



CHAPTER 2 - TIMBER PROPERTIES, MARKET and RESOURCE



Timber properties

For well over 100 years blackwood has been accepted internationally as one of the world's great decorative timbers. It can be classed within an elite group of species which include walnut, mahogany and teak. Apart from black walnut, it has qualities which are unlikely to be matched by any other exotic species that can be grown in New Zealand. Blackwood was extremely popular with Victorian and Edwardian cabinet makers. It is highly suitable for furniture, cabinet-making (see photo above), veneers, turnery and knobs. It is also suitable for panelling, carving, flooring, boat-building, and gunstocks.

The timber is medium-weight and is easy to work, has even texture, is usually straight, but sometimes has wavy grain. It turns and bends well and dresses to a smooth finish.

Colour/Figure/Texture

The heart wood is commonly golden-brown in colour, often containing darker bands or reddish streaks. The sapwood is pale, from white to straw. However, there can be considerable variation in heartwood colour, ranging from yellow to reddish-brown, to almost black. This variation causes some problems for furniture makers. Tension wood streaks can result in dark, denser wood, and can add to the character of the timber.

Variation in colour has been attributed to:

- Genetics - this appears to be the dominant influence. Striking variations in colour occur within seedlots, and on the same site. A small-scale New Zealand study (p.26)

showed no significant difference between two Tasmanian and two South African seedlots.

- Site – there is much anecdotal, but little scientific evidence to suggest that site strongly influences colour. A South African study suggested that the best colour is found on sites with deep organic soils, well watered in the growing season, and with a definite dormant season.
- Growth rate – two New Zealand studies have shown no relation between colour and growth rate. Many New Zealand users feel there is no significant difference between blackwood sourced in Australia and New Zealand.

Colour variation can cause difficulties in matching timber. To date, this has not influenced prices in the Australian or New Zealand markets, but it has influenced South African sales, where the darkest wood is preferred and fetches a premium.

The Australians recognise several attractive grain patterns which are favored by craftsmen and in veneers. These include fiddleback, and birdseye. These features are believed to be genetically influenced.



Figure 10: Variation in log colour from a Rotorua plantation.

Density

There is remarkable variation in density between blackwood trees in New Zealand. Basic density ranged from 465 - 670 kg/m³ in a group of 70 year-old trees, and another study has shown considerable differences between seedlots. These studies also confirmed that density is not influenced by growth rate.

Basic density varies very little with height, but considerably over the radial profile. Density appears to be largely determined by formative age, since it increases from the centre outwards. New Zealand material is slightly denser than Australian material (Table 2).

Table 2: Comparison of blackwood density for NZ and Australian grown material

	Density kg/m ³		
	green	air-dry	basic
New Zealand			
Mortimer 1984	-	660	-
Haslett 1983, 1986	1040	680	593
Nicholas <i>et al.</i> 1994a ¹	972	-	471
Clifton 1990	-	680	-
Miller and Young 1989 ²		-	428
Australia	889		
Bootle 1983	870	640	570

¹ 10 year old trees

² Mean age 7 years

Strength

The strength values of New Zealand grown blackwood compare favorably with data from Australian grown material. The strength is directly related to the basic density of wood (Table 3).

Shrinkage

Blackwood has a low shrinkage. Shrinkage from green to 12% moisture content is 3.6% and 1.8% tangentially and radially respectively. Because blackwood is more impermeable than radiata pine, it has better short term stability.

However, radiata pine has superior long term stability probably because of the very low shrinkage intersection point of blackwood (Table 4).

Australian grown blackwood has a reputation for dimensional instability, which can

result in glue-line failures. To minimise this problem, timber should be dried to the correct moisture content and correctly glued. Wide cross sections should be avoided. These recommendations apply equally to New Zealand grown blackwood.

Table 3: Comparison of blackwood strength properties for NZ and Australian grown material

Source	Modulus of rupture (MPa)		Modulus of elasticity (GPa)		Compression parallel to grain (MPa)		Hardness (kN)	
	green	air-dry	green	air-dry	green	air-dry	green	air-dry
New Zealand								
Haslett 1986	76.4	129.9	9.95	14.4	29.4	62.5	na	6.60
Australia								
Bolza and Kloot 1963	75.0	115.0	9.27	13.2	29.8	60.3	4.23	4.89
Bootle 1983	70	99	13	13	33	48	4.6	5.9

Table 4: Dimensional stability (in %) of blackwood and radiata pine (from Haslett 1986).

