



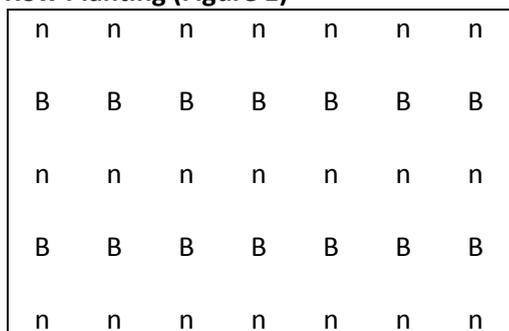
This series on Blackwood has five parts. Each part can be read individually or as part of the series.

1. Overview
2. **Establishment**
3. Pruning Regime
4. Thinning Regime
5. Labour Estimates

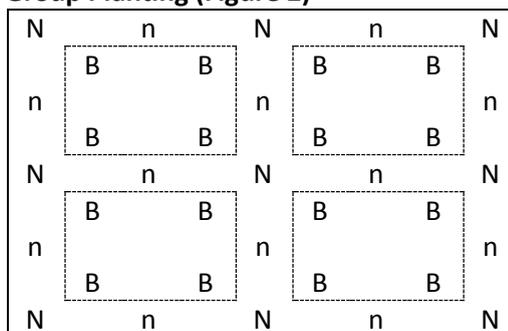
PLANTING DESIGN / LAYOUT

The following planting design options are recommended for establishment of a blackwood plantation. Both layouts may be established either with or without a nurse crop. Ongoing form pruning will be required to produce trees of acceptable form.

Row Planting (Figure 1)



Group Planting (Figure 2)



Row Planting (Figure 1)

- Easiest and cheapest planting design to establish.
- Suitable where ripping and mounding is to be undertaken.
- Even distribution of final crop trees is not guaranteed.
- Thinning must take into account the spacing between final crop trees.

Where possible, rows should be orientated perpendicular (90 degrees) to the direction of the prevailing wind. Rows established in the same direction as the prevailing wind may funnel the wind between the taller nurse crop trees. Form and growth rate of the blackwood is likely to be reduced under such conditions, increasing the form pruning requirements. This may not always be possible when ripping and mounding, as constraints upon row direction may be dictated by the Forest Practices Code.

Distance b/w blackwood trees within rows (m):	2.0	2.0	2.0	2.5	2.5
Distance b/w blackwood rows (m):	6.0	7.0	8.0	6.0	7.0
Initial Blackwood stocking (stems/ha):	<u>833</u>	<u>714</u>	<u>625</u>	<u>667</u>	<u>571</u>

If utilising a nurse crop, it is recommended that the rows of nurse crop species are no closer than 3.0m from the rows of blackwood (blackwood rows 6.0m apart). At this distance, significant suppression of the blackwood may occur as early as age 4-5, particularly when fast growing eucalypts such as *E.nitens* are planted as the nurse crop.

Group Planting (Figure 2)

- A slightly more difficult and expensive planting design to establish.
- More suitable for smaller areas where ripping and mounding are not undertaken.
- Relatively even distribution of final crop trees is ensured.
- Thinning is simply to the best tree/group, with no need to take into account the spacing between final crop trees.
- Final stocking is determined at establishment.
- Final stocking may be less than anticipated, as not all groups are guaranteed to produce a final crop tree of suitable form, health and vigour.
- Three to four blackwood are planted as a group, with 1.5 - 2.0m between trees within each group.

Distance b/w groups (m):	6.0	6.5	7.0	7.5	8.0
Number of groups/ha (final stocking):	<u>278</u>	<u>237</u>	<u>204</u>	<u>178</u>	<u>156</u>

Group planting and Nurse Crop Density

A. Fully Nursed

- A nurse crop tree is planted at all locations, as indicated by 'N' and 'n' (Figure 2).
- Planting ratio of nurse crop trees to groups is 3:1. Groups planted at a spacing of 7.0m (~200 groups/ha) will require ~600 nurse crop trees/ha, for a total stocking of ~1,400 stems/ha (assuming four blackwood planted / group).
- Shelter and sidelight suppression are maximised, with the aim of minimising the amount of form pruning required.
- Suppression of the blackwood by the nurse crop may occur relatively quickly, requiring regular monitoring and four thinning operations.

