How do different species of tree respond to management?

Adapted from information provided by David Lonsdale in various publications.

For species that lack durable heartwood, the first stage of pruning should, if possible, be confined to young branches, in which most of the cross-section consists of sapwood, rather than 'ripewood' and is therefore relatively resistant to extensive fungal colonisation.
New shoots often fail to form or die back after forming if the tree of a light demanding species (***see table below***) becomes heavily shaded when reduced below the height of surrounding trees. On the other hand, in a more open-grown situation, pruning can expose the retained stem and branches of the same tree to sudden, excessive sunlight, which tends to induce severe dieback in almost any trees species. Thin barked species are, however, especially liable to such damage.

ln smooth barked species such as beech, it is sometimes possible to see the original leaf scars and girdle scars, where dormant buds could be present. The more such scars per metre-length of branch the more buds there are likely to be.

Maintenance of a good, well-foliated canopy is favoured if the retained part of the crown already has a good structure of twigs and small branches before pruning' If not, adequate leaf cover can be re-established after cutting only if the tree can produce new shoots on old branches or stems. Its capacity to do so will depend on its reserves of stored energy and its predisposition (partly genetic) to produce epicormic* shoots.

Adventitious buds, arising within the bark tissues in response to pruning or branch fracture, are another potential source of new shoots, but they occur far more often in certain species (e.g. poplars and willows) than in others (e.g. beech). There is some evidence that their formation requires stimulation by relatively bright light.

In ash *Fraxinus excelsior,* for example, relatively rapid decay of the heartwood sometimes leaves little more than a thin shell of outer sapwood even though the sapwood may still retain good physiological function.

In species that contain durable heartwood (e-g. yew or pedunculate or sessile oak), the dead branches often persist for many years, since they have a durable core of heartwood. ln other species (e.g. beech or ash), decay occurs throughout the branch cross-section leading to failure within a few years.

The presence of dormant buds is an important factor in the response to cutting. Such buds are formed by all species that are traditionally coppiced but some species retain few buds in a viable state by the time that their stems are old enough to have very thick bark. If however, epicormic growth is present, it will bear a new generation of dormant buds.

Adventitious shoots** are sometimes the source of new growth after cutting or natural fracture. Most species can produce them but no reliance can be placed on this unless local experience suggests otherwise. Only certain species (e.g. hazel) regularly produce adventitious buds from roots throughout life; these species can therefore survive being cut very close to the ground.

Owing to differences in wood properties, decay-related failure is more frequent in some species than others.

* Epicormic buds lie under the bark of a trunk or branch and remain dormant, their growth suppressed by plant hormones but which can be stimulated into growth by certain factors, such as damage to parts of the tree higher up, when they can be stimulated into developing as epicormic shoots.

** Adventitious shoots are those that arise 'out of order', being produced from tissue other than from a bud or from the growing apex of a shoot.

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Summary of Information on the responses of key species.

Ash *(Fraxinus excelsior)*
Ash has a marked capacity to produce new stems or branches after major mechanical failure, by retaining a viable wall of sapwood around a hollow centre and by producing adventitious shoots.

Beech *(Fagus sylvatica)*
Despite high shade tolerance, beech is relatively likely to die back after severe cutting, since it tends to produce relatively few epicormic shoots. Also, its lack of durable heartwood often leads to excessive development of decay.

Birch *(Betula spp.)*
A very light-demanding genus that produces a large number of new shoots when 'coppiced', birch species are considered difficult to pollard. The non-durable heartwood and low resistance of sapwood means that large pruning wounds should be avoided as extensive dieback is likely to result. Birches have a tendency to produce a large number of shoots after cutting and then die, probably for similar reasons as in hornbeam.

Hornbeam *(Carpinus betulus)*
Hornbeam has a moderate ability to produce new shoots and is 'medium' with regard to light requirements; thus a good response to cutting is possible in sufficient light. However, the lack of heartwood means that the creation of big wounds will lead to extensive decay in the sapwood, leading to dieback of the new growth.

Lime *(Tilia spp.)*
Despite lack of a durable heartwood, lime produces sufficient shoots to survive well following pruning; it has very well defended sapwood.

Oak *(Quercus robur & patrea)*
With its durable heartwood and moderate ability to produce new shoots, oak may survive hard cutting but this is a high risk strategy because sometimes the new growth is so limited that the tree retains only a small leaf cover, which can at best maintain the survival of its 'functional units'. (In this context, a functional unit consists of foliage and roots connected by sapwood in the stem. A young tree might consist of a single unit but several units are likely to be recognisable in an old tree.) Since oak is ring porous, its large earlywood vessels are highly efficient at conducting water but its sapwood forms a relatively narrow band under the bark. ln old oaks this band tends to be *very* narrow so that over-heating from strong sunlight can be a problem. Also, mildew of young leaves and shoots presents an increasing problem for summer-cut trees, owing to uncontrolled moisture loss via the affected leaves.

Sweet chestnut *(Castanea sativa)*
Owing to ready production of new shoots, a durable heartwood and highly resistant sapwood, sweet chestnut can respond well to cutting and may withstand removal of large limbs. It usually tolerates hot dry conditions better than oak, perhaps because it is not affected by mildew. Also, although it similarly has a narrow band of ring porous sapwood, its vessels are different in shape and size, perhaps adding to its stress-tolerance

Yew *(Taxus baccata)*
Owing to very high shade tolerance, abundance epicormic production and durability of heartwood, yew is usually very amenable to pruning, although can be killed if the subsequent conditions are desiccating.

Willow *(Salix spp.) & Poplar (Populus spp.)*
Both willow and poplar respond well to cutting and produce abundant new shoots when they receive sufficient light. However, they have non-durable heartwood, or are lacking distinct heartwood, and the sapwood has a low resistance to decay, which is likely to become extensive if big pruning wounds are made. A poor response is likely in shady conditions.