# SILVICULTURE GUIDELINES 2/95

## SILVICULTURAL PRACTICE IN THE KARRI FOREST

**These guidelines supersede Silviculture Specification 6/89.**

**CONTENTS**

# 1. INTRODUCTION

The strategies for the sustainable management of the karri forest in areas designated as State forest and Timber Reserves under the CALM Act are contained in the *Forest Management Plan (1994-2003)* and the Ministerial Conditions.1

This document details the silvicultural guidelines for field application, in particular treemarking and silvicultural treatment to achieve the desired forest structure at the coupe level in areas from which timber is harvested.

Silvicultural objectives will be met through commercial removal and sale of the produce wherever possible.

# 2. SILVICULTURAL OBJECTIVES AND TREEMARKING FOR HARVESTING

- The broad silvicultural prescription provided to operational staff for each coupe will be prepared by the Planning Officer on the *CALM Integrated Management Control and Information System* (*CIMCIS*) sheet as a 'concept' plan. The prescription takes into account the overall planning requirements and is based on information from existing records, aerial photo interpretation and other sources.

- This 'concept' plan is refined in the field as more accurate and detailed information becomes available through site inspections.

- Appropriate silvicultural practice varies according to the existing structure of the stand of which there are three broad silvicultural types:

  - Immature even-aged stands
  - Single storied mature forest
  - Two-tiered stands

- An overall forest structure will be developed where the individual patches of regeneration are of a manageable size, but which vary in size in different management zones according to the needs of different forest values.

- Harvesting and treatment practices will be varied in accordance with the visual and landscape management objectives of the site. Gap size, thinning intensity, felling cycle, rotation length, treatment method, sequence of harvesting, coupe shape and uncut patch size may all be adjusted (see "*Landscape Management Guidelines for Integrated Forest Harvest Planning and Design*").

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1 Ministerial Conditions means the "Statement That A Proposal May Be Implemented (Pursuant to the Provisions of the Environmental Protection Act 1986). Amendments to the 1987 Forest Management Plans and Timber Strategy and Proposals to Meet Environmental Conditions on the Regional Plans and the WACAP ERMP." Department of Conservation and Land Management. Published by the Minister for the Environment' 24 December 1992 and associated Determination of Annual Sustainable Timber Resource Available for Allocation dated 16 August 1993, approved by the Minister for the Environment.

## 2.1 IMMATURE EVEN-AGED STANDS

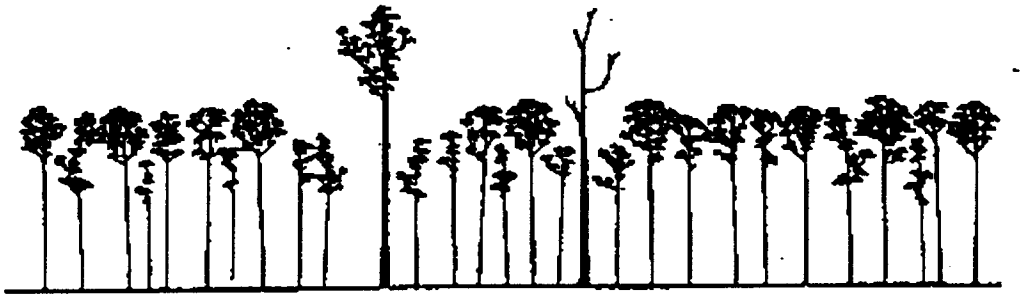


**Figure 1**

*These stands consist of a predominantly single storey of immature trees of the same age forming a single layered canopy.*

*They have resulted from the complete, or near complete, removal of the original mature forest by either logging, clearing for agriculture, or by wildfires. Included in this category are stands of 2ha or more and those stands that contain up to 15% crown cover of an overstorey canopy.*

*The silvicultural objective for these stands is to apply one or more thinnings before regeneration at the nominated rotation age.*

*See Specification 1/92 for detailed management of these stands.*

Most of this stratum has been identified and mapped but there are some virgin even-aged stands of vigorous trees in excess of 80 years old that have not been identified by conventional aerial photography. For that reason they will often be included in areas to be regenerated on CIMCIS sheets. These should be identified at the time of coupe inspection. Patches over 2 ha should be scheduled for thinning, rather than regeneration.

