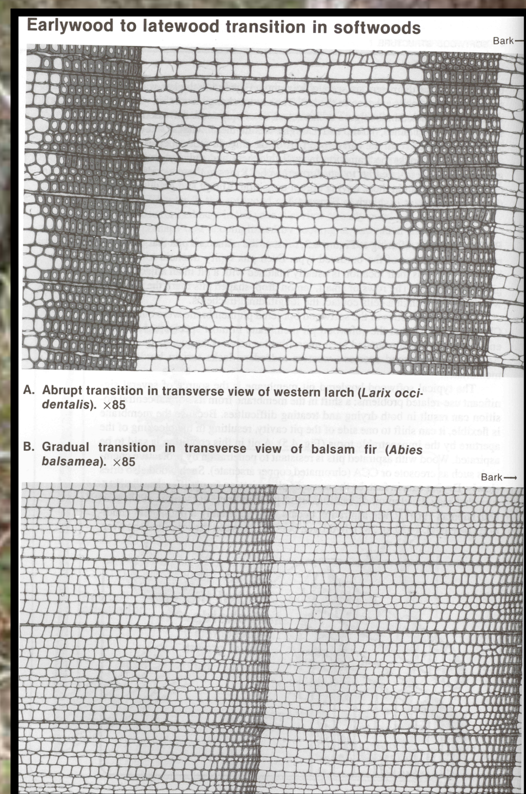
Softwood Features



Bowyer et al 2003

Softwood Features

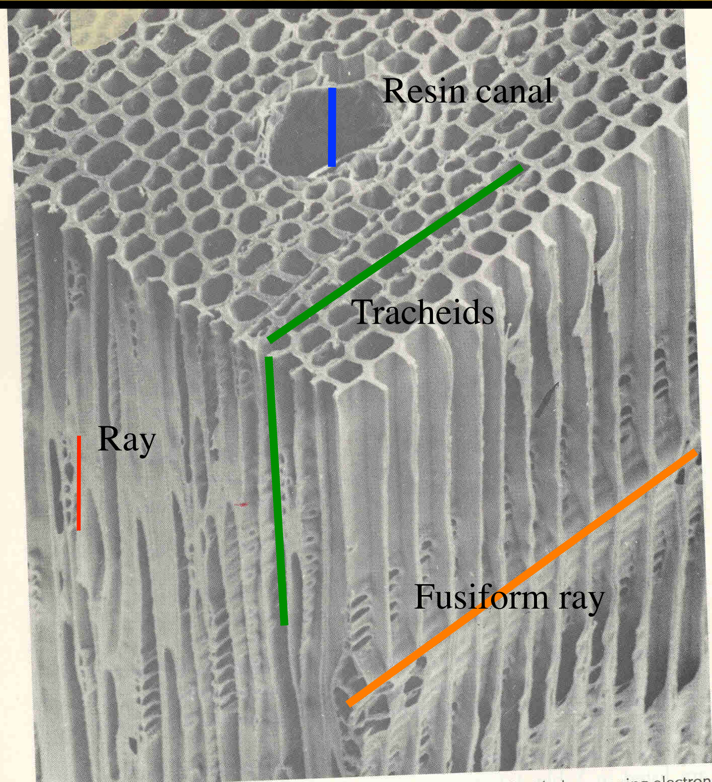
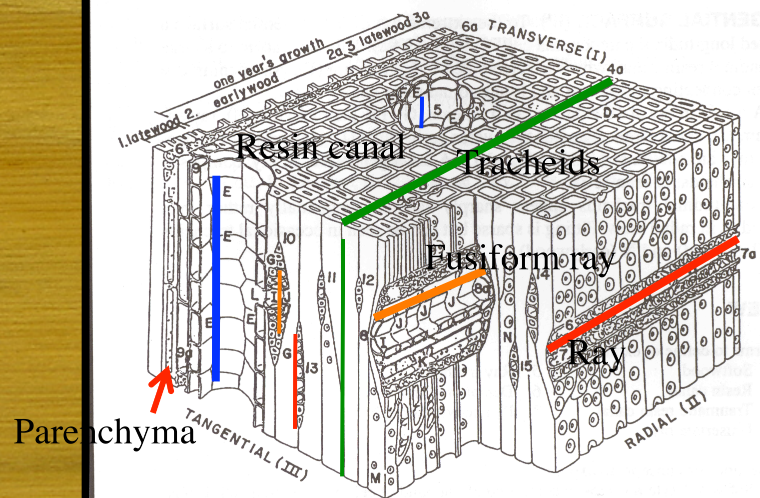


Figure 4-1 Eastern white pine (*Pinus strobus* L.) wood as viewed with the scanning electron microscope. (150×) The structures visible are noted in Fig. 4-2. (Courtesy of Center for Ultrastructure Studies, State University of New York, College of Environmental Science and Forestry, Syracuse, N.Y.)

