FOREST REGENERATION AFTER LOGGING - *KARRI*

OPERATIONS MANUAL – 1999

NOTE: FOR UPDATES ISSUED IN 1999 REFER TO THE ENTRIES UNDER THE FOLLOWING – Fire Operations Manual : Volume 3 : Fire Protection Instructions. 1993

MISSION AND OBJECTIVES – 1999-1997

CALM Annual Report 1998/1999. 1999
CALM Annual Report 1997/1998. 1998
CALM Annual Report 1996/1997. 1997

NOTE: REFER TO ENTRY UNDER ANNUAL REPORT 1992/1993 – SIMILAR WORDING

SILVICULTURAL GUIDELINE - 1997

Silvicultural guideline 3/97 Karri Seed Crop Assessment & Monitoring

"[…] *Due to the irregular availability of naturally occurring seed crops however, regeneration of harvested coupes must be augmented by artificial regeneration methods if an annual regeneration program is to be achieved. This mainly involves the planting of nursery raised seedlings. As artificial methods such as this are more expensive in application every effort needs to be made to utilise the naturally occurring availability of seed.*

[...] *Seed monitoring is needed for planning appropriate harvest and regeneration methods and for planning seed collection operations*." (p. 1)

2. Objective
"*The objective of karri seed crop assessment and monitoring is to provide for:*
* *mid term harvest planning through detailed forecasting of the stage of development of seed crops within coupes added to the 4 year logging plan.*
* *annual monitoring of coupes within the 4 year plan assessed as suitable and available for harvesting to seed trees.*
* *detailed pre-burn assessment of coupes harvested to seed trees*." (p. 1)

3. Mid Term Seed Forecasting
3.1 Suitability:
" […] *For those coupes or parts of coupes which appear suitable for consideration for seed tree regeneration detailed assessment is required*." (p. 2)

3.3 Selection of Sample Trees:
"*Sample trees need to be subjectively selected to ensure a representative sample of the range of sites within the coupe has been obtained, ie. ridge to valley.*

The sample trees also need to be selected on the basis of being representative of the average floral cycle stage of potential trees within the coupe, eg. there is no point in selecting a tree to be included in the sample if it is carrying a heavy seed crop when the majority of trees are carrying a very poor seed crop." (p. 2)

3.5 Timing of Assessment:
"*Assessment of coupes is to be completed during October/November each year with a copy of results (Appendix 1,2 including recommendations on year of best cut for regeneration via seed trees), being forwarded to the Southern Forests B.U. Silvicultural Officer by 1st December annually.*" (p. 3)

3.6 Bee Introduction:
"***Note:*** *A coupe proposed to be harvested to seed trees will not have the dominant/co-dominant strata harvested until flowering has finished. Harvesting prior to or during flowering may result in reduced cross pollination and loss of flowers due to exposure.*" (p. 3)

4. Annual Monitoring
"[…] *To take account of this, all coupes which have been harvested or are proposed to be harvested to seed trees within the 4 year plan but which are not proposed for regeneration burning in the current financial year will receive an annual seed monitoring assessment*" (p. 3)

5. Pre-Burn Assessment
"*Because our measure of success requires 85% of the area of the coupe to be adequately stocked, it is necessary that 85% of the surface of the coupe is exposed to the minimum recommended rates of seed fall. This needs to be evenly distributed across the coupe to ensure that no holes in the regeneration occur.*

As a rule of thumb, 65% to 70% of seed trees must contribute at the minimum rate per hectare (eg. 30, 000 viable seeds/tree for a spring burn for 4 seed trees per ha), with no more than 1 in any group/triangle of 3 contributing less than this.

5.1 Timing:
"*Pre-burn seed assessment is to be completed no more than 2 months prior to regeneration burning programmed for spring. For seed tree regeneration burning programmed for the remainder of summer/autumn assessment is to be completed no later than 15th January with results forwarded to the Southern Forests B.U. Silvicultural Officer by this date. This will allow all options for remedial action to improve potential regeneration stocking to be considered.*" (p. 4)

5.4 Mapping:
"*Any areas which are highlighted as being potentially understocked will require assessment of all trees to determine the exact boundaries and total area involved.*" (p. 5)

5.5 Remedial Action:
"*Having decided on the adequacy of each area to achieve regeneration, remedial action will need to be prescribed for areas which may result in gaps in regeneration.*[…]" (p. 5)

SILVICULTURAL GUIDELINE - 1997

Silvicultural guideline 3/97 Establishment Guidelines for Karri Forest Regeneration Following Harvesting

4. Regeneration Stocking
"*The target stocking rates to be achieved following regeneration will be 85% of the regenerated area at (Optimal + Adequate), with no continuous areas at less than this stocking rate larger than 1 hectare. (see silvicultural specification 1/90)*" (p. 2)

5. Regeneration Burning
"*Irrespective of the method by which regeneration is achieved, fire is the principle* […] *means by which a suitable site for seedling establishment is created.*

The objectives of burning are:

- *to create maximum receptive seed bed;*
- *induce seed fall from seed trees';*
- *remove logging debris;*
- *achieve maximum burn Intensity consistent with control and safety.*
- *temporarily remove competition from the understorey*." (p. 2)

6. Site Preparation Requirements

"*Harvesting operations carried out during winter conditions using equipment with high ground pressures results in the mixing of soil horizons and soil compaction. Although soil damage in terms of the mixing of soil horizons is largely confined to major snig tracks and landings, soil compaction will occur on any part of a harvesting coupe traversed by machinery. This will seriously effect the ability of germinating seed to establish and reduce seedling growth.*" (p. 2)

"*To ameliorate this effect, all coupes harvested in winter must be ripped prior to establishing regeneration. This is to include all parts of the coupe traversed by machines.*

Ripping is to be programmed following regeneration burning to ensure the maximum area is available free of harvesting debris. […] *Access requirements for other tasks such as planting must also be considered.*

Ripping is not feasible where seed tree regeneration systems are used due to excessive debris being present prior to burning and limited opportunity after burning before seed fall. Therefore where harvesting to seed trees is considered harvesting is to be scheduled for the summer months. This minimises the risk of soil compaction occurring and negates the need for ripping of the site." (p. 3)

7. Regeneration Method

7.1 Choice

"*Priority is to be given to achieving regeneration following harvesting through the use of seed trees. The goal is to achieve at least 30% of regeneration requirements per year by this method.*

Seed forecasting of the karri forest according to Silvicultural Guideline 2/97 provides a precise guide as to the suitability of coupes to be harvested to seed trees. Every effort is to be made to schedule harvesting to allow full use of this regeneration method.

Where seed availability or other harvesting constraints exclude the use of seed trees as the regeneration method for proposed harvesting coupes, these coupes are to be schedules for regeneration by either seeding or planting. Planting will be the usual option applied, although direct seeding will be applied to the extent of seed stocks available.

The goal is to fully regenerate all coupes within 2 years of harvesting being completed." (p. 4)

7.3 Direct Seeding

"*Where this method of regeneration is considered the following requirements will be satisfied:*
- *Application rate is to be 45, 000 viable karri seeds per hectare.*
- *Seed source is to be from the same karri zone as the coupe to which it is to be applied (see Appendix 1).*
- *The seed is to be applied without pre treatment ie (pelleting).*
- *The seed is to be broadcast sown using cyclone seeders or a similar device. Seeders are to be calibrated to ensure seed application rate is accurate.*
- *Seed is to be baulked with sand as required.*
- *Spacing between seeder operators will be determined prior to seeding commencing to ensure at least a 1 metre overlap between seeding swathes.* (p. 4)

7.4 Planting

"*During the planting of seedlings the following requirements must be adhered to:*

- *avoid planting in straight rows.*
- *aim to position plants immediately on the edges of rip lines where possible.*
- *plants must not be planted closer than 1 metre to logs and stumps.*
- *Planting lines must not commence within 3 metres of the edge of any road.*
- *plants are to be heeled or toed in to remove air pockets from around roots and to ensure they are firmly positioned.* […]
- *the stem of planted seedlings must be vertical or near vertical*." (p. 6)

9. Mixed Stands
"*Management of the regeneration process in these stands must consider the stocking status of jarrah regeneration.* […] *Regeneration burning intensity must be such that damage to ground coppice is minimised.*

Where jarrah ground coppice is inadequate these considerations do not apply." (p. 7)

11. Infilling of Failed Areas
"*All areas identified in initial establishment surveys as being unacceptably stocked with seedlings must be programmed for infill planting the following winter.*

Areas identified for infill planting must be ripped during dry soil conditions to improve soil structure and remove developing understorey competition. Ripping specifications to be applied are as outlined in Section 6.1.3.

A regeneration survey is to be applied to all areas infilled to measure planting success in the summer following establishment." (p. 7)

OPERATIONS MANUAL – 1997

NOTE: FOR UPDATES ISSUED IN 1997 REFER TO THE ENTRIES UNDER THE FOLLOWING –
Fire Operations Manual : Volume 1. 1993
Fire Operations Manual : Volume 3 : Fire Protection Instructions. 1993

MISSION AND OBJECTIVES – 1996

CALM Annual Report 1995/1996. 1996

NOTE: REFER TO ENTRY UNDER ANNUAL REPORT 1992/1993 – SIMILAR WORDING

TIMBER HARVESTING … 1996 ED. – 1996

Timber Harvesting in Western Australia … 1996 Ed. 1996

PART ONE : CODE OF HARVESTING PRACTICE

Preface
NOTE: REFER TO ENTRY UNDER 1993 EDITION (SIMILAR WORDING)

Section 2 : General
NOTE: REFER TO ENTRY UNDER 1988 EDITION (SIMILAR WORDING)

Section 3 : Felling, Trimming and Crosscutting
NOTE: REFER TO ENTRY UNDER 1988 EDITION (SIMILAR WORDING)

Section 4 : Extraction

NOTE: REFER TO ENTRY UNDER 1988 EDITION (SIMILAR WORDING)

PART TWO : MANUAL OF HARVESTING SPECIFICATIONS

Section 1 : Planning and Monitoring

Specification 1.1 : Harvesting and Regeneration Plans

1. Responsibilities

NOTE: REFER TO ENTRY UNDER 1990 EDITION (SIMILAR WORDING)

2.3 Short Term Integrated Harvesting and Regeneration Plan

"*This is the tertiary level integrated harvesting plan which shows in detail proposed harvesting areas over a one or two year period. The short term plan takes into account the principles contained in 'Guidelines for Integrated Forest Harvest Planning and Design'.*" (p. 16)

NOTE: THE LISTING HAS BEEN EXPANDED TO INCLUDE THE FOLLOWING –

"*These plans shall include:*

[…]

(3) 1:25, 000 plans showing, when available:

[…]

- *lignotuber status.*

[…]" (p. 16)

7. Field Plans

"*In most cases it is necessary for the forest Officer in Charge of a harvesting operation to be in possession of a relatively large scale field plan. The field plan is used to record the progress of cutting and extraction, and the progress of any silvicultural treatments.* […]" (p. 17)

8. Records

"*SFRBU or District staff must maintain up-to-date field records of areas cut over and silviculturally treated. Forms for input into the computer system 'SILREC' will be collated every six months with assistance from Forest Management Branch.*" (p. 17)

Section 3 : Silviculture

Specification 3.1 : Current Specifications

NOTE: REFER TO ENTRY UNDER 1989 EDITION (SIMILAR WORDING)

NOTE: THE FOLLOWING ENTRY WAS NOT INCLUDED IN THE 1996 EDITION (REFER TO ENTRIES FOR EARLIER EDITIONS) - Specification 3.3 : Karri Silviculture

Section 4 : Coupe Management

Specification 4.2 Felling (Including Tree Marking Techniques)

NOTE: REFER TO ENTRY UNDER 1989 EDITION (SIMILAR WORDING)

Section 5 : Environmental Protection

Specification 5.4 : Protection of Crop Trees

NOTE: REFER TO ENTRY UNDER 1987 EDITION (SIMILAR WORDING)

MISSION AND OBJECTIVES – 1995

CALM Annual Report 1994/95. 1995

NOTE: REFER TO ENTRY UNDER ANNUAL REPORT 1992/93 – SIMILAR WORDING

SILVICULTURE GUIDELINES - 1995

Silviculture Guidelines 2/95 : Silvicultural Practice in the Karri Forest. 1995

NOTE: SUPERSEDES SILVICULTURE SPECIFICATIONS 6/89

2. Silvicultural Objectives and Treemarking for Harvesting
"*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 stocking of regeneration (See Specification 1/90).*

Marri regeneration in mixed stands will come from existing lignotubers." (p. 3)

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. [...]" (p. 3)

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. […]

"*Seed trees must be marked before any harvesting of mature trees has begun*." (p. 4)

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.* [...]
Areas larger than 1 ha that are devoid of suitable seed trees will be clearfelled and planted." (p. 4)

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*." (p. 4)

Seed Tree Protection
"*Retain any additional tree which when felled is likely to uproot or damage the crown of a seed tree*." (p. 4)

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 ... 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." (p. 4)

2.2.4 Combined Regeneration Methods
"[…] *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*." (p. 4)

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.*" (p. 5)

2.2.6 Removal of Seed Trees
"*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*." (p. 5)

2.4 Mixed karri/jarrah stands
"*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 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. (p. 8)

Mature and Two-tiered Stands
"*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.*" (p. 8)

2.5. Regeneration on steep slopes
"*Slopes 14-20 degrees:*
- *Will be burnt for regeneration in spring, not autumn*
- *Will NOT be cut to seed trees*

Slopes >20 degrees will not normally be harvested." (p. 9)

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." (p. 9)

NOTE: REFER TO ACTUAL DOCUMENT FOR THE FOLLOWNG – Appendix 1 : Minimum Seed Requirements

GUIDELINE - 1995

Guidelines For Forest Landing & Snig Track Design & Management. 1995

Construction
- "*No woody debris will be pushed closer than 1 metre to retained vegetation. No debris will be heaped within 5 metres of retained vegetation. Retained vegetation refers to vegetation planned for retention, i.e. – crop & habitat trees, visual amenity vegetation, etc.*" (p. 3)

Protection Of Retained Landscape Elements
- "*Damage to retained trees, including vegetation screens, rock outcrops and landform immediately surrounding landings and in-coupe roads is to be avoided.*" (p. 3)

MISSION AND OBJECTIVES – 1994

CALM Annual Report 1993/94. 1994

NOTE: REFER TO ENTRY UNDER ANNUAL REPORT 1992/93 – SIMILAR WORDING

MANAGEMENT PLANS - 1994

Forest Management Plan 1994-2003. 1994.

1.Managed Forest Values
Harvesting Timber from State Forests
"*The quantity of timber which can be harvested from publicly owned native forest in Western Australia is constrained to be within the overall growth capacity of the forest. This means that the timber yield may be sustained in perpetuity.*" (p. 35)

Ecological Processes
"*This Forest Management Plan will ensure that the ecological processes continue to be maintained by:*" (p. 42)

- "*ensuring that there is no loss of soil by disturbance (other than that associated with mining) or no net loss of nutrients from forest ecosystems;*

- *ensuring that all areas of forest which are harvested or disturbed by other activities are regenerated with the same mix of forest species which was present prior to the disturbance.*" (p. 43)

Biological Diversity
"*The Plan seeks to preserve and enhance biological diversity in the forests by:*

- *maintaining a balanced forest structure, including a significant component of the mature and senescent stages of forest development, in perpetuity;*

[…]" (p. 43)

National Estate Values Outside Reserves
"*The planning and operational guidelines designed to minimise impacts on national estate values which are sensitive to timber production operations include:*" (p. 47)
[…]

- "*Ensuring that silvicultural operations do not prevent the re-establishment of the original structure of the forest type.*" (p. 48)

2. The Strategies for the Sustainable Management of Native Forests
Karri Forest Structural Strategies
"*1. The minimum proportion of the area of karri forest dominated by the mature and senescent stages of development will be retained at approximately 40 percent.*

2. Silviculture of the karri forest will be progressively modified to ensure that the preceding stages of development are represented in sufficient proportions to sustain the mature and senescent stages in perpetuity." (p. 9)

Silviculture in the Karri Forest
"*Rotation lengths will be varied to ensure the forest structural goal is achieved:*
[…]
5.Over 20 percent of pre-1940 regrowth will be deferred from clearfelling and 'grown on' to develop mature/senescent characteristics. The remainder will be managed on a rotation length of at least 100 years." (p. 11)

"*6. Over 30 percent of the total area of regrowth forest regenerated between 1940 and 1975 will be deferred from clearfelling. The remainder will be managed on a rotation length of at least 100 years.*

7. Stands regenerated between 1975 and 1990 will be scheduled for future harvesting to ensure that in any year approximately:

*10 percent will be felled and regenerated at 60 years**
10 percent will be felled and regenerated at 80 years
70 percent will be felled and regenerated at 100 years
10 percent will be 'grown on' to the senescent stage

**UNDERSTOCKED OR FIRE-DAMAGED AREAS*

8. 50 percent of all stands regenerated after 1990 will be grown on to the senescent stage." (p. 12)

GUIDELINES – 1994

<u>Guidelines for Integrated Forest Harvest Planning & Design. 1994</u>

Special Areas
Exclusion Areas
"*These are areas set aside from harvesting and are often linked to natural lines and forms eg. rock outcrops and stream zones. Often, however, for silvicultural purposes and the protection of habitat, these exclusion*

areas are not often linked to such natural lines. It is important that the most natural position is found for these link reserves and that natural lines and forms are followed where these reserves need to be located. (Fig. 5.1.1)" (p. 5)

MISSION AND OBJECTIVES – 1993

CALM Annual Report 1992/93. 1993

"***CALM's mission :***

We conserve and manage Western Australia's wildlife and the lands, waters and resources entrusted to the Department for the benefit of present and future generations." (p. i)

"*In keeping with our mission, the Department of Conservation and Land Management has the following objectives.*

Conservation: *To conserve indigenous plants, animals and ecological processes in natural habitats throughout the State.*

Value and Use of Resources: *To optimise the value and economic return to the community of wildlife, lands, waters and resources entrusted to the Department without compromising conservation and other management objectives.*

Tourism and Recreation: *To identify and provide opportunities and services to the community which allows them to enjoy the wildlife, lands, waters and resources entrusted to the Department without compromising conservation and other management objectives.*

Knowledge: *To seek and provide an up-to-date and sound scientific and information basis for the Department's conservation and land management activities.*
[…]" (p. i)

TIMBER HARVESTING … 1993 ED. – 1993

Timber Harvesting in Western Australia … 1993 Ed. 1993

PART 1 : CODE OF LOGGING PRACTICE

Preface
"*This new publication 'Timber Harvesting in WA' contains revised editions of the 'Code of Logging Practice' (the Code) and the 'Manual of Logging Specifications' (the Manual).*

The Code and the Manual form parts of a hierarchy of rules relevant to timber harvesting operations controlled by the Department of Conservation and Land Management.

- *Conservation and Land Management Act (1984)*
- *Forest Management Regulations 1993 (gazetted 9 February 1993).*
- *Code of Logging Practice.*
- *Manual of Logging Specifications.*
- *Bush Fires Act*
- *Individual Contracts to Supply negotiated between a logging contractor and CALM.*
- *Forest Produce Licence.*" (p. I)

Section 2 : General
NOTE: REFER TO ENTRY UNDER 1988 EDITION (SIMILAR WORDING)

Section 3 : Felling, Trimming and Crosscutting
NOTE: REFER TO ENTRY UNDER 1988 EDITION (SIMILAR WORDING)

Section 4 : Extraction
NOTE: REFER TO ENTRY UNDER 1988 EDITION (SIMILAR WORDING)

PART 2 : MANUAL OF LOGGING SPECIFICATIONS

PART 2 : MANUAL OF LOGGING SPECIFICATIONS

Section 1 : Planning and Monitoring
Specification 1.1 : Harvesting and Regeneration Plans
Part A : Hardwood
"*Complete details are contained in the Department's 'Provisional Manual of Hardwood Logging Planning'. The following is a summary.*" (p. 20)

1.1 Responsibilities
NOTE: REFER TO ENTRY UNDER 1990 EDITION (SIMILAR WORDING)

7. Field Plans and Checklists
NOTE: REFER TO ENTRY UNDER 1990 EDITION (SIMILAR WORDING)

8. Monitoring and Records
NOTE: REFER TO ENTRY UNDER 1992 EDITION (SIMILAR WORDING)

Section 3 : Silviculture
Specification 3.1 : Current Specification
NOTE: REFER TO ENTRY UNDER 1989 EDITION (SIMILAR WORDING)

Specification 3.3 : Karri Silviculture
1. **Karri Regeneration Method**
NOTE: REFER TO ENTRY UNDER 1990 EDITION (SIMILAR WORDING)

2. **Seed Forecasting**
NOTE: REFER TO ENTRY UNDER 1990 EDITION (SIMILAR WORDING)

3. **Karri Seed Collection**
NOTE: REFER TO ENTRY UNDER 1990 EDITION (SIMILAR WORDING)

4. **Planning**
NOTE: REFER TO ENTRY UNDER 1990 EDITION (SIMILAR WORDING)

5. **Clearfelling without Seed Trees**
NOTE: REFER TO ENTRY UNDER 1990 EDITION (SIMILAR WORDING)

6.Clearfelling with Seed Trees
NOTE: REFER TO ENTRY UNDER 1987 EDITION (SIMILAR WORDING)

6.1 Cutting with Seed Trees
NOTE: REFER TO ENTRY UNDER 1987 EDITION (SIMILAR WORDING)

6.1.1 Seed Tree Stocking
NOTE: REFER TO ENTRY FOR UNDER 1987 EDITION (SIMILAR WORDING)

6.1.2 Seed Tree Specification
NOTE: REFER TO ENTRY FOR UNDER 1987 EDITION (SIMILAR WORDING)

6.1.3 Seed Tree Species
NOTE: REFER TO ENTRY FOR UNDER 1987 EDITION (SIMILAR WORDING)

6.1.4 Seed Tree Protection
NOTE: REFER TO ENTRY FOR UNDER 1987 EDITION (SIMILAR WORDING)

6.2 Regeneration Burning
NOTE: REFER TO ENTRY UNDER 1990 EDITION (SIMILAR WORDING)

6.3 Removal of Seed Trees
NOTE: REFER TO ENTRY UNDER 1987 EDITION (SIMILAR WORDING)

Section 4 : Coupe Management

Specification 4.1 : Coupe Demarcation
5. Demarcation of Karri Regrowth Permanent Increment Plots
NOTE: REFER TO ENTRY UNDER 1990 EDITION (SIMILAR WORDING)

Specification 4.2 : Felling (Including Tree Marking Techniques)
NOTE: REFER TO ENTRY UNDER 1989 EDITION (SIMILAR WORDING)

Specification 4.3 : Logging Operation Inspections and Certifications
NOTE: REFER TO ENTRY UNDER 1987 EDITION (SIMILAR WORDING)

Section 5 : Environmental Protection

Specification 5.4 : Protection of Crop Trees
NOTE: REFER TO ENTRY UNDER 1987 EDITION (SIMILAR WORDING)

MANUALS – 1993

Fire Operations Manual : Volume 1. 1993

NOTE: INCLUDES UPDATES ISSUED IN 1997

1.3 Burning Plans
1.3 (iii) Fire Exclusion Areas
"*Protection will be afforded to 'No Planned Burn Areas' as specified in Management Plans, or Interim Guidelines for Necessary Operations. Other areas to be protected include:*
[…]

- "*Regenerated hardwood areas where tree saplings or poles do not have sufficient bark thickness to withstand mild intensity fires.* […]" (p. Chapt 1 – Page 2) Issued 14/1/97

7. Prescribed Burning and Fuel Reduction
7.1 Prescribed Burning on CALM Lands
"*Prescribed burning can be used to achieve a wide variety of land management objectives, for example:*
[…]
2. To achieve silvicultural objectives, eg. regeneration, clearing
[…]." (p. Chapt 7 – page 1) Issued 14/1/97

7.2 Types of Burning
7.2 (ii) High Value Buffers
"*These are located to keep fires out of such high value areas as town sites, schools, sawmills, isolated settlements, plantations, research areas, regeneration, recreation and ecologically valuable or sensitive areas.*[…]." (p. Chapt 7 – page 2) Issued 14/1/97

7.2 (iv) Maintenance of Buffers
"*Within designated buffers, fuel reduction is the priority activity. No other activity is permitted which will prevent fuel reduction being carried out during the period the buffer is so designated.*

Logging within buffers is not permissible except for the following operations.

- *Thinning which retain adequate stocking and does not create gaps.*[…]

Logging which creates regeneration is to be avoided. Even where it is planned to sacrifice resultant regeneration difficulties will arise. […]" (p. Chapt 7 – page 2) Issued 14/1/97

7.2 (v) Fire Management Areas
Prescribed burning of large areas outside of designated buffers may be programmed to meet various objectives such as: to minimise the impact of wildfires on forest values (eg, timber); to facilitate the control of wildfires; to facilitate achievement of a range of silvicultural objectives; to enhance wildlife; to study fire effects; to provide structural diversity of vegetation associations. The application of this system depends on the land-use objective, the burn objectives, the vegetation/fuel types, the rate of fuel build-up together with seasonal weather, manpower availability and other local circumstances." (p. Chapt 7 – page 2) Issued 14/1/97

7.2 (vi) Advance Burning
These are applied prior to logging operations, for the protection of the residual stand and the safety of the logging crews.[…]" (p. Chapt 7 – page 2) Issued 14/1/97

7.2 (vii) Regeneration Burns
"*Regeneration burns (often called Slash Burns) are conducted following logging of forests to meet several objectives: removal of logging debris; stimulation of seedfall in stands where seed trees have been retained; production of seed bed (ashbed) or suitable planting sites. Refer to Slash Burning Guidelines (17P1 37). These burns are often of high intensity and take place during the Prohibited Burning Time. (See also FPI 46 Slash Burning Prescription Preparation, and FP1 54 Standards for Coupe Preparation for Karri Regeneration Burning.)*

7.2 (viii) Tops Disposal Burns
"[…]
The aim is to remove flash fuels and woody material up to 2.5 cm in diameter which have accumulated as a result of the logging operations. (See Silviculture Specification 1191.)

7.2(ix) Release Burns
Release Burns Release burning is carried out to enhance the development of regeneration in jarrah harvested forest to the silvicultural objective of regeneration release (gap creation). It is particularly important where there has not been an advance bum. The objective includes the removal of scrub competition, the stimulation of dynamic growth of lignotubers and the removal of poorly formed saplings. (See Silviculture Specification 1/91.)" (p. Chapt 7 – page 3) Issued 14/1/97

Fire Operations Manual : Volume 2 : Fire Protection Instructions. 1993

Fire Protection Instruction 1 : Master Burn Plan Review Process

Appendix 1 PLANNING STEPS

"*The following are Planning Steps that need to be considered and appropriately acted upon to properly implement the Prescribed Burning Planning Process.*" (Fire Protection Instruction 1 : p. 11) Issued 21/09/93

"*PLANNING STEP* *FP2*

Year Relative to Burn: -8 (Jarrah forest where interpretation required)

Issue:	***Regeneration in Burning Buffers.*** *Exclude regeneration from 1st stage Burning Buffers. Regenerate 2nd Stage Burning buffers as early as possible.*
Action:	*Regional Operations Officer (in liaison with Districts) confirms current buffer plans are up to date. Provide this information to resource planner.*
Information:	*Location of 1st and 2nd Stage Burning Buffers and logging proposals.*
Custodian:	*Regional Operations Officer.*
Input by:	*Operations Officer, District Fire Protection Officer, FOIC, Resource Planner.*
Received by:	*District Fire Protection Officer, FOIC, Resource Planner.*
Critical:	*Yes, to ensure that Resource Planner identifies areas inside 1st Stage Burning Buffers that are deficient in Jarrah advance growth for shelterwood operations and directs release cutting / regeneration operations into 2nd Stage Burning Buffers.*
Other Options:	*No*" (Fire Protection Instruction 1 : p. 11) Issued 21/09/93

"*PLANNING STEP* *S1*

Year Relative to Burn: -8

Issue:	***Protection of existing regeneration.***
Action:	*Prepare maps of regeneration status and suitability for burning.*
Information:	*Areas of regeneration requiring protection and its likely time of availability for prescribed burning. FMIS should contain year of regeneration information*
Custodian:	*Regional Silviculturalist/Regional Operations Officer*
Input By:	*Fire Management Branch, District Silviculturist or Fire Protection Officer.*
Received By:	*Regional Fire Protection Officer.*
Critical:	*Yes, loss of regeneration will lead to reduced future timber production, and reduced area burnt may increase risk unnecessarily.*
Other Options:	*Yes, can be done earlier.*" (Fire Protection Instruction 1 : Page 12) Issued 21/09/93

"*PLANNING STEP* *PL3*

Year Relative to Burn: -4 (Jarrah forest where interpretation completed, or Karri Forest)

Issue:	***Regeneration in Burning Buffers (BB)*** *Exclude regeneration from 1st Stage BB. Regenerate 2nd Stage BBs as early as possible.*
Action:	*Regional Operations Officer (in liaison with Districts) confirms current buffer plans are up to date. Provide this information to resource planner.*
Information:	*Location of 1st and 2nd Stage Burning Buffers and logging proposals.*
Custodian:	*Regional Operations Officer.*
Input By:	*Operations Officer, District Fire Protection Officer, FOIC, Resource Planner*
Received By:	*District Fire Protection Officer, FOIC, Resource Planning Officer.*

Critical: *Yes, to ensure that Resource Planner identifies areas inside 1st Stage Burning Buffers that are deficient in Jarrah advance growth for shelterwood operations and directs release cutting / regeneration operations into 2nd Stage Burning Buffers.*
Other Options: *No*." (Fire Protection Instruction 1 : p. 14) Issued 21/09/93

"*PLANNING STEP* *S4*

Year Relative to Burn: *-1*

Issue: ***Objectives for silvicultural burns.***
Action: *Clear definition of silvicultural and other management objectives, assessment of stand conditions (including fuel).*
Information: *Silvicultural objectives, management concerns, protection values, time frame for burn success, seed status.*
Custodian: *District Silviculturist.*
Input By: *Prescribing officer usually the Coupe Silviculturist assisted by Forest Management Branch silviculturist where required.*
Received By: *District Silviculturist, Fire Protection Officer.*
Critical: *Yes, for successful and cost-effective regeneration.*
Other Options: *No, seed cycles in some species have a narrow window of opportunity.*" (Fire Protection Instruction 1 : p. 18) Issued 21/09/93

"*PLANNING STEP* *TS2*

Year Relative to Burn: *-1*

Issue: ***Advance burn for logging.***
Action: *Ensure that demarcation has been completed prior to burning.*
Information: *When dieback demarcation is completed.*
When coupe preparation is planned.
Custodian: *District Fire Protection Officer.*
Input By: *District Logging Officer.*
Received By: *Regional Fire Protection Officer.*
Critical: *Yes, burn is required for silvicultural reasons (lignotubers), and safety of logging operation.*
Other Options: *No*." (Fire Protection Instruction 1 : p. 19) Issued 21/09/93

"*PLANNING STEP* *FP4*

Year Relative to Burn: *O (immediately following)*

Issue: ***Post Burn inspection and monitoring***.
Action: *Use post burn appraisal form.*
Information: *Area burnt, effect of fire, burn security, long term monitoring of species as required.*
Custodian: *District Manager.*
Input By: *Burn Supervisors.*
Received By: *As required.*
Critical: *Yes, allows for evaluation and ensures that burn is secure.*
Other Options: *No*." (Fire Protection Instruction 1 : p. 20) Issued 21/09/93

Fire Operations Manual : Volume 3 : Fire Protection Instructions. 1993
NOTE: INCLUDES UPDATES ISSUED 1997

Fire Protection Instruction 46 : Slash Burning Prescription Preparation

1.Scope

"*This prescription describes the procedures for preparing slash for burning and is applicable to either clear felled or seed-tree areas*." (Fire Protection Instruction 46 : p. 1) Issued 20/1/99

2.Objectives

"*To produce suitable seed bed for natural or artificial regeneration.*

To induce seed fall from seed trees.