	Blackwood	Radiata pine
Shrinkage Intersection point	25.4	28.7
e.m.c. at 90 % RH	19.2	21.2
e.m.c. at 60% RH	12.0	12.3
Long term movement		
Tangential movement from 60%-90%RH	2.7	2.0
Radial movement from 60%-90%RH	1.3	1.0
Short term movement		
Tangential swelling after 24 h at 95% RH	1.6	2.2
m.c. increase after 24 h at 95% RH	4.6	7.4

Durability

Tests by Forest Research have shown that the heartwood is moderately durable. It is unsuitable for ground contact, and is not reliable in situations where it is fully exposed to the weather. The sapwood is perishable. Blackwood is rated as Class 3 (5-15 years in-ground natural durability).

Heartwood Percentage

A New Zealand study showed wide variation in heartwood percentage (0 – 74% in 10 year-old trees). The heartwood percentage was not related to seedlot, but varied significantly within seedlots. The mean percentage of heartwood matched the figures published by Harrison in South Africa, where it was reported

that within regions the highest heartwood percentage was produced on moist, well-drained organic soils.

Some clonal selections for blackwood in New Zealand have included heartwood percentage among selection criteria.

The Market

New Zealand

Blackwood should be readily accepted in the local and international market place. New Zealand grown blackwood can be promoted as both exotic and plantation grown. It should therefore occupy a niche in an international market increasingly aware of the exploitation of tropical rain forests and fragile native ecosystems.

Several authors who have reviewed the role of specialty timber species in New Zealand considered blackwood has a role to play in providing cabinet timbers for both local and export markets. Although the species did not have the ability to attract major corporate support, it can produce high-quality timber and veneer when correctly sited and managed. Others have stated that blackwood can be ranked along with black walnut in the very high value category, but also recognised that it has major form problems. However, unlike many other high value species, it was more tolerant to a wide range of sites.

A New Zealand company specialising in blackwood lumber sales began promoting the timber in the early 1980s. Current demand for this company alone has grown and there is concern that the available resource is unlikely to sustain even the current level of supply until new plantings reach millable size around 2015-2020.

The current price in 2002 for good (clear two faces) air dried blackwood is around \$3,000/m³, compared to radiata pine clearwood at approx. \$750-800/m³.

At the present time, New Zealand blackwood is receiving stumpages in the order of \$150 /m³ to between \$200 /m³ for sound trees.

Currently, three New Zealand furniture companies have developed specialist blackwood lines (see web links, Chapter 15). There are many others who utilise the timber for one-off products.

The value of blackwood timber in New Zealand has been rising steadily over the last decade, but a consistent market price requires a regular supply. Oneoff sales have lead to a wide range in prices paid for a variety of quality. With pressure on the existing Rimu timber sources, blackwood is poised to provide a more than suitable substitute, which may command similar prices or higher. With Rimu wholesale prices in 2002 for clear heart grades currently averaging \$3,241/m³, prices for blackwood timber appear promising in the long term.

Australia

Prices in 2002, supplied by Hasell Britton Pty Limited, a major blackwood retailer located in Australia, are listed in Table 5. This firm using Tasmanian sourced material is exporting to New Zealand, South East Asia, China, USA, and Japan.

The market for blackwood in Australia is described by Hasell Britton as small but consistent, with only enough business for a few wholesalers in different states. Kitchen door companies make up the majority of their blackwood sales, with most of the 25 mm (75 – 200 mm) pieces going into kitchen door manufacture. The other sizes are utilised in furniture and joinery manufacture.

These end uses mean that blackwood sales are dependent on domestic and commercial building trends, and hence reflect the current Australian market situation.

However, Hasell Britton are developing finger jointed, laminated and flooring products to expand the market in blackwood away from dependency on door manufacture and to utilise sizes that are not used in other applications.

Britton Bros. from Smithton who have specialised in blackwood timber production for over 90 years annually produce about 2,500 m³ of sawn blackwood of all grades.

This represents approximately 30-40% of Tasmanian and Victorian production. They have reported cyclic markets with little timber price increases, and have extended processing capability by installing veneer processing equipment. They consider that an emphasis on quality and more effective marketing in a united manner by the blackwood industry are the requirements for a sustainable and healthy blackwood market in the long term.

Plantation wood property and colour assessment.

Some basic wood properties were assessed by Forest Research on 45 trees of 21 year-old blackwood trees grown in Hunua Forest, Auckland. Basic density averaged 480 kg/m³ with a range between individual trees of 382 to 566 kg/m³. These results were in keeping with the known variability of blackwood density

in New Zealand. Green density of 1045 kg/m³ and green moisture content of 118% were also recorded. Heartwood percentage at this relatively young felling age was 61%.

Assessments were made of heartwood colour intensity using both instrumentation and visual estimates. Linear regression analysis suggested that green density was the best predictor of colour but that basic density, heartwood percentage and growth rate all had a contributing influence. Colour assessments carried out while the wood was “green” bore little relation to those assessments carried out after drying, and it is probable that green field assessments of colour will not assist in matching colour intensities in use. The best techniques for assessment are probably visual assessments following drying and surface preparation. Alternatively a “colourometer” could be used to assess the black/white colour variation.