Panshin & DeZeeuw 1980

Three-dimensional representation of distinct-ring softwood



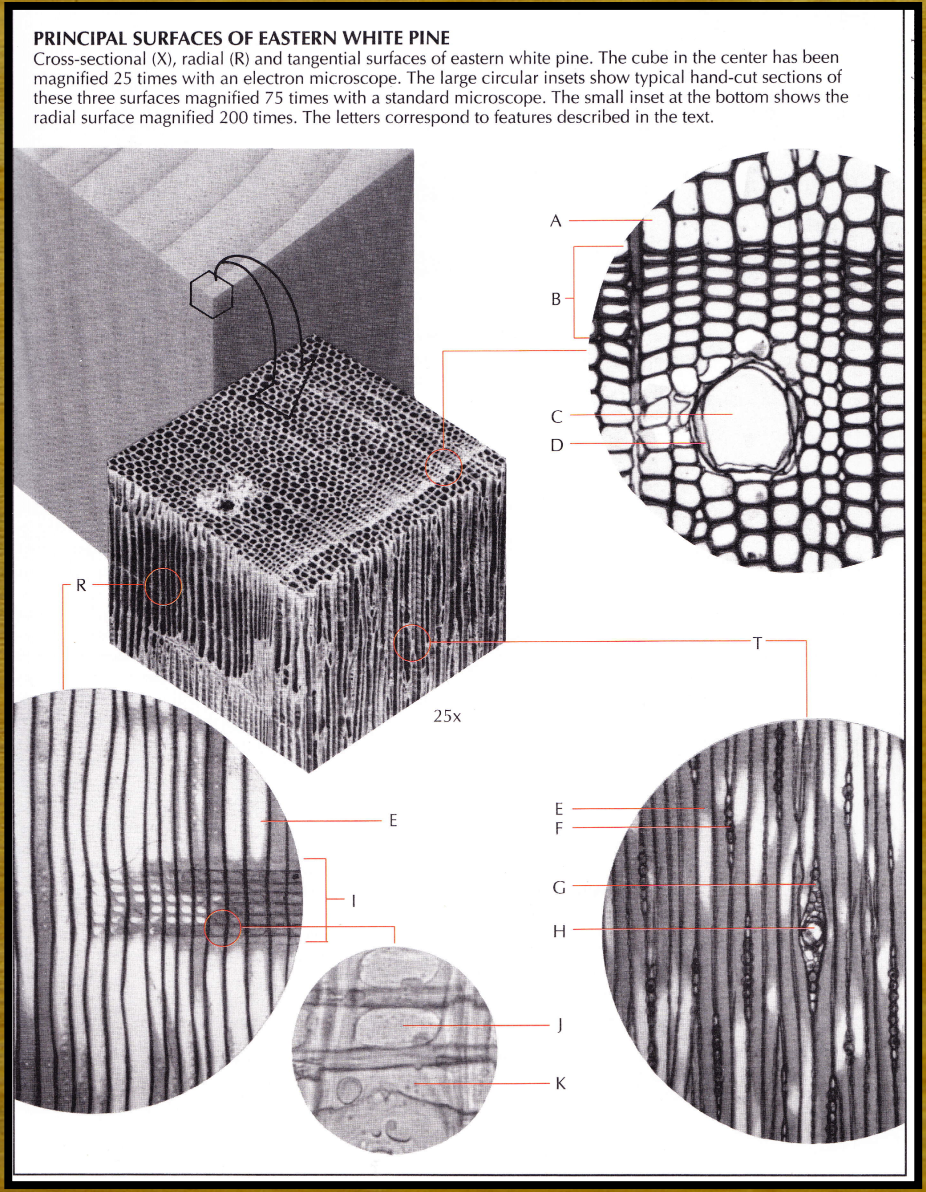
Transverse surface (I). *1*, latewood of one growth ring; *2-2a*, earlywood; *3-3a*, latewood of growth ring formed subsequent to *1*; *4-4a*, row of longitudinal tracheids initiated by earlier anticlinal division of cambial initials at *4*; *5*, longitudinal resin canal; *6-6a*, row of sectioned ray tracheids; *A,B,C,D*, bordered pits; *E*, epithelial cell; *F*, longitudinal parenchyma.

