



## CHAPTER 2 - TIMBER PROPERTIES and MARKETS

**Mark Dean (Ernslaw One), Charlie Low, Russell McKinley and Dave Page (Scion),  
Rob Webster (NZ Forestry)**

The redwood market in California has changed drastically over the last thirty years. As more old crop forest has been placed in reserves, increasing volumes of second generation forests are now being logged. There is little segregation of logs by grade from natural forests other than by small end diameter. Most clear grades come from large old growth logs, which are now in very short supply, with the result that clear lumber grades have virtually priced themselves off the market. This means there is considerable potential for pruning in New Zealand planted forests to produce clearwood. The dimension of logs produced from Californian second growth stands is similar to those of radiata pine logs produced in New Zealand.

The following chart (Figure 4) shows the change in markets for redwood lumber over the past three decades. Although cyclical, the overall trend in total production is relatively static. However, the volume available for export sales or to eastern states of the USA

has steadily diminished. Now, virtually all utilisation is within California, with only small amounts in other western States.

New Zealand has a small domestic market, mostly because of the lack of New Zealand-grown material rather than lack of demand. Trial shipments of New Zealand material have been well received in the Californian market.

### New Zealand experience

Redwood timber imported from California has a good (and well-deserved) reputation for exterior use and for high-quality joinery. In contrast, New Zealand-grown redwood timber has shown acceptable performance as exterior cladding and interior sarking, but its low density, low hardness, and low-to-moderate durability restrict its range of uses. There has also been considerable tree-to-tree variation in some wood characteristics.

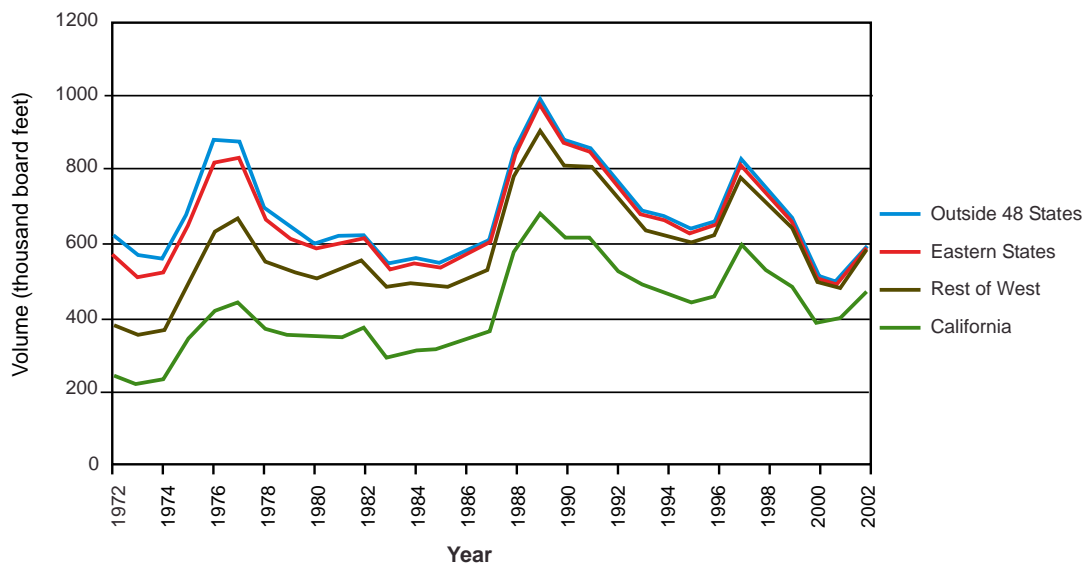


Figure 4: Destination of Redwood Lumber 1972 - 2002

**Table 1: Comparison of wood properties of New Zealand-grown redwood and radiata pine (from Knowles and Miller 1993)**

Property	Description	Redwood*	Radiata pine#
Density kg/m <sup>3</sup>	Basic	335	420
	Air-dry	380	500
	Green	910	955
Shrinkage air-dry %	Volume	4.8	7.0
	Tangential	3.2	4.7
	Radial	1.5	2.2
	Longitudinal	0.02	0.10
Modulus of rupture (MPa)	Green	56	40
	Dry	63	90
Modulus of elasticity (GPa)	Green	6.4	5.8
	Dry	6.6	9.0
Maximum crushing (MPa)	Green	24	16
	Dry	36	38
Hardness (kN)	Green	1.8	2.5
	Dry	1.9	4.2

