

Clearwood Pruning and Tree Selection

Two of the major management decisions a plantation owner will make are when and if to prune and the timing of the thinning. The decision of, if to prune, will dictate the management of the stand for the rest of the rotation.

Pruning is costly in time and money and can be risky if not carried out correctly. When considering pruning, the plantation owner should consult timber processors about desired species and future markets for knot-free timber. The distance from these markets should also be taken into account. However as the owner of a small plantation, the aim should be to produce a high quality product, hence the question must be asked: Can you afford not to prune?

Small plantations can be considered to be under 20 hectares in size

The major source of degrade in plantation timber is knots. Knots impact on the strength of timber as well as its appearance and ability to be sawn. To produce knot-free or 'clear' wood, branch pruning of the trunk must be carried out early in the life of the plantation and over a number of seasons.

The benefits of pruning to produce clear wood are potentially rewarding as the availability of high quality timber decreases. One essential requirement for high-priced timber is that it be knot-free timber.

Self-Pruning Eucalypts?

Many of the eucalypt species grown commercially on the East-Coast of Australia are by nature fast growing and intolerant of competition for light and nutrients from other trees. They are also arguably 'self pruning' although the branching habit of the species needs to be considered with regard to this.

In a plantation, the tree grows rapidly towards the light resulting in canopy closure. The lower branches, now cut off from the light source, cease to function effectively as energy processors for the tree and gradually die off (senesce). This phenomenon of self-pruning is also described as a ***rising (green) crown***.

Once dead the branch eventually snaps off at its base or further up the branch and the tree stem grows over the dead wood stub, forming a knot (Figure 1). There is no time limit for this process; some branches can senesce and leave a clear stem over a short time, while other branches can hang on for years depending on the availability of side-light and competition around the tree.

Unpruned timber will therefore have branches and bark incorporated throughout the wood profile as the tree grows, ultimately resulting in degraded timber.

Branching Habit

Different species have different branching habits. Blackbutt for example has a finer branching system when compared with the coarser branching habit of Flooded Gum. Gympie Messmate in particular holds onto its branches for a long time. The density (or stocking) of the plantation also affects the size of the tree branches with coarser branches forming in low density stands compared with the more slender branches formed in high density stands. Tree density and the branching habit of the species needs to be considered when devising a pruning and thinning strategy.

Why Prune?

A clearwood pruning operation will remove *green branches* to a given height at the same time. This leaves a core of knotty timber while the wood produced after pruning will be knot-free.

As the tree grows additional pruning operations or lifts are carried out further along the stem, maintaining the original knotty core diameter and increasing the length of knot-free timber.

The advantages of pruning over self-pruning are

- 1. Pruning removes larger, more persistent branches that will impact on the volume of timber recovered and the grade that the log is placed in.*
- 2. if the plantation has been measured before and after pruning, the owner of the pruned plantation can guarantee the amount of clearwood available to the buyer by subtracting the volume of knotty core from the volume of merchantable timber.*
- 3. For smaller plantations the product is more able to be sold and a higher price can be negotiated for the product.*

Knotty Core

The core is made up of the diameter measured over the pruned stubs plus the diameter involved in the healing over of the stubs. If for example, the objective was to restrict the size of the defect core to less than 13cm diameter and the callus growing over the pruned stubs takes about 3cm in diameter to seal it, then pruning would need to take place when the stem diameter was 10cm or less. Figure 1 demonstrates the effect of pruning to achieve clearwood production and the importance of early pruning to minimise the size of the knotty core.