Radial Surface (II). *7-7a*, sectioned uniseriate ray; *8-8a*, sectioned fusiform ray; *G*, dentate ray tracheid; *H*, ray parenchyma; *I*, transverse resin canal; *J*, ray epithelial cells; *K*, ray tracheid.

Tangential Surface (III). *9-9a*, longitudinal parenchyma strand; *10*, fusiform ray; *11, 13, 14, 15*, uniseriate heterogeneous rays; *12*, homogeneous ray composed of ray tracheids; *E*, epithelial cells; *G*, ray tracheid; *H*, ray parenchyma; *I*, transverse resin canal; *J*, ray epithelium; *L*, opening connecting longitudinal transverse resin canals; *M*, longitudinal tracheid (latewood); *N*, longitudinal tracheid (earlywood).

Boyer et al. 2003

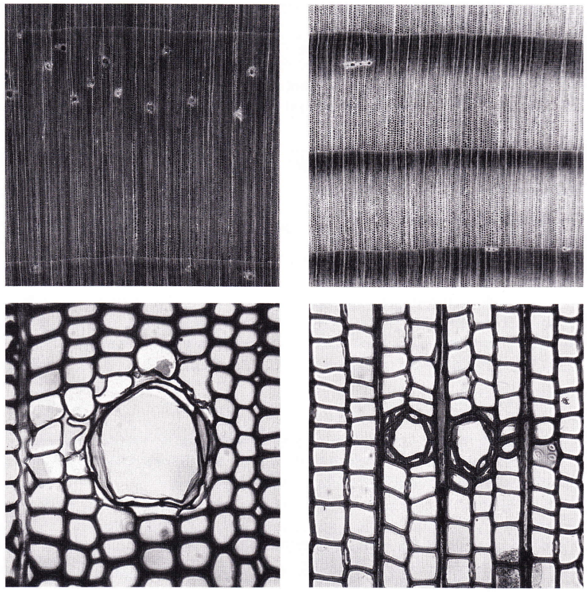
Softwood Features



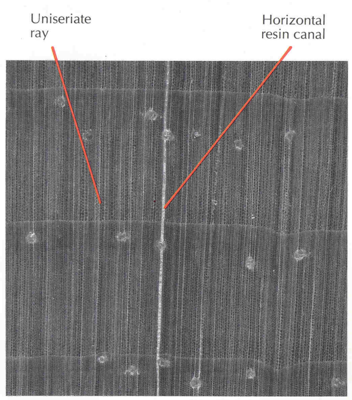
Hoadley 1990

Softwood Features

Resin Canals

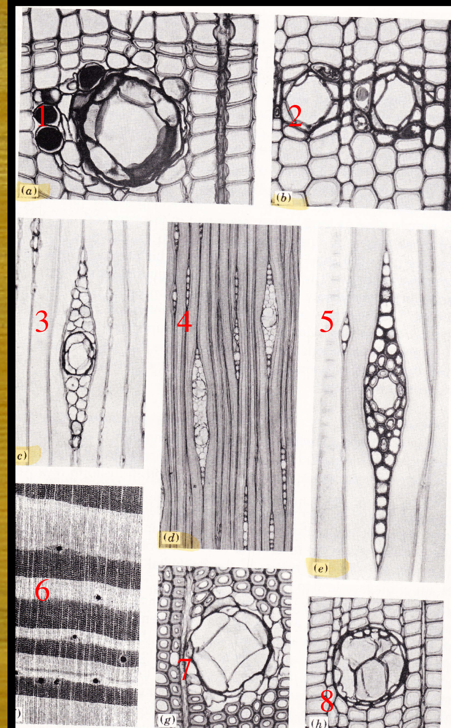


RESIN CANALS
In pines (top row, left [10x]), resin canals are usually larger, numerous and quite evenly distributed, occurring singly; the epithelial cells (bottom row, left [200x]) are thin-walled. In Douglas-fir (top row, right [10x]), spruces and larches, resin canals are usually smaller, fewer in number and erratically distributed, occurring singly or in tangential groups of four to several; the epithelial cells (bottom row, right [200x]) are thick-walled.



