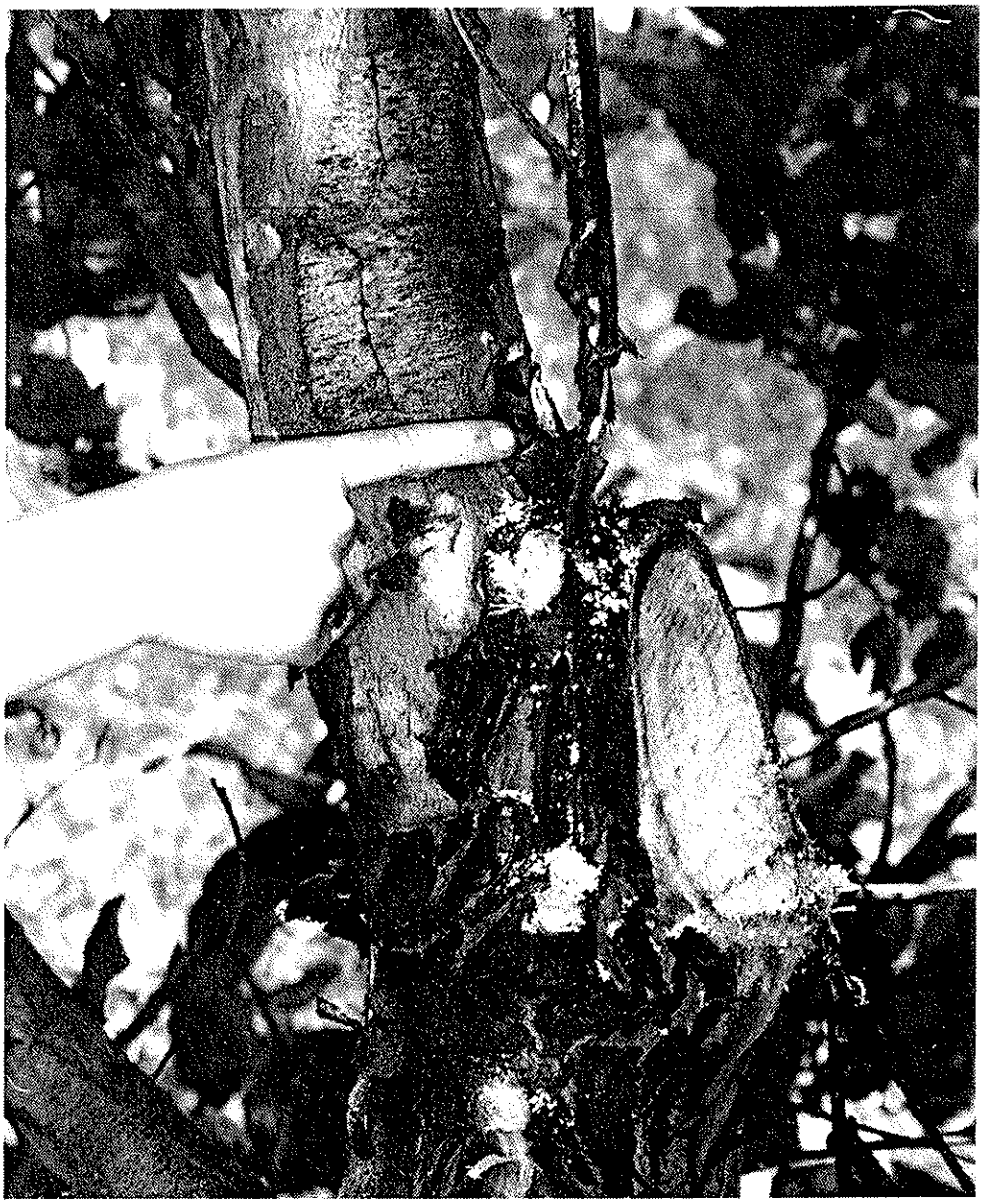
SILVICULTURE
FOR MANAGING PARROT DAMAGE
TO BLUEGUM TREE CROPS



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Department of Conservation and Land Management;
Bunnings Treefarms Pty Ltd;
Australian Eucalypts Ltd.