## 2.2 SINGLE STORIED MATURE STANDS

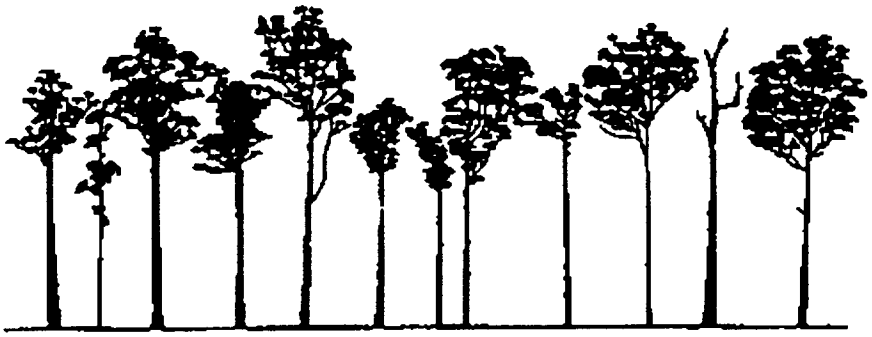


**Figure 2**

*These are stands where the forest canopy is predominantly a single layer of mature and senescent trees. They generally have a canopy cover of 70-80%. In mixed stands of karri and marri, the marri forms a lower layer than the karri but in the context of these guidelines they are considered to be part of the single upper-storey. Although a few smaller or younger stems do occur in these stands they are not a significant component.*

*When these stands are to be harvested, they will be cut for regeneration. Regeneration will be achieved by retained seed trees, artificial seeding or planted seedlings*

The preferred method of regeneration is by seed trees when there is sufficient seed available to ensure successful regeneration. The seed tree method will not be used when seed availability at the time of the burn will be less than indicated in Appendix 1 or when the seed bed conditions are not conducive to producing acceptable stocking of regeneration (See Specification 1/90).

Marri regeneration in mixed stands will come from existing lignotubers.

### 2.2.1 Seed Forecasting

An assessment of seed availability is required to determine whether an area of forest can be regenerated using seed trees or whether it will need to be regenerated by seeding or planting.

Each coupe that has been nominated for seed tree regeneration will be assessed for seed availability and monitored right up until the regeneration burn. The technique for this is the subject of a separate Specification.

Wildfire or prescribed burning is likely to cause abortion or premature seed shed. For that reason areas to be regenerated by the seed tree method should not have been burnt during the previous 3 years.

### 2.2.2 Clearfelling with Seed Trees

Where the planned method of regeneration is by seed trees and seed forecasting shows that there will be sufficient seed available at the anticipated time of the regeneration burn (Appendix 1) then the area will be marked to retain seed trees.

Coupes being cut to seed trees will not have the dominant/codominant strata harvested until flowering has finished. Cutting to seed trees prior to or during flowering may result in reduced cross pollination and loss of flowers due to exposure.

Wherever possible, areas suitable for seed tree regeneration should be scheduled for harvesting in summer. Seed trees must not be retained in areas harvested in winter (see 2.2.3).

***Seed Tree Stocking***

Seed trees will be retained at a stocking of 3-4 trees/ha. This corresponds to a spacing of about 60 metres between the boles.

This number must be increased to 6 trees/ha (40-50m spacing) in areas with past severe fire damage or stands of less than average height class (commonly MK stands).

Additional seed trees may also be retained to provide for losses due to windthrow or falling damage if there is reason to believe that this will be a problem.

Seed trees must be marked before any harvesting of mature trees has begun.