HORIZONTAL RESIN CANALS
A fusiform ray in this cross-sectional view of eastern white pine has been sectioned through its horizontal resin canal. The fusiform ray shows as a conspicuous radial line, distinct from the barely visible uniseriate rays. (15x)

Hoadley1990



Panshin & DeZeeuw 1980

Softwood Features

Traumatic Resin Canals

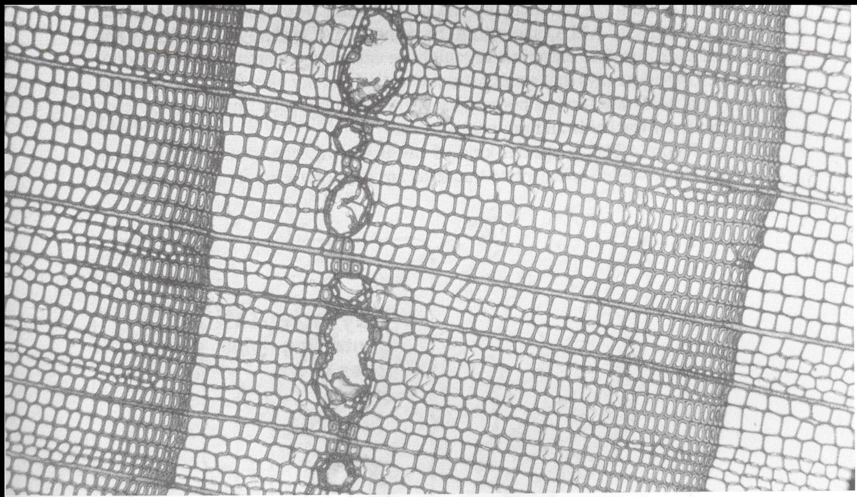
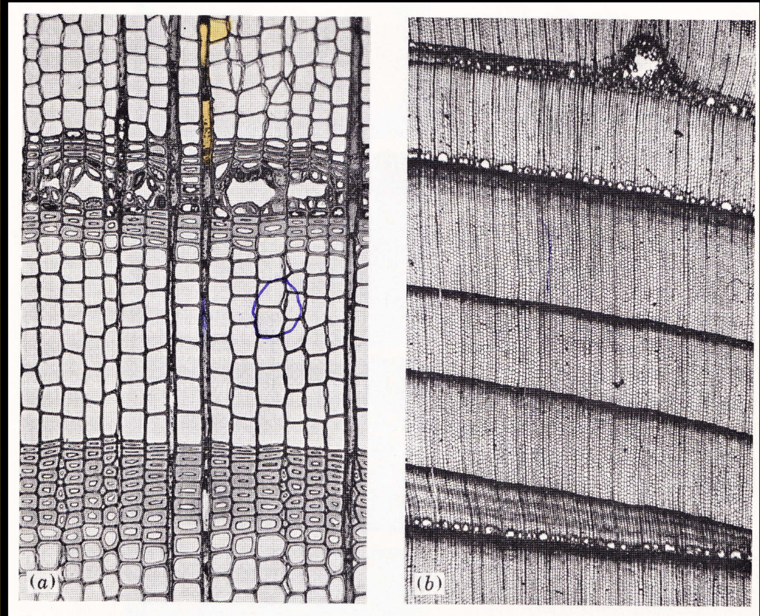


Fig. 4.8
Traumatic resin canals
Transverse view of incense cedar (*Librocedrus decurrens*). ×80

Boyer et al. 2003



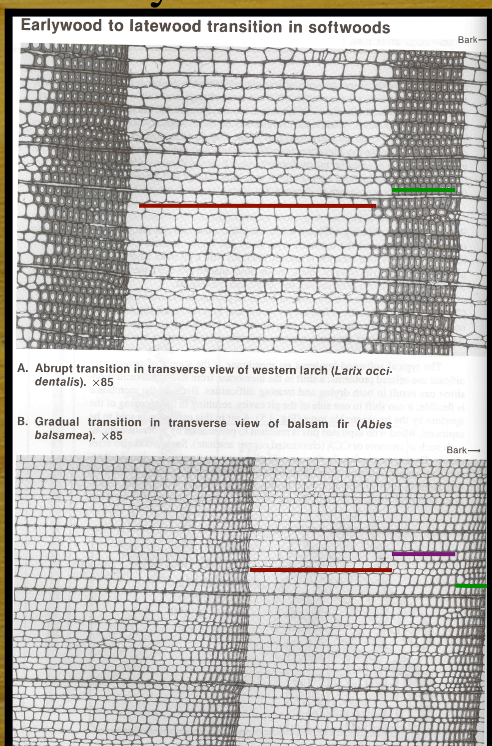
Panshin & DeZeeuw 1980

Traumatic resin canals occur as a result of injury. They are usually arranged in tangential rows of up to a couple inches and are in many instances restricted to the earlywood portion of a growth ring. The epithelial cells of traumatic resin canals as a general rule are thick-walled, pitted and appear lignified.