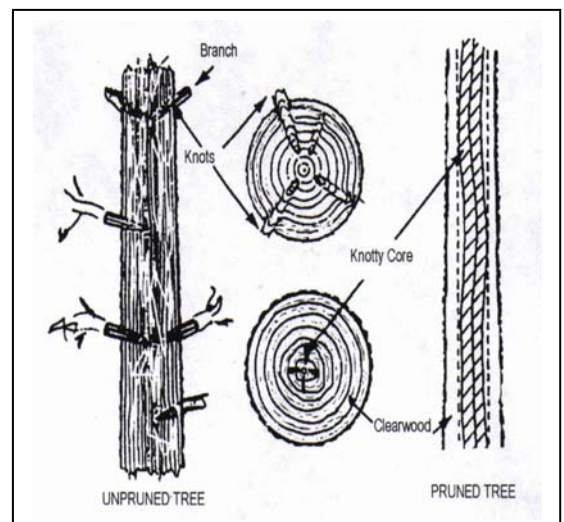


Figure 1. Cross and longitudinal sections showing the effects of pruning and not pruning.
Source: Bragg A. 1997

Pruning Aims

The aim of clearwood pruning should be to produce the highest volume of clearwood over a given rotation, without compromising the health and vigour of the plantation.

To achieve this, proper attention should be given to:

1. *Pruning Selection*
2. *Pruning on Time*
3. *Pruning Height*
4. *Pruning Technique*

These terms are explained below:

1. Pruning Selection

Pruning is a costly operation in time and/or money. Contractors can charge between \$1.50 to over \$2.50 per tree depending on the pruning height, conditions, number of trees pruned etc. The time taken to select and prune a tree can range from 2 minutes for an experienced contractor to a lot longer for an experienced worker, again depending on conditions.

As a result, it pays to carefully select the trees that you will prune.

As a guide, select trees that are:

- Straight to at least 6 metres
- Dominant or co-dominant - compared to surrounding trees in the plantation
- Not obviously damaged or affected by insects (eg. stem borers)
- Small-branched – The maximum branch size should be less than 3cm and most branches should be under 2cm in diameter or less. Pruning large branches significantly increases the chance of infection and time taken for occlusion
- Healthy – avoid trees which have been under prolonged insect attack. Stressed trees are not growing vigorously and if pruned, may be overtaken by unpruned tree and become suppressed

The criteria for thinning your plantation will be similar. That is, only the straight, healthy, pruned ?, dominant and co-dominant trees will be chosen as 'final harvest trees and the rest will be either thinned or grown as lower quality logs.

2. Pruning on Time

A pruning operation should ideally be started and finished in the same season. There is no significantly better season to prune, but prune should not be undertaken in times of high humidity i.e. when it is wet, as this reduces the chance of fungal infection on the pruned stem. As pruning is hot, hard work it may also be more pleasant to prune in the cooler months.

Pruning should be timed so that green rather than dead branches are pruned.

Green branches tend to grow over or 'occlude' faster and do not leave a loose knot. Pruning dead branches may cause loose knots, which impact on the strength and stability of sawn timber. It may also result in the loose branch stub being pushed to the outside of the stem as the tree grows, creating a knot hole and space for further degradation by insects and/or fungus.

3. Pruning Height

The plantation owner must take into account three factors when considering the height in which to prune their stand. These are:

1. *Presence of green branch*
2. *Green crown height*
3. *Market specifications*

The height to which a tree can be pruned in a single lift is governed by the height of the green crown. Pruning more than 50% or 'scalping' the green crown will result in a reduction in growth of that tree. The implications other than slower volume growth are that unpruned trees next to the scalped tree may grow faster and eventually suppress the pruned tree.

As mentioned a pruning operation should be timed to include green rather than dead branches and pruned height should coincide with the market specifications for sawlog length. As a general rule for example, many plantation owners aim to prune their best trees to a maximum of 6 metres.

When all three factors are considered, the popular target of 6 metres can only be achieved through three lifts, which can occur over three to five seasons. However as branch size and natural attrition may be an issue, not all the pruned trees will reach 6 metres, some may be pruned to a lower height.