To remove logging debris to:

- *allow safer access for planting.*
- *reduce damage to future crop trees.*

To meet these objectives, using the maximum fire intensity possible, within control, safety and cost guidelines."(Fire Protection Instruction 46 : p. 1) Issued 20/1/99

Material Required

- *Slash Burn Prescription (CLM 657 [1991]).*
- *CALM Environmental Checklist (CLM 32 [1991]).*
- *Blown up HOCS sheet of coupe (from treemarker).*
- *Latest aerial photo of coupe*." (Fire Protection Instruction 46 : p. 1) Issued 15/09/93

5. Technique (Office)

"*From blown up HOCS sheet and aerial photo draw up a working sketch of the proposed burn including buffers and adjacent areas, especially showing areas of value that may be at threat during the proposed slash burn.*

On your plan indicate:

(a) Fuel Ages and Forest Types (after checking fuel age plans)
(b) Land Tenure (other than State forest)
(c) Water Points
(d) Stream Reserves, Water Reservoirs
(e) Road Reserves, DRA status
(f) Apiary Sites
(g) Public Use Areas (recreation sites, walk trails etc)
(h) Area in hectares
(i) Location
(j) Harvesting completion date" (Fire Protection Instruction 46 : p. 2) Issued 15/09/93

6. Technique (Field)

"*After consulting the data set for stream reserves, research trials, and other non burn areas, drive around the slash and buffer areas observing the following and noting on the plan:*

(a) Topography
(b) Road construction/ improvement requirements (for burning, plus future regeneration and protection needs). Allocate temporary names for unnamed roads and tracks. […]

(c) Locations where edges to be pushed in (advance mop-up) - where no burn or high value areas area adjacent is required
(d) Water supplies (existing and proposed)
(e) Danger points (for vehicles and lighters)
(f) Slash component - age, density, arrangement, type etc
(g) Consider desirable wind direction, lighting pattern/method, and burn quality required, commensurate with season desired
(h) Stag failing requirements (within coupe and buffer)
(i) Location(s) of Control Points
(j) Special areas in buffers requiring protection (karri pole stands)
[…]" ((Fire Protection Instruction 46 : p.11) Issued 09/15/93

"*(l) Environmental considerations - permanent creeks, steep slopes, Phytophthora (dieback) occurrences.* […]
(m) Log salvage within buffers
(n) Consider season of burn and timing of buffer burns
(o) Services - Telecom and SECWA lines, water pipes, bridges etc
(p) Problem areas (dense gullies near boundaries)
(q) Fuel sampling within buffers
(r) Allocate sectors along boundaries" […]" (Fire Protection Instruction 46 : p. 3) Issued 09/15/93

7. Slash Burning Preparation Prescription
"[…]. *All work must be discussed to ensure operators are fully conversant with location, standards, environmental constraints etc. Refer to stag failing guidelines and discuss safety before commencing this operation.*" (Fire Protection Instruction 46 : p. 3) Issued 09/15/93

9. Lighting Technique
"*There are specific techniques for both buffers and post harvest or regeneration.* […] *Detailed lighting technique details are contained in the Slash Burn Guidelines.*" (Fire Protection Instruction 46 : p. 4) Issued 09/15/93

10. Pre-Burn Checklist
"*Complete a Pre Burn Checklist (CLM 32) and complete action items identified.*" (Fire Protection Instruction 46 : p. 4) Issued 09/15/93

14. Post Burn Appraisal
"*Complete details as listed on P4 of Prescription Form (CLM 657)*

Ensure information is properly recorded and the prescription is stored for future reference. […]" (Fire Protection Instruction 46 : p. 5) Issued 09/15/93

Fire Protection Instruction 54 : Standards for Coupe Preparation for Post Harvest and Regeneration Burning
Scope
"*This prescription covers standards required for various components during the preparation of post harvest or regeneration burns. Location and quality of all operations during preparation of the burn are to be detailed in the Post Harvest or Regeneration Burn Preparation Prescription and Plan.*

The Forest Officer in Charge will ensure that all work is done to these standards. […]" (Forest Protection Instruction 54 : p. 1) Issued 21/09/93

2. Objectives
"*a) To ensure that the standards defined herein are applied uniformly.*
b) All proposed burns are prepared to these standards.

b) Satisfactory future access is assured.
d) The potential for future productivity is maximised." (Forest Protection Instruction 54 : p. 1) Issued 21/09/93

3. Preplanning and Training
"*With sufficient forethought and planning before and during logging operations many benefits will be assured.*

Coupe Shape – symmetrical preferred.

Coupe Location – avoid untrafficable boundaries at all times.

Forest types – cutting to adjacent forest types will avoid cutting poorly shaped coupes in the future. […] […]." (Forest Protection Instruction 54 : p. 1) Issued 21/09/93

"*High value/risk areas adjacent, eg karri regrowth stands, pines, silviculture, private property etc. which must not be burnt under any circumstances, will require special preparation and protection considerations, such as preburnt buffers etc.*." (Forest Protection Instruction 54 : p. 2) Issued 21/09/93

5. Standards
"*Preparation standards are to be closely monitored as work progresses. The CALM Supervisor will have the final say on any work below standard and additional work required to rectify the problem.*" (Fire Protection Instruction 54 : p. 3) Issued 22/09/93

5.2 Cell Formation
"*Formation of these cells will provide;*
[…]
- *more flexibility of the lighting pattern to the fire boss.*
- *greater access during future regeneration operations.*
- *breakup the coupe for future prescribed burning/suppression activities.*
- *access for the future logging operations and other management needs.*" (Fire Protection Instruction 54 : p. 4) Issued 21/09/93

5.3 Scrub Rolling
"*This is the operation to roll green standing understorey scrub, unmarketable small trees, poles etc so that they will burn more readily and create a more suitable site for future regeneration.* […]

The sooner scrub can be rolled (even during logging operations) and allowed to dry the better so as to maximise the burn result. […]" (Fire Protection Instruction 54 : p. 4) Issued 21/09/93

5.5 Advance Mop-Up (Pushing In)
"*This is the pushing of logs and large debris away from any boundary (into the burn) before burning commences. This allows better control when burning adjacent to no-burn areas (stream reserves etc) and avoids costly and extensive mopping up after the burn.*

The location of any pushing in will be marked on the prescription plan and will need to be done where no buffer is proposed or recent burn exists." (Fire Protection Instruction 54 : p. 4) Issued 222/09/93

5.7 Flexibility
"*In some cases it may be desirable to push in logging debris, plus prepare for a buffer burn along a particular flank. This will allow a greater amount of flexibility in the 'when and how' the burn is to be conducted and reduce the risk of escapes and costs at the same time. Again it is preferable to burn the buffer out well in advance if possible.*" (Fire Protection Instruction 54 : p. 6) Issued 22/09/93

Fire Protection Instruction 61 : Objectives and Standards : Aerial Prescribed Burning : Southern Forest Region

Hazard Reduction Burning

Objectives:

Protection

[…]

To provide a reduced fuel zone to protect adjacent karri regeneration from wildfire.

To provide protection to established jarrah and karri regeneration within or adjacent to the burn

To provide a fuel reduced buffer between adjoining jarrah or karri regeneration cells as per the Regional Management Plan.

[…]

To burn out flats vegetation only, leaving forested areas unburnt for age diversity purposes." (Fire Protection Instruction 61 : p. 2) issued 14/1/97

Standards:

Karri or Tingle:

"*Severe crown scorch in dominant and/or co-dominant trees not to exceed 10% of forested area within the burn boundary.*" (Fire Protection Instruction 61 : p. 2) issued 14/1/97

Silvicultural

Objectives:

Karri:

Regeneration Burning:

- "*To produce a receptive ashbed for natural or planted seedlings.*
- *To induce seed fall from seed trees.*
- *To reduce accumulation of harvesting debris.*
- *To reduce the fire hazard in the early years of regeneration.*
- *To reduce the competition to seedlings from understorey vegetation.*
- *To produce a low fuel zone for adjacent forests.*" (Fire Protection Instruction 61 : p. 4) Issued 14/1/97

Regrowth Burning – Unthinned Stands:

[…].

- *To reduce potential future damage to the stand from wildfire.*

[…]

- *To kill unwanted whips or suppressed saplings from stands prior to thinning.*
- *To reduce potential tree butt or bole damage by strictly adhering to recommended maximum fire intensity levels.*" (Fire Protection Instruction 61 : p. 4) Issued 14/1/97

Regrowth Burning – Thinned Stands:

- "*To reduce potential damage to the thinned stand from wildfire.*
- *To reduce understorey scrub competition to maximise growth on retained trees.*
- *To minimise potential butt damage to retained trees by strictly adhering to recommended maximum fire intensity levels.*
- *To provide improved protection to adjacent forests or values from wildfire.*" (Fire Protection Instruction 61 : p. 4) Issued 14/1/97

Standards:

Karri:

Regeneration Burning:

- "*To burn 80% of the scrub and woody materials of 75mm diameter or less.*
- *To produce a suitable ashbed for regeneration over at least 80% of the slash area.*

- *To ensure sufficient intensity is achieved by only lighting slash burns when the sheltered slash fine fuels are less than 18%*
- *To burn at least 95% of the logging debris.*" (Fire Protection Instruction 61 : p. 4) Issued 14/1/97

Regrowth (Pre-thinning) Burns:
- "*Maximum scorch height 6 metres.*
- *No unburnt pockets within 100m of boundary.*
- *Boundaries to be mopped up to required standards on completion.*
- *Reduce litter and trash quantity to <10 tonnes/ha.*
- *Avoid butt damage by burning when Soil Dryness Index <1000.*
- *Fire intensity levels to <350 kw/metre.*
- *Remove 80% branch material <25mm diameter.*" (Fire Protection Instruction 61 : p. 4) Issued 14/1/97

Regrowth (Post Thinning) Burns:
- "*Scorch height <6 metres.*
- *No unburnt pockets within 100 metres of boundary.*
- *Boundaries to be mopped up to required standards on completion.*
- *Reduce litter and trash quantity to <10 tonnes/ha.*
- *Remove 80% branch material <25mm diameter (depends on time since harvesting completed/season/SDI)*
- *Avoid butt and bole damage to retained trees by only burning when SDI <500 and fire intensity levels <350 kw/metre.*" (Fire Protection Instruction 61 : p. 4) Issued 14/1/97

POLICY STATEMENT - 1992

Policy Statement No. 41 : Beekeeping on Public Land. 1992

Strategies
"*11. CALM will periodically use bees as a mechanism to achieve it's [sic] silvicultural objectives, for seed set, or seed collection.* […]" (p. 5)

SILVICULTURE SPECIFICATION - 1992

Silviculture specification 1/92 : Karri Thinning. 1992

Silvicultural Objective
"1. *Maintain stands unthinned until the maximum possible bole length to a 3.5 cm branch diameter has been achieved.*

2. Thin to intensities that will maintain volume increment per hectare consistent with maximising value increment.

3. Provide an economic thinning yield.

4. Rethin at intervals that will maintain stand volume increment and provide economic thinning yields.

5. Maintain species and visual diversity.
[…]" (p. 1)

Strategy
1. Delay first thinning until stands have acquired a Top Height of 30 metres. This will allow for the maximum possible 18 m clean bole to develop. Thinning may occur sooner where the branch size on all crop trees has already exceeded 3.5 cm.

2. Thin to the minimum density which will maintain stand basal area increment. [...]

3. Thin more conservatively in a second thinning in order to maintain stand basal area increment.

4. Rethin before the stand has reached the maximum basal area appropriate to its Top Height but after it is possible to obtain an economic thinning.

5. Thin to favour the long term production of high value products.

6. Maintain the productive potential of the site by minimising soil damage and delaying prescribed burning for three years after thinning to give sufficient time for the breakdown of leaves in the thinning tops." (p. 1)

Thinning Operation
Selection of Areas
"[…]*Top Height class maps will be produced from which stands taller than 30 m Top Height and of sufficient stocking will be selected for thinning.* […]" (p. 1)

Tree marking
"[...] *Intensity is based on the retention of a density equivalent to dominants and codominants*." (p. 2)

Maintenance of Diversity
"*Retain all groups and where practicable, individuals of Allocasuarina. Retain wildlife habitat trees. In mixed stands, retain marri to ensure that a mixture is maintained. Up to 10% of the retained trees may be 'non-crop tree' marri in addition to other species which provide diversity or habitat*." (p. 3)

Protection of Crop Trees
"*Damage to crop trees must be kept to a minimum during the logging operations. Limits of acceptability and the assessment method are given in the Manual of Logging Specifications. Tops and debris from the current operation which are larger than 75 mm must be moved more than 1 m from the base of all crop trees.*" (p. 3)

TIMBER HARVESTING … 1992 ED. – 1992

Timber Harvesting in Western Australia … 1992 Ed. 1992

PART 1 : CODE OF LOGGING PRACTICE

Preface
" *'Timber Harvesting in WA' contains, under one cover, revised editions of the 'Code of Logging Practice' and the 'Manual of Logging Specifications'.*

The Code and the Manual are parts of a hierarchy of rules relevant to timber harvesting (logging) operations controlled by the Department of CALM:

* *CALM Act (1984) and other relevant Acts.*
* *Regulations under the CALM Act and other relevant Acts. (Note: Forest Resource Management Regulations under the CALM Act are currently being prepared. Until they are endorsed by Parliament, regulations under the Forest Act (1918) apply.)*
* *Manual of Logging Specifications, and other CALM guidelines relevant to timber harvesting.*

* *Log Supply Contracts between CALM and logging contractors, and Forest Produce Harvesting or Collection Licences.*" (p. i)

Section 2 : General
NOTE: REFER TO ENTRY UNDER 1988 EDITION (SIMILAR WORDING)

Section 3 : Felling, Trimming and Crosscutting
NOTE: REFER TO ENTRY UNDER 1988 EDITION (SIMILAR WORDING)

Section 4 : Extraction
NOTE: REFER TO ENTRY UNDER 1988 EDITION (SIMILAR WORDING)

PART 2 : MANUAL OF LOGGING SPECIFICATIONS

Section 1 : Planning and Monitoring
Specification 1.1 : Harvesting and Regeneration Plans
Part A : Hardwood
"*Complete details are contained in the Department's 'Manual of Hardwood Logging Planning'. The following is a summary.*" (p. 20)

1.1 Responsibilities
NOTE: REFER TO ENTRY UNDER 1990 EDITION (SIMILAR WORDING)

7. Field Plans and Checklists
NOTE: REFER TO ENTRIES UNDER 1990 EDITION (SIMILAR WORDING)

8. Monitoring and Records
"*District staff must maintain up-to-date field records of areas cut over and silviculturally treated. For each coupe, a Coupe Silvicultural Report (CLM 160) must be completed as quickly as possible following the completion of harvesting. (Refer Attachment 1.1.2)*

A Post Operation Checklist (CLM 813) must be completed between 12 and 24 months following the completion of harvesting. (Refer Attachment 1.1.3)" (p. 27)

Section 3 : Silviculture
Specification 3.1 : Current Specification
NOTE: REFER TO ENTRY UNDER 1989 EDITION (SIMILAR WORDING)

Specification 3.3 : Karri Silviculture

6. Karri Regeneration Method
NOTE: REFER TO ENTRY UNDER 1990 EDITION (SIMILAR WORDING)

7. Seed Forecasting
NOTE: REFER TO ENTRY UNDER 1990 EDITION (SIMILAR WORDING)

8. Karri Seed Collection
NOTE: REFER TO ENTRY UNDER 1990 EDITION (SIMILAR WORDING)

9. Planning
NOTE: REFER TO ENTRY UNDER 1990 EDITION (SIMILAR WORDING)

10. Clearfelling without Seed Trees
NOTE: REFER TO ENTRY UNDER 1990 EDITION (SIMILAR WORDING)

6.Clearfelling with Seed Trees
NOTE: REFER TO ENTRY UNDER 1987 EDITION (SIMILAR WORDING)

6.1 Cutting with Seed Trees
NOTE: REFER TO ENTRY UNDER 1987 EDITION (SIMILAR WORDING)

6.1.1 Seed Tree Stocking
NOTE: REFER TO ENTRY FOR UNDER 1987 EDITION (SIMILAR WORDING)

6.1.2 Seed Tree Specification
NOTE: REFER TO ENTRY FOR UNDER 1987 EDITION (SIMILAR WORDING)

6.1.3 Seed Tree Species
NOTE: REFER TO ENTRY FOR UNDER 1987 EDITION (SIMILAR WORDING)

6.1.4 Seed Tree Protection
NOTE: REFER TO ENTRY FOR UNDER 1987 EDITION (SIMILAR WORDING)

6.2 Regeneration Burning
NOTE: REFER TO ENTRY UNDER 1990 EDITION (SIMILAR WORDING)

6.3 Removal of Seed Trees
NOTE: REFER TO ENTRY UNDER 1987 EDITION (SIMILAR WORDING)

Section 4 : Coupe Management
Specification 4.1 : Coupe Demarcation
Demarcation of Karri Regrowth Permanent Increment Plots
NOTE: REFER TO ENTRY UNDER 1990 EDITION (SIMILAR WORDING)

Specification 4.2 Felling (Including Tree Marking Techniques)
NOTE: REFER TO ENTRY UNDER 1989 EDITION (SIMILAR WORDING)

Specification 4.5 : Logging Operation Inspections and Certifications
NOTE: REFER TO ENTRIES UNDER 1987 EDITION (SIMILAR WORDING)

Section 5 : Environmental Protection
Specification 5.4 : Protection of Crop Trees
NOTE: REFER TO ENTRIES UNDER 1987 EDITION (SIMILAR WORDING)

LEGISLATION - 1991

Conservation and Land Management Amendment Act No. 20 of 1991

"*AN ACT to amend the Conservation and Land Management Act 1984, and to consequently amend certain other Acts.*

[Assented to 25 June 1991.]" (p. 1)

Section 5 amended
"*5. Section 5 of the principal Act is amended by inserting after paragraph (c) the following paragraph-*
' (ca) conservation parks;'." (p. 3)

Section 6 Repealed and a Section Substituted
"*6. Section 6 of the principal Act is repealed and the following section is substituted –*

Categories of Land Defined
‘ 6. (1) State forest comprises all lands that –

(a) immediately before the commencement of this Act were dedicated as a State forest under section 20 of the Forests Act 1918;

(b) after such commencement –
(i) are reserved under section 8; or
(ii) are acquired and set apart under section 15,
for the purpose of a State forest; or

(c) under any other Act become reserved for the purpose of a State forest.

(2) Timber reserves comprise all lands that –

(a) immediately before the commencement of this Act were timber reserves under section 25 of the Forests Act 1918;" (p. 3)

"*(b) after such commencement –*
(i) are reserved under section 10; or
(ii) are acquired and set apart under section 15,
for the purpose of a timber reserve; or

(b) under any other Act become reserved for the purpose of a timber reserve." (p. 4)

Section 33 Amended
"*21. Section 33 of the principal Act is amended –*
(a) in subsection (1) –
[…]
(dc) to promote the conservation of water, as to both quantity and quality, on land referred to in paragraph (a);

(ii) in paragraph (e) by deleting subparagraphs (i) and (ii) and substituting the following subparagraphs -

‘ (i) the management of land to which this Act applies;" (p. 12)

"*(ii) the conservation and protection of flora and fauna; and*
(iii) the taxonomy of flora and introduced plants,';
and
(iii) in paragraph (f) by inserting after 'other person' the following -
‘ , whether in the State or elsewhere';

(b) in subsection (3), by deleting paragraph (b) and substituting the following paragraph –

(i) in the case of nature reserves and marine nature reserves, in such a manner that only necessary operations, within the meaning in section 33A (1) are undertaken;

(ii) in the case of national parks, conservation parks and marine parks, in such a manner that only compatible operations, within the meaning in section 33A(2), are undertaken; or

(iii) in any other case, in accordance with the provisions of section 56 applicable to the land.'.

and

(c) by deleting subsection (4)." (p. 13)

Section 33A Inserted
"*22. After section 33 of the principal Act the following section is inserted-*

Definition of 'necessary operations' etc.
' *33A. (1) In section 33 (3) (b) 'necessary operations' means those that are necessary for the preservation or protection of persons, property, land, flora or fauna, or for the preparation of a management plan.*" (p. 13)

Section 55 Amended
"*27. Section 55 of the principal Act is amended by inserting after subsection (1) the following subsection (1) the following subsection-*

' *(1a) A management plan for an indigenous State forest or timber reserve shall specify the purpose, or combination of purposes, for which it is reserved being one or more of the following purposes-*
[…]
(c) timber production on a sustained yield basis;
[…]" (p. 17)

Section 56 Amended
"*28. Section 56 of the principal Act is amended-*

(a) in subsection (1)-

(i) by repealing paragraph (a) and substituting the following paragraph-

' (a) in the case of indigenous State forests or timber reserves, to achieve the purpose, or combination of purposes, provided for in the proposed management plan under section 55 (1a);';

(ii) in paragraph (c) by inserting after 'national parks' the following-

' and conservation parks';

and

(iii) in paragraph (d) by inserting after 'and fauna' the following-

' , and to preserve any feature of archaeological historic or scientific interest';

and

(b)by repealing subsection (2)." (p. 17)

STRATEGIC PLAN – 1991

<u>CALM Annual Report 1 July 1990 to 30 June 1991. 1991</u>

NOTE: THE STRATEGIC PLAN 1989-1993 IS REPRINTED WITH AN ADDITIONAL CLAUSE (THE FINAL ONE UNDER THE FOLLOWING HEADING) –

"*To achieve the primary objectives the Department will:*" (p. 11)

"***Prepare and implement management plans for lands and waters entrusted to the Department.***

This will involve:

- *Establishing priorities for management plan preparation according to set criteria.*
- *Preparing and implementing management plans according to agreed priorities.*
- *Developing and implementing 'Interim Guidelines for Operations', according to an approved procedure and format, where there is a need for protection of people, property, land, flora and where there is no approved management plan.*" (p. 14)

MANUAL OF LOGGING … 3RD. ED. – 1990

Manual of Logging Specifications … 3rd Ed. 1990

Section 1 : Planning
Specification 1.1 : Logging Plans
1. Responsibilities
"*In all cases, planners must produce fully integrated plans and consult with Regional staff, District staff, Specialist Branch staff and where relevant Timber Industry Representatives during plan preparation.*" (p. 1)

4. Monitoring and Records
"*Logging cannot commence until an approved logging plan has been issued and CLM 109 has been signed by Regional Manager (ref Part 6 of this Specification).*

District staff must maintain up-to-date field records of areas cut over and silviculturally treated. This information must be ready when inventory officers visit Districts within one month of the close of the logging season (refer to revamped HOCS – issued from SOHQ on 14/8/90 and CLM 160 – Coupe silviculture report – Jarrah – refer Attachment 1.1.2)." (p. 3)

8. Field Plans and Checklists
"*In most operations it is necessary for the Forest Officer in Charge of the operation to prepare a checklist of work required in the field before and during logging, and to prepare a sketch diagram of the coupe (commonly referred to as a 'blown-up HOCS sheet'). The sketch diagram is drawn sufficiently large to show the following information:*
** individually numbered sub-coupes and/or faller's blocks.*
[…]
** all areas reserved from cutting.*
[…]" (p. 4)

"*These sketch diagrams or plans are used to record the progress of cutting and extraction, and silvicultural treatment.* […]" (p. 5)

Section 3 : Silviculture
Specification 3.1 : Current Specification
NOTE: REFER TO ENTRY UNDER 1989 EDITION (SIMILAR WORDING)

Specification 3.3 : Karri Silviculture
"*For clearfelling operations the following guidelines apply:*

1. Karri Regeneration Method
"*Regeneration of clearfelled karri areas will, whenever possible, be by the 'Karri seed tree method'. Regeneration by planting of seedlings or sowing of seed is second priority.*" (p. 49)

2. Seed Forecasting
"*Following receipt of the medium term logging plan, areas of karri to be logged must be inspected to ascertain their current and future seed cycle status. (See SFR Operations Manual, Item 4.12, for information about seed forecasting.) The result of the inspection will indicate whether or not the particular coupe will be regenerated by seed trees.*" (p. 49)

3. Karri Seed Collection
"*If mature karri seed is available in commercial quantities it is imperative that arrangements be made to pick this valuable resource as soon as possible. If the area is to be cut to seed trees, the seed trees will be marked prior to felling. (See Iten 13, SFR Operations Manual)*" (p. 49)

4. Planning
"*The sequence of falling operations, location of internal log haul and/or boundary - roads, and scrub rolling by contractors during the logging phase, must be well planned. Well located roads can be used for fire management and regeneration, including planting, purposes. The falling sequence can allow the safe burning of portions of completed coupes after logging, and properly supervised scrub rolling during log extraction will allow a more effective regeneration burn.*
[…]" (p. 49)

6.Clearfelling with Seed Trees

6.1 Cutting with Seed Trees

6.1.1 Seed Tree Stocking

6.1.2 Seed Tree Specification

6.1.3 Seed Tree Species

6.1.4 Seed Tree Protection
NOTE: REFER TO ENTRIES FOR THE ABOVE UNDER 1987 EDITION (SIMILAR WORDING)

6.2 Regeneration Burning
"*Prior to the regeneration burn in karri seed trees area it is essential that branches from retained trees be removed to allow sampling of the viability and numbers of seed per capsule.*

The release of seed from capsules following the regeneration burn depends on:

* *Time of year burnt*
* *Maturity of seed*
* *Intensity of burn*
* *Size, health and vigour of seed trees*
* *Time elapsed since logging commenced (exposure of crowns to wind and weather)*
* *Soil dryness index*
* *Weather conditions (especially temperature and rainfall) leading up to and during burn*
* *Viability and number of seed per capsule.*" (p. 51)

6.3 Removal of Seed Trees

NOTE: REFER TO ENTRIES FOR THE ABOVE UNDER 1987 EDITION (SIMILAR WORDING)

Section 4 : Coupe Management
Specification 4.1 : Coupe Demarcation
5. Demarcation of Karri Regrowth Permanent Increment Plots.
Over 230 permanent increment plots are located throughout the karri forest, These plots range in size from 30m by 30m to 70m by 70m and are identified in the field by five star pickets, one at the plot centre and one at each corner. All trees within the plot are tagged. Forest Officers and logging contractors must take care not to disturb these plots. Forest Officers are required to exclude these plots, and a suitable buffer zone of at least 25m width, from any cutting, using painted white crosses. [...]" (p. 54)

Specification 4.2 : Falling (Including Tree Marking Techniques)

NOTE: REFER TO ENTRY UNDER 1989 EDITION

Specification 4.5 : Logging Operation Inspections and Certifications

NOTE: REFER TO ENTRIES UNDER 1987 EDITION (SIMILAR WORDING)

Specification 5.4 : Protection of Crop Trees
NOTE: REFER TO ENTRY UNDER 1987 EDITION (SIMILAR WORDING)

SILVICULTURE SPECIFICATION – 1990

Silviculture Specification 1/90 : Karri Regeneration Surveys

Preamble
"*This specification outlines the techniques to be used for regeneration surveys of karri types and the standards of acceptability to be adopted. It is applicable to planted, seeded and seed tree regeneration and replaces both the milacre and survival count techniques.*" (p. 2)

2.0 Objectives
"*To evaluate the success of regeneration operations in forest subject to timber harvesting and to establish the extent of infill planting required to achieve acceptable stocking.*" (p. 2)

3.0 Strategies
"*The regeneration survey technique outlined in this specification will enable an assessor to:*

(a) estimate the stocking of regeneration at a number of point within the regeneration area,

(b) estimate the overall stocking for the regeneration area based on the percentage of sample points which are acceptably stocked,

(c) locate areas which are understocked, and

(d) estimate the magnitude of infill planting that is required in the understocked areas.

