Citation: Schoch,W.,Heller,I.,Schweingruber,F.H.,Kienast,F.,2004:Wood anatomy of central European Species. Online version http:www.woodanatomy.ch

Identification key

Coniferous wood

Wood without vessels (pores), with tracheids only

Pitting in rays	Resin canals	Transversal tracheids	Spiral thickenings in tracheid walls	Species	Key characteristics
large (pinoid pits)	present	present	absent	**Pinus sylvestris**	Transversal tracheids with dentated walls, cannot be differentiated from P. mugo and P. nigra.
				Pinus mugo	Transversal tracheids with dentated walls, cannot be differentiated from P. sylvestris and P. nigra.
				Pinus nigra	Transversal tracheids with dentated walls, cannot be differentiated from P. sylvestris and P. mugo, sometimes early-/latewood transition seems more abrupt than in the two other species.
				Pinus cembra	Transversal tracheids with smooth walls, in general small growth rings, latewood zones always narrow.
				Pinus strobus	Transversal tracheids with smooth walls, in general larger growth rings, latewood zones narrow, similar to P. cembra.
small	present	present	absent	**Picea abies**	Transition from early- to latewood continuous. Resin canals with thick-walled epithelial cells. Bordered pits in axial tracheids generally uniseriate.
				Larix decidua	Transition from early- to latewood abrupt. Resin canals with thick-walled epithelial cells. Bordered pits in axial tracheids often biseriate.
			present	**Pseudotsuga taxifolia**	Transition from early- to latewood abrupt. Resin canals with thick-walled epithelial cells. Fine spiral thickenings.
	absent	absent	absent	**Abies alba**	Transition from early- to latewood abrupt. In radial section the tangential ray cell walls show distinct nodular chains.
				Juniperus communis	Colored deposits in parenchyma cells, smooth walled ray cells.
			present	**Taxus baccata**	Distinct spiral thickenings.

Dicotyledon wood

Wood with vessels (pores)

Ring-porous wood

Ray width	Perforation plates	Spiral thickenings	Species	Key characteristics
uniseriate	simple	absent	**Castanea**	Latewood with dendritic pore arrangement, rarely biseriate rays.
bi- to triseriate	simple	absent	**Fraxinus**	Latewood pores solitary or in small radial groups, thickwalled.
		present	**Hippophaë**	Ring-porous, sometimes semi-ring-porous, rays generally storied.
3- to 5-seriate	simple	present	**Ulmus**	Pores, vascular tracheids and parenchyma in latewood in tangential to slightly oblique bands.
			Robinia	Pores, vascular tracheids and parenchyma in latewood in clusters to short bands, conspicuous tyloses.
>5-seriate	simple	absent	**Vitis**	In the narrow latewood pores in radial files and small groups. Rays very wide. Vessels with scalariform pits.
		present	**Clematis**	Latewood generally narrow, growth ring boundaries festoonlike, large rays.
			Berberis	Ring-porous to semi-ring-porous, latewood pores and vascular tracheids in clusters with a tangential to diagonal or dentritic orientation.
			Laburnum	Growth ring boundaries festoonlike, rays often over 5 cells wide, gum deposits in the heartwood vessels.
			Ailanthus	Often slightly oblique to tangential parenchyma bands, often indistinct ring-porous, variable.
uni- and multiseriate	simple	absent	**Quercus**	Dendritic pore groups in the latewood, uniseriate and very broad rays.
		present	**Rosa**	Broad rays often over 10 mm high.

Diffuse- and semi-ring-porous wood (uniform distribution of pores)

Ray width	Ray type	Perforation plates	Spiral thickenings	Species	Key characteristics
uniseriate	homo-geneous	simple	absent	**Populus**	Large and simple ray-vessel pits.
			present	**Aesculus**	Pores solitary or in radial rows of two to some pores.
				Euonymus	Numerous small pores.
		scalariform	absent	**Alnus viridis**	Pores in radial multiples, rarely in clusters, scattered.
				Alnus glutinosa **Alnus incana** **Corylus**	See aggregate rays.
				Betula nana **Betula humilis**	Extremely small numerous ray-vessel pits, occasionally bi- to 4-seriate rays.
	hetero-geneous	simple	absent	**Salix**	Large and simple ray-vessel pits.
			present	**Daphne**	Pores loosely packed in dendritic patterns.
bi- to tri-seriate	homo-geneous	simple	absent	**Juglans**	Pores large, infrequent, solitary or in radial rows of 2 to 4 cells.
			absent to (sometimes: occasionally) present	**Maloideae:** **Amelanchier, Cotoneaster, Crataegus, Cydonia, Mespilus, Pirus, Sorbus**	Numerous to very numerous small pores, often indistinctly semi-ring-porous, occasionally with fine spiral thickenings.
			present	**Hippophaë**	Generally semi-ring-porous, sometimes ring-porous, rays generally storied.
				Acer	Pores widely spaced, solitary or in radial files of 2 to 3 pores.
				Prunus	See 3- to 5-seriate rays, slightly heterogeneous.
				Tilia	Vessel outlines angular, radially orientated pore files and clusters. Rays flare along growth ring boundaries.
		scalariform	absent	**Betula**	Extremely small numerous ray-vessel pits, scattered pores in radial files of 2 to 4, or clusters.
	hetero-geneous	simple	present	**Frangula**	Generally semi-ring-porous, pores rather widely spaced, especially in latewood.
				Lonicera	Multiseriate rays conspicuously heterogeneous with numerous rows of square and upright marginal cells.
				Ligustrum	Rays often with 1-2 (4) rows of square and upright marginal cells.
				Ostrya	Pores infrequently, in radial multiples of 2 to 10 pores.
				Prunus	See 3- to 5-seriate rays, slightly heterogeneous.
				Sambucus	See 3- to 5-seriate rays.
		scalariform	absent	**Buxus**	Narrow pores, round to oval scalariform perforation plates with mostly <10 bars.
				Viburnum	Rays conspicuously heterogeneous, perforation plates scalariform with >20 bars.
				Cornus	Rays markedly heterogeneous, more likely 3- to 5-seriate, scalariform perforation plates with many bars.
			present	**Viburnum**	Rays conspicuously heterogeneous, perforation plates scalariform with >20 bars. Fine spiral thickenings in the fibre tracheids: Viburnum