For a small plantation a typical clearwood pruning strategy might be:

Year 2-3 – First Lift

No. stems suitable for pruning: – 400

Average Height of Trees Suitable for Pruning :– 6.5m

Pruned height :– 1.8 metres

Year 3-4 – Second Lift

No. stems suitable for pruning: – 250

Average Height of Trees Suitable for Pruning: – 9.5m

Pruned height: - 3.3 metres

Year 5-6 – Third Lift

No. stems suitable for pruning: – 200

Average Height of Trees Suitable for Pruning : – 14m

Pruned height: - 6 metres

4. Pruning Technique

Good pruning technique is important to ensure a quick operation and a healthy, pruned stand. When pruning, or hiring pruning contractors, these points should be considered.

- When a branch is pruned it should come off cleanly so as not to tear the surrounding bark. Torn bark opens the tree to infection, causing wood quality problems;
- the wound formed from the pruned branch should have as little surface area as possible to reduce the chance of fungal infection. To facilitate this, trees with large branches and branches with an acute angle to the main stem should be avoided during tree selection;

- when pruning ladders are leant against the tree, care should be taken to avoid any damage to the bark;
- Branches should be pruned as flush as possible to the branch collar. (Figure 2)
- Pruners should avoid 'coathangers' or stubs protruding more than 5mm from the branch collar (Figure 3).
- Avoid scalping the tree by estimating the pruning height limit before pruning the tree.

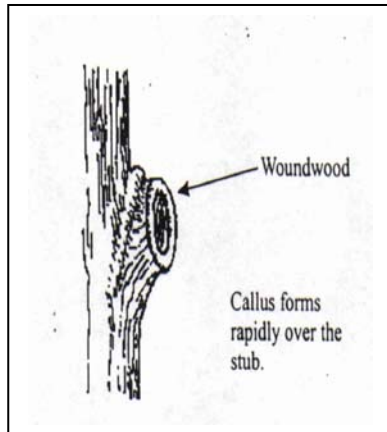


Figure 2: Correctly pruned branch showing the branch collar.

Source: Bragg A. 1997

Measuring Your Pruned Stand

Pre-Pruning

The stand should be measured before a pruning operation to ascertain the number of trees to be pruned. Data collected should include height and diameter at breast height. It will also be useful to record the number of trees suitable for pruning according to the selection criteria mentioned above.

Criteria chosen will depend on the:

1. *Target market*
2. *Species*
3. *Funds and time available*
4. *Form, health and vigour of the stand*

Data can be collected via randomly selected plots with (preferably) around 15 - 20 trees in each plot. In a 1000 tree/hectare plantation, plots of 0.02 hectares are sufficient. The more plots the more accurate the estimate will be, however one plot per three hectares, with a minimum of three plots, is a good guide.

Post-Pruning

The post pruning inventory is crucial as it records the pruned height and the actual diameter of the knotty core (Figure 3). It is from this data that the volume of clearwood can be later calculated at harvest.

If contractors have been used, the post pruning inventory is essential for assessing if your pruning specifications have been adhered to and the correct number of trees have been pruned and to the correct height.

A 100 x 6 metre transect (.06 hectares) at 70 degrees to the planted row provides a quick assessment of a pruned stand.

Pruning and Thinning

In a small plantation grown for high quality sawlogs, thinning should be considered between first and second pruning lift. This is because by pruning, the trees for final harvest have already been selected and will be competing for space and light against trees that have not be pruned. These unpruned trees may grow faster than the pruned trees eventually suppressing the pruned trees. They should be considered for thinning.

Although the increased light resulting from thinning may encourage epicormic growth from the branch stub, the second pruning lift will control this without affecting knotty core measurement.

Pruning more than 50% or 'scalping' the green crown will result in a reduction in growth of that tree. The implications other than slower volume growth are that unpruned trees next to the scalped tree may grow faster and eventually suppress the pruned tree.

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Source Material

Tree Pruning for Quality Wood Production

Bragg, A Department of Natural Resources, 1997.

Thinning Hardwood Plantations: A guide for Northern NSW

Black, J & Simpson, A. Northern Rivers Private Forestry, 2001.