In addition the technique will yield information useful for the prediction of future stand development and yield possibilities." (p. 2)

4.0 Standards
4.2 Overall Stocking Standard
"*The percentage of sample points at the different levels of stocking provides a basis for predicting future yield and for determine the extent of infill planting required.*

All productive forest areas will be regenerated to a target stocking of at least 85% (Optimal + Adequate)." (p. 2)

"*To achieve this target infill planting will be required where:*

(a) the survey map indicates understocked areas of 1 ha or more, and
(b) 15% or more of the productive area# is understocked.

**Estimates of point density refer to these derived from the triangular method of Ward (1989), (refer to Appendices 3 and 4).*

 # Productive area refers to the area that has the potential to support an acceptable stocking of regeneration. […]" (p. 3)

5.0 Survey Method
5.1 Timing of Surveys
"*Initial regeneration establishment surveys of all planted, seeded and seed tree regenerated coupes are to be carried out from December to January.*

This allows for some stabilisation of seedling numbers during the first summer, increased visibility of seedlings and for the finalisation of nursery stock to be raised in time for infill planting any understocked areas in year 2.

Results are to be forwarded to the Regional Regeneration Officer by the end of the first week in February." (p. 3)

5.3 Office Procedure
(iv) Locate Assessment Cells
"*Regeneration success will be assessed on a cell basis with a maximum cell size of 20 ha.*
[…]
Survey data and other observations are to be used to establish boundaries of assessment cells reflecting any obvious changes in regeneration success due to factors such as site types, presence of swamps or creeks, etc.

In this way variation in regeneration success within cells can be minimised and if necessary different standards applied to particular cells.

The location of each assessment cell is to be marked onto the map." (p. 5)

(b) Stocking Calculations
"*Sample points are classed as stocked if they have the number and distribution of stems to provide enough crop trees of acceptable form by the time of first thinning.*

The overall stocking for a coupe is the percentage of the productive area which is acceptably stocked. Sample points at either optimal or adequate stocking are regarded as acceptable." (p. 5)

(c) Map Interpretation
"*Sampling on a grid basis produces a map showing the general location of larger understocked areas because the map is derived from a series of sampling points it will not necessarily indicate the exact location and size of all understocked areas.*

Understocked points distributed evenly across a cell indicate patchy regeneration and sizeable individual understocked areas may not exist.

However if all of these small understocked areas sampled sum to an unacceptable proportion of the productive area then infill planting is required.
[…]" (p. 6)

(d) Locating Areas for Infill Planting
(i) Large Understocked Areas
"*Within each assessment cell outline any understocked areas of 1 ha or more. For an 80 x 20 metre grid this represents approximately 6 or more immediately adjacent sample points with at least 3 consecutive understocked points on any one survey line.*

These areas will require infill planting." (p. 6)

(f) Check Final Expected Stocking
"*A check must be made to determine if the treatment of all the areas outlined on the survey map will be sufficient to obtain the target stocking for the whole coupe. Enter calculations in the summary sheet.*" (p. 7)

"*(i) Calculate the total area which will be acceptably stocked when all understocked and soil damage outlined on the survey map are treated ie. Area of Optimal Stocking + Area at Adequate Stocking + Area of Infill + Area of Soil Damage Outlined for Treatment.*

(ii) If the area calculated in (i) is less than 85% of the productive area then additional areas will need to be outlined for treatment such that the target stocking can be obtained.

Exactly which areas should be selected will depend on the extent of soil damage and the location of the remaining understocked points within the coupe. Select areas which will achieve the target stocking in the most efficient and practicable manner." (p. 8)

(g) Calculating Infill Plant Requirements
"*Infill planting will aim to obtain a stocking at least that of full planting, ie. that given by at least 1666 spha.*

All calculations are to be done on a cell by cell basis and recorded on the summary sheet." (p. 8)

(h) Planning Infill Planting
"*It is important that infill planting succeed in the first instance otherwise increased scrub competition will severely limit further restocking possibilities. Where possible, infill planting is to be undertaken early in the planting season.*" (p. 8)

6.0 Records
"*It is important that an accurate record of all regeneration survey results be kept. These will be required for future reference with respect to:*

(i) relocating understocked areas at the time of infill planting
(ii) evaluating past regeneration performances in the light of refined standards, and
(iii) prediction of stand development and yield possibilities." (p. 9)

7.0 Follow-Up
"*All areas of infill planting must be assessed for survival between December and January in the year of infill planting.*
[…]
The aim of this survey is to determine finally if previously understocked areas have been successfully regenerated to an acceptable standard.

At the completion of this survey the % stocking for the whole coupe is to be updated by adding to the original stocked area the area which is now acceptably stocked due to infilling and the rehabilitation of landings and snig tracks.
[….]
If large areas of infill planting fail additional site preparation and scrub control measures must be considered before any further infill planting occurs." (p. 9)

Appendix 2 : Acceptable Stems
"*The following stems are considered equally acceptable when recording the stocking at a point:*

- *(a) karri germinants*
- *(b) marri germinants and advanced growth*
- *(c) jarrah advanced growth*
- *(d) karri, marri and jarrah coppice if the base of stem is at ground level. Coppice off the side of large stumps is not acceptable.*

Only stems which appear likely to survive in the immediate future are considered acceptable." (p. 13)

SILVICULTURE SPECIFICATION – 1990

Silviculture Specification 2/90 : Karri Thinning

Preamble
"*Substantial areas of even aged karri regrowth are becoming due for first thinning. This specification is particularly directed at those above-average quality stands that were regenerated after 1965, but it is also applicable to older stands up to 55m in top height. Although few stands are ready for second thinning at the present time the specification also indicates thinning intensities that are appropriate to second and subsequent thinnings. Above-average quality stands are defined as those that have reached a top height of 26m by age 20 years. This specification will be amended to incorporate lower quality stands as further data becomes available.*" (p. 1)

Silvicultural Objective
"*1. Maintain stands unthinned until the maximum possible bole length to a 3.5 cm branch diameter has been achieved.*

2. Thin to intensities that will maintain volume increment per hectare consistent with maximising value increment.

3. Provide an economic thinning yield.

4. Rethin at intervals that will maintain stand volume increment and provide economic thinning yields.

5. Maintain species and visual diversity.

6. Maintain wildlife habitat.

Strategy
1. *Delay first thinning until stands have acquired a Top Height of 30 metres. This will allow for the maximum possible 18m clean bole to develop.* […]

2. *Thin to the minimum density which will maintain stand basal area increment. This is reflected in the schedule given in Table 1. The preferred method of control for first thinnings up to 35m Top Height is by*

stem numbers. For taller stands and for all second thinnings, basal area is the preferred method of control.

3. Thin more conservatively in a second thinning in order to maintain stand basal area increment.

4. Rethin before the stand has reached the maximum basal area appropriate to its Top Height but after it is possible to obtain an economic thinning.

[…]" (p. 1)

"*6. Maintain the productive potential of the site by minimising soil damage and delaying prescribed burning for three years after thinning to give sufficient time for breakdown of leaves in the thinning tops.*" (p. 2)

Thinning Operation
Selection of areas
"*Areas of even aged regrowth will be surveyed by Inventory Branch at about age fifteen. Top Height class maps will be produced from which stands taller than 30m Top Height and of sufficient stocking will be selected for thinning. The date when shorter stands will reach 30m will also be predicted and programmed for future operations. Field inspection will be required for confirmation and for the preparation of detailed logging plans.*" (p. 2)

Treemarking
"*In unburnt stands due for first thinnings, high scrub density makes initial marking by a treemarker impractical. The initial selection will therefore be made by the harvesting machine operator, retaining 25% more stocking than specified in Table 1. Marking to the final density will be carried out by the treemarker. Table 1 provides a guide to expected thinning intensity. Intensity is based on the retention of a density equivalent to dominants and codominants.*

[…]
Preference for retention:
- *Select with regard to spacing*

- *Where a choice exists retain a smaller codominant tree in preference to a larger limby 'wolf' tree if the codominant has at least 10m bole to 3.5 cm branch diameter and is greater than two thirds of the diameter of the 'wolf' tree.*

- *Where a 'wolf' tree has less than a 5m bole to a 3.5cm branch then retain any alternative codominant tree with a bole length greater than 10m regardless of relative size.*

- *Retain all trees where the density does not meet the minimum specification.*

[…]" (p. 2)

REFER TO DOCUMENT FOR - Table 1. Thinning Intensity for High Quality Karri Regrowth Stands

Maintenance of Diversity
"*Retain all groups and where practicable individuals of Allocasuarina. In mixed stands, retain marri to ensure that a mixture is maintained.* […]" (p. 3)

Maintenance of Thinning Intensity Standards
"*Regular stand sampling is essential to maintain standards and provide feedback for the refinement of silvicultural specifications.* […]" (p. 3)

Protection of Crop Trees
"*Damage to crop trees must be kept to a minimum during the logging operation. Limits of acceptability and the assessment method are given in the Manual of Hardwood Logging Specifications. Tops and debris from the current operation which are larger than 75mm must be moved more than 1m from the base of all crop trees.*" (p. 3)

Subsequent Thinnings
"*Figure 1 gives the proposed density limits of first and subsequent thinnings at different Top Heights. It is based on the presumption of more conservative second and subsequent thinnings to maintain maximum basal area increment and maximum sawlog increment.*

[…]
Following first thinning to the appropriate density (4), the stand is allowed to grow on until its density exceed that required for an economic thinning (2) but before it reaches maximum density (1). It is then rethinned to the more conservative second thinning limit (3) and the process repeated. The minimum time between thinnings on this basis is about 15 years in high quality stands." (p. 4)

Appendix 1 : Procedure for Monitoring the Application of Thinning Specifications
"***1. Frequency of sampling*** *– at the completion of each two hectares of thinning.*

2. Number of samples *– five sample points per two hectares.*

3. Selection of sample points *– on each two hectares, select :-*

3.1 One point representative of the densest patch of forest.

3.2 One point representative of the least dense patch (not on a landing or road but it may include a snig track).

3.3 Three points near the middle of the two hectare thinned area. Select the first point at random, the second at 50m from the first and the third at 50m from the second to form more or less an equilateral triangle." (p. 5)

6. Reporting of Results
"*Forward a copy of Thinning Standards Report to the Regional Operations Officer at the end of each month. Forward a copy of both reports to the Inventory Office at the completion of each compartment or at the end of each year for final analysis of results and inclusion in HOCS records.*" (p. 5)

CODE OF LOGGING … - 1990

<u>Code of Logging Practice. 1990</u>

Introduction
"*The 'Code of Logging Practice' is a concise set of rules governing the conduct of timber harvesting (logging) operations on state forest and other Crown lands managed by the Department of Conservation and Land Management, and on private property where CALM is in control of the logging operation.*

The Code, which applies to both hardwood and softwood logging operations, is part of a hierarchy of rules relevant to logging operations controlled by CALM :

- *CALM Act (1984) and other relevant Acts*
- *Regulations under the CALM Act and other relevant Acts*
  (Note : Forest Resource Management Regulations under the CALM Act are currently being prepared. Until they are endorsed by Parliament regulations under the Forests Act (1918) apply)
- *Code of Logging Practice*

- *Manuals of Logging Specifications and other guidelines relevant to logging*
- *Log Supply Contracts between CALM and Logging Contractors, and Forest Produce harvesting or collection licences.*" (p. [i])

Section 2 : General
NOTE: REFER TO ENTRY UNDER 1988 EDITION (SIMILAR WORDING)

Section 3 : Felling, Trimming and Crosscutting
NOTE: REFER TO ENTRY UNDER 1988 EDITION (SIMILAR WORDING)

Section 4 : Extraction
NOTE: REFER TO ENTRY UNDER 1988 EDITION (SIMILAR WORDING)

STRATEGIC PLAN – 1989-1993

Strategic Plan For the Period 1989-1993. 1988

Functions Under the Legislation
"*The Conservation and Land Management Act specifies a series of functions for the three controlling bodies and the Department. In brief these function are:*" (p. 4)

"*The Department of Conservation and Land Management (CALM)*
- *manages State forests, timber reserves, national parks, nature reserves, marine parks, marine nature reserves and other designated lands and the associated forest produce, fauna and flora;*
- *assists the Commission, Authority and Council in their functions;*

[…]" (p. 6)

General Principles/Philosophy
"*The Department is committed to the principle that it is managing public land and natural resources, and conserving indigenous wildlife on behalf of the public of Western Australia. Consequently, particular importance is placed on informing the public of the Department's activities and wherever possible involving the public.*

The regional system of management as adopted by the Department ensures that its officers develop a detailed knowledge of the area of their operations, are available to interact with local communities and resolve problems associated with local conservation and land management operations. […]" (p. 10)

5. Mission
"*Western Australia has a beautiful and diverse natural environment which provides material, aesthetic and spiritual benefits. The natural environment is an essential component of the quality of life for West Australians. The statement of mission for the Department of Conservation and Land Management is therefore:-*

> *TO CONSERVE WESTERN AUSTRALIA'S WILDLIFE AND MANAGE LANDS AND WATERS ENTRUSTED TO THE DEPARTMENT FOR THE BENEFIT OF PRESENT AND FUTURE GENERATIONS.*" (p. 11)

6. Primary Objectives
"*Five primary objectives have been established:-*

- *MANAGEMENT*
  To protect, restore and enhance the value of resources entrusted to the Department so as to meet, as far as possible, the diverse expectations of the community.

[…]

- *PRODUCTION*
  To provide and regulate the supply of those renewable resources that Government decides should be used, on a sustained yield basis for the satisfaction of long term social and economic needs, and in a manner that minimises impact on other values." (p. 12)

"**7. Broad and Sub Strategies**
"*To achieve the Primary Objectives the Department will:-*
[…]
7.8 Prepare and implement strategies to promote and encourage development of the forest production requirements of the State.

This will involve:
[…]
The development of cost effective procedures for growing, processing and marketing timber
7.8.2 at the level sustainable under sound forest management.
[…]
7.8.5 Re-forestation of cleared lands with hardwood forests to supplement production from native forests and to assist in soil and water conservation." (p. 17)

"***7.9 Manage approved commercial operations on renewable natural resources according to the following principles.***

(i) resources are managed to ensure their long term conservation;" (p. 17)

10. The Organisation
10.3 Planning
"*Detailed planning of conservation and land management activities is a key function in the Department.*

Under the Conservation and Land Management Act, there is a responsibility to prepare management plans for all land and water vested in either the Lands and Forest Commission or the National Parks and Nature Conservation Authority. Such plans must be available to the public for comment for a period of at least two months. They apply for a maximum period of ten years.

Two levels of this planning are undertaken. These are regional and area management plans.

Regional management plans are to be prepared for each CALM administrative region. They will cover all categories of land and water entrusted to the Department. Each plan will described the management objectives to be achieved over the life of the plan and the strategies for implementation which are to be adopted.

Area management plans will apply to specific areas such as a national park, marine park, nature reserve, marine nature reserve. State forest, or other reserve. These are more detailed than regional management plans. Area management plans will be prepared only where there are requirements that cannot be adequately considered by a regional management plan. Each area management plan will also describe management objectives and strategies for implementation." (p. 31)

"*Other major plans prepared by the Department are issue plans that are either a follow up to an approved management plan, or consist of interim guidelines for necessary operations where there is not yet an approved management plan. Issue plans cover all relevant topics, such as site plans, fire plans, dieback plans, recreation plans, resource allocation plans and wildlife management programs. Issue plans are generally prepared by district or regional staff in conjunction with research and other specialist branches within the Department.*
[…]" (p. 32)

In addition, the Department prepares operational guidelines, manuals and prescriptions. These draw on the results of research and experience and are used to implement the works and activity programmes derived from the planning process." (p. 32)

10.4 Regionalisation
"*The Department is extensively regionalised in a way which provides the benefits of small autonomous organisations in close proximity to their area of operations while providing access to services that are best provided by a larger integrated organisation. Regions are responsible for the management of all departmental lands and waters and for conservation of flora and fauna within their boundaries. According to the intensity of activity regions are subdivided into districts.*" (p. 32)

"*The general responsibilities allocated to regions are to:*

- "[…]
- *supervise and regulate industry (e.g. wildflower pickers, apiarists, timber and mining operations) on departmental and some other land;*
- *preserve or restore the natural environment on departmental land and water;*
- *provide information and advice on land management and conservation to people in the region; promote conservation and good land and marine area management;*" (p. 33)

10.5 Specialist and Support Services
"*Functions of the Branches within each of these Division are as follows:*" (p. 35)

Forest Resources Division
- "*Timber Production Branch – controls and monitors the harvesting of timber and collection of royalties; advises on timber quality, wood technology and related matters.*

- *Silviculture Branch – develops silvicultural guidelines and practices, advises on their implementation, and manages nurseries and seed supplies.*

- *Inventory Branch – services management operations of the Department with resource information and plans for forest production, disease protection; develops relevant computer systems.*" (p. 35)

STRATEGIC PLAN (SOUTHERN REGION) – 1989

Strategic Plan : Southern Forest Region. 1989

4. Most Important 5 Year Goals
"*4.1 Implementation of the Timber Strategy.*

To ensure the successful implementation of the Timber Strategy, its 49 commitments will be reviewed quarterly and standards of implementation inspected in the field.
[…]" (p. 12)

5. Most Important One Year Goals
"*5.3 Hardwood Silviculture*

- *To integrate the activities of Silviculture Branch, Silviculture Research workers and operations staff in the SFR.. Quarterly reviews of jarrah and karri silviculture research programmes, field operations and prescriptions will be conducted. (Deputy R/M and R/L Operations to arrange).*

- *Silviculture research programmes, field operations and prescriptions will be conducted.*

- *A jarrah regrowth definition and identification project will be initiated by 1/2/89.*" (p. 14)

Key Result Objectives
Karri Regeneration
"*Objective*
1. To satisfactorily and effectively regenerate all areas of logged karri forest.

To reduce the overall cost by maximising the use of seeding (artificial and natural) rather than planting.

Priority
1. *To regenerate all cut over karri forest within 8 months of regen. burn.*
2. *To develop a system of collecting annual targets of karri seed set by Silviculture Branch for no more than $1200/kg of clean seed set by Silviculture Branch for no more than $1200/kg of clean seed.*
3. *Optimise the ratio of seeding and planting according to Silviculture Branch guidelines.*
5. *To improve the accuracy of seed forecasting and reduce the staff time involved by at least 50%.*
6. *Liaise with Silviculture Branch and Research Branch to develop improving seeding prescriptions. Develop spot seeding into an operational technique by 1990.*

Objective
2. To improve both the quality and quantity of karri seed collected.
[…]" (p. 46)

Hardwood Tending
"*Objectives*
1. *Karri.*
Ensure tending operations particularly thinning of 12 to 20 y.o. regrowth are directed to areas where stand growth and strategic importance are maximised.
[…]
Measure of Performance
'Priority'
1. *All young karri regrowth thinning to be in primary buffers to enable fuel reduction burning.*
[…]" (p. 47)

Seed Collection
"*Objectives*
1. *To maximise the quantity and quality of seed collected from all required species in accord with Silviculture Branch needs.*

Measure of Performance
'Priority'
1.Implement system of karri seed management according to Silviculture Branch guidelines, and reduce the price to no more than $1 200/kgm clean seed.
[…]
2.Develop and tend karri seed orchards and seed production areas in accord with Regional Plan.

4.Meet the collection targets specified by Silviculture Branch." (p. 49)

Retained Crop Trees
"*Objectives*
[…]
2. Implement a standard procedure for checking that silvicultural prescriptions are being applied correctly in thinning operations." (p. 58)

Environmental Controls
Codes of Logging Practice
"*Objective*
1.Ensure all logging contracts contain a comprehensive 'Code of Logging Practice." (p. 58)

Crop Trees
"*Objective*
1. Ensure protection of retained crop trees in karri and jarrah regrowth forests.

Measure of Performance
'Priority'
1.Introduce a monitoring and penalty to reduce damage to crop trees in all regrowth logging areas.

Incorporate in 'Code of Practice' for all new Contracts." (p. 60)

MANUAL OF HARDWOOD … 2ND ED. – 1989

Manual of Hardwood Logging Specifications … 2nd Ed. 1989

Section 1 : Planning
Specification 1.1 Logging Plans
1. Responsibilities
"*The preparation and distribution of logging plans is the responsibility of the Regional Inventory Branch Offices. These plans are prepared for each Supply Area and include:*
i) a one or two year logging plan (short-term)
ii) a four or five year logging plan (medium term)
and
iii) a long term (eg. 15 years) logging plan (long term).

These plans are produced after consultation with District staff, Regional staff and specialist branch staff, and timber industry representatives where necessary. The plans must be integrated with all other operational plans including plans for roading, silviculture, mining, fire control and visual resource management." (p. 1)

6. Monitoring and Records
"*Logging must not commence until plans are issued. If during a year additional areas of forest are to be cut, additional or amended plans must be issued by the relevant Inventory Office. Districts supervising logging must keep accurate records of areas cutover and quantities of log products removed and forward such information to the relevant Inventory office as required.* […]" (p. 2)

Section 3. Silviculture
Specification 3.1 : Current Specifications
"*3. The decision as to which silvicultural specification to use must be given careful consideration prior to the commencement of treemarking and harvesting. The decision made must be noted on the Hardwood Harvesting Prescription Form (CLM093).* […]" (p. 26)

Specification 3.3 Karri Silviculture

NOTE: REFER TO ENTRIES UNDER 1987 EDITION (SIMILAR WORDING)
2. Clearfelling

3. Clearfelling with Seed Trees

3.1 Cutting to Seed Trees

3.2 Removal of Seed Trees

4.Thinning Karri Regrowth and Two-Tiered Karri Forests

6. Environmental Considerations

7. Stem Damage to Crop Trees

Section 4 : Coupe Management

Specification 4.2 Falling (Including Tree Marking Techniques)

2.Tree Marking

NOTE: REFER TO ENTRY UNDER 1987 EDITION (SIMILAR WORDING)
***EXCEPT* FOR THE FOLLOWING-**

"*Tree marking will normally be carried out by Forest Officers. Occasionally, however, the Forest Officer in Charge may allow cutting to take place without tree marking. This may occur in 'first thinning' of young, even-aged regrowth stands, and in 'clear cutting' areas. In these cases the FOIC must ensure that:*

iv) silvicultural objectives are not compromised and
v) *protection of retained crop trees meets standards as per Specification 5.4.*" (p. 37)

Specification 4.5 : Logging Operation Inspections and Certifications

NOTE: REFER TO ENTRY UNDER 1987 EDITION (SIMILAR WORDING)

Section 5 : Environmental Protection

Specification 5.4 : Protection of Crop Trees
NOTE: REFER TO ENTRY UNDER 1987 EDITION (SIMILAR WORDING)

SILVICULTURE SPECIFICATION – 1989

<u>Silviculture Specification 6/89 : Logging of Regrowth in Two-Tiered Karri Stands</u>

3. Logging Prescription
3.1 Even-aged regrowth
"*Thin from below according to normal prescriptions. Fig. 1 (see Technical Report No. 1)*
[…]
"*b. Where the overstorey will not be clearfelled for more than 3 years*
- gaps larger than 60m diameter -
1989-1995 thin from below (figure 3A0
1996 + thin from above
- gaps less than 60m diameter – thin from above (Fig. 3B)
Maintain more than 20% crown cover in regrowth groups to retard regeneration.

The health and vigour of the surrounding overstorey will determine whether it can be thinned at some time. For more detail see Technical Report No. 1 pp. 15-20.

4. Application
"*Identification of stands containing the above structural classes is important. The recommend sequence of operations in stands not scheduled for clearfelling within the next 3 years is:*
4.1 Identify areas of even-aged regrowth and two-tiered stands with gaps over 60m from aerial photos. Gaps over 60m diameter are relatively rare, most selection logging having produced smaller gaps.

4.2 Locate and demarcate those pockets requiring thinning from below.
4.3 Log the regrowth areas, removing unmarked trees from marked areas and allowing operators to select small sawlogs from the unmarked areas. Other regrowth (chipwood) may be removed within the limits of the volumes required, provided that the crown cover within the regrowth patches is not reduced below 20%." (p. 2)

CORPORATE PLAN OBJECTIVES - 1988

CALM Annual Report 1st July 1987 to 30th June 1988. 1988

NOTE: REFER TO ENTRY UNDER ANNUAL REPORT FOR 1986/87 AND 1985/86, ENTRY IS SIMILAR EXCEPTING THAT THE MISSION STATEMENT HAS CHANGED (THE SCOPE HAS BECOME THE STATEMENT OF MISSION)]

"*TO CONSERVE WESTERN AUSTRALIA'S WILDLIFE AND MANAGE LANDS AND WATERS ENTRUSED TO THE DEPARTMENT FOR THE BENEFIT OF PRESENT AND FUTURE GENERATIONS.*" (p. 6)

NOTE: THE ENTRY UNDER TIMBER PRODUCTION HAS CHANGED TO INCLUDE AN ADDITIONAL OBJECTIVE (SEE THE FINAL OBJECTIVE)

"*Prepare and implement strategies to promote and encourage development of the forest production requirements of the State.*

This will involve:
[…]
- *The development of cost effective procedures for growing, processing and marketing timber at the level sustainable under sound forest management.*

[…]

- *Re-forestation of cleared lands with hardwood forests to supplement production from native forests and to assist in soil and water conservation.*" (p. 9)

STRATEGIC PLAN – 1988?

Central Forest Region Strategic Plan. 1988?

Industry Control – Timber (Function)
Hardwood
Objective
"*1. Use hardwood logging as a silvicultural tool to improve the forest.*" (p. 52)

Strategy
"*i) Carry out all hardwood logging operations in accordance with the Code of Hardwood Logging practice and the Manual of Specifications for the control of Hardwood Logging Operations.*

[…]
iii) Ensure retained crop trees are protected." (p. 52)

Measure of Performance
"*1. Silvicultural benefits are achieved.*
2. Forest growth rates are improved.
3.Forest is regenerated." (p. 52)

CODE OF LOGGING PRACTICE – 1988

Code of Logging Practice. 1988

Section 2 : General
NOTE: REFER TO ENTRY UNDER 1987 EDITION (SIMILAR WORDING)

Section 3 : Felling, Trimming and Crosscutting
NOTE: REFER TO ENTRY UNDER 1987 EDITION (SIMILAR WORDING)
***EXCEPT* THAT 3.8 NOT INCLUDED IN THIS EDITION**

Section 4 : Extraction
NOTE: FOR 4.1 REFER TO ENTRY UNDER 1987 EDITION (SIMILAR WORDING)

"*4.3 A Contractor is required to confine his extraction activity to certain defined coupes, subcoupes and/or faller's blocks within the cutting areas. These defined areas must be extracted to the satisfaction of the F.O.I.C. before further areas will be made available for extraction.* […]" (p. 13)

NOTE: FOR 4.8 REFER TO ENTRY UNDER 1987 EDITION (SIMILAR WORDING)

GUIDELINES – 1988

Guidelines for Slash Burning in the Karri Forest. 1988

1. Introduction
"*Slash burning for karri regeneration requires specialised lighting and logistics. These guidelines outline the principles involved and the methods to be used.*" (p. 5)

2. Objectives
"*The objectives of slash burning are:*

- *To produce a receptive seed bed for natura1 or artificial regeneration.*
- *To induce seed-fall from seed trees.*
- *To reduce accumulations of logging debris;*
- *To reduce fire hazard in the early years of regeneration; and*
- *To reduce competition from the understorey vegetation.*" (p. 5)

3.2.4 Burn Rating and Fuel Moisture Content

4. Slash Burn Preparation
"*The more input a regeneration burn receives in terms of preparation, the greater the chances of success.* […]" (p. 7)

4.6 Advance Mop-Up
" *Advance mop-up must be carried out on the entire perimeter, except where the edge adjoins buffer areas or recent burns.* […]" (p. 9)

4.8 Installation of Buffer Strips
"*Buffer strips, even if pre-burnt and mopped up, must never be considered 100% safe on the day of the burn, particularly at intense fires. Constant patrolling must always be carried out.*

Burn prescriptions must be drawn up and adhered to in order to meet fuel reduction objectives with minimum fire damage." (p. 11)

4.9 Other Preparatory Work
"*Other desirable work is:*
[…]
Consider adjacent high risk/value areas, e.g., karri regrowth stands, private property, etc. which must not be burnt under any circumstances. The slash burning prescription form will allow you to select the correct preparatory treatment for these areas." (p. 11)

General Comments
"*Always prepare burns from the north of the coupe southwards. This enables a cut-off to be made if the entire coupe cannot be burnt, or is not ready.*" (p. 11)

4.14 Burn Prescriptions
"*A prescription (see Appendix, page 25) must be prepared for every slash burn. It will be compiled by the Regeneration Officer and fully discussed with the District Manager prior to the burn. A Pre-Burn Checklist (CLM 32) form must also be drawn up for each burn.*

All items on the prescription must be completed." (p. 13)

4. Slash Burn Control
"[…] *Factors the Controller must consider are:*
7.1 Prescription
The slash burn prescription (see Appendix I) must be consulted before lighting commences. Check whether expected weather conditions on the day match those prescribed. […]" (p. 20)

7.8 Mopping Up
"*All burns must be made safe by mopping up the edges as soon as this can be done. Standard rules require that burning material must be extinguished –*
- *for 20 metres from the edge on the ground, and*
- *for 100 metres from the edge in the air.*" (p. 23)

9. Recording
"*The final responsibility of the Controller of each burn is to ensure full and correct records are made in the divisional office concerning each slash burn – viz*
- *The date of the burn*
- *Weather conditions*
- *Exact area burnt*
- *Completion of the post-burn appraisal*

These date are transferred to HOCS records at the end of each month or burning season" (p. 24)

POLICY STATEMENT – 1987

Policy Statement No. 19 : Fire Management Policy. 1987

Strategies
"*4.2Use of Fire*

Prescribed fires will be used to achieve a range of management objectives, including … forest regeneration […].