Softwood Features

<u>Growth Rings</u>

Softwood structure from a macroscopic view point displays <u>DISTINCT</u> growth rings typically with an earlywood and latewood component to each annual growth ring. Transition from one growth ring to the next is either gradual or abrupt as seen below. Within each ring we then look to see if resin canals are present or not and if they are normal or traumatic.



Transition

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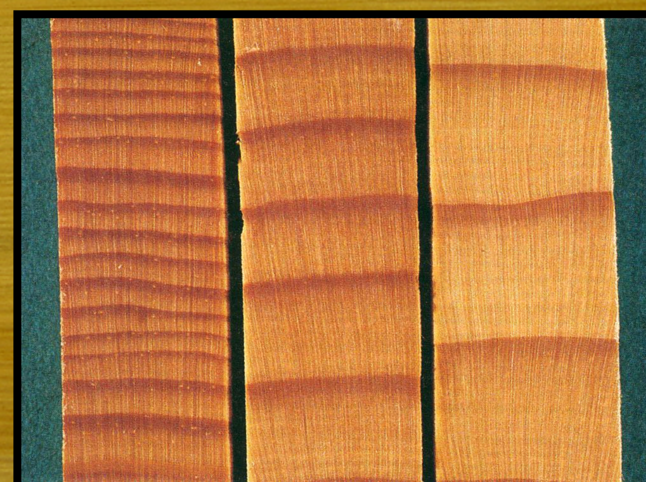
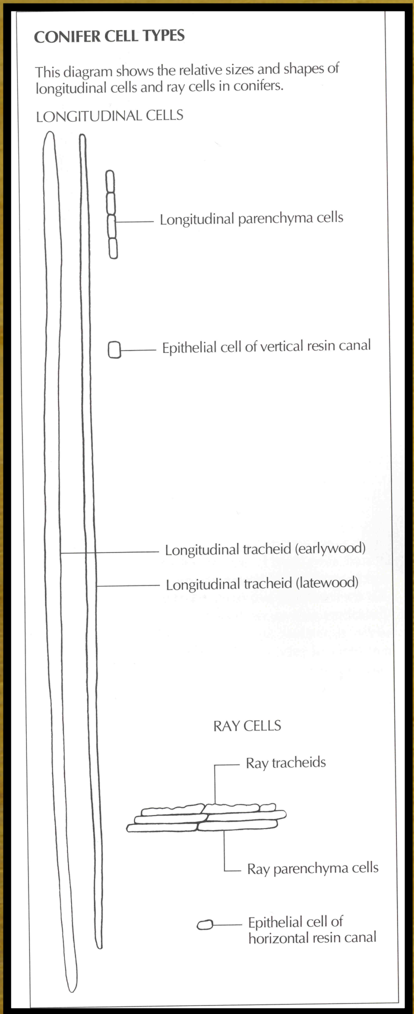


Percent latewood – what % of the growth ring is latewood.
Rate of growth – see above (L = slow, M = medium, R = fast
Radial variation – sample dependant.

Softwood Features



Hoadley 1990

Texture

In general softwoods are fairly simple in their cell make-up with over 90% being longitudinal tracheids. Other than tracheids there are longitudinal parenchyma cells, resin canals and radial oriented ray cells and resin canals. Texture is a measure of how these different cells align with one another. For example if a wood has no resin canals or axial parenchyma and has only tracheids and rays the wood is looking like a fine textured wood. So if this is the case and the tracheids are all small diameter then it is in fact a fine textured wood (Eastern Cedar, 20µm). If the tracheids are very large (Redwood, 80µm)then the wood will be coarse textured. If axial parenchyma and resin canals are present then the wood is likely at least medium textured and potentially coarse textured. In general if the cells are small, similar in size and organized then the wood is fine textured, if there are several cell types of varying sizes and arrangement then the wood is likely medium to coarse textured.