Cover photo:
The original leader of this tree withered and died due to bark stripping by parrots (hand points to bark stripping). This allowed the development of two replacement leaders and hence a fork at around 1.5 metres height. However, silvicultural treatment to remove one stem at age 3 years has returned the tree to the single-stem form best for harvesting and utilisation. Otherwise the fork and base log (too short for economic harvesting) would have been wasted.

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Parrot damage to Bluegums

Parrot damage to Bluegums (*Eucalyptus globulus*) crops is an emerging problem. It is worst in the Boyup Brook/ Darkan area though not confined there. Generally it is considered to be the work of the Twenty-eight Parrot (*Barnardius zonarius*). In south-west WA this species has two forms (races), the green-bellied form (*B. z. semitorquatus*) and the yellow-bellied form (*B. z. zonarius*, also known as the Port Lincoln Parrot). Intermediate forms are also common.

The parrots strip bark from the lead shoots of Bluegums causing many of the shoots to wither and/or break off. Consequently, lateral shoots develop resulting in deformed (bent or multi-stem) trees unsuited to harvest and utilisation.

Prospects for controlling parrot damage to Bluegums

In general, there are three prospects for controlling parrot damage to Bluegums: (1) Control the numbers of parrots; (2) Stop parrots damaging the trees; (3) Rectify the damage after it occurs. Techniques fitting each of these prospects are being trialed. Ultimately, the best strategy for managing parrot damage may depend on a variety of techniques that are applied in combination or individually, according to circumstances.

These notes are concerned with the prospect of rectifying parrot damage after it occurs. This would depend on silvicultural techniques.

What silvicultural techniques may be suitable?

Silviculture (from Latin *silva* woodland + culture) is concerned with the cultivation of trees and forests. Generally the purpose is to establish, maintain and enhance the productivity of forest stands.

Silvicultural techniques being tested for potential to rectify parrot damage are:

- **Pruning.** Where multiple replacement leaders have formed in response to destruction of the lead shoot these could be thinned to just one per tree. Refer Fig. 1 over page and cover photo for illustration. Pruning would re-establish the single-stem growth form important for wood production.
- **Culling**. May also be referred to as 'thinning'. Badly deformed trees could be removed

from a stand of trees giving the remaining (better form) trees more room to grow (Fig. 2). Increased growth of the retained trees would at least partly offset losses from removing trees.

- **Coppicing.** Likely to be applicable to 'worst case' stands only, i.e. those stands damaged beyond the point where it is worth growing the trees on to harvest. All trees would be felled to waste and the stand regenerated from new shoots (coppice) growing from the stumps (Fig. 3). At the time of coppicing it may also be necessary to implement other measures to reduce subsequent parrot damage, e.g. control the number of parrots or divert parrots from damaging the trees. Once the stems reached a height such that fresh damage below the critical height (Fig. 4) is unlikely they could be thinned to the required 1-2 stems/stump.