According to management objectives, appropriate prescriptions will be developed, and staff will be trained in their application.

Monitoring of the effects of fires will be undertaken wherever effective systems have been developed and resources are available." (p. 5)

CONSERVATION POLICIES - 1987

Strategies for Conservation and Recreation on CALM Lands in Western Australia. 1987

The Objectives and Principles in the State Conservation Strategy (SCS)
"*The SCS for W.A. sets out five key objectives for conservation. These are:*

> *to maintain essential ecological processes and life-support systems;*
> [...]
> *to ensure the sustainable utilisation of species and ecosystems;*
> *to maintain and enhance environmental qualities;*
> [...]" (p. 4)

"*CALM is committed to the objectives and principles listed in the SCS and uses them as the basis for all conservation planning and operations.*" (p. 4)

The Legislative Base
"*CALM operates under two legislative acts: the CALM Act and the Wildlife Conservation Act.*

These Acts place a number of statutory requirements on the way in which CALM manages land and wildlife. The major requirements are:

(1) Management must be in accord with a published management plan and all management plans must be made available for public review and comment in the draft phase.

(2) All lands are vested in two controlling bodies (not the Department). The controlling bodies (National Parks and Nature Conservation Authority and Lands and Forest Commission) are comprised mainly of members of the public representative of conservation and land management interests.

(2) The Department must perform the following functions:

> *manage land vested in the NPNCA and LFC;*
> *provide the NPNCA and LFC with assistance;*
> [...]" (p. 4)

The Corporate Plan : The CALM Mission and Key Objectives
General Principles and Philosophy
"*CALM is committed to the principle that it manages public land and natural resources and conserves native wildlife on behalf of the public of W.A. Emphasis is placed, then, on informing the public of the Department's activities and, wherever possible, involving the public in planning and management.*" (p. 5)

Statement of Mission
"*In recognising that Western Australia has a beautiful and diverse natural environment which provides material, aesthetic and spiritual benefits and that the natural environment is an essential component of the quality of life for Western Australians, a statement of mission adopted for the Department of CALM is:*

> *TO PROVIDE FOR THE USE OF THE NATURAL ENVIRONMENT WITHOUT DETRACTING FROM POSSIBLE FUTURE USE.*" (p. 5)

Charter
"*The scope of the Department's responsibilities is represented by its charter which is:*

> *TO CONSERVE WESTERN AUSTRALIA'S WILDLIFE AND MANAGE PUBLIC LANDS AND WATERS ENTRUSTED TO THE DEPARTMENT FOR THE BENEFIT OF PRESENT AND FUTURE GENERATIONS.*

Primary Objectives
Five primary objectives have been established:

> *Management*
> *To protect, restore and enhance the value of resources entrusted to the Department so as to meet, as far as possible, the diverse expectations of the community.*
>
> *Conservation*
> *To conserve the indigenous plant and animal species and environmental processes in natural habitats throughout the State.*
>
> *Production*
> *To provide and regulate the supply of renewable resources on a sustained yield basis for the satisfaction of long-term social and economic needs, and in a manner that minimises impact on other values.*" (p. 5)

"*Subsequent sections of the Department's corporate plan elaborate on these objectives, particularly those relating to conservation. The strategies used to meet these objectives are:*

> *ESTABLISH AND MAINTAIN A SYSTEM OF SECURE RESERVES WHICH PROTECT VIABLE REPRESENTATIVE SAMPLES OF ALL THE STATE'S NATURAL ECOSYSTEMS AND SPECIES BOTH TERRESTRIAL AND AQUATIC, AS WELL AS AREAS SUITABLE FOR RECREATION AND THE PRODUCTION OF RENEWABLE NATURAL RESOURCES.*" (p. 6)
>
> "*PREPARE AND IMPLEMENT MANAGEMENT PLANS FOR LANDS AND WATERS ENTRUSTED TO THE DEPARTMENT.*
>
> *This will involve:*
>
> *The establishment of priorities for management plan preparation according to set criteria.*
> […]" (p. 7)
>
> "*PREPARE AND IMPLEMENT TIMBER PRODUCTION STRATEGIES WHICH MEET THE OBJECTIVES OF THE STATE.*
>
> *This will involve:*
>
> *Continuous review of supply and demand data for wood products.*

The development of cost effective procedures for growing, processing and marketing timber at the level sustainable under sound forest management.
[…]" (p. 7)

"*MANAGE EXPLOITATION OF RENEWABLE NATURAL RESOURCES ACCORDING TO THE FOLLOWING PRINCIPLES:*

resources are managed to ensure their long-term conservation;
[...]" (p. 7)

CORPORATE PLAN OBJECTIVES - 1987

CALM Annual Report 1st July 1986 to 30th June 1987. 1987

NOTE: REFER TO ENTRY UNDER ANNUAL REPORT FOR 1985/1986, ENTRY IS SIMILAR EXCEPTING FOR THE FOLLOWING ADDITION UNDER THE OBJECTIVE FOR TIMBER PRODUCTION –

Corporate Objectives
[…]
"*To achieve the primary objectives the Department will:*
[…]
Prepare and implement timber production strategies which meet the objectives of the State.

This will involve:
[…]
- *The development of cost effective procedures for growing, processing and marketing timber at the level sustainable under sound forest management.*

[…]" (p. 12)

TIMBER STRATEGY - 1987

Timber Production in Western Australia : a strategy to take W.A.'s south-west Forests into the 21st Century. 1987

Objectives
"*The objective of this strategy is to provide a plan for an efficient timber industry which is sustainable indefinitely.* […]" (p. 2)

Principles
"*(3) forest areas harvested for timber production will be regenerated, and previously regenerated forests will be silviculturally managed to optimise the management objective;*" (p. 2)

Future Forest Management Proposals
"*It is proposed to further upgrade forest management during the planning period by:*
[…]
(2) commencing thinning 500 ha per annum (rising to 2 000 ha per annum by 1992) of karri regrowth stands at between age 15 and 20. These areas correspond to the developing age classes;
[...]
(5) a karri growth model which will permit the derivation of optimum thinning regimes for regrowth will be developed by 1988. [...]

(6) the hardwood tree breeding program will be expanded;
[...]" (p. 35)

MANAGEMENT PLANS- 1987

Northern Forest Region Regional Management Plan 1987-1997. 1987
Central Forest Region Regional Management Plan 1987-1997. 1987
Southern Forest Region Regional Management Plan 1987-1997. 1987

Objectives and Principles
"*In addition, the following principles set down in the State's timber strategy apply also to the preparation of this regional management plan:*
[...]

> *All areas of forest managed for timber production are also to be managed to provide for other values of the forest and all areas harvested are to be regenerated.*" (p. xiii in *Northern Forest Region Regional Management Plan 1987-1997*)

Hardwood Timber
"[…] *Silviculture is aimed at encouraging regeneration or increasing growth rates of selected crop trees. High quality stands receive follow-up stand improvement treatment after logging, including the removal of logging residue from the trunks of retained trees and the removal by cutting and poisoning of suppressed trees, and competing species.*" (p. 47 in *Northern Forest Region Regional Management Plan 1987-1997*)

Northern Forest Region Regional Management Plan 1987-1997

Regional Strategies
"*In addition to implementing Departmental policies and guidelines … during the period of this plan CALM staff in the region will:*

(i) implement the strategy described in 'Timber production in Western Australia' CALM (1987);

(ii) maximise growth on retained trees or regeneration;
[...]
(iii) implement the 'Code of hardwood logging practice' and 'Manual of specifications for control of hardwood logging operations in the Northern Jarrah Forest' (CALM 1986);
[…]" (p. 48)

Central Forest Region Regional Management Plan 1987-1997

Regional Strategies
"*In addition to implementing Departmental policies and guidelines … during the period of this plan CALM staff in the region will:*

(i) implement the timber strategy described in 'Timber production in Western Australia' CALM (1987);

(ii) achieve full occupation of the site after logging and maximise growth on retained trees or regeneration;
[...]
(iv) maintain the 'Code o f Hardwood Logging Practice' which defines silvicultural, disease and environmental criteria for logging, within the context of CALM management policies and objectives; " (p. 49)

Southern Forest Region Regional Management Plan 1987-1997

Regional Strategies
"*In addition to implementing Departmental policies and guidelines … during the period of this plan CALM staff in the region will:*

(i) *implement the strategies in 'Timber Production in Western Australia. A strategy to take W.A.'s South West Forests into the 21st Century' (1987) ...;*" (p. 46)
[…]
"*(vi)* *progress towards totally integrated logging operations for all log products including minor forest produce ...;*
(vii) *ensure that all logging and related operations conform to the 'Code of Logging Practice';*
[...]
(x) *control logging under logging plans.*" (p. 47)

MANAGEMENT PLAN – 1987

Shannon Park and D'Entrecasteaux National Park Management Plan 1987-1999. 1987

10.0 Conservation Opportunities
"*Protection of the natural values of the Parks is a fundamental concern of this plan. Thus, management and sustained use must not cause irreversible environmental damage or impairment of scenic beauty.*" (p. 43)

1.0 Management Objectives For National Parks
"*The following management objectives for national parks are derived from the Conservation and Land Management Act (1984) and departmental polices for management. The objectives are to:*
[…]
4.Regulate use to be consistent with the maintenance and protection of natural resource values and to minimise conflict between uses.
[…]" (p. 47)

2.0 Management Objectives For the Shannon Park and D'Entrecasteaux National Park
"*Management objectives specific to the two Parks were derived from: the above general objectives; the dual purpose of 'national park and water'; and the information provided in B. Description of the Parks. The following background information is most relevant to the determination of specific objectives –*

- *The Shannon Park contains the most protected watershed in the State's south-west and the largest contiguous area of karri forest reserved for conservation.*" (p. 47)

6.0 Protection
6.1 Fire
Objectives
"*The Parks are to be managed primarily to conserve their natural ecosystems and landscapes, whilst ensuring the Park visitors have the opportunity to enjoy the Parks without detrimentally affecting them. In setting the specific fire management objectives to achieve the management objectives for the Parks, the protection of life and property within and near the Parks must be of high importance.*

Consistent with this principle, the following objectives will apply in order of priority:

[…]
1. *To protect community and environmental values in or near the Parks including settlements, private property, recreation facilities, forest regeneration and public utilities.*

[…]" (p. 75)

Fire Management Regimes
"*Three fire management regimes are used in this plan. These are:*

1. Short-rotation Protection Burns
Under this regime, fuel reduction burns will be applied whenever ground fuel-loads exceed critical levels at which fire containment, by direct attack, under hot summer conditions, becomes very difficult and unsafe for firefighters. The rotation period between burns will vary from approximately six to eight years depending on the rate of fuel accumulation of the vegetation." (p. 77)

"*The burns will be arranged in wide buffers to restrict the movement of wildfires through large areas of the Parks. These low fuel areas will also be strategically located adjacent to high risk zones (eg. settlements, heavy fuel areas, recreation facilities) and high value zones (eg. karri regrowth, private property).*" (p. 77-78)

"*These short-rotation burns are categorized as either park or forest protection burns depending on their location.*" (p. 78)

Prescribed Burning
"*7. Stands of regenerating karri within areas to be prescribe burnt will not be isolated and protected, as by the time most stands are burnt they will be mature enough to withstand prescribed burning.*" (p. 80)

MANUAL OF HARDWOOD … - 1987

Manual of Hardwood Logging Specifications … 1987

Specification 3.3 Karri Silviculture
2. Clearfelling
"*Where an area is to be regenerated by hand planting or 'artificial' seeding the cutting prescription is to remove all merchantable stems within the demarcated coupe.*" (p. 33)

3. Clearfelling with Seed Trees
3.1 Cutting to Seed Trees
"*The aim of this operation is to retain and protect trees which will provide a seed source for regeneration.*" (p. 33)

> *3.1.1 Seed Tree Stocking: Seed trees will be retained at a stocking of 4 trees per hectare. This corresponds to a spacing of about 50-60 metres between the boles*
>
> *Allowable Variation:*
> *(a) Up to 80m in high site quality pure karri stands (2 trees per hectare).*
> *(b) Down to 40m in severe fire damaged areas or MK stands (6 trees per hectare).*" (p. 33)
>
> "*3.1.2 Seed Tree Specification: The seed tree will be a windfirm dominant or codominant stem with a healthy spreading crown, of a good form and free from hereditary defect such as severe sweep and bends, forking or grain deviations.*
>
> *Allowable Variation:*
> *Retain any seed source (ie, cull tree) if no seed tree meeting the above specification is available at the prescribed spacing.*
> *Significant areas void of suitable seed trees will be clearfelled and planted.*
>
> *3.1.3 Seed Tree Species:*

Seed tree will be karri (and tingle if it is tingle stand), but marri or blackbutt will be retained in the absence of a suitable seed tree at the prescribed spacing. Marking for Seed Trees is required before any trees are cut.

3.1.4 Seed Tree Protection:
Retain any tree which is likely to uproot or damage the crown of a seed tree when felled.

3.2 Removal of Seed Trees:
The objective of the operation is to remove seed trees with the minimum of damage to seedlings and soil." (p. 34)

"*3.2.1 Seed trees which are burnt in the summer months (December to February inclusive) will be removed no sooner than 5 weeks after the burn to allow seed shed throughout the warm summer period. Autumn regeneration may allow the removal of seed trees within 3 weeks of the burn following approval by R/L Timber Production. Seed Trees shall be removed within 2 years of the regeneration burn. Any extension to this period must be requested in writing and may only be approved by T/L Timber Production*

3.2.2 In some cases the Industry may be left to complete the removal of seed trees with minimal supervision from Departmental staff. The Forest Officer will be mainly involved in monitoring utilisation and ensuring that environmental standards are maintained." (p. 35)

4. Thinning Karri Regrowth and Two-Tiered Karri Forests
"*4.1 These stands will be marked for retention, the intensity varying with both site and age as reflected by co-dominant height. Control will be by basal area (Table 1) with the proviso that stocking density does not fall below 90 stems per hectare (ie, 10.5m x 10.5m) spacing.* […]" (p. 36)

Co-Dominant Height (m)	*BAOB Retained (m2/ha)*
Less than 29	*Delay Thinning*
29-31	*8*
32-34	*10*
35-37	*12*
38-41	*14*
42-45	*16*
46-48	*18*

(p. 37)

"*4.3 Veteran trees will be removed after the thinning is completed provided they can be removed without damage to growing stock and if there is a regrowth stem or stems to fill the gap created. This must be borne in mind when selecting crop trees.* […]" (p. 37)

"*5.3 Advance burning is required 3-5 years before thinning to allow access and to reduce the intensity of the tops disposal burn.*

5.4 A tops disposal burn will be carried out as soon as possible after an area has been thinned.

5.5 Tops disposal around retained stems is to be carried out by the contractor. […]

5.7 Systematic measurements of co-dominant height and basal area to be carried out by the Forest Officer at the completion of each section as a check on quality control." (p. 38)

6. Environmental Considerations
"*6.2.2* […] *Deep ripping will not be carried out because of damage to established root systems.*" (p. 39)

7.Stem Damage to Crop Trees
"*Damage assessments will be carried out on a regular basis.*" (p. 39)

Section 4 : Coupe Control
Specification 4.2 Falling (Including Tree Marking Techniques)
2.Tree Marking
"*Trees to be removed from an area may be indicated to fallers by marking either those trees to be removed or those trees to be retained as crop trees. The Forest Officer in Charge will decide which method is to be used depending on the type of bush being cut and other practicalities. Once the decision is made, the tree marking method must not be changed within an individual coupe.*" (p. 44)

2.1 Tree Marking for Removal
[…] *In areas where trees are marked for removal by either of the two methods described, no other trees may be felled.*" (p. 45)

Specification 4.5 Logging Operation Inspections and Certifications
"*1. The contractor's foreman or supervisor must check logging standards periodically on a faller's block by faller's block (or sub-coupe by sub-coupe) basis to ensure falling and extraction standards are maintained. CALM's Forest Representative will periodically accompany the contractor's foreman or supervisor on these inspections to monitor standards.*

Aspects of logging to be inspected include:
[…]
- *damage to retained (crop) trees by falling and/or skidding*
- *extraction pattern*
[…]
- *tops disposal*." (p. 42)

Section 5 : Environmental Protection
Specification 5.4 : Protection of Crop Trees
"*1.In coupes where crop trees are marked for retention, Industry personnel must make every effort during all phases of logging to protect the crop trees from physical damage. Physical damage is any damage resulting in one or more of the following:*

(a) The exposure of more than 100cm ^{2} of cambium on the bole of a crop tree.
(b) The falling, breaking, or uprooting of a crop tree, or
(c) The removal of more than 30% of the crown of a crop tree.

2.Periodical assessments of crop tree damage must be carried out by a Forest Officer using the 'Assessment of Crop Tree Damage' form. In carrying out these assessments, a Forest officer must assess a sample of at least 100 crop trees in a given faller's block or sub-coupe. […]" (p. 69)

"*4. Copies of all crop tree damage assessments must be handed immediately to the relevant District Manager. Copies must be forwarded to the Manager of the relevant logging operator, and the relevant Industry Bush Boss.*" (p. 87)

"*5. As well as avoiding physical damage, Industry must ensure, that all logging debris created by a logging operation is removed from the base of crop trees. This task is commonly known as 'tops disposal', and is designed to protect crop trees from fire damage. The debris to be removed include all woody material greater than 75mm diameter. This material must be moved at least lm away from the bole of a crop tree Tops disposal must be completed before a faller's block o sub-coupe is certified complete.* […]" (p. 88)

CODE OF HARDWOOD – 1987

Code of Hardwood Logging Practice. 1987

"*Where specifications for the performance of the rules and instructions in this Code are required they are to be found in the Manual of Specifications covering the forest area in which logging operations are taking place.*" (p. i)

Section 2 : General

"*2.1 The Instructions contained in this Code shall be observed by all persons participating in any hardwood forest logging operation on land managed by the Department of Conservation and Land Management.* […]

2.2 An Operator shall observe all Acts of the State of Western Australia, and in particular, the Bush Fires Act 1954, the Conservation and Land Management Act 1984, the Inspection of Machinery Act 1921, the Machinery Safety Act 1974, the Road Traffic Act 1975, the Timber Industry Regulation Act 1926, the Workers Compensation Act 1912, the Wildlife Conservation Act 1950-79, the Agriculture and Related Resources Protection Act 1976-83, the Country Areas Water Supply Act 1947-76, and the Water Authority Act 1986, including all amendments to those Acts for the time being in force and any Act passed in substitution or in lieu thereof and all Regulations for the time being in force thereunder as well as this Code of Logging Practice." (p. 4)

"2.*7 An Operator shall exercise strict supervision and control over operations of all workers employed by him, with a view to:*

2.7.1 Preventing any breach of the Conservation and Land Management Act and Regulations, the TIR Act and Regulations and this Code of Practice.

2.7.2 Preventing damage to other standing timber during felling extraction and hauling operations in accordance with current silvicultural prescriptions.

2.8 All operations carried out by, or on behalf of, an Operator in hardwood forest areas shall be carried out as directed by a Forest Officer. <u>Any monetary penalties for breaches of this Code or for damage to or waste of timber in breach of the instructions of this Code will be deducted from any money due to the Operator, or failing that from the Operator's deposit.</u>" (p. 5)

Section 3 : Felling, Trimming and Crosscutting

"*3.1 All felling, trimming and crosscutting shall be carried out in such place, order, time and manner as the Forest Officer in Charge shall from time to time approve.*" (p. 8)

"*3.7 If possible, areas of forest suitable for operation by approved machines will be made available. A maximum of two sub-coupes per machine or group or machines will be demarcated for operation at any one time. Further sub-coupes will not be worked until one of the previously allocated sub-coupes has been utilised to the satisfaction of a Forest Officer.*

3.8 Extraction, erosion control and cleaning up must work progressively through fallers blocks and allocated coupes." (p. 9)

3.9 Marking of Trees for Removal

"*(a) Where trees are marked for removal an Operator shall fell and utilise only such trees as have been marked or otherwise indicated for the purpose by a Forest Officer.* […]

(b) An Operator shall not fell, damage or utilise any unmarked trees.

(c) *If an Operator wishes to cut unmarked trees to assist his operations, eg, widening vehicle tracks, extending landings, he shall refer the matter to the Forest Officer in Charge and such trees will not be cut until marked by a Forest Officer.*" (p. 9)

3.10.1 Marking of Trees for Retention

"*(a)* *Trees to be retained as crop trees will be marked or otherwise indicated by a Forest Officer. All other trees in the coupe are to be felled if in the opinion of the Forest Officer in Charge they contain log produce designated as such under the conditions of the Operation.*" (p. 9)

"*(b)* *An Operator shall not fell, damage or utilise any tree marked for retention by a Forest Officer.*

(c) *If an Operator wishes to cut marked (retained) trees to assist his operations, eg, widening vehicle tracks, extending landings, he shall refer the matter to the Forest Officer in Charge and such trees will not be cut until released by a Forest Officer.*" (p. 10)

"*3.11* *An Operator shall incur penalties at rates determined by the Executive Director for any wood contained in any trees felled by him in breach of Instructions 3.9 and 3.10. Such trees shall remain the property of the Department.*" (p. 10)

"*3.14* *All felling, trimming and crosscutting is to be carried out with a minimum of damage to retained standing trees.*

Where standing trees are damaged by him an Operator shall be liable for such damage at rates determined by the Executive Director. Any penalties will be charged under Instruction 2.8 of this Code. Such damaged trees shall remain the property of the Department." (p. 10)

"*3.17* *An Operator shall be liable to pay the Department for all wood not cut in accordance with Instruction 3.12, 3.12 or 3.16 at rates determined by the Executive Director.*

[…]

3.19 *'Hangups' shall be dislodged and cut-off tops shall not be left leaning against standing trees.*

3.20 *The tops and branches of any trees felled by the operator which fall close to retained crop trees shall be cleared away from the crop trees into open spaces to the satisfaction of the Forest Officer in Charge.*" (p. 11)

Section 4 : Extraction

"*4.1* *All extraction shall be carried out in such places, order, time and manner as the Forest Officer in Charge shall from time to time approve.*

4.2 *The Forest Officer in Charge may determine the priority of extraction of produce from time to time. An Operator shall comply with the Forest Officer's expressed priority of extraction. This priority maybe expressed in type of log, point of removal, dieback hygiene requirements and deadline for delivery of all four together.*" (p. 12)

"*4.7* *An Operator shall not carry on extraction at such times or places, or by methods or equipment which a Forest Officer has prohibited until such prohibition has been revoked by the Forest Officer.*" (p. 13)

Section 6 : Loading and Hauling

"*6.6* *Loading and hauling of logs and timber shall be carried out with a minimum of damage to standing trees. Where standing trees are damaged by him an Operator shall be liable for such damage at rates determined by the Executive Director. Any penalties will be charged under Instruction 2.8 of this Code.* […]" (p. 16)

OPERATIONS MANUAL - 1987

Southern Forest Region : Operations Manual. 1987

Measurement of Forest Fuel Quantity
Location of Sample Lines within Burn Area
"*The fuel sampling techniques described below allow for reliable estimation of fuel quantity on large areas. Three factors which must be considered when planning the sampling intensity and assessment procedure, determine the number of location of sampling sites required. The first consideration is the importance of the area in respect to the value of the timber and conservation assets, the presence of vulnerable regeneration and the proximity to private property. The second is that sampling intensity increases with diversity of the area sampled, whilst the third consideration is the ease of access.*

The location of sampling lines must be carefully planned as it is important to assess the full range of major forest or vegetation associations and fuel types in order to reduce costs and damage from the prescribed burning operations.

The following sets out the steps to follow in locating the sample lines.

(a) *From past burning plans trace the areas of same age burns onto the 1:25000 (where practical) map of the proposed area. Label with year and season of last burn.*
(b) *Outline the major forest or vegetation association types within the areas of same burning age.*
(c) *Isolate the canopy cover extremes of each forest type, and randomly select sites for two sample lines within these extremes.*" (p. 5)

Hardwood Burning Prescription Preparation
"*The following notes have been issue to obtain uniformity in the preparation of the Hardwood Prescription and Burning Report. These notes accompany the handout describing the assessment of forest fuel quantity.*" (p. 14)

Location
"*1. The hardwood burning prescription form must be completed as follows: (See Appendix 1)*

Prior Inspection
"*2. The PLAN of the area must be included in the Burning Prescription.*" (p. 14)

4. Suggested Conditions for Burning
"*In setting the conditions necessary to achieve a successful burn result, it is important to keep in mind the factors that dictate the number, the timing, the fire danger ratings, and the strip spacing of each of the lightings required.*

These factors include:
- *the season of burn*
- *the forest or vegetation type, condition and vegetation/tree size,*
- *the total <u>available</u> fuel quantities*
- *the acceptable scorch limits,*
- *the range of fire danger index required to burn the full range of fuels.*" (p. 15)

4.1 Season
"*Allocation of the burn season depends on the moisture content of the fuels, the crown height of the potential crop trees and other local requirements. In general, Autumn burns are cleaner and so of high protection value than Spring burns. Certain forest areas, e.g., flats and eastern wandoo types, will not burn in early spring. However, Autumn burns are associated with high scorch heights due to the dryness of outer bark, heavy ground fuels and duff litter. Also the Autumn burning season can be cut short by winter rains and at best is an*

unpredictable burning season. On the other hand, Spring is a more reliable season, and burning at this time leads to less scorch damage." (p. 16)

4.2 Total Available Fuel Quantity
"*Fire behaviour studies indicate that scorch heights vary with fire intensity which in turn is related to the amount of available fuel and the fire rate of spread.*

These relationships have been tabulated for both karri (including karri-marri) and jarrah forest associations.

To calculate the available fuel quantity, refer to appropriate trash and scrub fuel tables (Forest Fire Behaviour Tables) and obtain the available fuel weight for these components. Obtain the available litter weight by multiplying the total litter weight by the Available Fuel Factor (AFF). (For Jarrah litter one can assume AFF to be 1.0; for Karri litter AFF = 0.5)

Add the trash, scrub and litter available values to derive the total available weight." (p. 16)

4.3 Acceptable Scorch Height Limits
"*The forest type, condition and height of canopy will indicate the level of scorch which is considered acceptable. Stands susceptible to scorch, such as young saplings, require a lower scorch standard than pole stands, which in turn can stand less fire than mature forests.*" (p. 16)

Table 1 : Maximum Scorch Acceptable for Various Tree Sizes

Stand Type	*Max. Scorch Height (metres)*	
	Spring	*Autumn*
J Coppice	*3m*	*3m*
J, M or K Saplings	*4*	*4*
J, M or K Poles (10-18m tall)	*5*	*5*
J, M or K Poles (20+ m tall)	*6*	*7*
" Mature	*7 to 9*	*7 to 12*

Note: These scorch limits may need to be modified if stands contain logging tops or massive fuel accumulations." (p. 17)

7. Pre-Burning Work Required
"*Record on the prescription form details of the following jobs that must be completed before lighting takes place.*" (p. 19)

Slash Burning Prescription Preparation – Karri
Scope
"*This prescription describes the procedures for preparing slash for burning (from Karri Logging Operations) and is applicable to either clear felled or seed-tree areas.*" (p. 41)

Objectives
"*2.1 To produce suitable seed bed for natural or artificial regeneration.*
1.2 To induce seed fall from seed trees.
1.3 To remove logging residues, so as to allow safer access for planting operations and reduce future damage to future crop trees.
1.4 To meet these objectives, using the maximum fire intensity possible, within control, safety, and cost guidelines." (p. 41)

Technique (Office)
"*4.2 On your plan indicate:-*
a) Fuel ages and forest types (after checking fuel age plans).

b) Land Tenure (other than State Forest).
c) Water Points.
d) Stream Reserves, Water Reservoirs.
e) Road Reserves, MPA's, DRA status.
f) Apiary sites.
g) Public use areas (recreation sites, walk trials etc).
h) Area.
i) Location.
j) Logging completion date." (p. 41)

Technique (Field)
"*5.1 After consulting the plan for stream reserves, research trials, and other non burn areas, drive around the slash and buffer areas observing the following and noting on the plan:-*

a) Topography
b) Road construction/improvement requirements (for burning, plus future planting and protection needs).
[…]
c) Locations where edges to be pushed in (advance mopup) – where no burn or high value areas are adjacent.
d) Water supplies (existing and proposed).
e) Danger points (for vehicles or lighters).
f) Slash component – age, density, arrangement, type etc
g) Consider desirable wind direction, lighting pattern/method, and burn quality required. Commensurate with season desired.
h) Stag falling requirements (within coupe and buffer).
i) Location/s of control points.
j) Special areas in buffers requiring protection (karri pole stands etc).
[…]
l) Environmental problems – permanent creeks, steep slopes, phytophthora (dieback) occurences.
m) Any log salvage within buffers.
n) Consider season of burn and timing of buffer burns.
[…]
p) Problem areas (dense gullies near boundaries).
q) Fuel sampling within buffers.
[…]" (p. 43)

Top Disposal in Karri Regrowth Stands
Scope
"*This prescription covers the removal of logging debris from around the base of retained stems following thinning in karri regrowth stands.*" (p. 119)

Objective
"*To prevent future cambial damage during prescribed burning by removing woody material from the base of crop trees.*" (p. 119)

Technique
"*a) Programme gangs to carry out the work as soon as possible after thinnings is complete. Maximum 2 years after thinning.*
[…]
d) Debris and logs to be cleared for at least 1 metre from the base of stems marked for retention.
[…]" (p. 119)

Standards for Coupe Preparation for Karri Regeneration
Scope
"*This preparation covers standards required for various items during preparation burns. Location and quality of all operations during preparation for the burn are to be detailed in the 'Slash Burn Preparation Prescription'.*" (p. 123)

Objectives
"*a) To ensure that standards defined herein are applied uniformly between Districts.*
b) So satisfactory future access is assured.
c) And that the potential for future productivity is maximised." (p. 123)

3. Preplanning
"*Obviously if sufficient fore thought and planning takes place before logging commences many benefits will be assured.*
3.1 Coupe Shape – symmetrical preferred.
Coupe Location – to avoid untrafficable boundaries if possible.
Forest Types – Cutting to adjacent forest types will avoid cutting poorly shaped pockets in future. Many allow buffer burning of jarrah types adjacent to reduce preparation expenditure.
Existing Road Use – To avoid additional expenditure and duplication.
[…]" (p. 123)

4. Standards
4.1 **Roading**
"*a) Internal Roads* […]
These roads (usually 5-6m surface) will form the basis for future fire control and logging access, were expensive to construct, and must be retained. […] *Sufficient drainage to avoid erosion or ponding is required.* […]" (p. 123)

"*b) External Roads – These are primarily for fire control and access purposes only. As such they will generally be built to summer access standards only, but will be drained and piped to avoid deterioration and provide winter access if possible.* […]

4.3 Scrub Rolling
"*This is the operation to flatten standing green scrub, unmarketable small trees, poles etc. sp they will burn more readily and create a more suitable sites for future regeneration. A D7 or D6 size machine with tree arm is required.*

However, depending on the time of year especially, not all scrub needs to be rolled. Small areas of material (20 metres square) may be left standing, where surrounded by dense dry logging slash." (p. 123)

4.5 Advance Mop-Up (Pushing In)
"*This is the pushing of logs and large debris away from any boundary (into the burn) before burning commences. This allows better control when burning and adjacent to no – burn areas (stream reserves etc.) and avoids costly and extensive mopping up after the burn.*

The location of any pushing in will be marked on the prescription plan, and will need to be done where no buffer burn is proposed or recent burn exists.