Preliminary analysis of the wood properties of blackwood thinnings from five North Island regime trials in New Zealand

The influence of site and silviculture was assessed on growth and selected wood properties of 18-year-old blackwood. Height, diameter, basic wood density, heartwood colour, and heartwood percentage were measured in thinnings from silvicultural-regime trials at five sites in the North Island of New Zealand. A total of 306 trees, all of one common seedlot from Tasmania, were felled from 22 plots across all sites. Stocking of these plots ranged from 150 to 800 stems/ha. Discs were collected at a height of 1.4 m from all felled trees and used to make visual assessments of colour: quantitative measurements were made with a Minolta Chroma Meter.

Diameter growth of the thinned trees was greatest in regimes with the lowest stocking. Conversely, the tallest trees were in regimes with the highest stocking. Height and diameter were least at Hunua, near Auckland. Heartwood percentage was positively related to stocking and lowest in the lower stockings. Among the sites, Hunua had the lowest heartwood percentage. Darker visually-rated heartwood colour was associated with higher stockings, and heartwood was darkest at Hunua. The L* colour range (black to white) also indicated a trend of darker heartwood with higher stockings. Basic wood density was inversely related to stocking and highest at lower stockings. Trees at the fastest-growing site, Whakarewarewa, had higher density than at the other sites. Density at the slowest-growing site, Hunua, although lowest, was not significantly different from the remaining three sites.

This study has shown that wood properties can be influenced by site and silviculture. Increased growth rate from lower stockings was associated with increased basic wood density and reduced heartwood percentage but had little influence on wood colour. Several of these attributes were also influenced by site. The data suggest that there is no reason to target silviculture for wood characteristics.

Source: Nicholas *et al.* 2006a



DBH Discs from regime trial wood study, by plot



Variation in colour from wood study samples

A comparison of timber quality of blackwood grown in young swamp forest, fenced regeneration, and a plantation in Tasmania

This study compared the timber properties of blackwood grown under three different silvicultural systems: swamp forest regeneration, fenced regeneration mixed with eucalypts, and plantation. The plantation material was sourced from seed taken from a single tree at the same location as the swamp forest regeneration. Trees sampled were from 14 to 22 years old.

Timber attributes, including basic density, green moisture content, percentage heartwood and heartwood colour, were measured, as were tree and bole height. Wood samples from the two native forest treatments (swamp forest regeneration, and fenced regeneration) had similar properties. Wood samples from the plantation were similar in most respects to those from the native forests but had significantly higher green moisture content. Increased diameter increment did not adversely affect basic density or heartwood colour of the timber at the tree ages studied.

Source: Bradbury, 2005

For further discussion of heartwood colour, see chapter 5 - genetics.

Understanding blackwood (*Acacia melanoxylon*) markets; an opportunity for improving blackwood plantation returns

In 2005 Ian Nicholas was awarded a Chavasse Travel Award by the New Zealand Institute of Forestry, to investigate blackwood (*Acacia melanoxylon*) markets in Australia and New Zealand. Nearly 50 blackwood processors and manufacturers using blackwood in Tasmania, Sydney, Victoria and New Zealand were interviewed in late 2005 and early 2006. It is estimated those interviewed trade approximately 80% of the volume of the Australasian blackwood market.

In total, the blackwood market in Australia is approximately 14,000 m³/yr of logs and 4,000 m³/yr of sawn timber, while the New Zealand market is only about 85 m³/yr of sawn timber. The most important blackwood wood characteristic recognised by those interviewed was wood colour, and the most important issue was supply of logs/timber. Most of the trade in blackwood involves select or clear timber, often in short lengths which creates problems for many users.

Both Australia and New Zealand have a similar price for clear grades, lack a consistent use of knotty grade boards, and are exploring export opportunities. Both Australians and New Zealanders see potential in marketing blackwood as a flooring material using knotty and clean grades. The investigation of innovative uses of poorer grades showed that although small clear lengths were used for craft material, this was not recognised as a viable market by processors in either country.

The greatest new opportunity in blackwood marketing in both countries is to develop a range of flooring products. New Zealand has an opportunity to supply quality timber to Australia as New Zealand's resource matures, but the priority should be to establish a stronger market following in New Zealand before exporting is considered.

Blackwood manufacturers in both countries need to raise the profile of blackwood above commodity level into an elite timber market.

As part of this marketing strategy, the recognition that plantation-grown blackwood is a sustainable plantation timber resource should be emphasised.

New Zealand has an estimated 26,000 m³ annual harvest of sawlogs available when the blackwood resource reaches normality.