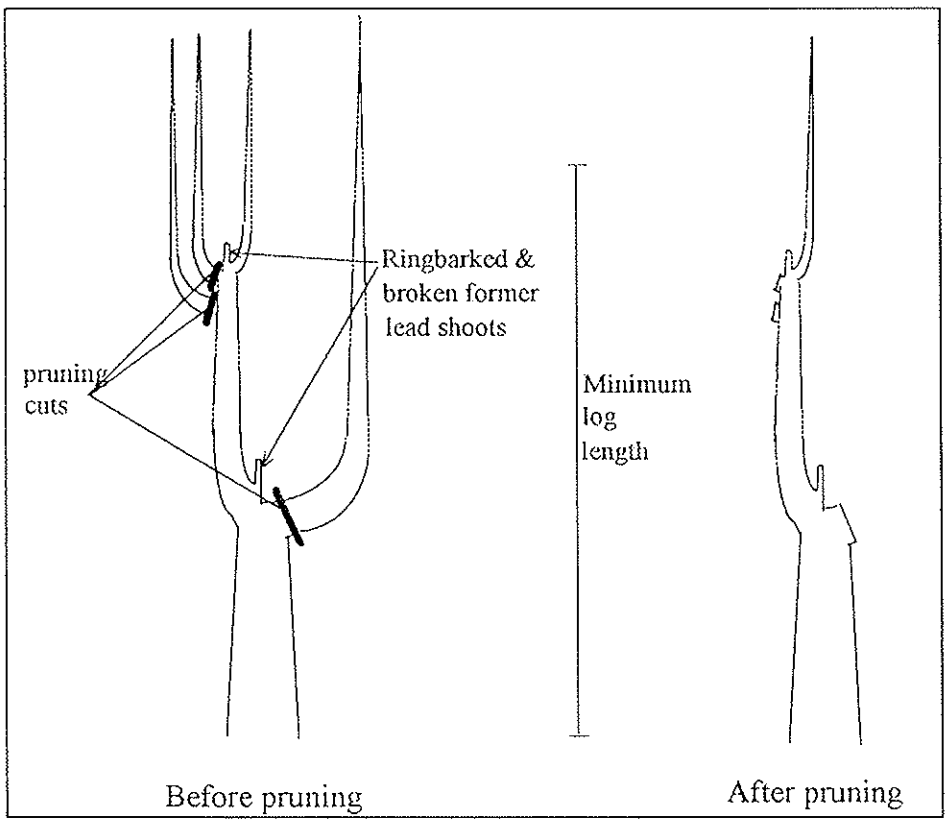

Fig. 1. Representation of the trunk and stem(s) of a tree before and after pruning to correct parrot damage.

Note:

(i) Right hand stem above the first fork unacceptable for retention because of severe "sweep" in this stem just above the fork.

(ii) Any further damage to the tree after pruning is likely to occur above what would be the first (base) log length.

(iii) The tree as illustrated 'after pruning' may still appear to have fairly severe deformities but the tree will tend to 'grow over' those deformities. If pruning is done at age 2 years then by harvest age (around 10 years) the tree should be nearly 5 times as tall and 5 times the diameter.

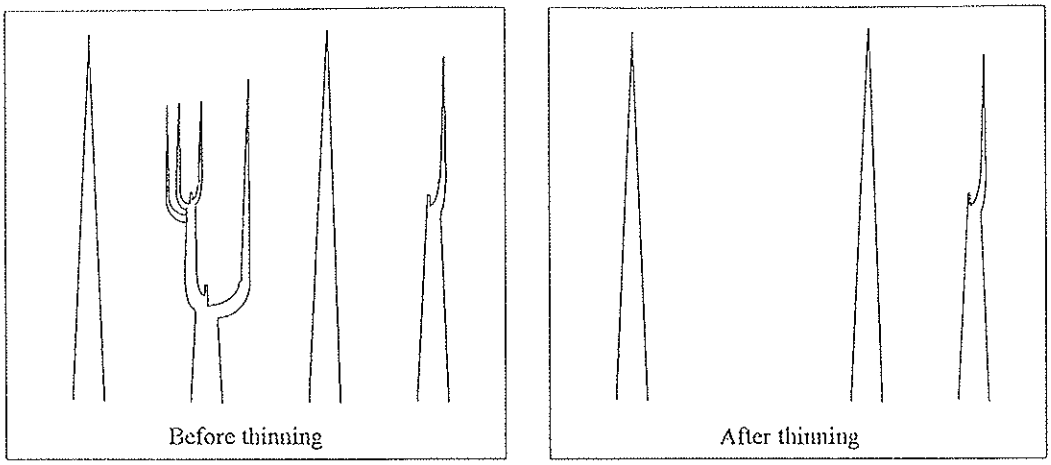

Fig. 2. Illustration of thinning (culling). In this simplified example one badly deformed tree from a group of 4 trees is removed. In a heavier thinning operation the tree on the right (slightly deformed) would also be removed concentrating all growth on the two remaining undamaged single-stem trees.