The depth of pushing will be 20 metres …[…]" (p. 125)

4.8 Other Preparatory Work
"[…]
High value/risk areas adjacent eg: karri regrowth stands, pines, private property etc which must not be burnt under any circumstances will require special preparation and protection consideration." (p. 127)

Landing and Snig Track Rehabilitation for Planting
Scope
"*This preparation covers landings and snig tracks in completed cutting coupes in the Southern Forest Region.*" (p. 129)

Objective
"*To prepare (level, clear, rip, drain) landings and snig tracks for regenerating (planting, seeding with selected tree spp plus scrub spp if required).*" (p. 129)

Technique
"*3.1 <u>Preplanning</u>*
[…]
3.1.4 Rehabilitation will commence in late spring (November) in the drier lateritic soil types (Jarrah forest), in the northern end of the region, and proceed south into the loams and clays (Karri forest) during the summer and autumn." (p. 129)

Operation
"*5.3 Landings shall be cleared of logging debris which will be stacked to the rear or sides of landing ready to burn at a later stage. This debris will not be stacked within 20m of the road edge so as to avoid future mop up problems.*

1.4 The landing surface will then be leveled, with top soil if possible and drained if necessary. Ripping will then be done on the contour at 1m intervals and at 1m depth.

1.5 *Snig tracks are to be ripped as indicated on the coupe sheet only.* […]

[…]" (p. 130)

Direct Seeding for Karri Regeneration
Scope
"*This prescription covers the technique required to regenerate clear cut karri coupes by direct seeding.*" (p. 132)

Objective
"*To ensure a minimum of 35, 000 viable seeds per hectare are evenly distributed over the coupe.*" (p. 132)

Planting Open Root Nursery Stock
Scope
"*This prescription covers the transplanting of one year old open rooted karri (E. diversicolor) and yellow stringybark (E. muellerana) to regenerate clear cut coupes.*" (p. 134)

Objective
"*To ensure planting achieves:-*
a) full production stocking
b) optimum growth and long term security
c) a survival of 95% twelve months later" (p. 134)

Plant Placement
"*6.1 Plants will be planted at 1250/ha at a spacing of 4m x 2m for full stocking and at 625/ha at a spacing of 4m x 4m for half stocking.*" (p. 136)

Job Prescription : Planting Open Rooted Karri
General
"*The transplanting of one year old open-rooted karri seedlings is an essential operation for the reforestation of many cut over forests in the karri area.*

Planting is a costly yet vital job and extreme care must be taken to ensure the survival and satisfactory development of transplanting seedlings." (p. 138)

Nursery Stock
"*Nursery procedures aim to produce karri seedlings to the following specifications:*
i) 30-45 cm in height
ii) woody stem
iii) fibrous root system no longer than 15cm
iv) at least 1/3 of the stem is leafy

Minor variations around these specifications are acceptable, but substandard seedlings will be rejected at the time of lifting, (not in the field). […]" (p. 138)

5. Spacing
"*5.1 Spacing between plants is aimed at producing a stocking rate of about 1250 plants per hectare."*(p. 139)

6. Planting
"*Whilst economy and efficiency must always be considered, quality is the essential objective in the karri planting operation.*" (p. 140)

8. Survival Counts
"*8.1 The target rate for karri planting is 95% survival."* (p. 140)

Assessing Regeneration Success in Karri Forests
Scope
"*This prescription is applicable to all Karri coupes regenerated by the above methods within the Southern Forest Region.*" (p. 143)

Objective
"*The detailed information prepared as a result of this assessment will allow consideration as to whether supplementary enrichment planting will be required at a later date.*" (p. 143)

Seed Crop Forecasting Prior to Karri Logging
Scope
"*This prescription explains the procedure for forecasting the status of Karri Seed Crop prior to logging operations, within the Southern Forest Region.*" (p. 155)

Objectives
"*To provide the Planning and Logging Sections with sufficient information so as to allow them to accurately predict the optimum time to log any particular area and if available utilise the seed source that has been ascertained thereon.*" (p. 155)

Method
"*5.1 Fall one tree per 15-20ha of coupe area.*
5.2 Fall only light or medium sized crown trees (those able to be pulled with skidder).
[…]
5.3 Do not fall any trees which will obviously need to be used as a seed tree in the future.
[…]" (p. 156)

Karri Seed Collection
Scope
"*Applies to collection of seed from mature Karri stands.*" (p. 159)

Objective
"*To collect Karri seed in the most efficient manner*." (p. 159)

OPERATIONS MANUAL - 1987

Operations Manual : Southern Forest Region. 1987

Slash Burning Prescription Preparation – Karri
Scope
"*This prescription describes the procedures for preparing slash for burning (from Karri Logging Operations) and is applicable to either clear felled or seed-tree areas.*" (p. 41)

Objectives
"*2.1 To produce suitable seed bed for natural or artificial regeneration.*
To induce seed fall from seed trees.
To remove logging residues, so as to allow safer access for planting operations and reduce future damage to future crop trees.
To meet these objectives, using the maximum fire intensity possible, within control, safety, and cost guidelines." (p. 41)

Technique (Office)
"*4.2 On your plan indicate:-*
[…]
d) Stream Reserves, Water Reservoirs.
[…]." (p. 41)

Technique (Field)
"*5.1 After consulting the plan for stream reserves, research trials, and other non burn areas, drive around the slash and buffer areas observing the following and noting on the plan:-*

a)Topography
b)Road construction/improvement requirements (for burning, plus future planting and protection needs). […]
c)Locations where edges to be pushed in (advance mopup) – where no burn or high value areas are adjacent.
d)Water supplies (existing and proposed).
e)Danger points (for vehicles or lighters).
f)Slash component – age, density, arrangement, type etc
g)Consider desirable wind direction, lighting pattern/method, and burn quality required. Commensurate with season desired.
h)Stag falling requirements (within coupe and buffer).
i)Location/s of control points.
j)Special areas in buffers requiring protection (karri pole stands etc).
[…]
l) Environmental problems – permanent creeks, steep slopes, phytophthora (dieback) occurences.
m) Any log salvage within buffers.
n) Consider season of burn and timing of buffer burns.
[…]
p) Problem areas (dense gullies near boundaries).
q)Fuel sampling within buffers.
r)Allocate tentative sectors along boundaries." (p. 43)

ADMIN. INSTRUCTION - 1986

Administrative Instruction No. 23 : Interim Guidelines For Operations. 1986

Introduction
"*For substantial areas of land under the control of the Department of Conservation and Land Management it will be many years before approved Management Plans will be developed. In the meantime the CALM Act provides in Section 33 (3) (b) that certain operations can be carried out when there is no management plan.*" (p. 1)

"*For indigenous State forest the operations are defined as those actions that ensure the multiple use and sustained yield of that resource for the satisfaction of long term social and economic needs.*

In accordance with the Departmental Planning Policy (Policy 1, January 1986) the necessary operations must be carried out in a planned manner through the development and implementation of INTERIM GUIDELINES FOR OPERATIONS.

The Interim Guidelines will consist of:

(1) a brief description and brief guidelines for major potential activities;

(2) a map showing the locality and area of proposed management activities;

(3) an indication of who must give approval before particular operations can be carried out.

This paper shows how the Interim Guidelines are intended to work." (p. 1)

Aim
"*The aims of the Interim Guidelines are:*

(i) to provide an adequate safeguard against natural and operational calamities on lands administered by CALM in the absence of an approved Management Plan;

(ii) to ensure that critical 'necessary operations' are identified and properly prescribed;

(iii) to ensure that the impacts of necessary operations are fully considered and effectively incorporated within existing management and control systems;

(iv) to provide a simple, efficient and attainable means of gaining approval for necessary operations." (p. 2)

Identification
"*The first step is to identify all the necessary operations within each of the areas concerned. Use can be made of a checklist showing all the possible necessary activities – see Appendix 1. Only those operations that are essential for safeguarding the area in question should be considered. These must be consistent with the objectives for the area concerned as described in the CALM Act.*" (p. 2)

Strategies and Prescriptions
"*The development of suitable strategies and prescriptions* ***will*** *necessitate consultation and collaboration between CALM Operations, Planning and Specialist groups.* […]" (p. 3)

Duration of Interim Guidelines
"*Most Interim Guidelines should have an approval duration of at least 3 years with a maximum of 5 years.* […] *However, the works programme that emanates from these Interim Guidelines must be reviewed and updated annually.*" (p. 4)

Approval
"*A system of approval for the Interim Guidelines and the methods of implementing these is to be adopted which recognises and utilises the established hierarchy of authority and control, i.e. District Manager to Regional Manager to Divisional Manager (or Branch Manager) to Directorate (Director National Parks or Director Nature Reserves or both, or entire Policy Directorate depending on the range of necessary activities). It is expected that once the pattern of the development of these Interim Guidelines have been universally accepted, that the final approval will be delegated to Divisional or Regional Managers.*" (p. 4)

CORPORATE PLAN OBJECTIVES - 1986

CALM Annual Report 1st July 1985 to 30th June 1986. 1986

Corporate Objectives
"*Under a corporate plan formulated in 1985/86 the statement of mission for the Department of Conservation and Land Management is:*

> *TO PROVIDE FOR THE USE OF THE NATURAL ENVIRONMENT WITHOUT DETRACTING FROM POSSIBLE FUTURE USE.*

The scope of the Department's responsibilities is represented by its charter which is:

> *TO CONSERVE WESTERN AUSTRALIA'S WILDLIFE AND MANAGE PUBLIC LANDS AND WATERS ENTRUSTED TO THE DEPARTMENT FOR THE BENEFIT OF PRESENT AND FUTURE GENERATIONS.*

Primary objectives are:

Management
> *To protect, restore and enhance the value of resources entrusted to the Department so as to meet, as far as possible, the diverse expectations of the community.*" (p. 9)

"*Production*
> *To provide and regulate the supply of renewable resources on a sustained yield basis in a manner that minimises impact on other values.*

[…]
To achieve the primary objectives the Department will:

Provide an effective administrative framework for the conservation of wildlife throughout the State and the management of lands, waters and natural resources entrusted to the Department.

This will involve:

- *The maintenance of a Policy Directorate to establish, review and refine Departmental aims, policies and priorities; to monitor the implementation of management plans; and to see that goals are achieved.*
- *The maintenance of an operations wing to implement policies and management plans and to set up efficient financial, administrative and management systems.*" (p. 9)

"*Establish and maintain a system of secure reserves which protect viable representative samples of all the State's natural ecosystems and species, both terrestrial and aquatic, as well as areas suitable for recreation and the production of renewable natural resources.*

This will involve:
[…]

- *Categorising lands and waters entrusted to the Department into priority use zones and applying the principle of multiple use consistent with the needs of (in order of priority) nature conservation, recreation and production.*" (p. 10)

- "*Protecting ecosystems, landscape and the cultural heritage on lands and waters entrusted to the Department from damage by fire, disease, grazing, feral animals and people.*

- *Developing prescriptions for control of disturbance and for rehabilitation of damaged forests, parks and reserves.*

[…]" (p. 11)

"*Prepare and implement management plans for lands and waters entrusted to the Department.*

This will involve:

- *The establishment of priorities for management plan preparation according to set criteria.*

- *Restricting procedures to necessary operations to maintain public safety and the status quo of area management where no management plan exists.*" (p. 13)

Manage exploitation of renewable natural resources according to the following principles:

- *resources are managed to ensure their long term conservation;*

[…]" (p. 13)

STRATEGIC PLAN - 1986

Strategic Plan : Southern Forest Region. 1986

Key Area : Karri Regeneration
Objective
"*1. To satisfactorily and effectively regenerate all areas of logged karri forest.*" (p. 15?)

Measure of Performance
"*1. To regenerate all cut over karri forest within 8 months of regen. burn.*
[...]
3. To complete at least 400ha of regen. annually by seeding methods." (p. 15?)

Objective
"*To improve both the quality and quantity of karri seed collected.*" (p. 15?)

Key Area : Hardwood Tending
Objective
"***1. Karri**. Ensure tending operations particularly thinning of 12 to 20 y.o. regrowth are directed to areas where stand growth and strategic importance are maximised.*" (p. 16?)

Key Area: Seed Collection
Objective
"*1. To maximise the quantity and quality of seed collected from all required species in accord with Silviculture Branch needs.*" (p. 17?)

Measure of Performance
"*2. Develop and tend karri seed production areas in accord with the Regional Plan.*
[...]
4. Meet the collection targets specified by Silviculture Branch." (p. 17?)

Hardwood Timber Production
Key Area : Retained Crop Trees
Objective
"*1. Train operators (machine and fallers) to select and protect crop trees according to current prescriptions.*

2. Implement a standard procedure for checking that silvicultural prescriptions are being applied correctly in thinning operations." (p. 24?)

Key Area : Crop Trees
Objective
"*1. Ensure protection of retained crop trees in karri and jarrah regrowth forests.*" (p. 25?)
Measure of Performance
"*1. Introduce a penalty system for damage to crop trees in all regrowth logging areas.*" (p. 25?)

Key Area : Wood Production
Objective
"*2. To maximise growth potential of all stands within environmental constraints.*" (p. 55?)
Measure of Performance
"*2. Regeneration to be established within 12 months of logging in consolidated units that can be managed in the long term.*" (p. 54?)

Key Area : Hardwood Establishment
Objective
"*1. To regenerate all areas of logged karri forest*" (p. 59?)
Measure of Performance
"*1. Regenerate all logged areas of karri forest within 12 months of completion of cutting.*

2. Maximise the use of seed trees as the means of regeneration." (p. 59?)

Key Area : Seeds
Objective
"*1. Establish and manage seed orchards and seed production areas*" (62?)

Key Area : Hardwood Establishment
Objective
"*1. To regenerate all areas of logged old growth karri forest.*" (p. 74?)
Measure of Performance
"*1. Carry out all regen. burns without significant escapes.*

2.Conduct regen. burns surrounded by established regrowth only when a moisture differential exists.

3. Establish, and burn, buffers where ever possible to reduce the amount of push in required.

4. All regen. burn boundary tracks are to be piped to reduce erosion and to ensure that they can be maintained once regeneration is completed.

5. All areas with sufficient seed to allow natural regeneration are to be distinguished." (p. 74?)

"*7. Regenerate all karri areas in DRA by either seed trees or by aerial seeding.*" (p. 75?)

Objective
"*2. To increase the amount of karri seed collected.*" (p. 75?)
Measure of Performance
"*1. Check the quality of all seed crops prior to initiating collections.*

2. Collect all heavy seed crops from areas being logged." (p. 75?)

Key Area : Hardwood Tending
Objective
"*1. Ensure crop trees are protected during and after silvicultural tending.*" (p. 76?)
Measure of Performance
"*1. Monitor logging operation and prevent unacceptable levels of stem damage to retained stems.*

2. Ensure that tops disposal is carried out by logging contractors.
[...]
5. Carry out mild tops disposal burns following tops disposal." (p. 76?)

Key Result Objectives - Walpole District
Silviculture
Objective
"*2. Scrub seed collection to be programmed and undertaken in 1986/87 for full rehab. of degraded land.*" (p. 88?)
Measure of Performance
"*1. A quantity of Kennedia, Acacia and other scrub seeds to be collected in Spring, 1986.*" (p. 88?)

Objective
"*3. To effectively regenerate all karri and jarrah areas back to the original species composition (as soon as possible) after logging.*

a) utilize karri seed trees (wherever possible) if sufficient seed is present
[…]" (p. 88?)

5. Five Important Tasks to Achieve in Next Five Years
5.2.2 Regeneration
"*Regeneration all forest areas within one season of completion of logging. Maximize direct seeding methods and reduce planting. Develop seed production areas and collection methods to economically collect a minimum of 100kg/annum.*" (p. 92?)

MANUAL – 1986

Manual of Specifications for Control of Hardwood Logging Operations in the Northern … 1986

Section 1 : Planning
Specification 1.3 Coupe Cutting Prescriptions and Plans
"*2. For each coupe or set of similar coupes, a Coupe Cutting Prescription must be prepared on the prescribed form (Attachment 1.3.1). This document requires the District to decide on silvicultural objectives and marking techniques and contains a checklist of work required before cutting starts.*

3. *A Coupe Plan or plans must accompany the Coupe Cutting Prescription.* […]" (p. 19)

Specification 5.4 Protection of Crop Trees
"*1. In coupes where crop trees are marked for retention, Industry personnel must make every effort during all phases of logging to protect the crop trees from physical damage. Physical damage is any damage resulting in one or more of the following:*
(a) The exposure of more than 100 cm2 of cambium on the bole of a crop tree.
(b) The falling, breaking, or uprooting of a crop tree, or
(c) The removal of more than 30% of the crown of a crop tree.

2. Periodical assessments of crop tree damage must be carried out by a Forest Officer using the 'Assessment of Crop Tree Damage' form (attachment 5.4.1). In carrying out these assessments, a Forest Officer must assess a random sample of:

(i) at least 100 crop trees in a given faller's block excluding those crop trees immediately adjacent to landings and major snig tracks and
(ii) at least 50 crop trees immediately adjacent to landings and major snig tracks.

If more than 5% of trees assessed in category (i) or 10% in category (ii) are damaged, then the Industry will be charged for all damaged trees in that faller's block at rates determined by the Executive Director. […]" (p. 72)

"*3. As well as avoiding physical damage, Industry must ensure that all logging debris resulting from a logging operation is removed from the base of crop trees. This task is commonly known as 'tops disposal', and is designed to protect crop trees from fire damage. The debris to be removed includes all woody material greater than 75mm diameter. This material must be moved at least 1m away from the bole of crop trees. Tops disposal must be completed before a faller's block is certified complete.* […]" (p. 73)

POLICY STATEMENT - 1985

Forests Department Annual Report 1 July 1984 to 21 March 1985. 1985

NOTE: REFER TO ENTRY UNDER 1982 EDITION, SIMILAR WORDING FOR ANNUAL REPORTS FOR 1983, 1984, 1985

LEGISLATION - 1984

Conservation and Land Management. No. 126 of 1984

"AN ACT to make better provision for the use, protection and management of certain public lands and waters and the flora and fauna thereof, to establish authorities to be responsible therefor, and for incidental or connected purposes

[Assented to 8 January 1985]" (p. 1881)

Part II. - Land To Which this Act Applies
Division 1. - Categories of Land
"*5. Where in this Act reference is made to 'land to which this Act applies', the reference is to land, or land and waters, comprising -*
(a) State forest;
(b) timber reserves;
(c) national parks;

(d) nature reserves;
[…]" (p. 7)

"*6. (1) State forest comprises all lands that-*

(a) immediately before the commencement of this Act were dedicated as a State forest under section 20 of the Forests Act 1918;

or

(b) after such commencement-
(i) are reserved under section 8; or
(ii) are acquired and set apart under section 15,
for the purpose of a State forest.

(2) Timber reserves comprise all lands that-

(a) immediately before the commencement of this Act were timber reserves under section 25 of the Forests Act 1918; or" (p. 1886)

"*(b) after such commencement-*
(i) are reserved under section 10; or
(ii) are acquired and set apart under section 15,
for the purpose of a timber reserve." (p. 1887)

Part IV. - Department of Conservation and Land Management
Division 1. - Establishment of Department
"*33.(1) The functions of the Department are, subject to the direction and control of the Minister-*

(a) to manage land-

(i) to which this Act applies; or

(ii) which becomes subject to the management of the Department under subsection (2),

and the associated forest produce, fauna and flora;

(b) to provide the Commission, the Authority and the Council with such assistance as they may reasonably require to perform their functions;" (p. 1905)

"*(d) to be responsible for the conservation and protection of flora and fauna throughout the State, and in particular to be the instrument by which the administration of the Wildlife Conservation Act 1950 is carried out by the Executive Director pursuant to section 7 of that Act;*

(e) to carry out or cause to be carried out such study or research of or into-

(i) the management of land to which this Act applies; and

(ii) the conservation and protection of flora and fauna,
as the Minister may approve;

(f) to provide advice to, or undertake work for or jointly with, and to supply services or facilities to, any department, public or private body or other person if that Minister is of the opinion that the provision of that advice or the undertaking of that work is in the public interest;

(g) upon request by the Minister to whom the administration of the Land Act 1933 is committed, to advise him on the reservation, alienation, and disposal of Crown land in rural areas under that Act." (p. 1906)

"*33(3) The management of land referred to in subsection (1) (a) (i) and the associated forest produce, flora and fauna shall be carried out-*

(a) where there is a management plan for the land, in accordance with that plan; or" (p. 1906)
"*(b) where there is for the time being no such plan-*
(i) in the case of national parks and nature reserves, in such a manner that only necessary operations are undertaken; or
(ii) in any other case, in accordance with the provisions of section 56 applicable to the land.
(4) In subsection (3) (b), 'necessary operations' means those that are necessary for the preservation or protection of persons, property, land, flora or fauna, or for the preparation of a management plan.

(5) Nothing in subsection (1) shall be read as limiting the functions of the Commission and the Authority under sections 19 and 22 respectively.

34. Subject to this Act and the Public Service Act 1978, the Executive Director has power to do all things that are necessary or convenient to be done for, or in connection with, the performance of the functions of the Department." (p. 1907)

Part V. – Management of Land
Division 1. – Management Plans
"*54. (1) A controlling body shall be responsible-*

(a) for the preparation of proposed management plans; and

(b) the review of expiring plans and preparation of further management plans,

for all land which is vested in it whether solely or jointly with an associated body.

(2) This Part applies to the preparation of a plan under subsection (1) (b) in the same way as it applies to the preparation of an initial management plan." (p. 1914)

"*(3) Proposed management plans for any land shall be prepared-*

(a) by the controlling body for that land through the agency of the Department; and

(b) within such period after the commencement of this Act as is reasonably practicable having regard to the resources of the Department available for the purposes." (p. 1915)

"*55. (1) A management plan for any land shall contain –*

(a) a statement of the policies or guidelines proposed to be followed; and

(b) a summary of the operations proposed to be undertaken,

in respect of that land during a specified period which shall not exceed 10 years.

(2) A management plan shall state the date on which it will expire, unless it is sooner revoked, but notwithstanding anything in this section or in the plan, a plan which would otherwise expire shall, unless it is revoked, remain in force until a new plan is approved." (p. 1915)

"*56. (1) A controlling body shall, in the preparation of proposed management plans for any land, have the objective of achieving or promoting the purpose for which the land is vested in it, and in particular management plans shall be designed –*

(a) in the case of indigenous State forest or timber reserves, to ensure the multiple use and sustained yield of that resource for the satisfaction of long-term social and economic needs;

[…]" (p. 1916)

"*(2) In subsection (1) (a) 'multiple use' means as many different uses as are possible and compatible among themselves.*" (p. 1916)

POLICY STATEMENT - 1984

Forests Department Annual Report 1984. 1984

NOTE: REFER TO ENTRY UNDER 1982 EDITION, SIMILAR WORDING FOR ANNUAL REPORTS FOR 1983, 1984, 1985

RECREATION PLAN – [1984]

Forest Recreation Framework Plan. [1984]

9.3 Planning and Management Strategies Applicable to all Management Units

"*2. Site Maintenance*

Strategy

[…]

- *site maintenance programmes will include the periodic inspection and maintenance of:*

[…]

tree crops

[…]" (p. 48)

POLICY STATEMENT - 1983

Forests Department Annual Report 1983. 1983

NOTE: REFER TO ENTRY UNDER 1982 EDITION, SIMILAR WORDING FOR ANNUAL REPORTS FOR 1983, 1984, 1985

GUIDELINES – 1983

Guidelines for Slash Burning in the Karri forest. 1983

Introduction

"*Slash burning for karri regeneration requires specialised lighting and logistics. These guidelines outline the principles involved and the methods to be used.*" (p. 5)

2. Objectives

"*The objectives of slash burning are:*

- *To produce a receptive seed bed for natural or artificial regeneration;*

- *To induce seed-fall from seed trees;*

[…]

- *To reduce competition from the understorey vegetation.*" (p. 5)

3. Factors Affecting Slash Burn Performance

"*Factors which influence slash burn intensity are:*

3.1 Fuel Quantity and Arrangement

The weight, distribution and arrangement of fine, flash fuels and heavy, woody fuels govern whether a fire will ignite, spread and be sustained. The amount of fine fuels determine the likelihood of igniting the heavier fuels and of spread from one heap to another. The arrangement and distribution of heavy fuels affect the amount of fuel consumed. Rough-heaped or windrowed fuels burn hotter and more completely than scattered, broadcast fuels." (p. 5)

3.2 Fuel Moisture Content (F.M.C.)

"*3.2.1 <u>Fine Fuels Moisture Content</u>*

The fine fuels must be dry enough to ensure ignition of the heavier fuels. The F.M.C. of flash fuels varies within a heap, and unless the lower sheltered fuel is dry enough the burn will fail. The sheltered fine fuels M.C. at which ignition will or will not occur, are: […]

Providing the heavy log and branch material is dry, a satisfactory burn will be achieved if fine sheltered fuels do not exceed 18 per cent moisture content." (p. 6)

3.2.2 Fine Fuel Moisture Differential

"*Drying on cut-over areas is more rapid than under adjacent forest. If a day can be selected when the fine slash is dry, but the surrounding forest is damp, then a satisfactory burn can be conducted with minimum risk of suppression problems.*

An adequate moisture differential occurs when the sheltered slash moisture content is below 18 per cent and the surrounding forest is 25 per cent or higher at the peak of the day.