\* Mean values typifying 50 year old trees

# Mean values typifying 35 year old trees

## Density

Variation in wood density among mature redwood trees is large. A tree evaluated at one New Zealand site was 256 kg/m<sup>3</sup> while the mean of trees from three other sites were 310, 356 and 385 kg/m<sup>3</sup>. Estimated wood density from increment cores of 92 trees from nine seedlots at age 20 years in the Bay of Plenty had a mean of 314 but tree-to-tree variation ranged from a minimum of 252 kg/m<sup>3</sup> to a maximum of 415 kg/m<sup>3</sup>. In this assessment tree diameter had a larger bearing on density than seed source, with larger trees lower in density. More testing of different redwood seedlots is required so selections for consistent wood properties can be undertaken.

## Durability

One of the main market strengths of redwood is the natural durability of its heartwood (the sapwood is not durable). Trials have been undertaken to assess the durability of New Zealand-grown redwood (Table 2). Tests by FRI in 1962 placed New Zealand-grown redwood in natural durability Class 3 (moderately durable). A second test with wood from the same source, some 30 years later, indicated that redwood should be in Class 2 (durable). However, with a further testing of new material, a third set of stakes was less durable than the first and supported the initial classification of Class 3.

Overall, New Zealand-grown redwood has shown quite variable durability. Even though stakes from 80-year old trees appear to be more durable on average than the other sets tested, the first failures occurred in that group after only 2-3 years. Based on the tests done so far, redwood could show durability variation in situations of moderately high decay hazard or in exposed situations where a long service life is required e.g. exposed exterior structural situations.

A series of new tests established in 2007 with 70 and 40-year-old South Island material is currently being evaluated using above-ground lap-joint samples and in-ground stakes. These will provide more information on redwood durability. Laboratory testing of redwood clones has also identified clonal variation in durability.

**Table 2: Summary of New Zealand durability tests**

Date tests established	Tested material	Location tested	Approx age of material (yrs)	Class
1962	18-19 mm stakes	Rotorua	50	3
1988/1989	20 x 20 mm stakes	Rotorua	80	2
1988/1989	20 x 20 mm stakes	Waitarere	80	2
2001	20 x 20 mm stakes	Rotorua	35	2
2001	20 x 20 mm stakes	Waitarere	35	2
1987	Weatherboards*	Rotorua	N/A	3
1987	Weatherboards*	Devonport	N/A	3

\* ex 150 mm rusticated  
N/A: Not available

The reasons for the high variability are not clear although this is not unusual in species with a Class 3 durability classification.

In a Californian study it was found that decay resistance also varied amongst trees and also within the heartwood of individual trees. It was found that decay resistance decreased from outer to inner heartwood.

In low decay hazard situations such as weatherboards, New Zealand-grown redwood should meet the requirements of NZS 3602:2003 (NZ Standard for Timber and Wood-Based Products for Use in Building). The service life of uncoated boards is likely to be limited by erosion and distortion but could be improved with well-maintained surface coatings.

### Use in Decking

Some New Zealand-grown redwood is too soft for exposed decking. Its low strength means that it would need to be either supported by joists at closer spacing or be thicker than radiata pine decking. Surface erosion on decking is likely to be worse than on uncoated weatherboards and would produce a very rough surface on lower density boards within five years. Its variable durability would also make it marginal for use as decking because a few failures in less than 15 years (the minimum requirement in NZS 3602) could be expected in exposed situations and in areas where there is a higher decay hazard e.g. poorly ventilated or constantly damp areas.

Giant sequoia has a reputation of producing similar timber to redwood, although it is

reported to be brittle and requires different drying schedules. Commercial production in California is very small compared to redwood production. New Zealand-grown giant sequoia has not been fully evaluated.