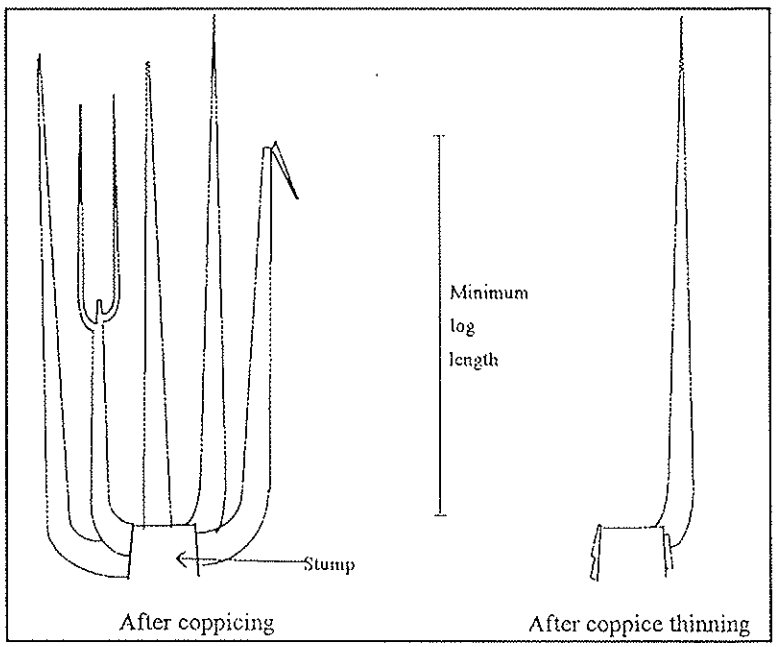

Fig. 3. Representation of the stump and stems (coppice shoots) of a tree after coppicing and after coppice thinning. Would retain 1 or 2 stems on the stump, this being the stem(s) with no, or least parrot damage. If have more than one undamaged stem then generally would retain the largest. In this example one stem (the largest stem with good form) is selected for retention.

