Blackwood

Info Sheet No. 1 - Overview

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

OVERVIEW

Blackwood (Acacia melanoxylon) is native to Australia. It is one of the largest and longest lived of the Acacias. It occurs throughout most of Tasmania and much of eastern Australia, from south-eastern South Australia to northern Queensland. Blackwood tolerates a wide range of soil types and rainfall zones. On dry, exposed sites with poor soils and low rainfall it can form a small shrub with no commercial value. On high quality sheltered sites with high rainfall it can form large commercial timber trees up to 40m in height and 1.5m in diameter. Native blackwood can be found growing in a wide range of environmental conditions, however, high quality commercial timber trees develop in the following forest types.

Blackwood Swamps

- Located in northwest Tasmania, these relatively flat, low lying areas are not true swamps, but are seasonally flooded with slow moving oxygenated water. During summer and autumn the soil profile is relatively dry.
- Prolific regeneration from ground stored seed occurs following wildfire or logging. The competing vegetation is particularly dense in tea-tree and paperbark species, resulting in intense competition for light. Under such conditions, blackwood usually forms a straight, single stem with little branch development.
- As height growth of the competing vegetation slows, blackwood expands its crowns and becomes dominant, forming high quality timber trees.

Wet Eucalypt Forests

- These forest types are common in Tasmania and southern Victoria and are dominated by large eucalypts such as Eucalyptus regnans and Eucalyptus obliqua.
- Prolific regeneration occurs following wildfire or logging. Blackwood forms part of the understorey, competing for light with other understorey species such as dogwood (Pomaderris apetala).
- It is the competing understorey species, rather than the eucalypts, that results in good stem form and little branch development in the blackwood. The dominant eucalypts, however, compete for resources resulting in relatively slow growth of the blackwood.

BLACKWOOD PLANTATIONS

Blackwood plantations have been planted in several countries, including Australia, New Zealand, South Africa, Chile and China, with most planting and associated research occurring since the early 1980s.[1] To date, limited success has been achieved with blackwood plantations in Australia, primarily due to inappropriate planting designs and a lack of management of associated nurse crops.

It is estimated that there are approximately 3,000 ha of blackwood in New Zealand.[1] The New Zealand resource is variable, ranging from unmanaged stands with little commercial value to high quality plantations with excellent prospects for commercial return. Forest Research of New Zealand and some private landowners have demonstrated effective management regimes for producing high quality blackwood in plantations. Although nurse crops have been utilised with success by some landowners, Forest Research has demonstrated how an intensive pruning regime can produce trees of acceptable form without planting a nurse crop.

GROWTH CHARACTERISTICS & PLANTATIONS - Growth, Form & Environment

- When open grown, or growing with other species that do not result in intense competition for light, blackwood usually branches heavily, with resulting poor form and little or no commercial value.
- Planting species such as tea-tree, paper bark or dogwood in a plantation to induce acceptable form and self-pruning of the blackwood, as occurs in native forests, is not feasible due to the excessive number of seedlings that would be required.
- When grown in plantations, form pruning and clearwood pruning are required to produce trees with acceptable form and knot-free, clearwood timber.

Artificial Nurse Crops

- The most common plantation regime in Australia has been to plant blackwood with an artificial nurse crop of faster growing species such as *Eucalyptus nitens* or *Pinus radiata*.
- These species do not eliminate the need for form and clearwood pruning. They out-compete the blackwood for resources relatively early in the rotation, particularly for moisture and light, resulting in suppression of the blackwood. Plantation failure has been a common outcome.
- Success with such regimes has been achieved where the nurse crop has been thinned appropriately.

Pure Blackwood

- In some instances, blackwood can be found in almost pure native forest stands. Form is usually poor, with multiple stems and leaders. High stocking and little ability to self-thin results in relatively tall trees and slow diameter growth.
- Pure blackwood plantations established at high stockings of ~2,500 stems/ha have been successful. High stockings do not improve tree form. Rather, a high stocking of pure blackwood provides a greater selection ratio from which trees of acceptable form may be selected.
- Thinning is required to enable adequate diameter growth. At high stockings, the cost of thinning and removal of the slash can be prohibitive, as slash removal is required for access and to reduce the fire risk.

