

Why are 'Oaks' called oaks?

Quercus is Latin for "oak tree". The Genus *Quercus* contains about 600 species of trees and shrubs (the "true" oaks) and is classified in the Family *Fagaceae*. This family includes Chestnuts (*Castanea*) the true Beeches (*Fagus*), the southern Beeches (*Nothofagus*) and other familiar trees.

Quercus is native to the Northern Hemisphere, from cold latitudes to tropical Asia & the Americas. Leaves are spirally arranged, the fruit is an acorn and the genus contains both deciduous and evergreen (live) species.

There are two main sub-genera: i) *Quercus* (with 4 or 5 Sections) and ii) *Cyclobalanopsis* which is not sub-divided. Within the Sub-genus *Quercus*, the four main groups are:

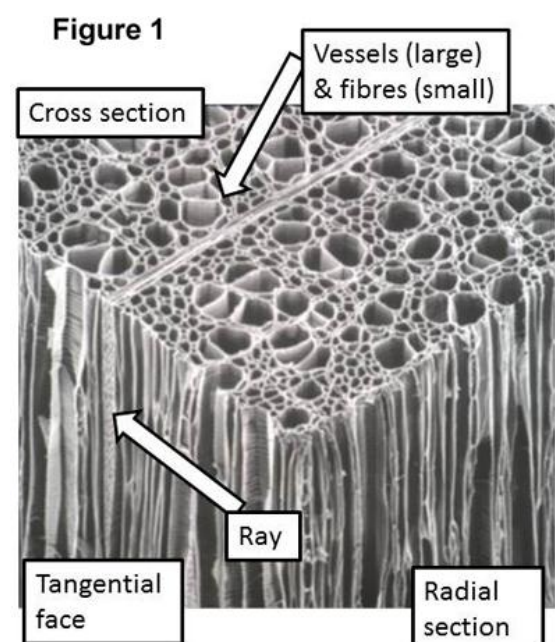
- a) *Quercus* – The white oaks of Europe, Asia and North America
- b) *Cerris* - Turkey oak & relatives in Europe & Asia (leaves with sharp lobes)
- c) *Protobalanus* – Canyon live oak & relatives in SW USA/Mexico (sharp lobes with bristles)
- d) *Lobatae* – Red (Black) oaks of North America & northern South America (sharp lobes with bristles)

The Sub-genus *Cyclobalanopsis* contains evergreen, ring-cupped oaks of eastern & SE Asia.

Botanical features of a tree can be used for identification (foliage, flower parts, fruit etc.), but they are of little value if all you have is a piece of wood. Thankfully, the anatomical features of the wood can also be used for identification and it is interesting to link the botanical features of a living tree to the anatomical features produced in the timber. The structure of hardwoods (Angiosperms) and softwoods (Conifers) differ significantly. Since Oaks are hardwoods, I will highlight the anatomical features of hardwoods.

The inner bark of a tree is called the phloem. It transports sugars and other products from the leaves down the stem. Vessels (or pores) in the xylem (sapwood) of hardwoods are aligned along the axis of the stem and transport water and nutrients from the roots up the stem. Medullary rays are aligned radially and transport sugars and auxins from the phloem to the sapwood. Fibres are much smaller than vessels and provide support and strength to the tree. These features can be seen in Figure 1.

Canberra is a great place to see both native and exotic trees that have been brought here and planted in the parks and streets of the ACT. The



book “Trees and Shrubs in Canberra” by L.D. Pryor and J.C.G. Banks (1991, Little Hills Press) provides an excellent way to check the identity of particular trees as the trees planted in the streets of most suburbs are listed. A range of Oaks have been planted around Canberra over the years but the most common are from the sub-genus *Quercus* (white oaks of Europe, Asia and North America) and the sub-genus *Lobatae* (Red or black oaks of North America).



Fig. 2 Members of the White Oak group planted around Canberra include *Quercus robur* (English oak or Pedunculate oak) from Europe and *Quercus bicolor* (Swamp white oak) from USA. These both have leaves with rounded lobes and their acorns are carried on relatively long stems (peduncles). The foliage and acorns of *Q. robur* is shown in Figure 2. In cross-section, the wood of most white oaks is similar in appearance to *Quercus alba*

(American white oak) shown in Figure 3. The cross section shows both large and small vessels, with the larger ones produced early in the season, so the growth rings are obvious (ring porous). Also evident are wide (wider than the vessels) and narrow rays, tyloses (deposits) in the vessels of the heartwood and bands of parenchyma (soft tissue) surrounding the vessels and arranged both radially and tangentially. In order to see this level of detail in the cross section of a piece wood, you will need a 10X lens and a very sharp chisel or scalpel so the end grain can be cut very cleanly.

