemendously thirsty

"Thank you to Natural Resources Wales for sharing this resource with Outdoor & Woodland Learning Scotland"