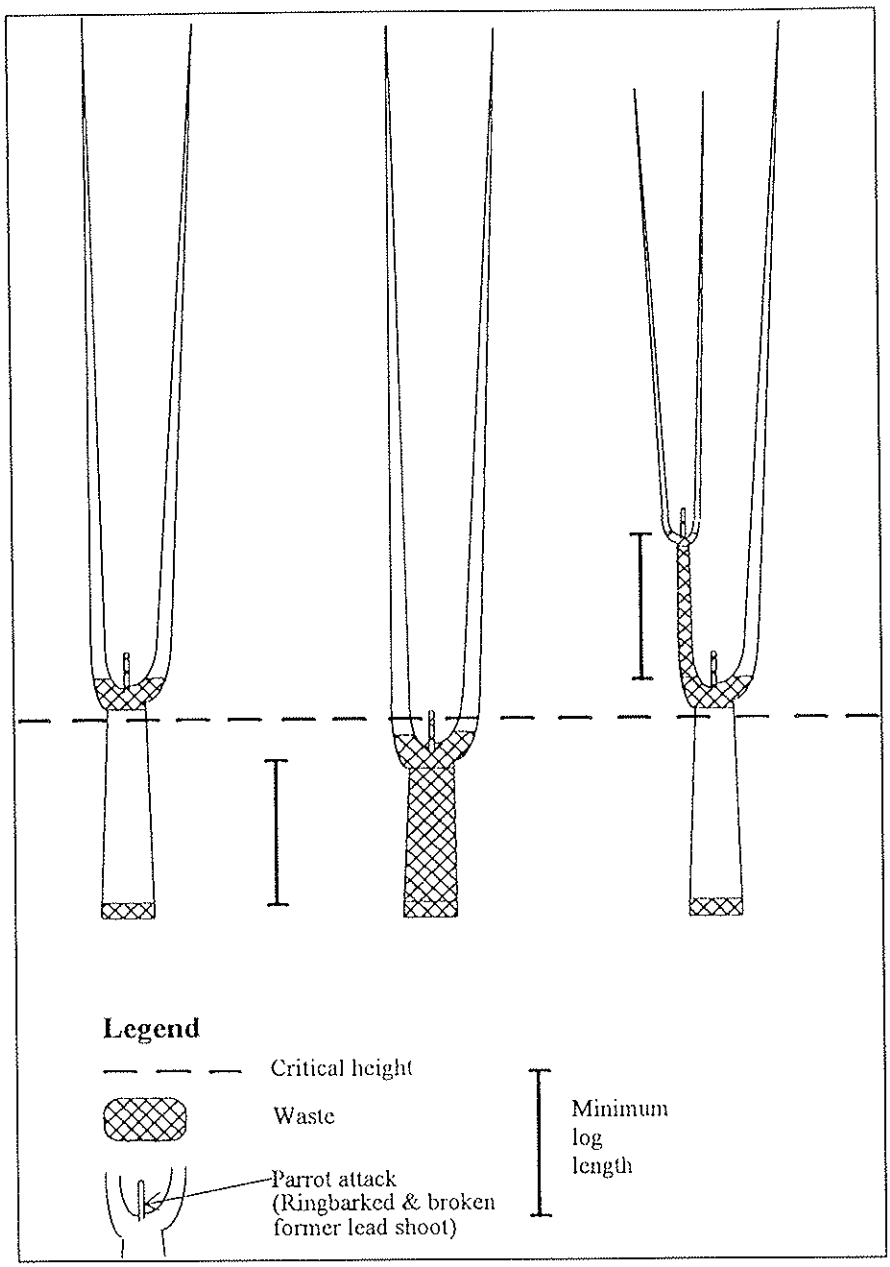

Fig. 4. 'Critical height' for parrot damage.

Left tree: Parrot attack above the critical height, i.e. after allowances made for a stump and removal of the fork crutch it is still possible to harvest a base log of acceptable length. *Minor volume loss only.*

Centre tree: Parrot attack just below the critical height. Base of tree wasted. *Major volume loss.*

Right tree: Two 'unacceptable deformities', both above the critical height but less than the minimum log length apart. *Moderate volume loss.*

Note that a parrot attack causing an 'unacceptable deformity' (fork or severe bend) is likely to be of most consequence if it occurs below the critical height for 2 reasons:

(i) Base logs have the most value per metre length because trees are widest at the base, e.g. base logs of 2, 3 and 6 metres would comprise around 17%, 25% and 47% respectively of the merchantable volume of a typical 25 m tall Bluegum at harvest age.

(ii) If parrot damage causing an unacceptable deformity occurs just below the critical height the base log will not meet minimum log length specifications and will be wasted. Compare waste in 'left' and 'centre' trees above.

Best stage to apply silviculture?

Determining when best to apply silviculture to correct parrot damage is one objective of the field trials discussed on pages 6-8. However, based on currently available information, a "best bet" age for trees of normal height growth is around 2-3 years after planting. This is calculated as follows.

The youngest age for application of pruning and culling will depend on the minimum log length you wish to protect and hence the critical height (Fig. 4) for parrot damage. Parrot damage to Bluegums is generally initiated in the top 2 m of the tree and it is logical not to prune above a height where parrot damage may re-occur. Therefore, if you wish to protect a 3 m minimum length base log, the trees should be at least 5 m tall (around 2 y.o.) and you should prune forks up to 3.1 m (allows 0.1 m stump). Or, if you wish to protect a 6 m base log, the trees should be at least 8 m tall (around 3 y.o.). and you should prune up to 6.1 m. Note that industry standards for minimum log length have yet to be set but the shorter the logs you harvest the greater will be harvesting and transport costs.

It seems reasonable that pruning and culling should be done as soon as the minimum length base log can be protected, though the trials in progress should shed more light on this matter. There are several factors to be balanced. On the one hand, there are financial benefits in delaying treatment costs to as close to harvest time as possible. But, on the other hand, delaying treatment will increase the cost (larger trees to treat) and may reduce returns (less time for the retained trees to respond to the thinning operation).

If a decision is made to coppice a stand (write off growth to that point and start again) then this could be done at any age except, perhaps, the first year when the stumps would be too small to produce adequate coppice. However, the older the stand the more growth that will be written off.

Application of silviculture

An advantage of the silvicultural approach to managing parrot damage is that it is possible to "wait and see" if parrots actually damage the crop before taking action. Other techniques must be applied without knowing for sure if they were really necessary. Particular situations where silviculture may be applicable include the following.

(i) *Only light or moderate damage is expected or it is difficult to predict the level of damage that will occur.* In these cases you may prefer not to take any action to control parrot damage initially, relying instead on silviculture to correct damage *if it occurs.*

(ii) *Other control measures fail or none are developed.* While other control measures (controlling parrot numbers, diversionary feeding, repellents) are being investigated it may turn out that none of them can be applied successfully or the economics of treatment are not as favourable as relying on silviculture. Alternatively, other control measures may be developed but, if they don't have a 100% success rate, you may wish to rely on silviculture in the event of a "failure".