Measurement of fuel M.C. in the forest must be made at least 30 m in from the boundary of the coupe to avoid edge drying effects." (p. 6)

3.2.3 Heavy Fuels Moisture Content

"*Success of ignition of large woody fuels varies with the period since logging, the drought factor as indicated by the Soil Dryness Index (S.D.I.), the time of the year, and the species. Under the same conditions karri logs will ignite and burn before marri, jarrah and tingle logs, in that order. Logs with M.C. below 30 per cent will ignite satisfactorily if fine fuels are abundant and dry.*" (p. 6)

NOTE: REFER TO TABLE 3.2.4 IN DOCUMENT – Burn Rating and Fuel Moisture Content

3.3 Weather Conditions

"*Temperature, relative humidity and wind strength affect the drying rate and final minimum values of the fine fuel M.C.*

Wind is the most variable and least predictable factor. Surface winds are affected by the topography and by local heating and cooling. Wind is also influenced by local synoptic changes and by the stability of the atmosphere. Controller and Fire Boss need a sound understanding of local wind behaviour supported by wind monitoring by local towers or spotter aircraft, during slash burns." (p. 7)

3.4 Topographic Effects

"*Topography affects wind speed, turbulence and direction.*

Topography also influences the rate of drying of fuels through the influence of aspect and slope or the degree of exposure of fuels to sun and wind." (p. 7)

8.1 Scrub Roll
[…]
Heavy logging slash must be pushed clear of seed trees, particularly those with hollow butts.
[…]" (p. 8)

7. Slash Burn Control
7.5 Knowledge of Danger Points
"*Danger points are:*
[…]
- *Seed trees with dead limbs near perimeter.*" (p. 22)

7.8 Mopping up
"[…] *In most case spot fires in the limbs of karri seed trees go out overnight. If left standing in this hope, such trees must be checked before first light on the morning after the burn.*" (p. 23)

POLICY STATEMENT - 1982

Forests Department Annual Report 1982. 1982

NOTE: SIMILAR WORDING FOR ANNUAL REPORTS FOR 1983, 1984, 1985

3. Objectives
"*The Government forest policy involves the following management objectives.*
[…]
Timber Production: To regulate the removal of produce from the native forests to a level that can be sustained by the forest growth in the long term.
[…]
"*Forest Protection: To maintain and add to the areas of permanently reserved forests; to protect these forests from fire, insects and other harmful agencies and to maintain and improve the health and vigour of the forest area.*
[…] " (p. 7)

WORKING PLAN- 1982

General Working Plan No. 87. Part I. 1982

The Concept of Multiple Use
"*With limited forest area and increasing demand for each forest value, management must cater for as many uses as possible in any particular location. The Department achieves this through multiple use management. In its simplest form, multiple use of land means the use of a tract of land for several different purposes.* […]

The approach adopted by the Forests Department involves the selection of a primary or priority use for an area together with compatible secondary uses. This requires priorities for use to be ranked. […]" p. 15)

Silviculture – Karri Forest
"*To provide for a more regular regeneration programme, and to minimize the period between cutting and regeneration, areas cut over are regenerated each year either by means of natural seed fall from seed trees during the seed years, or by sowing seeds artificially and planting seedlings in the intervening years. Operational techniques for direct seeding have also been developed but this method uses much more karri seed*

than planting seedlings, and limited supplies of seed restrict its use. Because of this, when seed trees cannot be used, planting seedlings from nursery stock is the preferred method of regeneration." (p. 13)

MANAGEMENT PLAN – 1982

Hardwood Management Plan (Central Region). 1982

Section 1 : Introduction
1.1 Objectives and Policy
"*1.1 Objectives and Policy*
Hardwood timber specifications in the Central Region must:
[…]
(4) be in accordance with the silvicultural prescription prescribed for the particular forest stand. Each stand will be treated after considering; species, site, land use priority, dieback status, stand structure and site quality.
[…]
(6) Consider the regeneration, protection and the maintenance of the stand in a healthy and vigorous condition.
[…]" (p. 1)

1.2 Scope
"*(1) This Hardwood Management Plan attempts to cover all hardwood operations in the Central Region. Sawmill logging cannot be considered in isolation. Silvicultural, hygiene and protection objectives cannot be neglected unless all operations are considered and co-ordinated.* […]" (p. 1)

2.2.2 Land Use Management Priorities (L.U.M.P.)
"*To enable a silvicultural system to be prescribed management priority must be considered.*

(1) Catchment Protection
(2) Water Production
(3) Protection
(4) Production
(5) Recreation
(6) Conservation" (p. 3)

2.2.3 Forest Structure
"*Depending on past events, stands fall into two broad categories:-*
(1) Densely stocked even-aged pole stands; and
(2) Other stands, normally comprising mixtures of size and age classes." (p. 3)

2.4.2 Uniform System
"*Crop Trees retained under this system are to be free from damage and with healthy crowns and stocked as per table 2.4.5.*" (p. 4)

2.4.5 Stocking Levels of Crop Trees and Regeneration
"*It is of utmost importance than an adequate stocking of potentially merchantable stems should remain standing following logging operations in all but graveyard forest.* […]" (p. 5)

2.4.6 Seed Trees
"*Where stocking is considered to be inadequate then a minimum of 10 seed trees per hectare will be retained. Seed trees must have healthy vigorous crowns and must be at least pile size.* […]" (p. 5)

3. Sawmill Logging Operations
3.1.1 Five Year Logging Plan
"*(1) This plan is to be prepared by IPS in close consultation with Divisions. When preparing the logging plan the following must be considered.*

- *Policy as per the General Working Plan*
- *Management Priorities*

[…]" (p. 6)

3.2.2 Preparation of Coupe Plans
"*(2) The cutting coupe boundaries will also be determined by:-*
[…]
- *Silviculture type*

[…]" (p. 10)

5. Regeneration and Rehabilitation
5.2 Tops Disposal
"*(1) Involves the removal of logging debris to a distance of at least one metre from the base of retained crop trees and the lopping of elevated branches in the debris.*

(2) Tops disposal will only be carried out in:

- *Protectable and dieback resistant stands.*
- *Where tenure of the forest can be assures until at least next trade cut.*
- *In moderate to good quality stands (B+ or better).*

[…]" (p. 20)

5.3 Regeneration
"*(1) Regeneration burn. In areas where the residual crop is inadequate a regeneration type burn will be carried out following logging. This should be intense enough to create ash beds and to promote seed fall. This must co-incide with good seed crop on the crop trees,…*" (p. 21)

6. Records and H.O.C.S
"*6.1 <u>Need for Records</u> The structure and quality of each forest stand is dependent on what happened in the past. It is important to know the history of the stand before clear understanding of the forest land and its future can take place eg.*
[…]
(2)Number, intensity, type and time of past trade cutting operations will determine the yield and type of regeneration that is present in the stand.
[…]" (p. 22)

FORESTERS' MANUAL – 1981

<u>Fire Control : Foresters' Manual. 1981</u>[included in *Foresters' Manual.* 1979]

9. Fire Protection
"*9.001 The problem of fire control is intimately connected with the questions of reforestation and afforestation, and the ultimate success of the Department's efforts in these projects is largely dependent on a strong measure of public sympathy and co-operation in attacking the fire problem.*

Of equal importance is the proper use of controlled fires to regenerate and protect the forest and its associated flora and fauna, and to guard adjoining communities from wildfire." (p. 1)
Updated 10/81

Master Plans

"*9.042Area O.I.C.'s must draw up prescribed burning master plans. These plans will show:*

Hardwood areas which will be burnt as buffer areas.

Hardwood areas for prescribed burning on a rotational basis for protection of timber, flora, fauna or recreational values. Rotation length should depend on the average rate of fine fuel accumulation for each forest type, unless defined management objectives dictate otherwise for a particular area. […]" (p. 23)

The prescribed conditions for burning an individual area will be decided by the primary land use objective for that area. Where timber values and preservation of flora and fauna are paramount, the following limits will apply:" (p. 23)

Standard for Prescribed Burning

"*9.043 (a) Management Priority Areas and other areas where primary land use requires mild prescribed burning.*

[…]

Karri Forest :
Burning cover in the range 60 to 80%. Up to 10% scorch in small clumps or individual crop trees.

Flats :
Burning under mild conditions only to give a mosaic pattern with 40 to 60% cover.

Poor Quality Forest :
Burning cover in the range 40 to 60% carried out under mild conditions.

(b)Wherever possible, planning must aim to use aerial ignition techniques and be designed for aircraft ignition.

(c)Where more intense fires are specified for management objectives, the desired fire intensity and level of acceptable crown damage must be defined in the prescription." (p. 23)

Updated 10/81

Prescriptions

"*9.043 A prescription is to be prepared for all burns whether hand, aerial, karri regeneration or clearing burns. Job specifications have been prepared describing the methods of fuel sampling and proper recording for the prescription form, i.e.:*

FD 655 for hardwood
[…]
FD 657 for clearing or regeneration burns" (p. 25)

Updated 10/81

Advance Burning

"*9.068In principle, advance burning aims to minimise the fuel hazard when fire risk is markedly increased by trade operations, and to protect the operators and equipment.*" (p. 31)

Karri

"*The advance burn, which is standard practice in jarrah forest, has been discontinued in karri forest where its advantages are outweighed by detrimental effects such as*

(a) the difficulty of securing a uniform burn without scorching of canopy and damage to buds and blossom, or release of seed which should ideally remain on the tree until after logging;

(b) adverse affect on the regeneration burn which becomes discontinuous and may destroy seedlings developing from the advance burn;

(c) dense establishment of fire weeds which inhibit development of karri." (p. 31)

Updated 10/81

Karri Tops

Burning of karri tops is tied completely to silvicultural requirements. The Regional Leader Operations will determine the time of burning. This will depend upon the particular regeneration method to be employed." (p. 31)

Updated 10/81

Karri regeneration

"*9.070 Karri regeneration areas. The following principles must be followed;*

Exclude fire from areas to be cut over for a sufficient time which will ensure a clean regeneration burn (not less than 3 years).

Cutting sections are to be surrounded by prescribed burns, where possible, to protect the regeneration area and provide safe boundaries to the regeneration burn. A comprehensive job specification has been prepared for planning and carrying out karri regeneration burns, and should be followed.

Regeneration must be protected until saplings can safely withstand prescribed burning, usually after crop trees reach 15m." (p. 32) Updated 10/81

FORESTERS' MANUAL – 1980

Foresters' Manual : Fire Protection. Rev. 1980

9. Fire Protection

"*1.The problem of fire control is intimately connected with the questions of reforestation and afforestation and the ultimate success of the Department's efforts in these project is largely dependent on a strong measure of public sympathy and co-operation in attacking the fire problem.*

2. Of equal importance is the proper use of controlled fires to regenerate and protect the forest and its associated flora and fauna and to guard adjoining communities from wildfire." (p. 1)

Hazard Reduction

Prescribed Burning

"*There are six types of prescribed burning that are standard practice:* […]

54.5 Slash burning, for regeneration or hazard reduction, following logging operations.[…]" (p. 16)

Areas To Be Protected

"*55. Except for those areas where specific approval for burning has been obtained from Head Office, complete protection will be afforded to:* […]

55.2 Karri tops or scrub-rolled areas being held for regeneration burning and areas programmed for cutting within three years.

55.3 Regenerated karri areas where crop saplings are less than 15 metres tall.[…]" (p. 16)

Issued 12/78

Standards for Prescribed Burning
"*The prescribed conditions for burning an individual area will be decided by the primary land use objective for that area. Where timber values and preservation of flora and fauna are paramount the following limits will apply:*

(a) […]
Karri Forest:
Burning cover in the range 60 to 80 percent. Up to 10 percent scorch in small clumps or individual crop trees." (p. 17)

Issued 12/78

Hardwood Prescriptions
"*63.Prescriptions for hardwood burning will be based on 1:25,000 scale A.P.I. plans.*

Preparation of hardwood prescriptions should follow guidelines set out below:

63.1Use the A.P.l. plan for separating each job into similar forest types based on species, height, and density.
63.2 Examine cutting records to determine top disposal requirements, sapling age, likely height of regeneration and changes to canopy density since aerial photography. In karri forest, proposed cutting will be noted. Where top disposal cleaning is necessary it is to be shown in prescription and works programme." (p. 19)

Issued 12/78

Karri Regeneration
"*Karri regeneration areas. The following principles must be followed:*
84.1 Exclude fire from areas to be cut over, for sufficient time to ensure a clean regeneration burn (not less than 3 years).
84.2 Cutting sections are to be surrounded by prescribed burns where possible to protect the regeneration area and provide safe boundaries to the regeneration burn. A comprehensive job specification has been prepared for planning and carrying out karri regeneration burns and this should be followed.
84.3 Regeneration must be protected until saplings can safely withstand prescribed burning, which is usually after crop trees reach 15 metres." (p. 26)

Issued 12/78

Advance Burning
87.2 Karri forest. The advance burn, which is standard practice in jarrah forest, has been discontinued in karri forest where its advantages are outweighed by detrimental effects such as:

(a) the difficulty of securing a uniform burn without scorching of canopy and damage to buds and blossom or release of seed which should ideally remain on the tree until after logging;

(b) adverse effect on the regeneration burn which becomes discontinuous and may destroy seedlings developing from the advance burn;

(c) dense establishment of fire weeds which inhibit development of karri." (p. 28)

Issued 12/78

Top Disposal
"*88. Burning of tops is carried out to reduce fine fuel hazard and to dispose of as much limb wood as possible.*[…]" (p. 28)
Issued 12/78

Burning of karri tops
88.2 Burning of karri tops is tied completely to silvicultural requirements. The Regional Leader Operations will determine the time of burning. This will depend upon the particular regeneration method to be employed." (p. 28)
Issued 12/78

WORKING PLAN – 1977

General Working Plan No. 86 of 1977 Part I

4.2 The Concept of Multiple Use of Land Management
"*(c) The selection of a priority or dominant use for an area with the practice of secondary uses which in some circumstances may not significantly interfere with the primary aim, but in others may impose a restriction on output from each competing use. This necessitates a social ranking of use priorities which can usually be done satisfactorily with limited data and experienced value judgement. The Forests Department has adopted this approach for the future management of State Forests and timber reserves.*

Multiple use has temporal as well as spatial over-tones. In the long term the structure of use priorities may alter with socio-economic, technological and successional changes. Such changes could be brought about by a number of influences such as dieback spread, mining, increased water supply requirements or altered demand for wood." (p. 31)

"***Conservation of the Physical Environment***: *To minimise the deleterious effects of land use and management on the soil, air and water components of the forest environment.*" (p. 4)

5.2 Wood Production
5.2.5.6 Wood Production Policies and Strategies
"*4. Continue investigations into harvesting techniques designed to avoid environmental damage.*" (p. 70)

5.2.6.2 Sawlog production strategy
"*8. Prevent damage to soil values, and further artificial spread of dieback, by reducing winter logging operations and developing summer stockpiling techniques.*" (p. 72)

5.2.6.3 Residue production policy
"*2. Harvesting of residues will be according to priorities set to achieve maximum State benefit and minimum environmental damage.*" (p. 73)

5.2.6.8 Forest management strategy
"*1. Taking into account growth and natural succession characteristics of forest stands, apply silvicultural techniques such as cultivation, fertilisation, thinning and removal of competing vegetation, which will stimulate growth on the remaining crop trees.* […]" (p. 75)

5.9 Protecting the forest from destructive agents
5.9.3.6 Background to policy formation
"*Throughout the hardwood forest prescribed burning during spring or autumn is applied on a rotational basis, except where management requirements for regeneration or research favour fire exclusion. In plantations where management is more intense and trees more sensitive to fire damage, prescribed burning in winter is generally used on buffer strips designed to restrict movement of wildfires.*" (p. 122)

3.2 Silviculture
3.2.2 Karri (E. diversicolor)
"*Following utilisation trials in 1965, the Uniform System was reintroduced in the karri forest in 1967. It is the most efficient and practical means of securing fully stocked, even-aged regrowth which is free to develop without the suppressing effect of trees from the original crop.*" (p. 26)

Regeneration
"*In order to provide for a more regular regeneration programme … it is now proposed that areas cut over will be regenerated each year by means of seed trees during the seed year and by direct seeding and planting in the intervening years. Techniques have already been developed and research is continuing.*" (p. 26)

POLICY - 1976

'Focus on Forest Policy', *Forest Focus*, No. 17, pp. 1-15.

"*The present regeneration process of the jarrah and karri forests will be continued. Because jarrah forest grows more slowly, particular attention will be given to the karri/marri forests.*[…]" (p. 6)

"*The principle objective in native forest management for timber production will be to adjust log removals to a level that can be sustained by forest growth*." (p. 6)

Forest Policy
"*The Forests Department will manage the state-owned forests and timber reserves in Western Australia according to a policy that will ensure provision for the optimum social and material needs of the people. At the same time the policy will provide for the environmental well-being of the forests themselves.*

The policy involves the following objectives:
[...]
To regulate the removal of produce from the native forests to a level that can be sustained by the forest growth.

[…]" (p. 15)

FOREST POLICY – 1975?

Forest Policy : Western Australia. [1975?]

Introduction
"*It has therefore become necessary to restate forest policies to take into account the major changes that have taken place since rigid control of the timber industries was first introduced in 1918.*

The objectives of forest management at that time were to protect the forest estate through control of the industry and to protect the forest itself from fire and other destructive agencies.

In more recent times there has been a greater emphasis placed on multiple-use of the forest but with a strong tendency still to produce timber for industry. However, multiple-use demands have imposed limits on the timber resources of the native forests. Emphasis has therefore been given to pine planting to provide a source of timber to supplement and in some instances replace those native forests that will be required for purposes other than timber production.

This statement will outline the current situation regarding those permanently dedicated State Forests and Timber Reserves which come within the stewardship of the Forests Department and formally establish management objectives according to the requirements that now exist. It will take into account a multiple-use concept of those forests managed by the Forests Department." (p. 2)

2.4 Forest Protection
"*As well as safeguarding the integrity of the forest estate, the principal avenues of the protection which must be afforded the dedicated State Forests are those of cutting control, fire protection and control of forest pests and diseases. Authority to undertake these protective functions is provided in the Forests Act.*" (p. 7)

2.9 Wood Chipping
"*The reasons for approval being given for the wood chip operations are many. They are both economic and social but from the forest management point of view, the opportunity is now given to bring about a renewed state of health and vigour to the forests. Past use of the forest has provided logs that have been used entirely by the sawmilling industry. It has hitherto not allowed complete utilisation of what are overmature forests, crowded by stagnant trees that preclude regeneration of a new forest crop which could, if allowed to grow, be managed and protected to produce most valuable and aesthetically – attractive forests. Such forests would be capable of not only generating their own economy but also providing the non-productive benefits that now exist.*

The management objective of the area now defined as the wood chip is to improve utilisation through use of residues not currently processed in an established sawmilling industry, to use the operation as a silvicultural tool and at the same time, continue to provide the current social values of the forest." (p. 11)

3. Future Management Objectives
3.1 Policy
"*The future policy will emphasise the multiple-use management of State Forests and Timber Reserves. It will continue to provide for the renewable resources of publicly-owned forests to be utilised in the combination that will best meet the needs of the West Australian people. The aim will be to make the most judicious use of the land for some or all of the resources or related service over areas sufficiently large to provide latitude for periodic adjustments in use to conform with changing public needs and the development of the forest itself.*" (p. 12)

3.1.1 Multiple-Use Priorities
"*Multiple-use management implies the realisation of the best combination of forest benefits according to the particular attributes of each area considered. Compatible benefits may be derived simultaneously from the same area, but separate areas must be used where there is conflict in management for non-compatible benefits.*

In order to overcome the problems imposed by limited forest area, it is proposed to establish a system of management priorities so that the greatest possible number of compatible uses can be practised throughout most of the forest, whilst carefully selected representative areas of native forest will be managed specifically to retain them in an undisturbed condition for scientific reference purposes." (p. 12)

"*The major forest values currently recognised for multiple-use management are:*

> *Timber Production*
> *Water Supplies*
> *Amenity and Recreation*
> *Flora and Fauna*
> *Special Scientific Values*" (p. 13)

3.1.2 Multiple-Use Requirements
"*Future requirements to meet the need for multiple-use forest management posed by increasing public demand are:*

> *Classification and designation of State Forest into areas to be managed according to a scale of multiple-use priorities, together with increased security for these management objectives.*
> […]" (p. 13)

3.2 Management of the Native Forests
"*The present regeneration processes of the jarrah and karri forests will be continued. The process is long in the case of jarrah and therefore particular attention will be given to the karri/marri forests. Although the latter forest type occupies only 7 per cent of the total State Forest, it provides 37 per cent of the total timber growth under current management. Prompt and effective regeneration of the seed tree system now used will be continued to re-establish areas cut over by the karri/marri sawmilling and the marri wood chipping industries. Environmental values will be taken into account and constantly monitored.*" (p. 14)

FORESTERS' MANUAL – 1973

Foresters' Manual : Fire Control. 1973

Introduction
"1. *The problem of fire control is intimately connected with the questions of reforestation and afforestation and the ultimate success of the Department's efforts in these projects is largely dependent on a strong measure of public sympathy and co-operation in attacking the fire problem.*

2. Of equal importance is the proper use of controlled fires to regenerate and protect the forest and its associated flora and fauna and to guard adjoining communities from wildfire." (p. 3)

Karri Regeneration
"*94. Karri regeneration areas. The following principles must be followed:*

94.1 Exclude fire from areas to be cut over, for sufficient time to ensure a clean regeneration burn.

94.2 Cutting sections are to be surrounded by prescribed burns to protect the regeneration area and provide safe boundaries to the regeneration burn.

94.3 Regeneration must be protected until saplings can safely withstand prescribed burning, which is usually after crop trees reach 17 metres." (p. 15)

Top Disposal
"*100. Burning of tops is carried out to reduce fine fuel hazard and to dispose of as much limb wood as possible. It may also be essential for regeneration.* […]
100.2 Karri tops burning is tied completely to silvicultural requirements. Seed must be present in retained trees and conditions chosen to achieve a clean seed bed." (p. 16)

FORESTERS' MANUAL – 1972

Foresters' Manual : Reforestation and Silvicultural Operations : Jarrah and Karri. 1972

Karri Forest Operations
Current Cutting Practice
"95. The principles of trade cutting and permit control outlined in Paras. 1 to 11 also apply to this section of the pamphlet. […] *Nevertheless, adjoining jarrah forests must be treated as outlined in "jarrah forest operations".*

Instructions and guidance given in the ensuing section pertain to stands of pure karri, free of severe fire damage, unless specifically stated otherwise.

96. Cutting will cease where pure stands become mixed, usually with marri. Generally, the cutting boundary will be self-evident; if not, then the guideline [sic] *of not more than five per cent. upperstorey stems of other species will be used to delimit the pure stand.*

97. Cutting may be scheduled in severely fire-damaged stands, cut-over Severely firestands, and other stands which may not be virgin. The occurrence of appreciable damaged cut-over amounts of karri regeneration may be a complicating factor. Special prescriptions stands for each area, compiled by the D.F.O. in consultation with ***the Silvicultural Officer,*** *must be submitted to the Inspector for approval before cutting may proceed.*
98. All cutting shall be guided by five-year plans, prepared by the D.F.O., 5-year plans which will show:-
(a) Areas to be cut within the five-year period.
(b) Priorities of cutting.
(c) Location of extraction routes.
(c) Fire protection proposal, including surround burning and access.

General agreement between the Divisional Forest Officer and the mill management must be obtained before five-year plans are adopted.

Five-year plans must take into account dieback hygiene and will be revised annually.

99. The aim in marking virgin karri is to employ trade cutting to replace the stand with a fully stocked even-aged crop of seedling karri.

100. The silvicultural system is 'Clear cutting with seed trees' (Jacobs, M. R., 1955). Seed trees are to be removed following a regeneration burn." (p. 25)

Sequence of Operations
102. The following sequence of operations comprises current practice:
(a) Fire protection on cutting section, and provision of access. Prescribed burning should be avoided five years prior to cutting.
(b) Prescription for tree marking and regeneration.
(c) Treemarking.
(d) Trade cutting (including "cull felling") where prescribed.
(e) Scrub rolling where prescribed.
(f) Appraisal of seed supply.
(g) Regeneration burning.
(h) Removal of seed trees.
(i)Regeneration survey.
(j) Remedial planting where necessary.
(k) Record on progress plans.
(1) Fire protection as prescribed." (p. 25)

Protection of cutting area
"*103. For good karri seedling regeneration a clean regeneration burn, with widespread ashbed and complete removal of green scrub and understorey is essential. Maximum dry fuel quantity of all sizes at the time of the burn is therefore desirable. This not only ensures widespread ashbed, but extends the limit of fire danger ratings which can be used into a lower, safer range. With-holding the cutting section from prescribed burning for five years prior to cutting ensures enough fine litter fuel to carry a fire between slash heaps, reduces the amount of fresh green scrub, and avoids the risk of damage to current seed crop development.*

Karri cutting sections are now opened up with bulldozed access tracks prior to logging, and are protected by burns in the surrounding jarrah and marri forest types and in non-timbered flats. (p. 25-26)

Treemarking Prescription
"***104.*** *The aim in treemarking (para. 99) is realized by:-*

(a)Retaining and protecting an adequate temporary seed source in the form of the best available seed trees.
(b)Releasing for utilization the balance of the stand. Direction of fall should be controlled to protect seed trees.
(c)Removing non-utilizable cull trees.

105. Seed trees must be of adequate size and spacing to both supply enough seed for regeneration, and to effectively disperse it over the area.

Seed tree requirements for an average healthy karri stand are:- Density: Three seed trees per two acres, evenly spaced, will provide enough seed and disperse it for good regeneration. This corresponds to a triangular spacing of 2.5 chains.

Quality: A seed tree must be a dominant or co-dominant over 12 feet G.B.H.O.B., and must have a healthy spreading crown. Preferably it should be of good form, marketable quality, free of defects such as double leader, heavy branching, pronounced spiral grain, kinks, bumps, swellings and excessive taper. Where a choice exists, trees with hollow butts, dry sides, termites, etc., should be avoided (such trees may not survive a regeneration burn). Where no choice exists a cull type is better than no seed tree.

106. It is essential for the treemarker to receive the D.F.O's guidance in respect of atypical areas, particularly where the forest is severely fire-damaged, grossly overmature, or carrying an exceptionally high proportion of marri. These areas will be withheld from cutting until treemarking and regeneration treatment is prescribed. Logging may be arranged immediately after a severe fire in karri forest, provided that seed supplies and/or planting stock are available for regeneration.

107. It must be stressed that treemarking plays a vital part in determining the future condition and productivity of the forest. D.F.O's are to ensure that careful instruction and close supervision is given to all treemarkers, especially those in training. Consistent attention to the maintenance of standards is imperative and all questions in this regard should be referred to the Inspector or Superintendent." (p. 26)

Regeneration Prescription
"*110. Prescriptions to obtain regeneration will be made by the D.F.O. in consultation with the Silvicultural Officer. In the karri forest detailed records are maintained of the development of buds, flowers, fruit and seed on each cutting section. From this information, predictions of seed availability can be made. Substantial variations can occur between areas only a short distance apart and additional sampling is required on specific areas to enable completely effective prescriptions. Where prescriptions require protection of regeneration by deferring prescribed burning, such areas are to be clearly defined on plans in the Divisional Office and brought to the notice of officers responsible for prescribed burn planning. This applies also to research plots specified for protection by Silvicultural and Working Plans Officers.*" (p. 27)

"*112. The objects of the regeneration burn are:-*

- *(a) To bare the mineral soil and create widespread ashbed, free of all green scrub.*
- *(b) To promote seedfall from retained seed trees upon the seedbed thus formed.*

Fire damage to seed trees, other than their removal by burning down, is considered unimportant because the current seed crop is not affected by scorching. Burns therefore should be prescribed to achieve (a), without regard to seed trees.

Regeneration burns must be timed to coincide with adequate seed supply (paras. 127, 128)." (p. 27)

Regeneration burn

"*113. Seed trees can be removed as soon as seed is shed. In a normal regeneration burn, 90 per cent. of the seed will be shed within one month of the burn. If fire intensity is less than prescribed, seedfall may be extended over a longer period. Sampling crowns by rifle shot or felling will indicate the seed shed situation at any time.*

114. Seed trees may have to be removed after germination has taken place. To minimize damage to seedlings:-

(a)The same network of snig tracks and landings as used previously must be used again.

(b)Slewing of logs while snigging is to be minimized. Crown cuts are to be completed by chain saw rather than rely on dozer power to effect the final break. Use of logging arches is to be encouraged.

115. The smaller the seedlings are when seed trees are removed, the less damage is likely to be done. Seed tree removal should not be left later than one year following germination.

116. Should natural regeneration fail, planting will be employed to ensure full stocking (paras. 136-140). Seed trees will not be kept to attempt reburning in subsequent seed cycles." (p. 27)

"118. […]*Protection must be given during this period by regular burning of the surrounding mixed forest types.*" (p. 27)

Karri Regeneration

Natural Regeneration

"*119. Under ideal conditions, karri develops rapidly from seed. Although it does not produce a lignotuber it has a weak capacity to coppice after fire.*

As natural regeneration depends on seedfall considerable attention is given to the planning of regeneration burns to make effective use of available seed." (p. 28)

"*120. Regular sampling throughout the karri forest enables the Research Branch to keep track of seeding cycles, to forecast both the quantity and time of optimum seed supply. The basis of the forecast is a graph (Figure 1) which shows the normal development of a floral cycle, and the expected loss of floral parts throughout. By consulting the graph it is possible at any stage within a cycle to forecast the number of capsules which will develop from the floral parts visible at that stage. The basic unit of measurement is the twig, which is defined as 'one year's terminal leaf growth'. The numbers of floral parts per twig gives the density of the crop.*" (p. 28)

"*127.As mentioned above, the regeneration burn is timed to furnish a seedbed (ashbed) for receipt of adequate seed released after the burn.* […]

Full natural seed release occurs during the second summer, hence burning in the second autumn is likely to prove abortive and should not be undertaken unless it is conclusively demonstrated that affective quantities of seed remain." (p. 29)

"[…]*Prior germination of fireweeds may completely inhibit karri seedling development or condemn seedlings to an etiolated condition for years until they emerge above scrub level to become active components of the new crop. A regeneration burn which removes all scrub competition is therefore essential.*" (p. 29-30)

"*132. It is axiomatic that the hottest burn produces the best regeneration. More fuel is consumed and ashbed, most favourable to seedling development, is more widespread and continuous. The object of the regeneration burn is to bare the mineral soil and create widespread ashbed and promote seedfall (para.123). The only restraint on fire intensity are the requirements for control. Seed tree damage is unimportant. A large quantity of dry fuel available for burning means that lower fire dangers can be utilised to achieve the desired seed bed.*" (p. 30)

"*134. A seedling stocking of 30 per cent. by milacres, and 2,000 per acre survey is regarded as the minimum for acceptable establishment. (A survival count of 500 per acre at age one year is equivalent.)*" (p. 30)

Artificial Regeneration
"*136. The technique for artificial establishment will be prescribed by the D.F.O. in consultation with the Silviculturist (karri). Three planting techniques are available-214 in x 214- in. peat pots, one-year-old wildings, and open-rooted nursery stock. Broadcast or spot sowing is unacceptable because of variable results and the extravagant requirements of costly seed*." (p. 30)

"*137. If wildings are to be used, one-year-old stock 18 in. to 24 in. in height should be selected. Techniques of lifting, transportation and planting are the same as for open-rooted pine stock.*" (p. 30)

"*140. All planting of karri must be accompanied by a surface application of fertiliser at time of planting. Until further work may indicate otherwise, 2 oz. of the general fertiliser 'Nutrifert' shall be applied to each plant.*" (p. 30)

Seed Collection
"*141. It is essential that Divisional Officers in charge of karri divisions take every opportunity to collect karri seed whenever this can be economically carried out.* […]" (p. 30)

Stand Improvement
Thinning and Cull Removal
"[…] *…thinning should be limited in extent, experimental in nature, and must have the approval of the Inspector."* (p. 31)

Appendix 'C'-Regeneration Surveys
Milacre Surveys for Regeneration Three-Quarters to Three Years Old
"*Regeneration surveys are used to map out areas that have too few seedlings so that they can be restocked.*"

Where very small seedlings are to be assessed, only small plots can be efficiently inspected.[…]"(p. 33)

C Office Work
"[…] *The stocking information will be used to map out stocked and understocked areas as described below (1).* […]" (p. 35)

FORESTERS' MANUAL – 1972

<u>Foresters' Manual : Control of Trade Operations. 1972</u>

Registration of Timber Workers and Brands
"*1. The purpose of the registration of bush workers is the proper control of men directly engaged in the cutting and removal of timber from the forest, natural or planted, and the prevention of waste and damage in all associated operations. Consequently, it is necessary that every man who is engaged in the extraction of forest produce shall be a registered timber worker*." (p. 3)

Permits and Licenses
"*31. The granting of sawmilling permits and licenses for general trade cutting is governed by the provisions of the general working plan for the hardwood forests, which regulates the annual cut. Areas of State forests and reserves which will serve as future sawmilling permits and licenses have been listed in these working plans and cutting rights over such areas will be submitted to public auction or tender or granted in accordance with the plan.*" (p. 7)

Quarterly TradeCutting Operations

"*67a. Within 30 days of the close of each quarter officers in charge of Divisions will submit completed form F.D. 517 (Progress plans check by Working Plans Office).*

The detailed information required for the areas cut over, is as follows:-

[…]

(ii) Land Tenure – whether State Forest Timber Reserve, other Crown Land or Private Property.