***Seed Tree Specification***

The seed tree will be a windfirm dominant or co-dominant tree with a healthy spreading crown, with good form and free from hereditary defect such as severe sweep and bends, forking or grain deviations. However it is permissible to retain any seed source (i.e. cull tree) if no seed tree meeting the above specification is available at the prescribed spacing. Areas larger than 1ha that are devoid of suitable seed trees will be clearfelled and planted.

***Seed Tree Species***

Seed trees will be karri. Marri regeneration will come from existing lignotubers. Blackbutt regeneration that may be required for specific sites will be produced by planting or broadcast sowing.

***Seed Tree Protection***

Retain any additional tree which when felled is likely to uproot or damage the crown of a seed tree.

### 2.2.3 Clearfelling Without Seed Trees

Where an area is unsuitable for seed tree regeneration, it is to be regenerated by hand planting or artificial seeding. Harvesting is to remove all merchantable trees within the demarcated coupe (except retained habitat trees - see Appendix 2, which will be trialed in selected areas and for a period of time as determined by the Executive Director).

Areas harvested in winter must be clearfelled, ripped and planted.

### 2.2.4 Combined Regeneration Methods

It is not essential that an entire coupe be regenerated by the same method. In sites where there is a patchy distribution of karri, it will not always be possible to obtain a full stocking of seed trees. Where insufficient seed trees occur, the patch (of 1 ha or more) should be clearfelled and planted. Coupe photos must be examined before the area is prepared for regeneration to highlight these areas. Every location where seed tree stocking falls below that which is specified, and where seed surveys indicate have inadequate seed, must be identified for planting in the first winter following the regeneration burn.

### 2.2.5 Diversity

Within patches of forest to be harvested for regeneration, the following will be retained in addition to the zones excluded from harvesting:

- Small patches of regrowth less than 2ha in size are to be retained if they can reasonably be protected during the regeneration burn. All patches of regrowth over 2ha are to be retained and protected.

- Retain patches (min 2ha) of mature forests where possible to ensure there is a maximum distance of approximately 400m between patches of mature forest.

### 2.2.6 Removal of Seed Trees

The objective of this operation is to remove seed trees after they have shed their seed, with the minimum damage to seedlings and soil.

Sufficient time must elapse after the burn to allow seed to shed prior to seed tree removal. For burns carried out in November to February, allow 5 weeks before removing seed trees. For burns done in March to April, allow 3 weeks. Seed trees must be removed within 2 years of the regeneration burn.

See *Timber Harvesting in WA* for harvesting practices that apply to the removal of seed trees.

## 2.3 TWO TIERED STANDS

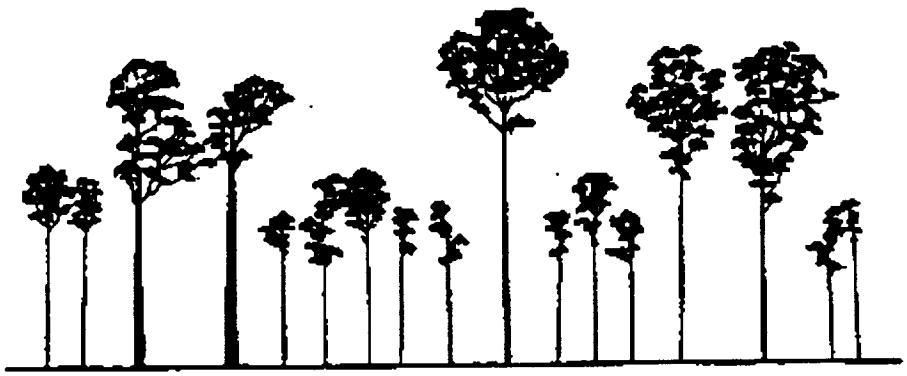


**Figure 3**

*These stands have a two layered canopy composed of trees that are distinctly different in age or maturity. The stands result from selective harvesting or the less complete removal of the original overstorey by agricultural clearing or wildfire.*