WOOD PROPERTIES

Blackwood is considered one of the world's great decorative timbers[1]. It is a medium density hardwood species. Density increases with age and is not influenced by growth rate. It has moderate durability, although it is not suitable for in-ground use or situations where it is exposed to the weather. Shrinkage upon drying is low, with good stability in use. Working properties are considered to be excellent, although highly figured grain can cause problems during machining. It is relatively easy to saw with portable mills and air-dry on farm, with little or no degrade.

Heartwood

Considerable variation exists in heartwood colour, varying from almost yellow to reddish-brown to almost black. Such variation can sometimes occur even within the same tree. This variation in colour causes some problems for manufacturers in matching timber. Some have used the natural colour variation as a visual and marketing tool for finished products. Colour variation has been attributed to[1]:

- Genetics (this appears to be the dominant influence).
- Site (the influence of site is uncertain at this stage).
- Growth Rate (studies in New Zealand have indicated no relation between growth rate and heartwood colour).

Occasionally, attractive grain patterns such as fiddleback or birdseye occur, and are believed to be genetically influenced. The sapwood is usually white and is not considered suitable for most end uses.

Heartwood Percentage

The width of the sapwood band and the percentage of heartwood can greatly influence the sawn recovery of valuable heartwood. Considerable variation in heartwood percentage can occur between trees. There are reports that a greater percentage of heartwood develops when growing in moist, well-drained organic soils. Heartwood percentage is likely to increase with age. Reports from one stand in New Zealand indicate 20-30% heartwood for 19 and 20 year old trees, while 32 year old trees from the same location had 70-90% heartwood[1].

END USES

Knot-free clearwood is used for various high-value end uses. Lower grade timber is rarely used for high-value end uses, although it can be utilised for firewood and pulpwood.

- Furniture
- Cabinet making
- Veneers
- Flooring
- Steam bending
- Panelling
- Turning and carving
- Musical instruments
- Billiard tables
- Gun stocks

PESTS & DISEASES

Although blackwood has relatively few pests and disease, some problems can be expected. To date, damage in Tasmanian plantations has been caused by:

- **Browsing** - Rabbits, hares, wallabies, possums and domestic livestock can cause establishment failures unless adequate browsing control is undertaken. Cows can damage mature blackwood through bark stripping, with subsequent decay of the underlying timber.
- **Psyllids** - Small insects that feed on the phloem (sap) in the growing shoots. Black sooty mould (fungi) is associated with sugars that accumulate on the young trees following infestation by psyllids. Sooty mould is more common on trees that are exposed to strong wind. Psyllids are a common cause of reduced vigour and poor form, resulting in multi-leadering. They can be controlled with insecticides but the cost and time is prohibitive.
- **Cicadas** - Female cicadas place their eggs in small branches and stems, causing obvious herringbone scars. There are no known control methods.
- **Wattle Grubs** - These are the larvae of the Wattle goat moth. Eggs are laid on the bark surface and once the grubs develop, enter the tree through points of damage such as damaged bark or poor quality pruning wounds. Trees that are under stress may be more susceptible, such as suppressed trees or those planted in dry, exposed situations. Grubs tunnel through the wood, leaving holes ~10mm in diameter before emerging as the adult moth. The recommended defence against Wattle grubs is to prune branches before they become too large, ensure quality pruning cuts, maintain good diameter growth to ensure rapid occlusion and avoid bark damage from pruning ladders. Good site selection and appropriate thinning of the nurse crop (if utilised) to prevent suppression and tree stress is recommended.
- **Heart Rot Fungi** - Occasional tree death has occurred in plantations in Australia and New Zealand. Armillaria is thought to be responsible[1], with extensive decay spreading throughout the tree. No method of control is known.

SITE REQUIREMENTS

While blackwood grows in a range of soil types and rainfall zones, the growing of commercial blackwood in plantations requires careful site selection.

Shelter

This is the most important factor to successful growth. Blackwood requires shelter from wind to enable rapid growth and adequate form. Locations that provide natural shelter such as gullies, lower valley slopes and adjacent vegetation are desirable. Shelterbelts can also be incorporated to increase available shelter.

Temperature & Elevation

The warmer the environment, the greater the growth rate, provided adequate moisture is available. Higher elevation induces colder temperatures and a shorter growing season. As a general rule, elevations up to 500m may be adequate, provided they are sheltered and relatively frost-free. The best growth will occur at low elevations near the coast where the climate is relatively mild.