Figure 3. *Quercus alba*

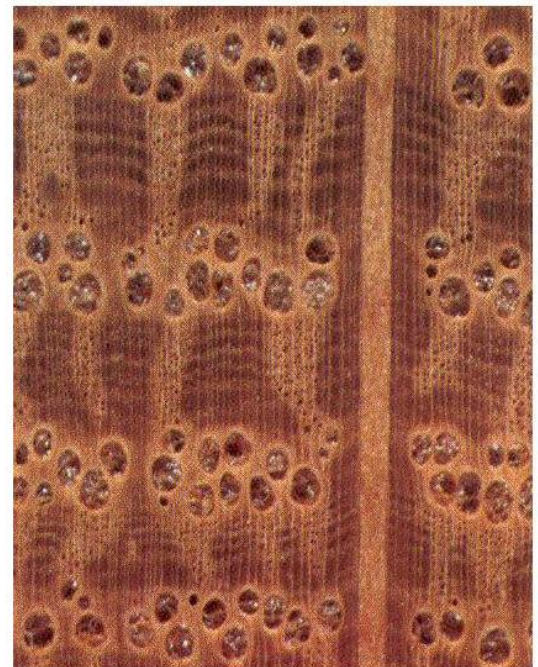
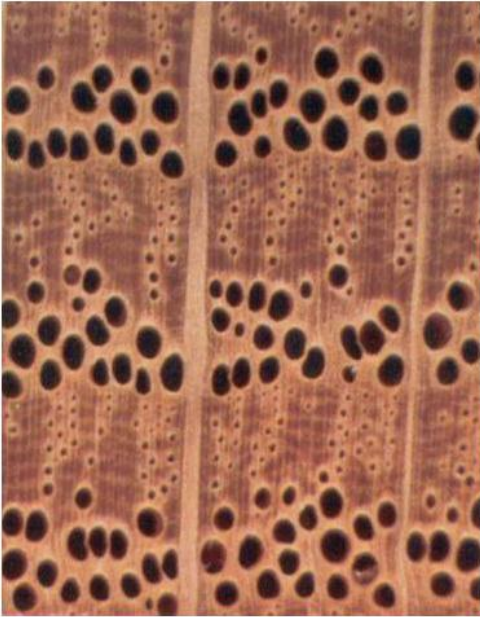


Fig. 4. *Quercus palustris*

In contrast to the White Oak group, the Red (or Black) oaks only occur naturally in North America. Members of this group are readily identified by the sharp lobes with bristles on their leaves. Figure 4 shows the foliage of *Quercus palustris*, that has been planted in many Canberra streets. In cross section, both large and small vessels are apparent in *Quercus rubra* (Red oak, Figure 5) but the vessels differ from White Oaks in that they

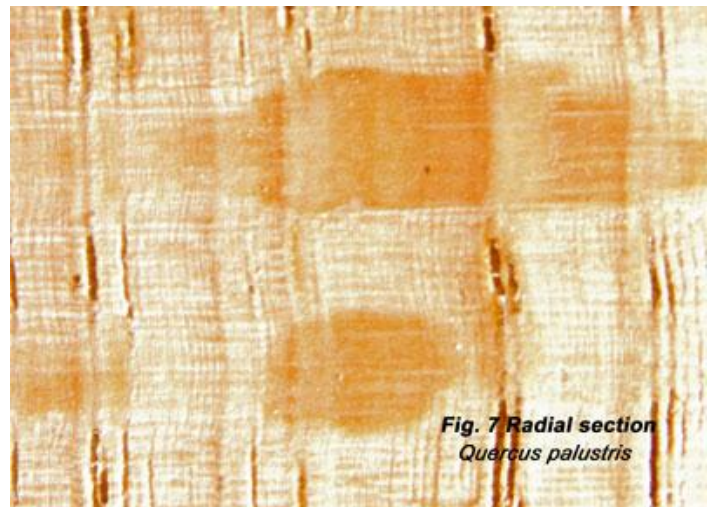
Fig. 5 *Quercus rubra*



generally contain few tyloses. Both wide and narrow rays occur in the Red Oaks but the amount of parenchyma is significantly less. The 'figure' in oak timber is due to the wide rays showing up on the surface of radially cut boards (Figure 6). By comparison, on the tangential surface the rays have 'lens-like' appearance (Figure 7).