*They are extremely variable in composition. The overstorey may be vigorous or decadent and may vary in crown cover from 15-50%. Patches of regrowth in the lower storey may be distinct or ill-defined and may vary in diameter from 40m to 140m. (Patches exceeding 140m in diameter (2ha), are regarded as even-aged stands.*
*The silvicultural objective for these stands varies according to the size of the lower storey patches.*

### 2.3.1. Coupes Containing Regrowth Patches >60m Diameter.

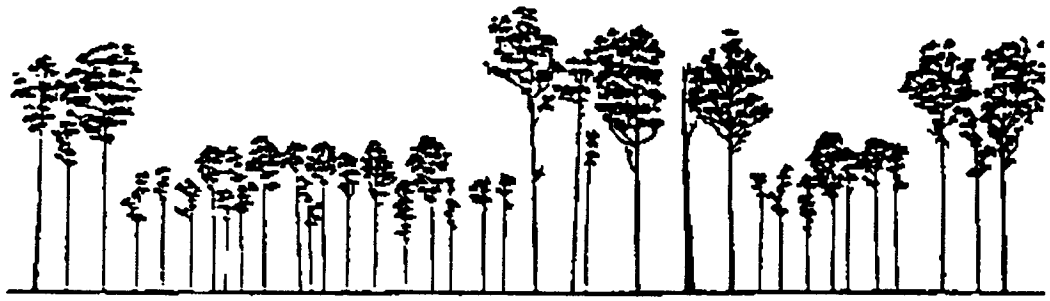


**Figure 4a. Before thinning.**

*Delay the regeneration cut for as long as possible if thinning is proposed. Thin large gaps (>60m) from below[2] in accordance with Specification 1/92.*

*Thin small gaps (<60m) from above[3] if these trees are large enough to provide small sawlogs. Retain a minimum of 20% crown cover within the lower storey patches to inhibit the emergence of young regeneration.*

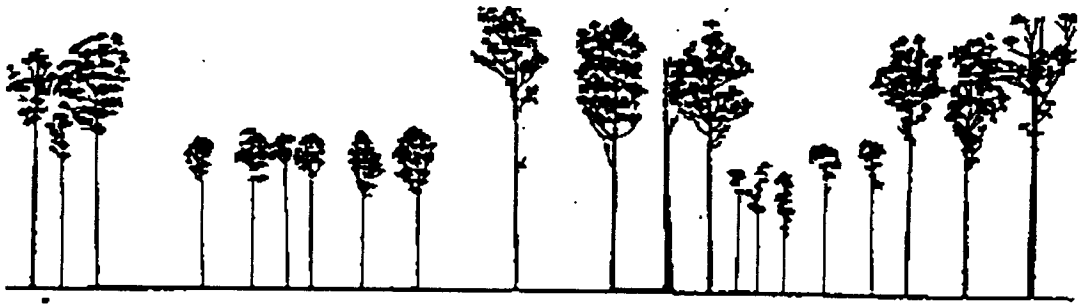


**Figure 4b. After Thinning - from below in large gaps.**
**- from above in small gaps.**

2 Remove the poorest and smallest components of the regrowth or lower storey of the stand, leaving the larger trees to grow on.

3 Remove from the lower storey only the larger regrowth stems that are marketable as sawlogs, leaving the smaller and unmarketable stems to be removed at the time of the regeneration harvest.

### 2.3.2 Coupes Containing Regrowth Patches Which Are All <60m Diameter.

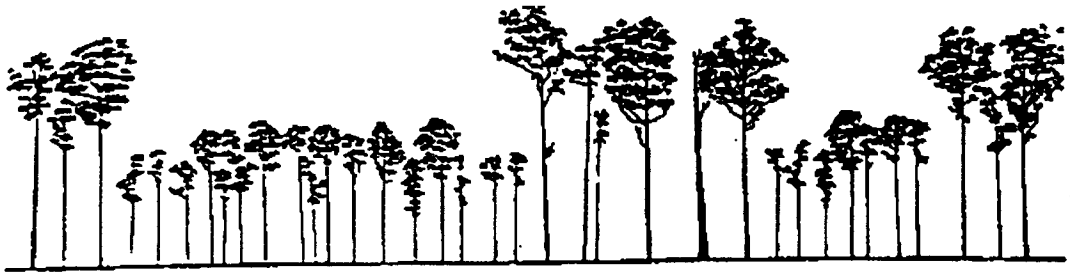


**Figure 5a. Before Thinning**

*Regenerate the coupe when required by the methods described in Section 2.2.*

*If regeneration cutting is not planned within 3 years, thin from above (if harvesting for small sawlogs) ensuring that a minimum 20% crown cover is retained in the lower storey patches. See Figure 5b.*

