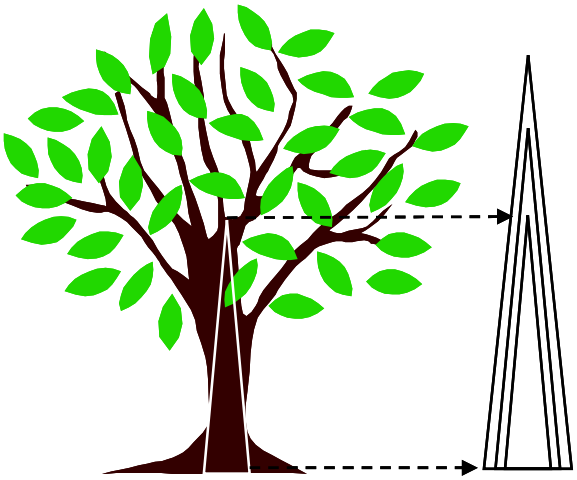
The Timber Preservers Association of Australia

Technical Note 3

Sapwood and Heartwood

Trees are basically triangular in shape and they gain height by growing outwards and upwards. At the start of each season, a growth layer is added to the outside of the wood so that every part of the tree gets bigger - roots, trunk, branches and twigs.

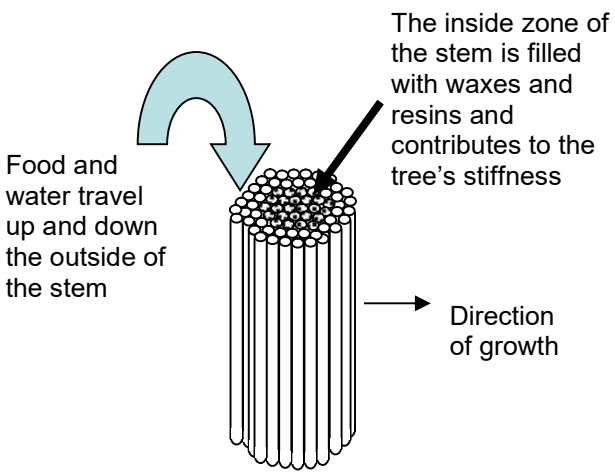


In cold climates new cells grow quickly in summer and slowly in winter. The tree does not grow evenly throughout the year. New cell growth can be seen as bands or rings of growth when a tree trunk is cross-cut. There is one band for each year of growth and so the age of a tree can be determined by counting the rings across a cross-section or core sample taken at the very base of the trunk.

In the tropics the difference between summer and winter temperatures is a lot less than in countries that have cold winters and a tree grows steadily all year. These trees may not show well-defined rings of yearly growth.

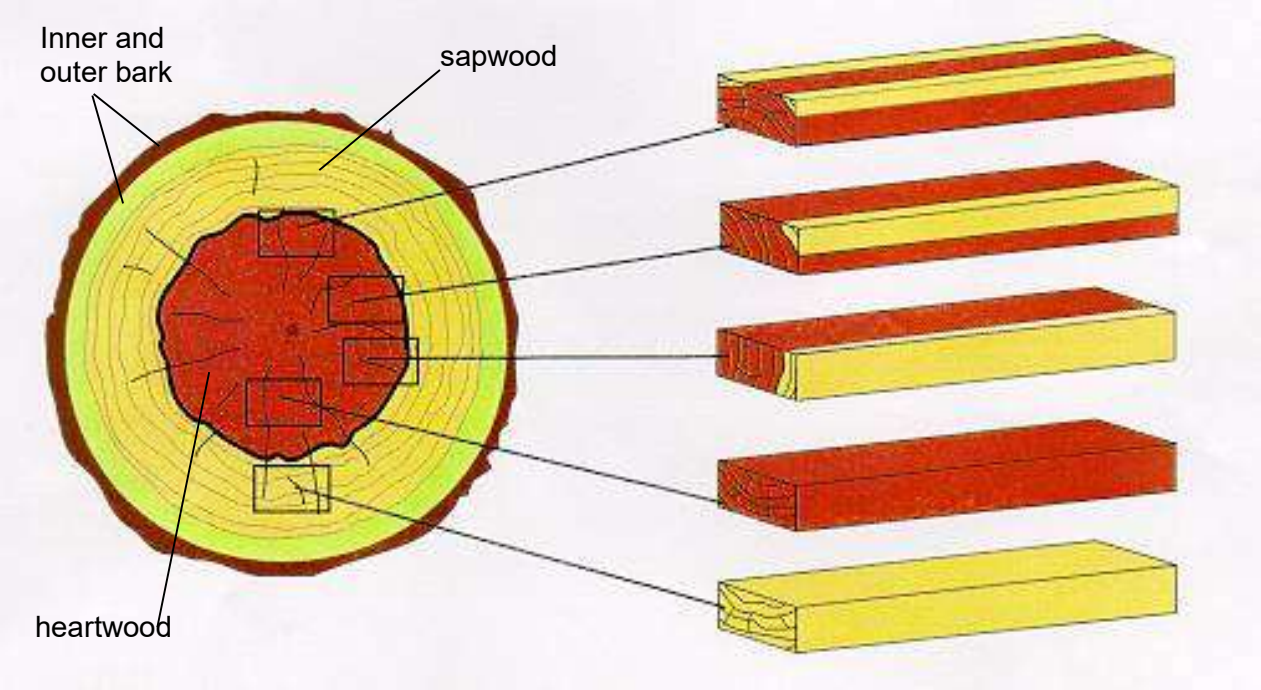
ZONES IN A TREE TRUNK

Every species of wood has its own arrangement of wood cells and scientists using a sharp knife and a magnifying glass can identify the species of wood simply by looking at the arrangement of wood cells.



The actual structure of a tree is complicated but an easy way to think about how a tree is built is to think of the wood in a tree as a clump of drinking straws. The straws around the outside are empty and allow water and tree food to travel up and down the stem, while the straws on the inside have been filled up with resins and waxes and are relatively impermeable.

A tree trunk has three main zones; the bark, the sapwood and the heartwood.



The outer bark is a layer of dead tissue whose main job is to protect the tree from external damage and to reduce the loss of water by evaporation. Some trees lose their dead bark every year and others have very persistent bark that is reduced only by weathering of the outer layers or by fires.

The sapwood zone is under the bark and is made up of empty cells whose job it is to carry water and mineral salts from the roots to the leaves, carry food down from the leaves to the site where new cells are made, store food materials and provide rigid support for the tree. This zone varies greatly in width from species to species and even within a species. Sapwood is usually lighter in colour than heartwood and the two layers may be well defined. However this is not always the case. In some species, the sapwood may be the same colour as the heartwood.

Heartwood, also known as truewood is formed from sapwood when the cells are blocked and stored food materials are converted into waxes, resins and other substances. It is these chemical changes that can make the heartwood more resistant to attack by insects, termites and decay than the sapwood. Wood cells in the heartwood are dead and give mechanical support for the tree.

Industrial wood preservation uses the empty cells of the sapwood to move preservative liquid around. All specifications in the Australian wood preservation standard AS/NZS1604 specify penetration of the sapwood by wood preservative. Envelope treatment to protect against termites is the only exception to this rule.

Because the fluid pathways of the heartwood are blocked by resins and waxes, it is very hard to penetrate heartwood through the movement of carrier liquids.

Industrial timber preservation increases the resistance (durability) of timber to attack by insects, decay, and marine borers and thereby increases the use of low durability timbers.

The durability of timber is discussed in **TPAA Technical Note 5**.