Source Nicholas, 2006



Blackwood floors, Marlborough



Table 5: Blackwood prices (2002) select kiln dried. Sawn ex. Sydney.

Board size	Price AUD \$/m ³	Price NZ\$/m ³
75 - 125 x 25	2,200	2,651
150/175 x 25	2,790	3,361
200wdr* x 25	2,960	3,566
75 - 125 x 38	2,790	3,361
150/175 x 38	2960	3,566
200wdr* x 38	3150	3,795
75-125 x 50	2860	3,446
150/175 x 50	3050	3,675
200wdr* x 50	3,150	3,795
Random 75mm	3,930	4,735
Random 100mm	4,110	4,952

The Resource

New Zealand

The true size of the resource in New Zealand is difficult to determine because of the many small-scale plantings by individual farmers. Other than some small forest plantings in the 1960s, most of the New Zealand blackwood planting occurred in the 1970s and 1980s by the NZFS. Since the mid-1980s, planting by farm foresters has ensured a small but consistent increment in the national resource.

Approximately half the New Zealand resource was established on the West coast of the South Island in the 1980s. The remainder consists of smaller areas established by the NZFS, now in private ownership, local body plantings (Hunua Ranges) and small farm forestry plantings. It is estimated that New Zealand has approximately 3,000 ha of blackwood.

Silviculture in New Zealand blackwood plantations has been variable, ranging from none at all, to excellent stand management practices.

Total yield of blackwood in New Zealand will depend on siting and silviculture. MAI figures range from 5-10 m³/ha/yr. If a mean

productivity value of 7.5 m³/ha/yr and a rotation of 35 years is calculated, an annual cut of 22,500 m³/yr is possible, provided of course plantations continue to be established. Most of this resource will not become available until around 2015, although small amounts from the earlier plantings could be available before 2015. With the increase in supply from 2015, the quality of the logs will also improve, reflecting a better standard of silviculture on many of the stands.

Tasmania

Blackwood sawlogs are sourced from several State forests. Material comes from swamp forest and from arisings (blackwood logs obtained in the course of harvesting or conversion of native eucalypt forest). A future supply will also be available from plantations.

The most important production areas are the blackwood swamps west of Smithton in the far Northwest, which over the last 5-10 years have yielded 60% of the State's blackwood sawlog total.

The total swamp production area is calculated at 5,650 ha. Blackwood plantations are currently 900 ha, with approximately 250 ha established on an annual basis for the next five years, to give a total State plantation estate of 1000 ha. These plantations are expected to contribute to the wood flow from 2018 to 2048.

The volume from arisings is difficult to predict but it is expected that it will make a significant contribution over the next 10 years. Arisings may contribute up to 50% of the annual yield, but are expected to drop to 10% in the long term.

The Tasmanian Forest and Forest Industry Strategy (TFFIS) has set a blackwood sawlog target for public land at 10,000 m³/yr.

A sustainable annual yield of 8500 m³/yr has been calculated for swamp forest and arisings through to 2063. The target of 10,000 m³/yr will not be met until 2025, when sawlogs from existing plantations come onstream. It is estimated that the target will be exceeded for

the following 20 years, peaking at 25,000 m³/yr for a short time before a sharp drop to 8,500 m³/yr (ie. The sustainable cut from swamps plus arisings).

Victoria

In the Otways, production from private land is estimated to be about 1000 m³/yr. Under the State Forest Management Plan it was stated in 1996 that up to 1,600 m³/yr of blackwood sawlogs would be made available to licence holders, with additional logs being sold by tender.

Other States

It is estimated that blackwood sawlogs from states other than Tasmania or Victoria provide less than 5% of the total annual production.



Key Points

- Blackwood is a medium-weight timber that is easy to work, turns and bends well, and dresses to a smooth finish. It has even texture with usually straight, but sometimes wavy, grain.
- Blackwood timber is extremely variable in wood density, colour and heartwood percentage.
- Growth rate has little bearing on wood quality.
- Blackwood is developing a market-following in New Zealand, where current demand is outstripping supply.
- The Australian market is cyclical, reflecting the Australian economy and fashion.
- Australia exports blackwood to at least five countries.
- The resource in New Zealand, estimated at approximately 3,000 ha, is young but will be producing timber from about 2015 when it will be capable of supporting a blackwood industry.
- The resource in Australia is based on sustainable production from natural forests and from plantations (when they mature in 2018-2048).

Suggested reading:

Bolza and Kloot 1963.

Bootle 1983.

Britton 2000.

Burdon and Miller 1995.

Clifton 1990.

Harrison 1975.

Haslett 1983, 1986.

Mesibov 2000.

Miller and Young 1989.

Mortimer and Mortimer 1984.

Nicholas, Young, and Gifford 1994a.

Wilcox 1993.