### The US decking market

The US residential deck market is large, 6.5 million new decks are constructed each year, with growth of 8.1% per year (1991-1999). Redwood was used in 12% of US residential decks in 1987 and 11.1% of decks in 1998. The small decline in market share was possibly due to the higher price for redwood, reducing demand. Using the approximate average size of constructed decks gives an estimate of the demand for redwood deck material in the US. This equates to approximately 3.6 million m<sup>3</sup>/yr. As an indication, this demand is approximately 80% of New Zealand's total sawn wood production in 2003. These figures are indicative only, as a greater proportion of decks in the western US use redwood, compared with the rest of the US. Also, decks in the south-western US tend to be larger on average than elsewhere.



California Redwood Association website.

### Log Prices

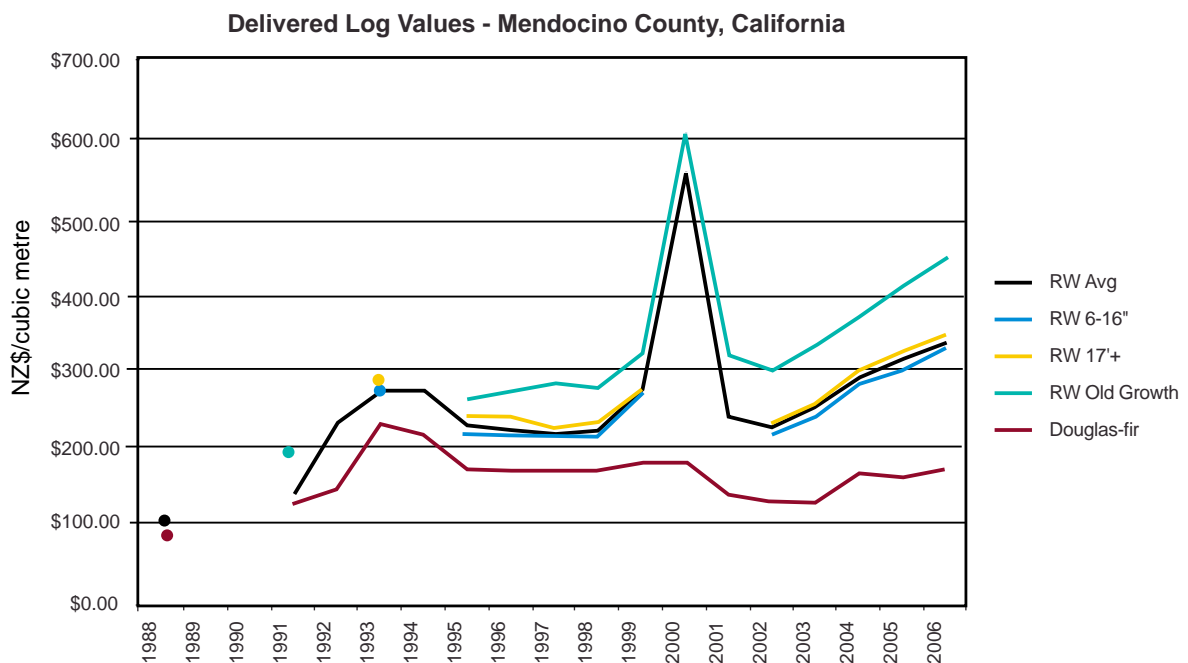


Figure 5: Redwood markets in USA

Most redwood logs exported from New Zealand have been marketed to Asian countries, such as Korea and Taiwan. Sources in this market

have suggested that they would purchase all the lumber New Zealand could produce and match US prices.



Rob Webster

**Figure 6:**  
Debarked  
redwood logs at  
the Palco sawmill  
at Scotia,  
Humboldt County.



**Figure 7:**  
Weatherboards  
on building,  
Coromandel  
Peninsula

Nick Kent

## Key Points

- There is considerable between tree variation in redwood wood properties, in both density and durability.
- Redwood has a strong market niche in California, which has moved from predominantly old crop to younger second crop logs.
- New Zealand growers have an opportunity to market redwood logs in California as well as locally.
- Clones or seedlots with acceptable durability ratings will be a key to market acceptance in both New Zealand and California.

## Suggested reading:

Bier and Britton 1999

Clark and Scheffer 1983

Clifton 1994

Cornell 2002

Cown 2008

Di Maio 1997

Knowles and Miller 1993

Nicholas and Garner 2007

Webb 2007