Moisture

Adequate moisture is required for sustained growth, particularly during the drier months. Locations with an annual rainfall of at least 1,000mm are recommended. Increased moisture is usually available near watercourses, gullies and lower valley slopes. Dry, exposed ridges should be avoided.

Soil Type

Soils with good drainage that retain moisture are required for sustained growth. Swampy ground with poorly oxygenated water must be avoided. Tertiary basalt soil is usually ideal, and is representative of typical locations on farms where commercial blackwood can be grown.

Frost

Sites that experience severe frost should be avoided. As a general rule, the higher the elevation the greater the chance of experiencing severe frost. Some low elevation sites can also experience frosts, particularly sites where cold air drainage is inhibited, such as valleys and locations where native vegetation can accumulate cold air.

Existing Vegetation

Ex-pasture sites are ideal, as weed control is usually relatively easy, with little regrowth of woody weeds to hinder access and growth of the blackwood. Ex-forest sites often have regrowth of woody weeds following establishment. This regrowth, with a deeper root system than pasture grasses, can provide on-going competition with the blackwood for moisture during the summer months, slowing growth.

Watercourses

Whilst planting along previously cleared watercourses is possible, commercial harvest within streamside reserves may be subject to restriction under The Forest Practices Code. Farmers should contact Private Forests Tasmania or a Forest Practices Officer if unsure how the Code may impact upon potential harvesting.

PROVENANCE (Seed Source)

With a wide natural distribution, blackwood seed can be sourced from a large number of provenances (geographic regions) some of which may have superior attributes for plantations. To date, relatively little is known about superior seed attributes. Higher elevation north west Tasmanian provenances are more frost tolerant than low elevation north west provenances[2] and high altitude north east provenances. Higher elevation provenances are slower growing. Queensland provenances perform poorly in southern regions. Trials established in Victoria and New Zealand indicate that some Victorian and Tasmanian (Smithton) provenances are the better performers with respect to growth rate and form. [1] At this stage, local provenances are recommended. If collecting seed from the local area, select from [2] vigorous, healthy, well-formed trees. If ordering seedlings through a nursery, ask what provenances of seed they have available and where possible, match the selected provenance to the planting site. Attributes to consider include soil type, elevation, temperature and proximity of the seed source to the planting site. If unsure, select 2-3 provenances and record where they are planted for future reference.

FINAL STOCKING & ROTATION LENGTH

Research from New Zealand suggests a final stocking of approximately 200 stems per hectare to produce trees with a diameter of ~60cm at breast height by age 35. On high quality sites in Tasmania, the rotation [1] length is anticipated to be 35-40 years. It may be possible to undertake commercial thinning from age 30 onwards.

Stocking levels significantly less than 200 stems per ha will enable greater diameter growth and shorten the rotation. However, total volume production per hectare will be less. In New Zealand, trees with diameters of 50-60cm have been grown within 20 years. Timber quality from such fast grown trees is uncertain.

Stockings significantly more than 200 stems per ha will reduce diameter growth, resulting in smaller diameter trees at age 35-40, or a significantly longer rotation to achieve adequate diameter. Processors prefer larger diameter logs with a small end diameter of at least 40cm. Smaller diameter trees usually [1]incur greater processing costs and provide less recovery, reducing stumpage to the grower.

SUMMARY

- High quality commercial blackwood sourced from native forest results from intense competition for light.
- Blackwood plantations have been established in several countries, with varying success.
- Form and clearwood pruning are required in plantations, regardless of the regime.
- Artificial nurse crops can be successful, provided they are managed appropriately.
- Blackwood is accepted as a high quality timber, with various end uses.
- Pests and diseases can be expected in plantations. Appropriate siting and management usually minimises their impact.
- Blackwood can be grown in a wide range of environments. For commercial timber production, warm, moist, sheltered sites with minimal frosts and fertile, well-drained soils are recommended.
- Seed should be sourced from local provenances, with seed collected from vigorous well-formed trees, or from a provenance that is matched to the site.
- A final stocking of 200 stems per hectare is recommended.
- Rotations of 35-40 years are anticipated for high quality sites.

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] Neilson, W.A. & Brown, D.R., (1997). 'Growth and silviculture of Acacia melanoxylon plantations in Tasmania', Tasforests, Vol. 9, pp. 51-70, Forestry Tasmania.