*If the regeneration harvest is planned to be within 3 years, prelog[4] See Figure 5c.*

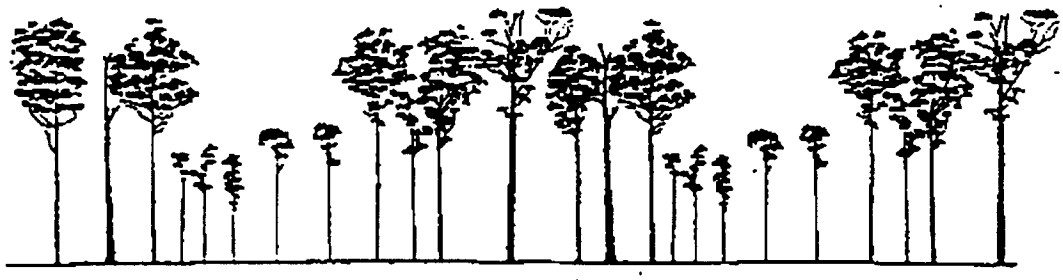


**Figure 5b. After Thinning**

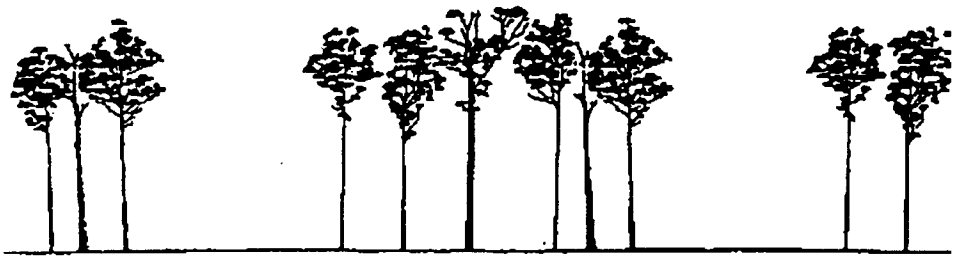


**Figure 5c. After Pre-logging**

4 Completely remove the lower storey prior to the main regeneration harvest.

## 2.4 Mixed karri/jarrah stands

These stands include a range of types within the karri/jarrah ecotone. They include stands with varying proportions of jarrah, karri and marri.

The objective is to manage them to retain the mixed species forest in the longer term, while acknowledging that the actual mix will vary over time.

A mixed karri/jarrah stand is defined as one that contains between 2 and 8 overstorey karri trees/ha, (i.e. with 5% to 20% crown cover of karri), within a predominantly jarrah, marri stand; or has contained such a stocking prior to selective harvesting.

These types occur as:

Transition zones between karri and jarrah types where soil types change; and

As substantial stands in their own right where the site type favours neither the full development of a karri nor jarrah type.

These stands will be managed as mixed types where there are patches of 1ha or more.

***Immature Even-aged Stands***

These stand types are to be thinned one or more times before regeneration. Patches exceeding 140m diameter (2ha) are to be managed as even aged stands.

Thinnings will be done according to Specification 1/95 and 1/92, depending on the proportion of each species, with the overriding objective of retaining a mixed stand.

***Mature and Two-tiered Stands***

Cut for regeneration as described in Section 2.2. In patches that contained jarrah:

- where the advance growth stocking is <25% at the rate of 1000 spha, plant jarrah at the rate of 500 spha
  - in addition to karri seed tree regeneration; or
  - in lieu of 500 karri planted seedlings
- Where jarrah advance growth stocking >25% at the rate of 1000 spha, no further jarrah planting is required.