(iii)*A method that does not involve manipulating parrot populations is preferred.* You may be a grower who does not wish to kill parrots or rely on a strategy, such as diversionary feeding, that is likely to boost parrot numbers.

Field trials

A trial and demonstration of silvicultural techniques (Table 1) was established in July 1994 at sites near Darkan. The two sites are Roclea South's farm 15 kms NW of Darkan and Water Authority land (ex-Wunnenberg farm) 10 kms SW of Darkan in the Wellington Catchment.

Table 1. Treatments in the silviculture field trials

Age (yrs) in 1994	Site	Treatments			
		High prune	Cull & low prune	Coppice	Control
2	Roclea South	✓	✓	✓	✓
3	Roclea South	✓	✓	✓	✓
5	Wunnenberg		✓	✓	✓

Notes:

- 'Control' = do nothing, necessary for comparison with treatment plots.
- No 'high prune' treatment in 5 y.o. as trees too tall.
- 2 plots of each 'treatment × age' combination, i.e. total 22 plots.
- Each plot approx. 500 m^2 with trees assessed in core area of 250 m^2.
- Assessments include height and stem diameter growth of trees, parrot damage and resulting deformities (bends, forks).

The treatments were applied as follows:

- *High Pruning* - Pruned all forks to top of trees in July 1994. Pruning shears or handsaws used for low limbs, then pole-saw to 4-5 m. Tree climbing ladders and handsaws used for higher limbs. Around 60%-80% of trees on each plot treated, other trees did not have forks to prune.
- *Cull and low prune* - Either whole trees were removed if they were badly deformed or individual stems of double- and multi-stem trees were removed up to around 3 m high. The stumps left after felling whole trees were poisoned by painting on a solution of Roundup (glyphosate). The proportion of stems removed on a plot varied from 26% to 47%, depending on the severity of parrot damage. Culling treatment applied February 1995.
- *Coppicing* - All stems on a plot felled in July 1994 and allowed to re-shoot. Coppice shoots to be thinned to 1 or 2 stems/stump once they reach a height of around 4.5 m.

The Darkan plots represent the lower (around 600 mm/year) rainfall extent of Bluegum planting. It is intended that other plots incorporating the same or similar treatments will also be established in 1995 at a higher rainfall site.

Initial results of field trials

1. Timing of operations indicated the following man-hour requirements.

Table 2. Man-hours to treat 1 ha

Age treated	High prune	Cull & low prune	Coppicing
2 y.o.	10	5	7
3 y.o.	25	5	8
5 y.o.	N/A	7	20

Notes:

(i) Times for pruning and culling include an allowance to assess trees as well as carry out the operations.

(ii) Times for coppicing are for felling only. Thinning out of the coppice shoots has not been undertaken yet.

(iii) Trees in the 5 y.o. coppice plots were extensively deformed (many branches near ground level) due to parrot damage. Hence the comparatively long time required to fell those trees.

(iv) It may be possible to reduce times with refinement of techniques.

2. *Effect of 'High Pruning'*
   - High pruning was done in July 1994 and assessments 5, 7 & 11 months later show that, over the 4 prune plots, the lowest new incidence of bark-stripping by parrots was at 3.3 m. Thus a first log length of 3 m was generally protected by the pruning treatment.
   - The time required to prune 3 y.o. trees (25 hours/ha, Table 2) would almost certainly make pruning 3 y.o. trees uneconomic unless far more efficient techniques are derived. Use of a pole-mounted chainsaw (extend up to 6 m) or a hydraulic lift (cherry picker) may increase efficiency.
   - A general observation was that pruning to the top 2 m of trees was not worthwhile. It was difficult to determine how a tree with damage to the top 2 m would develop, i.e. likely to waste effort pruning a section of the tree that would have developed with single-stem form anyway. There is also the risk of fresh damage to the top 1-2 m after pruning (effect of this will be quantified by later assessments). Not pruning the top 2 m of trees would, of course, reduce time requirements for high pruning.

3. *Effect of 'Cull & Low Prune' treatment*
   - The cull & low prune' treatment was applied in February 1995 and the plots assessed 4 months later (June 1995). It is too early to determine the extent to which the retained crop trees will increase growth and offset losses from removing trees, e.g. see Fig 5.