B. Partially Nursed

- A nurse crop tree is planted at all locations, as indicated by 'N' (Figure 2).
- Planting ratio of nurse crop trees to groups is 1:1. Groups planted at a spacing of 7.0m (~200 groups/ha) will require ~200 nurse crop trees/ha, for a total stocking of ~1,000 stems/ha (assuming four blackwood planted/group).
- Shelter and sidelight suppression are reduced compared to a fully nursed planting, increasing the form pruning requirement.
- Suppression of the blackwood by the nurse crop will be reduced, and occur later in the rotation compared to a fully nursed planting. Only two thinning operations are required to release the blackwood.

For optimum results when utilising nurse crops and group planting, each nurse crop tree planted at position 'N' should be successfully established. Any 'N' planting positions that fail to establish successfully can be re-planted 12 months after initial establishment. Nurse crop trees at positions 'n' are not as critical, provided a high proportion of successful establishment is initially achieved.

How many blackwood should be established?

Blackwood only

A planting ratio of at least 4:1 should be established. If a final crop stocking of 200 stems/ha is the objective, a minimum of 800 blackwood stems/ha should be planted.

Blackwood planted with a nurse crop

A planting ratio of at least 3:1, and preferably 4:1, should be established. For a final stocking of 200 stems/ha, a minimum of 600 blackwood stems/ha should be planted.

NURSE CROPS

The aim of a nurse crop is to force the blackwood to produce a straight stem of the desired length. Once this has been achieved the nurse crop is no longer needed and should be removed¹.

Advantages

- Increased shelter improves height growth and form of the blackwood.
- Sidelight suppression reduces branch development.
- Form pruning inputs are reduced.

Disadvantages

- Nurse crops can impose considerable suppression upon blackwood growth if thinning is not undertaken at the appropriate time.
- Additional costs are associated with the establishment and management of the nurse crop.
- Thinning of the nurse crop must be undertaken in several stages to reduce the potential for windthrow of the blackwood.
- The requirement to form prune the blackwood is not eliminated.

Nurse Crop Species

Fast growing eucalypts such as *E.nitens*

- Commonly planted as a nurse crop, although success is limited due to inappropriate management.
- Provides shelter and sidelight suppression from a young age, reducing form pruning requirements early in the rotation.
- Fast growth rates can result in significant suppression of the Blackwood as early as age 4-5, depending upon initial spacing.

Slower growing eucalypts such as *E.obliqua*

- Limited experience and knowledge to date with this species as a nurse crop.
- Shelter and sidelight suppression is not achieved as quickly, potentially increasing form pruning requirements.
- Slower growth rates result in less suppression of the blackwood, particularly early in the rotation.
- A greater window of opportunity exists for appropriate timing for removal of the nurse crop.

Pinus radiata

- Commonly planted as a nurse crop in the past, although with limited success.
- Early growth is slow. Blackwood usually outgrows the pine for the first few years. If utilised, *P.radiata* should be planted 1 year ahead of the blackwood.
- Shelter and sidelight suppression are not achieved until the *P.radiata* begins to outgrow the blackwood, usually from age 3-4 onwards.
- Effective 'nursing' of the blackwood is only achieved for 2-3 years, after which the *P.radiata* begins to suppress the blackwood significantly.
- *P.radiata* has a conical crown, compared to the more cylindrical crowns of the eucalypts. This conical crown shape further reduces effective shelter and sidelight suppression, particularly in the top third of the blackwood crowns.
- *P.radiata* has proven difficult to kill with stem injection, unlike the eucalypts. Manual felling may not be an option due to the risk of damaging the blackwood.

Blackwood established without a nurse crop

- Suitable form may be achieved with form pruning only. However, form may not be as good as that achieved with an appropriately managed nurse crop.
- Generally only suitable for very sheltered sites, or where shelterbelts are incorporated into the plantation design to reduce the impact of wind.
- Form, health and vigour of the blackwood are reduced by wind exposure.

WEED CONTROL

Important note: You should seek expert advice before applying chemicals, as incorrect applications may kill all trees.

Blackwood responds well to weed control. Knockdown and residual herbicides should be utilised at establishment. Release spraying (post-planting weed control) in the first growing season may be required, depending upon initial weed control and subsequent growth.