Diffuse- and semi-ring-porous wood (uniform distribution of pores)

Ray width	Ray type	Perforation plates	Spiral thickenings	Species	Key characteristics
3- to 5-seriate	homo-geneous	simple	absent	**Juglans**	Pores large, infrequent, solitary or in radial rows of 2-4 cells.
			present	**Prunus**	Diffuse-porous to semi-ring-porous, pores solitary or in radial rows of two to some cells or in clusters, gum deposits in heartwood vessels. Rays in some species frequent >5-seriate.
				Acer	Pores widely spaced, solitary or in radial files of 2 to 3 pores.
				Tilia	Vessel outlines angular, radially orientated pore files and clusters. Rays flare along growth ring boundaries.
		scalariform	absent	**Betula**	Extremely small numerous ray-vessel pits, scattered pores in radial files of 2 to 4, or clusters.
	hetero-geneous	simple	absent	**Sambucus**	Pores in clusters, mostly marginal bands of thin-walled vascular tracheids. Rays with sheath cells.
			present	**Prunus**	Diffuse-porous to semi-ring-porous (P. armeniaca to ring-porous), pores solitary or in radial rows of two to some cells or in clusters, gum deposits in heartwood vessels. Rays in some species frequent >5-seriate.
		scalariform	absent	**Cornus**	Rays markedly heterogeneous, 3- to 5-seriate, scalariform perforation plates with many bars.
			present	**Ilex**	Pores small, in long radial files, rays often up to 4mm high.
> 5-seriate often or predomi-nantly	homo-geneous	simple	absent	**Fagus**	Diffuse- to semi-ring-porous, rays very large, perforation plates both simple and scalariform.
				Platanus	Similar to Fagus, more often large rays, pits in vessel walls in horizontal rows.
				Hedera	Pores in clusters, predominantly tangentially orientated.
			present	Clematis	Very large pores, see ring-porous wood.
				Berberis	See ring-porous wood.
		scalariform	absent	**Fagus**	Diffuse- to semi-ring-porous, rays very large, perforation plates both simple and scalariform.
				Platanus	Similar to Fagus, more often large rays, vessel pits opposite, in horizontal rows.
	hetero-geneous	simple	absent	Hedera	Pores in clusters, predominantly tangentially orientated.
				Vitis	See ring-porous wood.
		scalariform	present	Ilex	Pores small, in long radial files, rays often up to 4mm high.
uniseriate and/to multiseriate	homo-geneous to hetero-geneous	simple	absent	**Fagus**	Diffuse- to semi-ring-porous, rays very large, perforation plates both simple and scalariform.
				Clematis	Ring-porous wood with very narrow rings appears sometimes similar to diffuse-porous wood, see ring-porous wood.
				Quercus	
				Fraxinus	
			present	Rosa	Ring-porous wood with very narrow rings appears sometimes similar to diffuse-porous wood, see ring-porous wood.
				Prunus	Diffuse-porous to semi-ring-porous (P. armeniaca to ring-porous), pores solitary or in radial rows of two to some cells or in clusters, gum deposits in heartwood vessels.
		scalariform	absent	**Ribes**	Rays often with sheath cells.
			present	Fagus	Diffuse- to semi-ring-porous, rays very large, perforation plates both simple and scalariform.

Diffuse- and semi-ring-porous wood with aggregate rays (uniform distribution of pores)

Ray width	Ray type	Perforation plates	Spiral thickenings	Species	Key characteristics
uniseriate and unregel-mässig mehrreihig	homo-geneous to hetero-geneous	simple	present	**Carpinus**	Pores in long radial files.
		scalariform	absent	**Alnus glutinosa**	Pores in radial multiples, perforation plates with generally more than 10 bars.
				Alnus incana	Cannot be differentiated from A. glutinosa.
				Corylus	Pores in radial multiples, often in dendritic arrangement, perforation plates with 5 to 10 bars.
			present	**Corylus**	

Diffuse- and semi-ring-porous wood, dendritic groups of pores

Ray width	Ray type	Perforation plates	Spiral thickenings	Species	Key characteristics
2- to 3-seriate	homo-geneous to hetero-geneous	simple	present	**Rhamnus**	Dendritic pore distribution.
				Daphne	

Diffuse- and semi-ring-porous wood, pores hardly differentiable from axial and ray parenchyma

	Species	Key characteristics
	Viscum album	Vessels, parenchyma and growth ring boundaries indistinct.

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