Softwood Features

Rays

Rays occur throughout softwoods at regular intervals. They occur as a fairly simple system when compared to hardwoods. Softwood rays typically are either uniseriate (one cell wide), biseriate (two cells wide) or triseriate (three cells wide and somewhat rare). Most common ray type in softwoods is uniseriate with the larger rays occurring in the lower bole of older trees. This makes the ray feature not so useful in identification.

Generally with softwoods the Rays category is somewhat dependant on the person examining the sample. Rays are small and as most softwood rays are uniseriate, they are difficult to see with the naked eye. So if you have very good eye sight you may in fact see the rays while others may not.

The best way to tell, I find personally, is to use your hand lens, find the rays and then ease the hand lens away while still looking at the rays with your eyes. This way you are not looking at artifacts that appear as rays (i.e. some striations that look like rays but aren't). So if you can see them mark it, but there are many species that the rays are not visible to the naked eye.

NOTE: sometimes it is easier to see this feature if you wet the block first.

Softwood Features

Ray size (width)

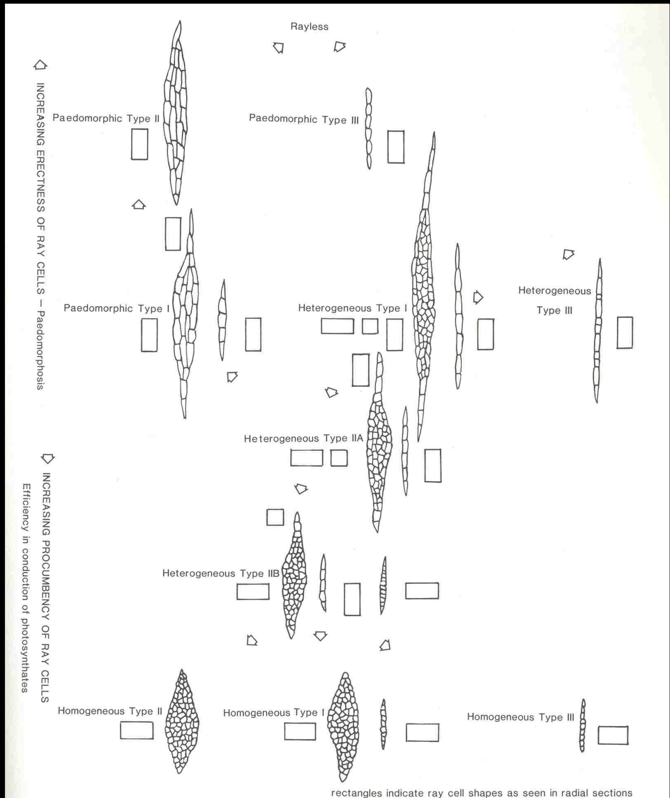
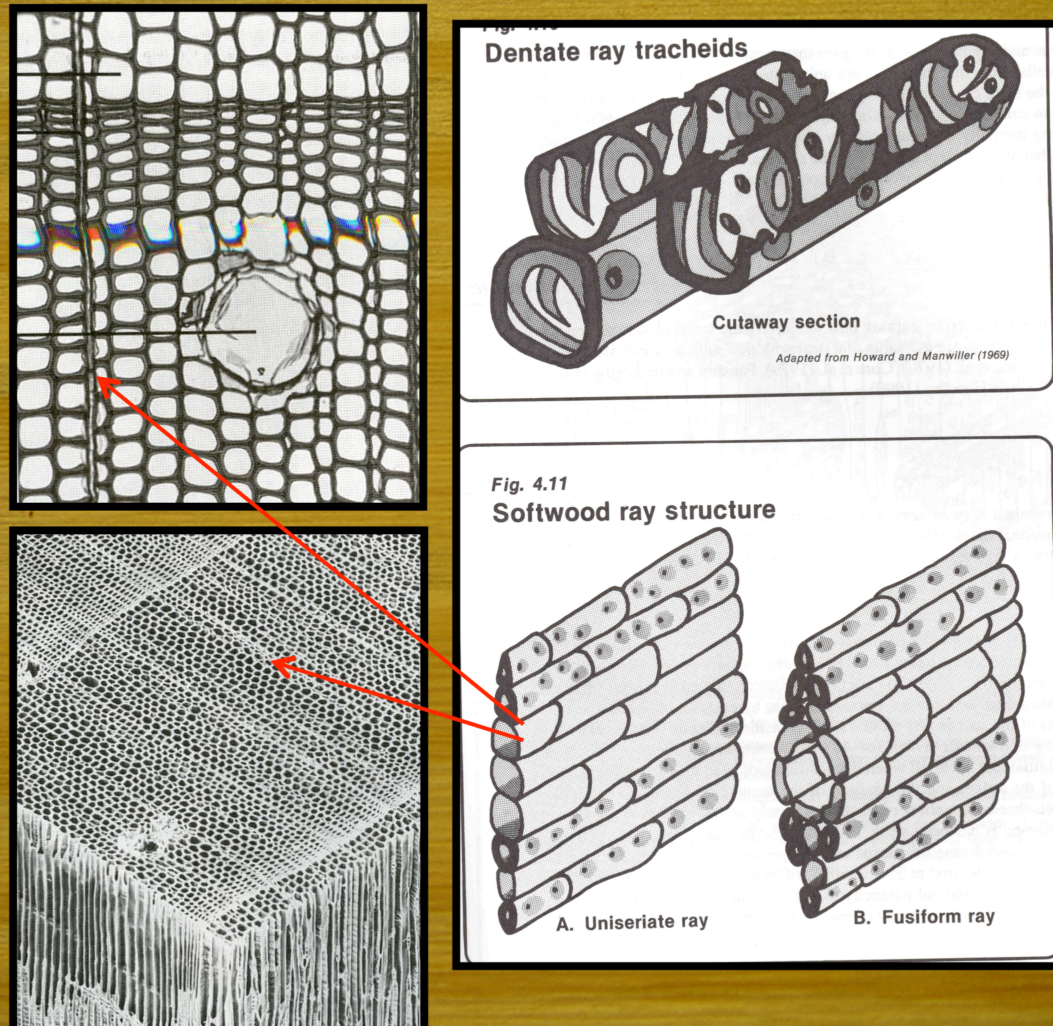