- Commence control of woody weeds such as blackberry 12 months before planting as a second application may be required.
- Spot or strip spray with glyphosate. If ripping and mounding, undertake cultivation prior to the application of residual herbicide.
- Spot or strip spray with atrazine or simazine for residual weed control prior to planting. At this stage, little information is available on the impact of other residual chemicals upon blackwood. Hexazinone commonly used for weed control within *P.radiata* plantations is likely to kill blackwood seedlings.

Warning

Experience to date has indicated that blackwood is very susceptible to herbicides that are effective against legume species. Read the label carefully and if it indicates that the herbicide controls legume species then **do not** apply post-planting. Products that contain metsulfuron methyl have some soil residual activity and control pasture legumes.

Post-planting weed control for nurse crops?

It may be beneficial not to undertake post-planting weed control around fast growing nurse crop species such as *E.nitens*, provided good initial weed control and successful establishment was undertaken. This approach is likely to slow initial growth of the *E.nitens*, potentially delaying the onset of suppression.

BROWSING CONTROL

- Blackwood is palatable to all browsing species, particularly wallabies and pademelons. Damage can also be expected from stock, rabbits, hares and possums.
- Poisoning, shooting and trapping may be used individually or in combination. A permit from the Parks and Wildlife Service is required for these activities.
- Fencing is expensive, particularly for small areas with a high perimeter to area ratio. For all but small areas (generally less than 1 hectare) fencing is usually a cheaper and potentially a more effective means of browsing control than tree guards.

Tree Guards

Experience with tree guards has delivered mixed results. Guards at least 90cm in height have proved successful at preventing browsing by pademelons, rabbits and hares. Possums have caused browsing problems with some guard designs. Possums can climb wire and plastic mesh guards, feeding on the foliage emerging from the top of the guards and occasionally breaking the stem at or above the top of the guard.

Advantages (tree guards)

- Growth is accelerated, with improved height in the first season.
- Form inside the guard is generally excellent, with little branch development and little or no pruning requirement.
- Post-planting release spraying is quicker and safer as the guard provides some protection.
- Potentially cheaper than fencing if establishing very small areas. Guards may be removed after 1-2 years and re-used for establishing further areas.

Disadvantages (tree guards)

- The top of the guard is a potential zone of stem abrasion as seedlings emerge from the guard and become subject to wind. Few guard designs successfully prevent this abrasion and potential stem damage.
- Ongoing control of possums with shooting or trapping may be required in conjunction with guards, depending upon design.
- Potential wind instability if guards are removed too early.
- Time consuming to install and remove.
- If good weed control is not achieved, excessive weed growth inside the guard can occur, reducing or even preventing growth of the seedlings.
- Expensive, at approximately \$2-\$4/guard, depending upon design.

FERTILISING

It is recommended that 150g of superphosphate (Phosphorous fertiliser) be applied to each tree 1-2 months after planting, provided good weed control has been achieved. The application of nitrogen (N) is not recommended, as blackwood is a legume and capable of fixing extra nitrogen from the soil through nodules that develop on the root system. Studies have indicated that the application of Phosphorous to blackwood can increase growth rates and root nodulation, while the addition of N has no significant effect².

Application Method

Measure 150 grams of superphosphate into a container (eg: spray can cap) to calibrate the application. Sprinkle the superphosphate around each seedling, ~50cm from the base. Unlike N, P does not escape into the air and does not need to be buried.

Fertilising of the Nurse Crop

It may be beneficial not to fertilise a fast growing nurse crop species such as *E.nitens*, provided good weed control allows them to establish successfully. This approach is likely to slow the initial growth of the *E.nitens*, potentially delaying the onset of suppression of the blackwood.

SUMMARY

- Row or group planting is appropriate.
- Good weed control is essential to promote early growth.
- Browsing control (usually fencing) is essential to ensure successful establishment.
- Nurse crops can improve height growth, form and health of the blackwood. However, if not managed appropriately (timely thinning) they often result in failure.
- Shelterbelts planted around the perimeter of the blackwood can increase effective shelter.
- If fertilising the blackwood, apply P fertiliser only, in the form of superphosphate.

REFERENCE

¹ Nicholas, I. & Brown, I., (2002). Blackwood: A Handbook for Growers and Users. Forest Research Bulletin 225, New Zealand Forest Research Institute Limited.

² Pinkard, E.A. & Beadle, C.L., (2002). Blackwood (*Acacia melanoxylon* R.Br.) plantation silviculture: a review, Australian Forestry, Vol. 65, No. 1, pp.7-13.



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