(iii) Classification of area as maiden or old bush.

(iv) Species – the areas cut over by species.

(v) Class of log, MNT, Dieback, salvage etc." (p. 11)

Pile and Pole Licenses

"*90. Owing to serious shortage of intermediate age classes in all areas of State forest and the need to conserve such growing stock to protect the future of the sawmilling industry, the Department for many years past has endeavoured to confine pile and pole getting to private property and land for alienation.*" (p. 14)

"*2. Poles and piles less than 45 feet in length should be obtained from the areas listed in sequence of priority under para. 91 sections 1 and 2. However, where it is necessary to obtain them under para. 91, section 3, removal under treemarking must ensure that:*

(a) An adequate level of growing stock is retained, especially in gaps.

(b) No cutting back in length will be permitted.

(c) Contractors will be expected to find orders for the full range of lengths becoming available.

(*d*) *No recutting will be permitted until the next major trade operation is scheduled.*" (p. 14)

"*3. A pile and pole license … must be obtained in all cases before piles or poles are cut. Licenses will be issued only to persons holding definite orders for the supply of piles or poles for use within the State who may be required to produce their orders or satisfactory evidence thereof. The term and area for which the license is issued must be clearly shown on the form. In no case should a license be issued for more than three months.*

"*94. Pile and pole licenses will in all cases set out the minimum maximum crown and maximum crown diameter of the poles and/or piles authorised to be obtained.* […]" (p. 14)

Tally of Piles and Poles in the Bush

"*104. Piles and poles cut under license must not be carted from the area where they have been obtained until they have been either inspected or tallied and correctly branded.*" (p. 15)

WORKING PLAN – 1971

<u>General Hardwood Working Plan No. 85 : Part I. 1971</u>

"*This General Working Plan No. 85 is prepared under Section 31 of the Forest Act 1918-1969 which provides amongst other things, that the Conservator shall from time to time, prepare Working Plans for each State Forest and Timber Reserves. The practical value of the General Working Plan is that it sets out the policy of the Forests Department for managing the State's Crown timber resources, thereby informing the Government and the Forests Department's professional staff of the details of this policy.*

The last General Working Plan No. 79 was approved by the Governor in Executive Council in 1956. The provisions of this plan were revised Departmentally in 1960 and again in 1966, but formal ratification was not sought because of the changes which could be foreseen in the structure and economic conditions of the industry and which have subsequently become more evident." (p. 1)

0.2 Major Changes Since 1956

"*A number of major factors affecting the timber industry have emerged since 1956 and current planning must take them into account. The most important are:*

1. *Final definition of the total area available for dedication for forestry purposes which can now be Stated as an absolute purposes which can now be stated as an absolute maximum of 4, 975, 405 acres provided that all outstanding dedications are completed.*

2. *Completion of a comprehensive inventory of the forest resource indicating that the total longterm hardwood sawlog yield from Crown land is unlikely to exceed 600, 000 loads per year compared with former estimates of 800, 000 loads per year and actual current demand for Crown timber of approximately 750,000 loads per year. Improved inventory data, and to a lesser extent, the identification of dieback areas have been the reasons for this change in estimate of longterm yield.*" (p. 1)

"*6.* *The delineation of 1.79 million acres of high quality jarrah and karri forest as units for intensive management with a view to maximising both volume and values of timber production. These high quality sites are of the greater significance for future timber production, and the need to exclude mining operations from them must be stressed, when areas of lesser forest value could be considered as more readily available for mining.*

7. *Development and application of economic techniques for silvicultural treatment of hardwood stands with a view to concentrating management upon and increasing yields from specially selected areas of high quality forest.*

8. *Modification of logging procedures to conform with:*

(a) *The silvicultural requirements for optimum regeneration in the karri forest.*
(b) *The needs of logging hygiene in areas affected by or susceptible to jarrah dieback.*

[…]

10. *The approaching end of the initial cut in virgin forest on several sawmilling permits whose permissible intakes, based on originally incomplete assessment data, and the closer utilisation in the boom period of 1950-1960, have proved optimistic.*

Associated with this problem, the reduced per acre yields, and the increased proportion of small logs becoming available from areas now being cut for the second or third time, must also be taken into account." (p. 2)

0.3 Conditions For Future Planning

"*1. These factors set a climate for planning under which two distinct contingencies must be covered:*

(1) *Continuation of the present downturn in the timber industry. In this case any rationalisation must be effected so as to reorganise permit boundaries and intakes to the lower level of longterm yield, but without detriment to meeting the anticipated increase in longterm needs of the industry in the most effective way.*" (p. 2)

"*(2) Early recovery from the present downturn in the industry, followed by a progressive increase in demand for sawn timber. In this case overcutting of the longterm hardwood yield for about 20 years must be provided for, followed by a reduction in hardwood production for an equivalent period as plantation conifers become available in sufficient quantity to bridge the gap.*

For this reason Working Plan 85 will remain in force until 31st December 1976, however it will be revised earlier depending on the importance and urgency of any new factors that might arise in the meantime.

2.Sleeper mills formerly operating on forest land to be alienated will have to cease operating on Crown land because they cannot be supplied from areas of permanent forest without seriously affecting the resources and planned future life of mills already established and many decades on State Forest.

7. *Mills established on private property resources and now reaching the 'cut out' stage, cannot be accommodated on the remaining areas of permanent forest, because timber supplies from these areas are already fully committed to the established sawmilling industry.*

8. *Amalgamation of intakes and re-organisation of permit boundaries is required to rationalise the level of production and hauling arrangements between major permit areas, especially in the forests centred north of Collie and south of Manjimup.*

9. *A temporary rationalisation of intake is required to overcome present conditions of oversupply caused by unbalanced orders, even though it is predicted that there will be an increase in total demand for sawn timber within the next decade.*

10. *There is a real and urgent need for additional funds for forestry purposes to provide for expanded programmes of plantation establishment, hardwood stand improvement and dieback rehabilitation, in order to increase yields and thereby attain a state of nett self-sufficiency in sawlog timber by the year 2030.*

11. *The need to press for additional Commonwealth assistance to both hardwood and softwood forestry is recognised and can be amply justified in that it is the only way to avert the need for increasing quantities of timber imports to meet future demands.*" (p. 3)

3. Silvicultural Considerations
3.2 Karri Forest
1. Early Treatment
"*The total area of prime karri forest is 172, 800 acres but karri occurs in mixture with jarrah and marri over a further 656, 000 acres. Early trade operations in the karri forest were conducted under a system of clear felling which resulted in some fine, even-aged pole stands as at Big Brook. In the late 1930's the clear felling system was superseded by the Group Selection System, which was primarily aimed at recovering the greatest quantity of damaged timber from the widest possible area of State Forest. Satisfactory regeneration was not invariably established due to overhead shading; trees retained as growing stock showed marked crown deterioration after the trade cut; and damage to established regeneration by the subsequent removal of the remaining crop trees is inevitable. Partial felling has also created problems in connection with the fire protection of substantial areas of highly irregular forest.*" (p. 10)

2. The Uniform System
"*After successful trials in 1966 the Uniform System was reintroduced into the karri forest as the most efficient way of securing fully-stocked, even-aged regrowth stands and of reducing the total area under regeneration and requiring intensive fire protection. The uniform system temporarily creates cleared areas, but the regrowth which restocks these areas grows into fine stands of pleasing appearance. This is well demonstrated by uniform stands of karri regrowth at Lefroy Brook, Karridale and Big Brook, which have now developed into tourist attractions in their own right, apart from being highly productive forest stands.*" (p. 10)

3. Silvicultural Regime For the Karri Forest
"*Inventory data has shown that even in pure karri stands approximately 30 per cent of the standing volume consists of defective stems, unmarketable as sawlogs. Silvicultural research has shown that overhead shade from retained trees markedly inhibits regeneration; that natural seed crops of sufficient density for adequate*

natural regeneration occur at irregular intervals of up to seven years; that effective regeneration can be secured economically by planting open-rooted karri seedlings; and that karri pole stands show a marked response to judicious and correctly timed thinning, even though over considerable periods the emerging dominants will eventually suppress the less vigorous elements of the stand, thereby achieving a degree of self-thinning." (p. 11)

"*Because of its high yield capacity the karri forest must receive overriding priority for hardwood expenditure with a view to minimising the time required to achieve full growing stock and minimum sawlog size. With this in mind available finance will primarily be directed towards intensive management of cutover karri areas involving-*

(a) The recutting of areas which have only been partly cut and partly regenerated.
(b) Cull felling and scrub rolling to provide the maximum area and the most favourable conditions for the development of regeneration.
(c) Synchronisation of regeneration burning with adequate crops of mature seed to obtain natural regeneration where possible.
(d) Artificial regeneration by hand planting during the lengthy gaps which occur in the natural seeding cycle or as required to enrich areas where natural regeneration has been only partly successful.
(e) Feasibility studies into thinning regime designed to produce maximum financial yield consistent with anticipated future demands." (p. 11)

3.3 Mixed Species Forest
"*For most practical purposes the jarrah-karri forests are managed according to the requirements of the dominant species.* […]" (p. 12)

3.4 Start Of Recutting
"*Virgin forest represents the capital accumulated by site productivity up to the end of biological rotation of the species. In most cases this is a much longer period than that required to produce sawlogs of commercial size. Under a selection system of forest management the first cut removes part of this capital so as to reduce the growing stock to a more productive level with a shorter rotation, while still growing logs of commercial size. The second (or any subsequent cut) under a selection system removes part of all of the remaining accumulated capital to further adjust the growing stock towards the desired level for optimum productivity.*" (p. 13)

2. Length Of The Cutting Cycle
"*The length of the cutting cycle depends on the intensity of the cut, the growth rate of the forest, market and economic factors, the kind of product desired, and the intensity of management.* […]" (p. 13)

3. Future Optimum Log Sizes
"*With a constant volume of growing stock, longer cutting cycles produce a smaller cut of larger sized logs and vice versa. However inherent growth stresses in small rapidly-grown eucalypts create problems in seasoning stability of the sawn product as well as lower recoveries on account of smaller log sizes. At present it is considered that the minimum log size required to overcome these problems and still to provide a log of acceptable recovery in a reasonable time is … 12" g.b.h. for karri, which should be attained in … 90 years respectively given reasonable management. These targets will be adopted as the basis for management in this plan.*" (p. 14)

4. Implications Resulting From Recutting
"*(a) The inevitable result of recutting will be an initial reduction in per acre yield accompanied by an increase in the proportion of small logs becoming available.*
(b) Initially there will be an increase in the range of log sizes, becoming available from the process of converting partly cut irregular stands into fully stocked stands of even-sized regrowth.
(c) This situation will persist until regrowth stands obtain minimum commercial size and produce a log supply consistent in both size and quality." (p. 14)

"*(e) Where original sawmilling permits were sold on the basis of incomplete data with the result that there is now insufficient large-sized material to sustain their annual intake, a reduction in intake will be required to phase the remaining large-sized material over the period required for the replacement.*" (p. 15)

4. Economic Considerations
4.2 Future Trends In Demand
"[…] *In order to attain the objective of nett self-sufficiency in timber by the turn of the century, it therefore becomes essential.*
[…]
(c) To intensify management of the hardwood forests, concentrated upon the karri forest and upon the high quality jarrah forest to further expand production in the longer term.

(d)To utilise current available hardwood resources in the most effective and efficient manner." (p. 16)

5.3 Determination Of The Longterm Allowable Cut
1.Concept Of The Allowable Yield
"*In a forest which lacks a balanced distribution of size or age classes, but which contains a very substantial proportion of unmarketable volume and incompletely regenerated areas, the classical concept of sustained yield is not truly relevant. In Western Australia the situation is further complicated by*

(a) Uncertainty as to the ultimate total area available for permanent forestry.
(b) The need for further improvements in hardwood growth rate data.
(c) Variations in standards of log acceptability due to changing market conditions.

For practical purposes, therefore, the concept of longterm allowable yield will be adopted. The long-term allowable yield will be regarded as the level of yield considered desirable to convert the forest into a condition of maximum productivity as soon as possible, while still providing reasonable continuity of log supplies in terms of both time and volume. This level of yield will be subject to review as improved data comes to hand and also as dictated by short term market conditions, but without prejudice to the basic principle that any cutting in excess of the estimated long term yield must be compensated by a corresponding reduction within a maximum period of the ensuing two decades." (p. 33)

6. Objectives Of Management
6.1 The Major Objective
"*A major objective of this plan is to regulate the cut from Crown lands so as to provide for anticipated demands in the next 20 years and to ensure the greatest degree of continuity in terms of economic production and employment in the timber industry within the framework of estimated longterm yield.*" (p. 35)

6.2 Secondary Objectives For Regulation Of The Cut
"*The major objective can only be achieved through a number of stages which may be termed 'secondary objectives'. These are:*

1.To maintain the allowable cut of 750, 000 loads per year from Crown land for the period of the plan within the capacity of established Crown land sawmills known to have adequate longterm resources.

2.To regulate the allowable cut by adjusting permit intakes or permit areas in accordance with mill efficiency and the location of the mill in relation to resource.

3. To hold in reserve without encroachment in any way by any other operator any areas or intake so yielded as the first step towards a future reorganisation of permit boundaries.

4.To ensure the greatest possible degree of continuity on a local basis within the limits of permissible intake and mill efficiency whilst creating flexibility for the future development of efficient centres of utilisation of economic size.

5.To achieve maximum forest utilisation so as to obtain the greatest major economic and silvicultural benefit from utilisation operations." (p. 35)

7. Prescriptions For Implementation Of The Working Plan Objectives
"*The following detailed prescriptions will be implemented to achieve Working Plan objectives depending upon which of the planning contingencies stated in Section 0.3.8 materialises.*" (p. 35)

7.1 Regulation Of Cut
"*1. Transfer of minor amounts of residual cutting thought to remain on any permit or licence area to a new owner of the mill originally operating on that permit or licence area will not be permitted.*

Short term permits or licences for cutting on Crown land will not be renewed on completion of operations where resources are known to have been exhausted.

2. The reopening or relocation of any Crown land mill known to have inadequate resources will require special approval." (p. 35)

"*3. No cutting by any other operator will be permitted on areas yielded by any permit holder as part of an approved programme of rationalisation.*
[…]
5. Former private property mills will not be allowed to encroach upon areas of Crown land required as longterm reserves for established Crown land mills.

6. Supplies of salvage logs will be continued at an absolute maximum of 30, 000 loads per year at current quotas with a reduction as supplies of this class of material become exhausted. Metropolitan mills running short of supplies cannot be given access to alternative sources of sawlogs from Crown land.
[…]
9. Acquisition of cutting rights as required for any new developments under this plan will be subject to the provisions of the Forests Act.
[…]" (p. 36)

7.2 Forest Conservation and Multiple Use Management
"*In all operations proper attention will be paid to:*

1.Preservation of selected forest reserves on areas where no major trade operation has taken place." (p. 36)

7.3 Control Of Trade Operations
"*1. Major trade operations will be controlled by the issue of approved annual coupes under five-year logging plans to be drawn up in accordance with the requirements of the forest hygiene programme and revised annually.*

2. Every effort will be made to encourage permit holders or licensees to utilise small logs and other marketable sections. Where permit holders choose to reject this material, alternative arrangements will be made for its disposal in the interests of maximum utilisation and of the silvicultural requirements of the forest." (p. 37)

7.4 Silvicultural Prescriptions
"*1. The uniform system will be continued in the karri forest and concentrated cutting will be continued in the jarrah forests where control of Phytophthora Root-rot is of vital importance.*

2. Artificial regeneration by hand planting karri seedlings will be adopted as standard practice for the regeneration of cutover karri forest in the intervals which occur between the development of adequate natural seed supplies." (p. 37)

8. Working Plan Control
8.1 Currency Of Plan
"*Working Plan No. 85 will remain in force until 31st December, 1976. It will then be superseded by a revised working plan which will incorporate:*

1. Up-to-date inventory data at predetermined reliability levels.
2. Revised yield calculations based on improved growth data." (p. 38)

8.2 Control Of Prescriptions Under the Plan
"*Progress in implementing the provisions of the working plan will be recorded as follows:*

Documentation
1. Amendments to Sawmilling Permits F.D. 70/A and Forest Produce Sawmilling Licenses F.D. 58/1953." (p. 38)

Trade Operations
"*2. F.D. 40A Application for the annual cutting coupe.*
F.D. 423 Quarterly assessment of cut-over bush.
F.D. 512 Bi-annual summary of areas cut-over.
F.D. 381 Monthly record of individual intakes and production." (p. 39)

3.Records Of Areas Cut-over
"*Plans T.O. 1, 2 and 3, 40 or 80 scale maps showing areas cut-over and revised half-yearly.*
Decades of cutting plans 80 scale maps summarising the above information by decades. Detailed progress plans will be maintained to show progress of silvicultural treatment." (p. 39)

4. Tenure Of Forest Land
"*District Plans, 40 chain tenure maps updated annually.*
State Forest Register.
Register of gazettal of deductions or alienations from each State Forest." (p. 39)

General Hardwood Working Plan No. 85. 1971: Part II : Detailed Prescriptions By Divisions. 1971

O.1 Introduction
"*The detailed prescriptions by Divisions which appear in Part II of this Working Plan are designed to implement the policy contained in Part I of this General Working Plan No. 85. These prescriptions will remain in force until 31st December, 1976, unless an early revision of the Plan becomes necessary in the light of new factors that might arise in the meantime. (See Part I Para. 0.3.1.2)*

0.2 General Prescriptions
"*1. General prescriptions for the implementation of Working Plan No. 85 are contained in Part I, Sections 7.1 to 7.5. All officers concerned are required to familiarise themselves with these prescriptions and to follow them closely.*

2. However the most important of these prescriptions are repeated below for emphasis." (p. 1)
[…]

(c) Five Year Logging Plan
"*All trade operations will be controlled by the issue of annual coupes under five year logging plans to be drawn up in accordance with the requirements of the forest hygiene programme, and revised annually. (See Part I Para. 7.3.1).*" (p. 1)

(d) Intensive Management Units
"*Within the broad framework of management classification shown in Appendix I, selected areas of prime Jarrah and Karri forest will be delineated as Intensive Management Units for management under detailed working plans. (See Part I Paras. 7.4.2 and 3).*" (p. 1)

(e) Regulation Of the Cut

"*Particular attention will be paid to the detailed conditions contained in permits and licenses issued in accordance with the overall prescriptions for regulation of the cut contained in Part I, Section 7.*" (p. 2)

0.3 Operations To Be Controlled Under Special Working Plans

"*Because of the complexity of technical detail involved, it is impracticable to deal adequately with the operations listed below by general prescription. Detailed working plans will, however, be revised or finalised during the Plan period.*

1. Hardwood logging operations.

2. Mining timber operations in Collie and adjacent Divisions.

3. Firewood operations for charcoal production in Mundaring and adjacent Divisions.

4.Forest improvement operations in the Intensive Management Units in all Divisions." (p. 2)

CODE OF LOGGING … - 197-?

'Code of Regrowth Logging Practice' for all Logging Operations … 197-?

Section 2 : General

"*2.1 The Instructions contained in this Code shall be observed by all persons carrying out any regrowth logging operation.* […]"(p. 3)

"*2.3 A contractor shall observe all Acts of the State of Western Australia, and in particular, the Bush Fires Act, 1954, the Forests Act, 1918-1976 … including all amendments to those Acts for the time being in force and any Act passed in substitution or in lieu thereof and all Regulations for the time being in force thereunder as well as this Code of Regrowth Logging Practice*." (p. 3)

"*2.5 A contractor shall exercise strict supervision and control over the operations of all workers employed by him with a view to:*

2.5.1 Preventing any breach of the Forests Act and Regulations and this Code of Practice.

2.5.2 *Avoiding damage to other standing timber during felling extraction and hauling operations.*" (p. 3)

"*2.10 All operations carried out by, or on behalf of, a contractor in Regrowth areas shall be carried out as directed by a Forest Officer. A contractor shall be liable to pay the Forests Department full compensation for any damage or waste of timber resulting from his failure to comply with such directions.*" (p. 4)

Section 3 : Felling, Trimming, Crosscutting, etc.

"*3.1 All felling shall be carried out in such place, order, time and manner as a Forest Officer shall from time to time direct.*" (p. 6)

"*3.3 A contractor shall from time to time as required by the Conservator, confine his operations to certain defined coupes. Such defined coupes shall be cut out to the satisfaction of a Forest Officer before a further coupe is made available for cutting.*

3.4 A contractor shall fell and utilise only such trees as have been marked or indicated for the purpose by a Forest Officer.

3.5 Marking of Trees for Felling

(a) Trees to be felled will be marked or otherwise indicated by Forests Department staff. Only such indicated trees are to be felled.

(b) In the event of a contractor wishing to cut unmarked trees to assist his operations, e.g., widening vehicle tracks, extending landings, he shall refer the matter to a Forest Officer and such trees will not be cut until marked by that Officer." (p. 6)

"*3.12 All felling, trimming and crosscutting shall be carried out with minimum of damage to standing trees. Where standing trees are damaged by him a contractor shall be liable for such damage at rates determined by the Conservator. Damaged trees shall remain the property of the Department.*

3.13 'Hangups' shall be dislodged and cut-off shall not be left leaning against standing trees. The tops and branches of all trees felled shall be dispersed to the satisfaction of a Forest Officer. All tops, slash and other debris shall be cleared from roads, firebreaks, creeks, landings and logging tracks as directed by a Forest Officer." (p. 7)

Section 4 : Extraction

"*4.1 All extraction shall be carried out in such place, order, time and manner as a Forest Officer shall from time to time approve.*" (p. 8)

"*4.4 All extraction is to be carried out with a minimum of damage to standing trees. Where standing trees are damaged by him the contractor shall be liable for such damage at rates determined by the Conservator. Such damaged trees shall remain the property of the Department.*" (p. 8)

"*4.8 A contractor shall not carry on extraction at such times or places, or by methods or equipment which a Forest Officer has prohibited until such prohibition has been revoked by a Forest Officer.*" (p. 8)

Section 5 : Loading and Hauling

"*5.1 All loading and hauling shall be carried out in such place, order, time and manner as a Forest Officer shall from time to time approve.*

5.2 […] *A contractor shall comply with the Forest Officer's expressed priority of loading.* […]" (p. 10)

"*5.6 Loading and hauling of logs and timber shall be carried out with a minimum of damage to standing trees. Where standing trees are damaged by him a contractor shall be liable for such damage at rates determined by the Conservator. Such damaged trees shall remain the property of the Department.*" (p. 10)

"*5.9 A contractor shall not carry on loading and hauling at such times or places, or by methods or equipment which a Forest Officer has prohibited until such prohibition has been revoked by the Forest Officer.*

[…]

5.16 Protruding limbs, loose bark and trailing debris of any kind on trucks loading karri are not permitted and must be removed before leaving the loading point or immediately when noticed 'en route'." (p. 11)

FORESTERS' MANUAL – 1964

The Foresters' Manual : Reforestation and Silvicultural Operations : Jarrah and Karri. 1964

The Importance of Fire Control
"*1. The problem of fire control is intimately bound up with the questions of reforestation and afforestation and the ultimate success of the Department's efforts in these projects is largely dependent on a strong measure of public sympathy and co-operation in attacking the fire problem.*

2.Of almost equal importance is the proper use of controlled fires in silvicultural and protective operations." (p. 7)

"*1.The axe and the spray gun used in treemarking for trade cutting and stand improvement are tools for the manipulation of the forest crop with the aim of applying the highest measure of the forest crop with the aim of applying the highest measure of wood increment to selected crop trees and to ensure that not only is regeneration assured, but that the new crop is as far as possible the progeny of the best trees in the stand.*" (p. 9)

Methods of regeneration
"*2. In Western Australia the two main species, Jarrah (Eucalyptus marginata) and Karri (Eucalyptus diversicolor), regenerate easily under ideal conditions. However, as conditions are frequently not ideal, particularly in the karri forest, it is important for all officers to be familiar with the problems involved and to study the effect on regeneration of factors such as burning, treemarking, seed source and weed competition. The aim is that regeneration shall develop naturally in the openings created by trade cutting.* […] *Karri regeneration involves burning with close regard to seed availability, supplemented where necessary by artificial means (see 'Karri Regeneration').*" (p. 9)

General Working Plan
"*5. The dedication of effective forest and accurate separation of forest types and volumes has been furthered by stereoscopic interpretation of aerial photographs which have now been secured for the whole of State Forest. Practically all forest worthy of dedication is now included in State Forest.*

6.For convenience of reference and compilation, Working Plan Areas have, where possible, been grouped in recent revisions of the General Working Plan into Planning Sections on the basis of common forest character or a common economic factor. A prescription for each Planning Section specifies permissible log intake for each established sawmill and provides for slight adjustments to permissible intakes and permit boundaries." (p. 9)

Aims and Policy
"*7. The Conservator, through the treemarker, controls all felling operations and in so doing ensures that the forest is worked systematically to ensure sound utilisation, effective regeneration and the retention of vigorous growing stock.*" (p. 10)

Cutting Section
"*8. Logging operations are each year confined to approved cutting sections. These areas are defined well in advance per medium of forward planning for at least five years by the Divisional Forest Officer, etc., in consultation with mill management, to ensure effective road planning and allocation of the cut for silvicultural improvement of stands which have suffered severe fire or other damage, and also to balance summer and winter operations.*" (p. 10)

Forest Composition
"*9. Jarrah and karri forest is comprised of groups, being more or less even aged within groups but frequently uneven aged between groups. Most of the virgin forest is physically mature or overmature and understocking is*

generally serious in the smaller age classes. In view of the considerably variation which occurs in the stand composition and, in some cases, degree of fire damage, the treemarker's approach must be flexible enough to treat each area to best advantage." (p. 10)

Treemarking – Historical
"*10. Early attempts to control the industry and preserve growing stock were by girth restriction (e.g.: … Karri, 108 inches). However, as this could at best have marked silvicultural disadvantages, treemarking was introduced in the early 1920s. The present system of marking trees for removal, with specification of direction of fall, was commenced in … karri forest in 1944.*" (p. 10)

Regeneration – Natural
"*11. The trade cut is virtually a regeneration felling, the new crop normally deriving from advance growth (Jarrah) or seedling (Karri), following a regeneration burn prescribed to take advantage of the first good seed year after logging (see below). Treemarking, in controlling trade cutting, is, apart from protection measures and seed check, the first step in the regeneration sequence and plays an essential and most important part in determining the post-cutting condition of the stand.*" (p. 10)

Current Practice
"*12. Broadly, the aim in marking virgin forest is to release to the trade the static portion of the crop and to retain for the future the dynamic, or vigorously producing portion.* […]" (p. 10)

Cutting Cycle
"*14. A cutting cycle of 30 years has long been accepted in management planning. In practice, however, because of variations in stand quality and composition, the cutting cycle must be flexible and will obviously be longer where the site is poor and shorter where the yield is high.*" (p. 10)

Sequence of operations
"*15. The following sequence of operations comprises current practice:-*
(a)Fire protection of cutting section and provision of access […].
(b)Prescription for treemarking and regeneration.
(c)Treemarking
(d)Trade cutting (including 'cull felling' where prescribed).
(e)Assessment.
(f)Top disposal (including 'cull felling' where prescribed).
(g)Regeneration burning.
(h)Regeneration appraisal.
(i)Compartment subdivision and record (Compartment Register).
(j)Fire protection as prescribed." (p. 10-11)

Advance Burn
"*16.The advance burn, which is standard practice in jarrah forest, has been discontinued in karri forest where its advantages are outweighed by detrimental effects such as-*

(a) *the difficulty of securing a uniform burn without scorching of canopy and damage to buds and blossom or release of seed which should ideally remain on the tree until after logging;*

(b) *adverse effect on the regeneration burn which becomes discontinuous and may destroy seedlings developing from the advance burn;*

(c) *dense establishment of fire weeds which inhibit development of karri.*" (p. 11)

"*17.In the few cases where karri advance burning can be justified, e.g. for reduction of extensive areas of dense acacia fire weeds, it is essential that such burning be confined to a karri seed year well in advance of logging.*" (p. 11)

Protection of Cutting Section
"*18. Karri cutting sections are now opened up with bulldozed access tracks prior to logging and are protected, in units not exceeding 1, 000 acres, by burns in the surrounding jarrah and marri forest types and in non-timbered flats.*" (p. 11)

"*19. It is essential for the treemarker to receive the D.F.O.'s guidance in respect of atypical areas, particularly where the prescription forest is severely damaged, grossly overmature, or carrying an exceptionally high proportion of marri. These areas will be withheld from cutting until treemarking and regeneration treatment is prescribed. Logging may be arranged immediately after a severe fire in karri forest, provided that seed supplies and/or planting stock are available for regeneration.*" (p. 11)

"*21. Prescriptions for regeneration will be made by the Regeneration D.F.O. in consultation with the Silvicultural Officer. In the karri forest detailed records are maintained of the development of buds, flowers, fruit and seed on each cutting section. From this information, predictions of seed availability can be made. Substantial variations can occur between areas only a short distance apart and additional sampling is required on specific areas to enable completely effective prescriptions. Where prescriptions require protection of regeneration by deferring controlled burning, such areas are to be clearly defined on plans in the Divisional Office and brought to the notice of officers responsible for control burn planning. This applies also to research plots specified for protection by Silvicultural and Working Plans Officers.*" (p. 11)

Treemarking
"*23. The aim in treemarking virgin forest is to-*
*(a)**Remove static volume** (mature, overmature and defective stems). Merchantable suppressed or defective stems below … 108 inch G.B.H. (Karri) are also marked.*

As a rule trees in this class are retained only if their felling would jeopardise valuable growing stock. Vigorous immature trees must on no account be marked for cutting, excepting, rarely, to permit removal of overmature trees.

