Blackwood

(*Acacia melanoxylon*): Refining Successful Plantation Silviculture
Wet Sclerophyll Forest - NW Tasmania

Even aged stands develop following major disturbance
Swamp Forest - NW Tasmania

Even aged stands develop following major disturbance

Nurse Crop
Melaleuca & Leptospermum
Riverine Rainforest - NW Tasmania

Surrounding vegetation includes species such as *Nothofagus cunninghamii*.

- Usually form uneven aged stands
- Fire (major disturbance) is a rare event
- Blackwood develops in canopy gaps (light wells) following windthrow

Young blackwood developing in a natural light well.
Pure Blackwood Forest - NW Tasmania

Even aged stands develop following major disturbance

- Few straight stems
- High stocking
- Poor self thinning
- Slow diameter growth

Pure stands with large diameter well formed trees are rare
Plantation Blackwood - Successful Options

Pure blackwood grown without a nurse crop
(NZ silviculture)

1. High initial stocking (2500 sph)
   - high selection ratio (1:12)
   - minimal pruning input

2. Low initial stocking (1000 sph)
   - low selection ratio (1:5)
   - intensive form pruning
Plantation Blackwood - Nurse Crops?

Blackwood grown with a nurse crop of either *Pinus radiata* or *Eucalyptus nitens* (Aust. silviculture)

Such regimes have usually failed due to:

- Inappropriate spacing of the blackwood and nurse crop
- Little or no management of the nurse crop
- Lack of form pruning
- Hope of extracting the nurse crop for commercial return
Plantation Blackwood - NZ Regime

Developed by the New Zealand Forest Research Institute (NZFRI) and experienced private growers

- Establish at 800-1000 sph
- Form pruning from age 2
- Gauge pruning from age 3 (30mm gauge)
- Clearwood pruning from age 4, retaining at least 3m of green crown
- Thin to best 400 sph at age 7-8, followed by further thinning to 200 sph by age 10
- Clearfell at a mean dbh of 60cm, anticipated to be age 35 in NZ
Claude Road Demonstration Site

- Established 1997
- Alternate rows of blackwood and nurse crop species
  - *Eucalyptus nitens*
  - *Pinus radiata*
- Initially an establishment trial to test site preparation techniques and early species performance
- Low quality site for blackwood
  - 1200mm rainfall
  - moderate soil quality
  - subject to frosts
  - strong westerly winds
Claude Road Demonstration Site

- Artificial nurse crops in the absence of form pruning do not produce blackwood with acceptable form.

- Form pruning conducted over several years to produce trees with suitable form:
  - October 2001 (2 years 8 months)
  - March 2003
  - November 2004
  - December 2005
  - Late 2006
    (final clearwood pruning to ~6.5m)

- Annual form pruning in late spring should be conducted from age 2.
Nurse Crop Management

- Stem injection and manual felling of every 2nd $E.\text{nitens}$ trialed at age 6
- Further stem injection with ‘half dose’ of glyphosate of remaining $E.\text{nitens}$ at age 7
- No management of the $P.radiata$ nurse crop to date
Blackwood diameter by form score under *E. nitens* and *P. radiata* nurse crops at age 6 & 9.
Claude Road Demonstration Site

Blackwood height by form score under *E. nitens* and *P. radiata* nurse crops at age 6 & 9

![Graph showing the relationship between Blackwood height and form score for *E. nitens* and *P. radiata* nurse crops at ages 6 and 9. The graph displays two sets of data points for each species, with *E. nitens* represented by blue squares and *P. radiata* by black triangles. The x-axis represents form score, and the y-axis represents blackwood height in meters. The form scores range from 1 to 3, and the blackwood heights range from 11 to 3 meters.](image-url)
Conclusions - Nurse Crops and their Impact

- *E.nitens* is the preferred nurse crops species at this site
  - dramatic improvement in form (combined with form pruning)
  - provides early shelter from wind exposure
  - suppression of blackwood diameter growth from an early age (<6 years)
  - easy to kill / suppress growth rate with stem injection
  - adequate stocking of final crop trees

- *P.radiata* not a successful nurse crop at this site
  - inadequate stocking of final crop trees
Group Planting with Nurse Crops
Group Planting - Creating Light Wells
Group Planting - Producing a Second Log
Can Silviculture Affect Wood Quality?

- 65cm dbh by age 20!

Theoretical Mean Density Curve

- Basic Density (kg/m³) vs Age (years) graph.
Can Silviculture Affect Wood Quality?

Diameter growth doesn’t affect density - however, it can affect the proportion of juvenile wood within a stem of a given diameter.

- 60cm diameter stem
- 43 cm by age 20
- 0-20 years 50% of area

- 60cm diameter stem
- 30 cm by age 20
- 0-20 years 25% of area
Conclusions - Eucalypt Nurse Crops

- Provision of shelter (blackwood intolerant of wind exposure)
- Improved height growth and tree form
- Reduced pruning requirements
- Smaller knotty core and increased recovery
- Potential to produce a second log (group planting)
- Improved wood quality (density) by reducing diameter increment early in the rotation?

CAUTION - In the absence of appropriate management, fast growing eucalypt nurse crops usually result in plantation failure.
Conclusions - Further Research

- Researchers and private growers from New Zealand have demonstrated how to produce plantation blackwood without the aid of nurse crops.

- However, can we further refine successful plantation silviculture?

- Further research is required to evaluate nurse crops and their impact (species, stocking, spacing and thinning).

- Growers should aim to produce the highest possible quality blackwood to ensure they produce a high value product that is in demand.

- Given the enormous variation in wood density and colour, clonal propagation of selected individuals should be undertaken.

- **FIDDLEBACK** - If we crack this one we have seriously valuable trees!