4. *Effect of 'Coppicing'*
   - All ages (2, 3 and 5 y.o.) produced good coppice. By June 1995 (11 months after felling) the survival rate of stumps was at least 92% on four of the six plots. Another plot (one of the pair felled at age 2 years) had 88% survival but stump mortality there was generally confined to the exposed western edge of the plot. The remaining plot (one of the pair felled at age 3 years) had only 65% of stumps carrying coppice in June

1995. However, this plot is on a harsh site, i.e. appears to be affected by salt, waterlogging and low soil fertility.

- Height growth of the coppice has been strong with coppice on all plots continuing to grow over the dry summer/autumn seasons of 1995 when growth of the trees was very slow, e.g. Fig. 6.
- Parrot damage to the coppice plots at Roclea South's has only been light so far (last assessment June '95) with an average of 6% of the coppice trees being damaged. However, at the ex-Wunnenberg site damage to the two coppice plots has been extensive with the proportion of coppice trees damaged being 76% and 100%. On these plots there appears to be little prospect of getting the coppice stems high enough for thinning without some intervention to control the parrot damage.

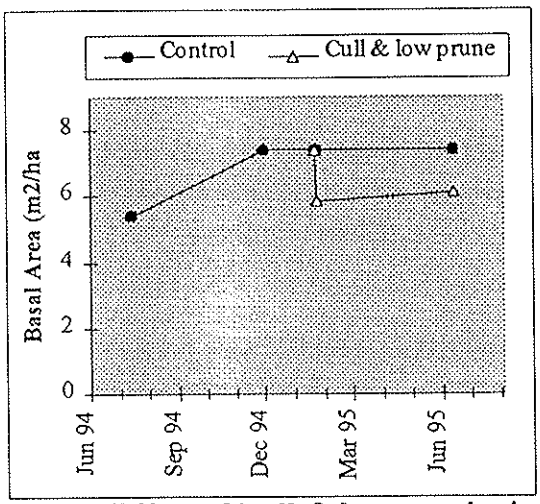

Fig. 5. Effect of 'cull & low pruning' on basal area at Site B (Roclea South, P91). Treatment applied Feb. '95. Basal area is the cross-sectional area of stems at the standard "breast height" (1.3 m).

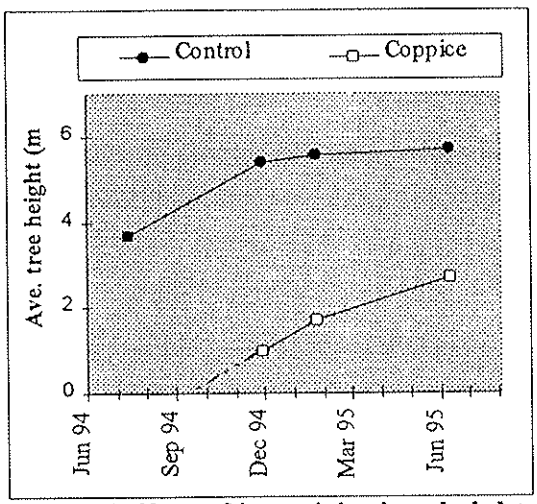

Fig. 6. Effect of 'coppicing' on height growth at Site D (Roclea South, P92). Trees felled in coppice plot in July '94, new shoots (coppice) emerging from the stumps around 2 months later.

Require more information?

If you are interested in applying silviculture to manage parrot damage to a Bluegum tree crop, or other tree crop, and/or would like more information please contact one of the following

- Peter Ritson, 32 Airlie Street, Claremont, WA, 6010; Tel/Fax: 09 384 4730. (Peter is a Consultant Forester, contracted to work on the silviculture project.)

- John Bartle, Farm Forestry Unit, CALM, 50 Hayman Rd, Como, WA, 6152; Tel: 09 334 0321, Fax. 09 334 0327. (John is Manager, Farm Forestry Unit, CALM.)

- Greg Dutkowski, Bunnings Treesfarms, PO Box 444, Manjimup, WA, 6258; Tel: 097 717 222, Fax: 097 771 377) (Greg is Technical Manager, BTf).