The objective is to achieve an 85% stocking at the rate of 1666 spha of karri, jarrah or marri when assessed (Specification 1/90) the following summer.

### 2.5 Regeneration on steep slopes

Slopes 14-20°:

- Will be burnt for regeneration in spring, not autumn
- Will NOT be cut to seed trees

Slopes > 20° will not normally be harvested.

## 3. RECORDS

Good silvicultural records are essential for future managers to assess the condition and needs of the forest without having to undertake detailed assessment. The aim is to have an accurate description of the condition of the forest when the operation is completed.

Harvested areas will be photographed in December each year for entry into GIS and subsequent reporting.

Areas managed as karri, jarrah or mixed stands should be clearly indicated.

Dr S Shea
EXECUTIVE DIRECTOR

**APPENDIX 1**

# MINIMUM SEED REQUIREMENTS

To achieve adequate regeneration using seed trees, the predicted minimum viable seed crop present at the time of the burn must be:

| | MINIMUM SEEDS/HA AT TIME OF BURN | |
|---|---|---|
| **SOIL TYPE** | **SPRING BURN** | **AUTUMN BURN** |
| Red "karri" loams<br>(high quality 'pure' karri types) | 120,000 | 90,000 |
| Podsols<br>(Generally mixed K, M types) | 180,000 | 135,000 |

# APPENDIX 2

## GROWING HABITAT TREES

'Old tree' habitat in State forest karri is provided for within:

- retained stream zones;
- strips of forest retained along specific roads;
- additional patches of mature forest retained every 400m.

However, to ensure continued recruitment of habitat trees, it is desirable to develop potential habitat trees of an intermediate age between the generally mature patches and the developing regrowth.

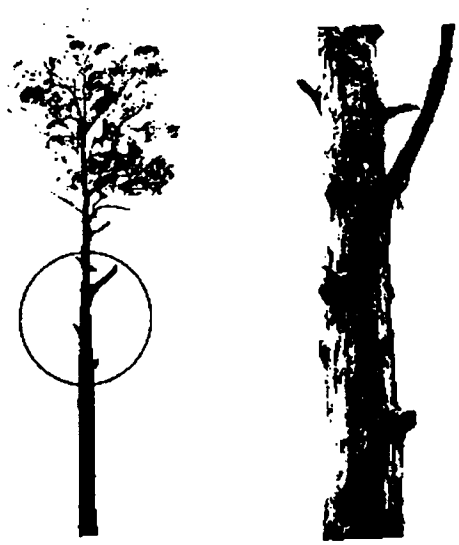
This can be done by retaining immature trees (say 40-80 years of age) and growing them in a way that will enhance the development of hollows at an earlier age than would normally occur.

In forest to be harvested for regeneration, potential habitat trees can be grown in the following fashion:

- Retain two trees per hectare in the 30-50cm dhb range.
- Ensure that the retained trees are not surrounded by heavy tops or logs that may lead to them being killed during the regeneration burn.
- It is preferable to scorch these trees during the regeneration burn. This will stimulate the development of an epicormic crown along the bole.
- In the early years of regrowth development, the retained trees will be open grown allowing the epicormic crown to become established. Growth rate will be rapid.
- By the time the stand is 50 years old, the regrowth will have overtaken the retained trees and be a similar height. The retained trees will be about 100cm dbh with a deep crown (on about half their total height). The lower epicormic branches will progressively die as light levels below the regrowth canopy are reduced. The dead branch stubs, with a vigorous crown above, then have the potential to begin forming hollows. These trees are capable of living for another 150 years.

Examples of this process can be seen in existing regrowth forests which are now 20 to 60 years old.

*Retained trees shortly after the regeneration burn - showing the development of epicormics on the bole*
**Figure 1**



*50 years later the epicormics have grown and become suppressed. Lower branches have died and broken off*
**Figure 2**