Fig. 6.2. Phylogenetic interrelationships of ray types. The seven ray types of Kribs (1935) are recognized (Heterogeneous I, IIA, IIB, III, Homogeneous I, II, III), and derivation from Heterogeneous Type I is indicated. In addition, paedomorphic ray types are proposed, and derivation of these indicated. The phenomenon of raylessness is included in this scheme



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Softwood Features

Color and Weight

Color is a feature that can be variable within a species depending on its growing conditions. Many woods have distinctive colors, for example redwood has a very unique burgundy color while western red cedar has a deep burgundy/red color. White pine has a fleshy heartwood color while firs are almost white. Fast growing trees tend not to have as intense color as slow growing trees (look at re-growth red cedar compared to old growth). Site conditions also affect color, if you look at eastern cedar on the west of Lake Nipigon the wood is very deep in color due to the red soils there, on the east side the cedar wood is much lighter as the red soils are not present there.

Another fact to consider is where in the tree you sample may have come from, if it is heartwood then it is likely the color is the one the species has been described to have (some variation on the intensity of the color is natural); however, if you sample comes from the sapwood then it will be light, almost whitewood in which case it will not match the description for that species.

So again this feature can be misleading, this is why macroscopic features can generally point you in the right direction but for a 100% answer we generally need to do microscopy.

Softwood Features

Color and Weight

Weight is a feature that can be variable within a species depending on its growing conditions as well. Many woods have distinctive weights for the species, for example tamarack is a very heavy softwood (600kg/m^3) while eastern white cedar is very light (300kg/m^3). Pines have a weight that is in the middle area. In general softwoods range from around 250kg/m^3 to over 600kg/m^3 in Canada with most below 500kg/m^3. Fast growing trees tend not to have as high a weight as slow growing trees due to more earlywood produced in each growth ring. Growth rate, as described previously affects weight as it affects EW:LW in each growth ring. Fast growing trees also do not produce as thick a secondary wall in each cell which contributes to a lower weight.

Site conditions also affect weight in that it affects growth rate as described above.

Another fact to consider is where in the tree you sample may have come from, if it is mature wood or juvenile wood zone. Mature wood is heavier than juvenile so if your sample is juvenile it will likely underestimate the species value for weight.

So again this feature can be misleading, this is why macroscopic features can generally point you in the right direction but for a 100% answer we generally need to do microscopy.