A third group of oaks represented in Canberra is the evergreen (or live) oaks. Several large blocks of *Quercus suber* (Cork Oak) from Europe (Figure 8) have been planted in Canberra

. One 5 ha block that was planted near the Glenloch Interchange in 1917 has had cork stripped successfully. The foliage of live oaks is variable but in *Q. suber* the leaves have small lobes with short spikes. In cross section, the wood of *Q. suber* has smaller vessels than



**Fig. 7 Radial section
*Quercus palustris***

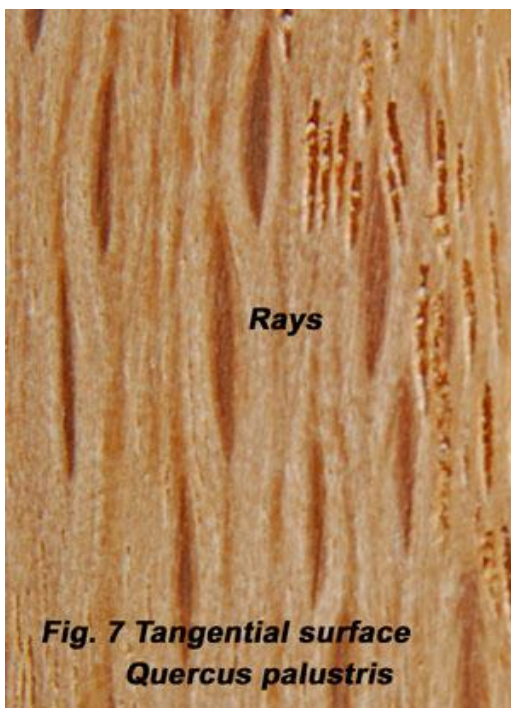
White or Red Oaks

(so the growth rings are less obvious), with less parenchyma and small amounts of tyloses in the vessels.

A number of native Australian species contain the word "Oak" in their common names. These include Silky Oak (*Grevillea robusta*), Northern Silky Oak (*Cardwellia sublimis*), Silver Oak (*Grevillea parellela*), Forest Oak (*Casuarina torulosa*), River Oak (*Casuarina cunninghamiana*), Swamp Oak (*Casuarina glauca*), Blush Tulip Oak (*Argyrodendron actinophyllum*), Red Tulip Oak (*Argyrodendron peralatum*) and many others.

These species are all botanically unrelated to the true Oaks of the genus *Quercus*. The one common aspect that seems to tie the Australian species with the true

Oaks is the presence of wide medullary rays that can be seen in the cross and tangential sections of the wood. The rays often give a dramatic quilted feature to the timber when



**Fig. 7 Tangential surface
*Quercus palustris***

they are exposed on a radial (quarter sawn) face. In many cases the features are more dramatic than those in true Oaks, because they are more highly coloured.

The term 'Tasmanian Oak' refers to a group of species including Mountain ash (*Eucalyptus regnans*), Alpine ash (*Eucalyptus delegatensis*), Brown barrel (*Eucalyptus obliqua*) and sometimes others. While these species tend to have clear growth rings, the rays are always smaller than the vessels and are quite indistinct so they do not exhibit ray figure. The term was coined purely for marketing purposes to allow a group of several species with similar timber characteristics to be marketed as a single product.

In summary, the 'true' Oaks are confined to the Genus *Quercus*. They have strong timber, are generally ring porous and have wide medullary rays. Some Australian species have 'oak' included in their common names but they are not botanically related to 'true' Oaks in the Genus *Quercus*. The main feature that they have in common with 'true' Oaks is their wide and obvious medullary rays. However, none of them are deciduous and they are not ring porous but some species of *Casuarina* have distinct growth rings. The marketing term 'Tasmanian Oak' contains several species - they do not have wide medullary rays although the growth rings are distinct and they tend to be ring porous.

**Fig. 8 *Quercus suber*
Cork oak (outer bark stripped)**



Robin Cromer