*(b) **Retain dynamic volume**, i.e., vigorous stems in all sizes. In general over 50 per cent. of merchantable volume is reserved in trees over 60 inch G.B.H. It is seldom necessary to retain jarrah trees over 12 ft. G.B.H.; however prime karri trees up to 18 ft. G.B.H. may occasionally be held to silvicultural advantage.*

(*c)Avoid damage to growing stock.*

(d)Create openings adequately served with seed trees and/or advance growth for generation of the new crop. (See also under 'Regeneration.')

(e)Remove cull trees (see under 'Improvement cutting.')

Seed Resource
24. Dynamic trees in the top canopy are not only the most productive component of the crop, but are also the best seed resource in terms of both quantity and quality. Eucalypt dominants produce more than 80 per cent of the total seed supply." (p. 12)

Standards of Treemarking
"*25. It must be stressed that treemarking plays a vital part in determining the future condition and productivity of the forest. D.F.O.s are to ensure that careful instruction and close supervision is given to all treemarkers, especially those in training. Consistent attention to the maintenance of standards is imperative and all questions in this regard should be referred to the Senior D.F.O., or Inspector.*" (p. 12)

"*26. Trees will be marked by branding in an axe cut at the foot of the tree in such a position that the tree must be felled directly over the brand, i.e., over a radial line extended from the centre of the tree through the centre of the toemark.* […]" (p. 12)

Trade Cutting and Permit Control
Control of Bush Operations
"*28. The treemarker, as the Conservator's representative in the field, is responsible for ensuring effective control of trade operations in respect of orderly working, satisfactory utilisation and protection of growing stock.* […]" (p. 12)

Fallers' Coupes
"*29. Fallers' coupes or blocks must be blazed by the bush boss, or other company nominee. No treemarking shall be commenced until the blocks are marked out to the satisfaction of the Forester in Charge.*" (p. 12)

Permit Boundaries
"*30. Regulation 37 of the Forests Act covers the responsibility for demarcation of permit boundaries.*

Inspection of Coupes
"*31. The treemarker must inspect coupes frequently to ensure that they are satisfactorily cut out before fallers are authorised to commence cutting on new blocks.*" (p. 13)

Assessment
Temporary Assessment Lines
"*35. All treemarkers are required to assess a portion of the area cut over at the close of each quarter and to forward the results to the D.F.O., who summarises them and forwards them to Head Office on Form F.D. 423 with a copy to the Working Plans Office.* […]" (p. 13)

"*The objects of these assessments are –*
(a)To inform the D.F.O. and the treemarker himself of the volume he is removing and the volume he is retaining per acre.
(b)To inform Head Office and the Working Plans Offices for management and working plans calculations.
(c)To assist the D.F.O. in preparing five-year logging programmes." (p. 13)

"*The assessment lines must be selected so as to be truly representative of the area cut over during the quarter and the D.F.O. must satisfy himself that this is, in fact, the case. Eight acres of assessment line will normally be run in each quarterly coupe and the direction of the line should be chosen so as to cross the prevailing topography.*" (p. 13)

Booking Procedure
"*39.The volumes of each tree encountered, or of each log removed, are recorded in Field Book type I/1954 and the classification of every tree as shown in paragraph 44 is also noted against each entry.* […]" (p. 14)

"*41. Loadages are totalled for each 10 chains and for the whole of the assessment line …*" (p. 14)

Prescription Required
"*43. Before completing his assessment, the treemarker should give a description of the forest remaining on the line and should write a prescription setting out his own ideas as to the future treatment of the forest. This is particularly important in areas where advance growth is inadequate or where only small sapling regrowth is inadequate or where only small sapling regrowth is present as special burning measures may be required to ensure satisfactory regeneration under these circumstances.*" (p. 14)

Tree Classification
"*44. The following tree classification will be used:-*

Standing Trees

A.[…] *Karri over 108 in.)*

(i)Trees retained as growing stock (or will be retained where bush not previously treemarked). Sometimes only fair trees are retained because there is nothing better.

(ii) Trees held for special reasons. In treemarked bush this includes logs held-

(a)To prevent damage to immature growth.

(b)Trees held to allow a top log to reach millable size.

(iii) Marketable logs which should be taken to a mill in the district. This includes trees M.N.T. because of quality or because they would fall over a road.

(iv) Trees not at present exploitable. These may include some of the M.N.T's.

B. […] *(Karri 72-108)*

(i) Growing stock for the future.

(ii) Trees that could be removed – too defective for future growing stock.

(iii) Trees not at present exploitable because of defects.

C. Trees between 60 in. and 72 in. G.B.H. *(Karri likewise)*

(i) Dealt with in same manner as B.

(ii) Dealt with in same manner as B.

(iii) Dealt with in same manner as B.

D. Under 60 in. G.B.H. Piles and Poles *(tree classes).*

When above 60 in. G.B.H. engineers' piles and poles will be classified according to their girth class, but the letter 'E' will be added in the class columns, e.g., BI (E)." (p. 14)

Engineers' Piles and Poles

Poles *(all species) -*

Minimum length 20 ft.

Minimum crown diameter 6 in.

Maximum crown diameter 9 in.

Piles *(all species)-*

Minimum length 20 ft.

Minimum crown diameter 10 in.

Maximum crown diameter 16 in.

Record position, crown diameter and length of engineers' piles and poles. For others down to 24 in. G.B.H. record number only, but not on a separate line-see specimen page of field book.

Removed Trees

[…]

Karri-

Over 108 in. over bark-Rl.

Under 108 in. over bark-R2.

The removed trees should be encircled thus in the case of an old cutting (R1), (R2) to differentiate from a further or new cutting which are marked thus, RI, R2." (p. 15)

"*46. Now that A.P.l. work is well in hand it is no longer necessary for the treemarker to provide detailed measurements of co-dominant trees, but he must ensure that the co-dominant height of the forest recorded in his Field Book is correct.*" (p. 15)

Top Disposal

"*47. On completion of the trade operation the Department carries out a top disposal cleaning programme to ensure that the burning of logging debris will do little or no harm to growing stock. Inflammable material is moved to a distance of at least three feet from the base of reserved trees and elevated branches are lopped flat. Although mainly axe work is required, chain saws can be used to advantage on large limbs. It is the overseer's*

responsibility to see that no areas or trees are missed, that the standard set is maintained and that unnecessary work is avoided. The overseer will indicate where the chain saw is to be used. In low quality bush the Inspector will decide whether top disposal is warranted." (p. 15)

Cull Trees
"*48. As mentioned under the heading 'Stand Improvement,' the elimination of cull trees may be coupled with the top disposal operation. In general culls will be ringbarked and/or treated with a hormone spray application*." (p. 15)

The Top Disposal or Regeneration Burn
"***49.*** *See under … Karri Regeneration*." (p. 15)

Karri Regeneration
"*63. Under ideal conditions karri develops rapidly from seed. Although it does not produce a lignotuber it has a weak capacity to coppice after fire*." (p. 17)

Natural Regeneration
64. As natural regeneration depends on seed fall considerable attention is given to the planning of regeneration burns to make effective use of available seed." (p. 17)

Seeding Forecasts
"65. *Treemarkers, are required each quarter to furnish floral samples from karri cutting sections, together with notes on the frequency of buds, flowers, fruit and seed. […] In addition, a monthly check on roving* seed trays enables compilation of records at the Manjimup Research Station to show the age and relative numbers of floral parts. At the same time the incidence of viable seed is checked so that it is possible to predict the years and seasons (spring and autumn) when regeneration burning may be carried out successfully*." (p. 17)

"*66. These forecasts are supplemented by observation in the field, in particular of the crowns of fallen trees including those of cull trees reserved for the purpose, to confirm the adequacy of the predicted seed supply.* […]" (p. 17)

Floral Cycle
"*67. Flower bud initials can be recognised in January, but do not differentiate as buds until March, usually becoming recognisable in April as buds about one-quarter of an inch long*." (p. 17)

"*68. Flowering commences 24 to 30 months after bud initiation (i.e., bud development generally takes upwards of two years), usually commencing in February-March, becoming general in May-June and continuing throughout the winter into the following summer*." (p. 17)

"*69. The capsule ripens and seed matures 10 to 15 months after flowering so that the elapsed time from bud initiation to first natural seed fall is approximately four years. It should be noted that whilst seed is mature at four years and its release may be triggered by a regeneration burn at that stage, natural release in quantity may be delayed while the capsule cures, extending elapsed time to five years from the first sign of buds.*" (p. 17)

"*70. The major part of the karri forest blooms in phase at intervals of 4-6 years. Between such general flowerings partial intermediate light to moderate flowering occurs, occasionally in successive years.*" (p. 17)

Seed
"*71. There are 60,000-80.000 seed plus chaff to the pound in normal sample, or approximately 300,000 clean seed per pound."* (p. 17)

"*72. Heaviest natural seed fall occurs in midsummer. Falls as high as one million seed per acre have been recorded during the month following the regeneration burn.*

73. Seeding may commence at approximate age 15 years in open grown karri and at 25 years in dense pole stands. However, in the latter case little seed is produced at this stage.

74. Only a small proportion of seed is carried to a distance equal to the height of the tree." (p. 17)

Regeneration Burning

"*75. As mentioned above, the regeneration burn is timed to furnish a seedbed (ashbed) for receipt of adequate seed released after the burn.*[…]" (p. 17-18)

"*76. Full natural seed release occurs during the second summer, hence burning in the second autumn is likely to prove abortive and should not be undertaken unless it is conclusively demonstrated that effective quantities of seed remain.*" (p. 18)

"*77. Owing to the natural periodicity of karri seeding, it is often necessary to withhold karri tops for periods of up to six years before adequate supplies of mature seed are available for a successful regeneration burn. For this reason, regeneration burning may be carried out during the prohibited period, under special suspension, so as to cover all areas ready for burning within the relatively short period available.*

It is therefore essential that district officers, in consultation with the D.F.O., organise advance programmes to ensure that-

a) The area to be burnt is surrounded by a freshly burnt buffer of adequate width to contain any escapes from the regeneration burn.
(b) All perimeter tracks and subdivision tracks within the area to be burnt are in a trafficable condition prior to commencing the regeneration burn." (p. 18)

Scrub Competition

"*78.Should burning be carried out when karri seed is lacking, the site is taken over by dense regeneration of scrub species, mainly Acacias (Karri Wattles A. urophylla, A. pentadenia, A. decipiens, A. strigosa, etc.) and also Bossiaea aquifolium (Netic). Should this occur, regeneration of karri must be deferred until a relatively hot fire can be arranged to take advantage of a subsequent heavy seeding.*" (p. 18)

"*79.Where karri germinates on even terms with the scrub species it gains and maintains an advantage. Prior germination of scrub, due to poor timing of the burn may completely inhibit karri seedling development or condemn seedlings to an etiolated condition for several years until they emerge above the scrub level to become active components of the new crop.*" (p. 18)

Nature of Burn

"*80.It is axiomatic that the hottest burn produces the best regeneration. More fuel is consumed, and ashbed, most favourable to seedling development, is more continuous. An intense burn, however, may seriously damage growing stock and in most cases burning conditions must be chosen to achieve effective regeneration on the one hand and little damage to upper canopy on the other. Where patches of advance growth occur it is desirable to minimise damage by lighting, firstly, in these under minimum conditions. In all regeneration burning it is desirable to secure a general burn. Karri regenerates vigorously on ashbed and reasonably well on disturbed earth. It does not, however regenerate on unburned undisturbed soil. It is desirable, wherever practicable, to increase ashbed distribution by falling cull trees, including marri, into openings which lack logging debris.*" (p. 18)

Germination

"*81.Germination occurs with the first winter rains (April, May). Under ideal conditions wheatfield regeneration occurs. As with jarrah the agencies of frost, fungus, drought and insects cause heavy seedling mortality.*" (p. 18)

"*82 Initial appraisal of regeneration results can safely be made in June. A seedling count of at least 2,000 per acre is regarded as a minimum for acceptable establishment. (A survival count of 500 per acre at age 6*

months is equivalent.) D.P.O's. are required to arrange appraisal and to list failed areas for artificial regeneration. In view of the rapid development of scrub competition, regeneration by seeding or planting must be given urgent priority.

It is important, before proceeding with enrichment planting, to be certain that seedfall and germination is complete. This applies particularly when a regeneration burn follows the first maturation of seed. In this case it may be possible to accept an initial seedling count of 1,000 per acre in the knowledge that additional germination will occur." (p. 19)

Artificial Regeneration

"*84 .The technique for artificial establishment will be prescribed by the Divisional Forest Officer in consultation with the Silviculturist (Karri). Seeding will depend on availability of seed supplied (see under "Seed Collection"). Broadcasting of seed has proved successful. However, it is extremely wasteful of costly seed and cannot be envisaged. Spot sowing succeeds only when large numbers of seed (at least 40) are sown in each spot.* […]" (p. 19)

Seed Collection

"*87. It is essential that Divisional Officers in charge of karri divisions take every opportunity to collect karri seed whenever this can be economically carried out.*" (p. 19)

"*88. The optimum time for collection of seed is from about 12-18 months after flowering and during the period November to March. Maturity of seed vessels is generally indicated by a hardening of the texture of the vessels and a dulling of their colour from green to brownish green. Cutting of capsules with a strong knife or sharp axe will enable a cheek to be made on the condition of the seed.*" (p. 19)

Stand Improvement

"*97. Trade cutting removes the less productive component of merchantable volume. Vigour is the prime criterion in selection of growing stock for retention. Important though it is as a silvicultural operation, the controlled trade cut rarely leaves the stand with the potential for full production.* […]" (p. 20)

"*98. Assuming that regeneration is satisfactory, the main avenues for improvement are-*
(a) removal of useless overstory;
(b)removal of useless understory;
(c) removal of surplus crop trees;
(d) removal of scrub competition." (p. 20)

"*99. Removal of all or any of these competing strata can be expected to favour crop trees.*" (p. 20)

Crop Tree-Definition

"*112. Other basic features of the prescription are:-*
(a) Crop tree-definition: A tree which occurs in or above the general level of the canopy and has a healthy crown of reasonable vigour. […]" (p. 21)

"(b) Surplus trees saleable as poles will be removed whenever possible prior to the improvement operation or concurrently with it. Otherwise such trees will be reserved for removal at an early date.
Surplus trees will be reserved for sale if they have-
(1) minimum straight bole length of 7 feet; and
(2) minimum. G.B.H.o.b. of 36 inches.
(c) Ringbarking for removal of surplus trees will not apply-
(1) within 5 chains of main roads; or
(2) within at least 20 chains of private property on peripheral boundaries.
In these cases surplus trees will be felled." (p. 21-22)

Burning Nullifies Effect
"*114. It should be noted that it may take a considerable period of time before translocation through plant or root-stock is complete. Burning soon after treatment can completely nullify its effect. It is essential that no burning should take place within 12 months of treatment.*" (p. 22)

Cull Felling
"*116. **Cull tree-definition:** The cull tree has no potential, but has sufficient crown vigour to occupy millable, effective growing space.*" (p. 22)

"*118. In the karri forest stand improvement is at present limited, apart from thinning trials, to cull felling, which is now adopted as standard practice on all karri cutting sections. It is a means by which the industry, as part of the normal trade operation, falls marked useless and doubtful trees and effectively proves the latter. Recovery of millable wood from doubtful trees is an essential feature of the operation. All useless trees carrying 30 per cent. or more of normal full canopy (including epicormic crown) are marked for culling. Useless trees with decadent crowns do not seriously compete and are not culled.*" (p. 23)

"*119. Culls required for seeding or for testing seed availability in connection with regeneration burning are reserved from cutting.*" (p. 23)

Cull Marking
"*120. Current marking procedure is as follows:-*

All trees marked are felled. Marking separately designates-
- *(a) Trees with normal millable potential. These are marked in the usual way and the Department admits no claim in respect of them.*
- *(b) Doubtful trees, distinguished by a double toe mark (one above the other).* […]
- *(c) Cull trees-have three toe marks set one above the other. These trees are merely felled and are paid for by the Department at cull rates.*" (p. 23)

Large Trees Not Culled
"*123. Cull trees above 24 ft. stump girth are not felled, this being the -reasonable size limit for one-man chain saws. These large culls, incidence one per 15 acres, are marked for ringbarking as part of the top disposal operation.*" (p. 23)

Appendix B : Karri Seed Supplies Sampling Procedure
1-Preliminary.
"*Successful Karri regeneration operations depend primarily upon the presence of adequate supplies of mature seed at the time of regeneration burning. The following notes serve to condense current practice into a readily usable source of reference, governing collection of information for the prediction of Karri seed supplies, based on data obtained from the collection of the contents of seed trays set out in cut-over bush awaiting regeneration.*" (p. 25)

2-Action at the Start of Cutting
"*(a)Number each new landing consecutively for later reference.*
(b)Select two cull trees per landing, to be felled later as a final cheek on quantity of seed available.[…]" (p. 25)

3.-Frequency of Seed Tray Collections
"*The frequency of collection, and the location of the seed trays is varied so as to maintain a complete picture of all stages in the development of the seed crop. Procedure will be as follows:-*
- ***(a) Quarterly collections-from formation of bud initials to the flowering stage.**-Two, seed trays per landing will be set under seed trees located about 5 chains apart.*
- ***(b) Monthly collections-following flowering to, the setting of fruit.**-Two seed trays per landing as before, plus two extra seed trays located in openings at a distance equivalent to half the height of the seed tree away from the trays under canopy.*[…]

(c) Monthly collections-when mature fruit has set.- *Trays as in 3 (b), but the trays located in the openings will be moved out to a distance equivalent to full tree height away from the trays under canopy.*

It is essential that monthly sampling be maintained at this stage.

(d)End of collections-when major germination has occurred*.*" (p. 25)

5.-Confirmation of seed Supplies

"*In addition to the information obtained from the seed tray collections, final confirmation of seed supplies is required before regeneration burning is carried out.*

Action immediately prior to burning will therefore be:-

(a) **Inspection with binoculars**.-*The district officer and the D.F.O. will confirm the presence of adequate quantities of capsules over the whole stand by inspection W, with (10 x 50) binoculars.*

(b) **Falling call trees**-*The two cull trees, selected under 2 (b), will be felled and 1 lb. of capsules win be forwarded to Research for testing.*" (p. 26)

6.Advice of Seed Yield and Quality from Research.

(a) **Initial sampling at start of Cutting (2 (c) (ii)).-***Results will be returned to Divisions within a fortnight to indicate the value of the crop for seed collection.*

(b) **Seed tray collections (3 (a), (b), (c)).-***Results will be returned to Divisions by ist December and 1st March each year to assist early programming of regeneration burning.*

(c) **Cull tree samples (5 (b)).-***These results will be combined with those from the seed trays on the dates stated (6 (b)). They will confirm the D.F.O's. estimates of seed availability and will enable him to make the final decision as to whether burning can proceed*." (p. 26)

Karri Germination and Survival Sampling Procedure

1. Preliminary

"*Early assessment of the results of Karri regeneration burning is essential for:-*

(a) Determining whether adequate germination of seedlings has occurred.

(b) Determining whether survivals up to the one-year seedling stage are sufficient to fully restock the subject area.

(c) Delineation of problem areas which might require supplementary enrichment.

For these reasons, the following procedure will be adopted to provide full assessment information in standardised form." (p. 26)

2.Time of Sampling

(a) For germination.-Before June 15th following the regeneration burn.

(b) For survival-Before February 15th next following the regeneration burn." (p. 25-26)

3.Density Classifications

"*Results of field counts will be summarised in the following classifications:-*

	Number of Seedlings per cent./acre.		*Equivalent Spacing l -year-old Seedlings.*
	Germinated.	*l-year-old.*	
Acceptable	*Over 40*	*10-40*	*Under 5 ft.*
Inadequate	*20-40*	*5-10*	*7-9 ft.*
Needs Treatment	*Under 20*	*Under 5*	*Over 10 ft.*

(Note: 10 mil-acre samples equal 1 cent-acre.)" (p. 27)

4.Seedling Classifications

"*The type of seedling encountered will be indicated by the .following initials:-*

S.-Sapling over 5 ft.

R-Established seedling under 5 ft.

G.-Freshly germinated seedling." (p. 27)

5.Seedbed Classification
"*The effects of seedbed on the results of regeneration and survival are well known and the type of seedbed encountered will be described by the following symbols to assist in interpreting results of field counts:-*

A.-Ashbed from burnt debris.
T.B.-Topsoil well burnt.
T.S-Topsoil not burnt but scarified.
N.S.-No seedbed, unburnt scrub, litter, or only subsoil." (p. 27)

5. Assessment Procedure
"*(a)* ***Germination assessment****. – Assessment of germination will form the major part of the work, but whilst it is in progress, sampling points will be selected and marked for survival counts at a later date.* […]" (p. 29)

(b) ***Survival Assessments****.-During the germination assessment in June after the burn, plots will be selected and demarcated for counting survivals in the following February.*" (p. 30)

(i) ***Selection of survival plots****-Two 4-mil acre plots will be selected to represent ashbed and the prevalent alternative seedbeds in the main karri type and the fringe type on each landing.*

(ii) ***Location of survival plots****-Where possible, survival plots will be located close to existing tracks. The centre of the plot will be pegged with a stout waddy, and the markers will be placed at 1 ch. centres along the line to enable rapid relocation of the survival plot.*

(iii) ***Survival counts****-The same procedure as set out for germination counts will be adopted, but seedlings present at the time of the survey will be pegged with a paint-topped wire marker.*" (p. 30)

FORESTERS' MANUAL – 1961

<u>The Foresters' Manual : Control of Trade Operations. 1961</u>

Registration of Timber Workers and Brands
"*1. The purpose of the registration of bush workers is the proper control of men directly engaged in the cutting and removal of timber from the forest, natural or planted, and the prevention of waste and damage in all associated operations. Consequently, it is necessary that every man who is engaged in the extraction of forest produce shall be a registered timber worker.*" (p. 7)

Timber Workers' Brands
"*19. Every person engaged in felling or hewing of Crown timber, including pine, must provide himself with a distinctive branding hammer to be obtained from the Forests Department at the prescribed cost, plus the registration fee. Timber workers must accept the designs allotted by the Department.*

20. No branding hammer shall be used by a timber worker unless it is registered with the Department. Evidence of registration and particulars of the timber worker's brand will be given on the timber worker's registration certificate." (p. 8)

Permits
"*53. A permit holder of any class of permit must operate continuously and comply with all the conditions of his permit, unless exempted by the Conservator.*[…]" (p. 12)

Quarterly Trade Cutting Operations
"*74a. Within 30 days of the close of each quarter, officers in charge of Divisions will submit a return of Trade Operation on Form F.D. 390B.*

The detailed information required for the area cut over is as follows:-
(i) Permit or License No. and local mill name.
(ii) Land Tenure – whether State Forest, other Crown Land, P.P.T. R. or Private Property.

(iii) Maiden or old bush.
(iv) Species – the area cut over by species and the number of loads of Jarrah, Karri, Wandoo and other species obtained.
(v) The total number of loads cut.
(vi) The average loads per acre – by species where possible." (p. 15)

Registration of Sawmills
"*78. Every sawmill used in the timber industry must be registered under and in accordance with the regulations made under the Timber Industry Regulation Act.*" (p. 16)

Tramway Permits
"*81. Permit holders desirous of retaining, constructing or using timber tramways over Crown lands for the removal of timber or other forest produce from the area of any permit shall make application annually in the form F.D. 49 to the Conservator.* […]" (p. 16)

"*82. An application shall be accompanied by a plan showing –*
(1) all tramlines constructed which are to be retained for the ensuing twelve months;
(2) new tramlines which are to be constructed during the ensuing twelve months, indicating the positions of landings;
(3) the area over which it is desired to conduct felling operations during the ensuing twelve months.

83. Applications must be lodged with the Divisional Forest Officer concerned who will submit them to head office with his recommendations." (p. 16)

Pile and Pole Licenses
"*110. Owing to serious shortage of intermediate age classes in all areas of State forest and the need to conserve such growing stock to protect the future of the sawmilling industry, the Department for many years past has endeavoured to confine pile and pole getting to private property and land for alienation. However karri poles are now available in quantity as thinnings and large numbers of jarrah poles should be available in the near future, also as thinnings.*

111. Licenses for the cutting of piles and poles may be issued only over-
(i) land which is in process of alienation or alienated land on which timber has been reserved to the Crown;
(iv) areas being cleared for pine planting or other purposes;
(v) land which is being held, pending the removal of timber before alienation;
(vi) subject to special head office approval, State forests and timber reserves as a sylvicultural thinning operation (in which case the trees available for cutting must be marked in advance).

112. Licenses for the cutting of piles over 50' and poles over 45' length on State forest, timber reserves or other Crown land may be issued from time to time by instructions from head office. All such piles and poles must be marked in advance of felling, and bush inspections to prevent waste must be carried out at intervals when cutting is in progress.

113. A pile and pole license in the form F.D. 202 must be obtained in all cases before piles or poles are cut. Licenses will be issued only to persons holding definite orders for the supply of piles or poles for use within the State who may be required to produce their orders or satisfactory evidence thereof. The term and area for which the license is issued must be clearly shown on the form. In no case should a license be issued for more than three months." (p. 19)

"*114. Pile and pole licenses will in all cases set out the minimum and maximum crown diameter of the poles and/or piles authorised to be obtained.*[…]"(p. 20)

WORKING PLAN – 1960

General Working Plan 1960 For The Regulation Of The Cut In The Jarrah, Karri and Wandoo … 1960

General Note
"*This Plan is concerned primarily with the regulation of the cut on State Forest and potential State Forest as provided for under Section 31 (3) (a) and (b) of the Act.*" (p. 1)

Introduction And Summary Of Principal Prescription, Object and Period Of the Plan
"*The object of the Plan, as stated at greater length in Part II, is to stabilise the Timber Industry; to ensure continuity of timber getting operations, and in so doing, ultimately to bring the cutting of the forests in units known as 'working circles' to a sustained yield basis.*

The Principal Prescriptions as set out in Part II cover:-

(1) The subdivision of all available forest under State control in the South West Zone of Western Australia into Planning Sections, and Working Plan areas to provide, as far as possible, sufficient forest in each section or area to ensure continuity of operations of existing mills or their equivalents and townships depending upon them." (p. 3)

Part I (a) Forest Area : Ownership and Subdivisions
"*In a Working Plan dealing with a forest area of the extent of over 5 million acres, it is necessary to sub-divide into units which may be discussed in relation to assessment, sylviculture, management and economics.*

The generally accepted ideals of working circles and logging sections cannot be followed in a young country where there is insufficient mapping and assessment of the area under consideration, and in this State previous plans adopted 'Working Plan areas' as units, about 70 of these areas being defined.

These units have a history and records under the previous Working Plans, and although they are not an ideal sub-division, it is considered desirable to adhere to them with, in some cases, their breakdown to sub-units, A.B.C. etc. They are no way to be regarded as Working Circles.

In plans prior to 1956, prescriptions for cutting dealt with each Working Plan area separately, but in the 1956 plan it was considered better to group the areas into 'Planning Sections' and this grouping is still desirable for this 1960 plan.

In designing these 'sections' the main criteria used were:-
[…]
(c) to provide units for which some general forest description was possible, although this latter requirement conflicted to some extent with the other factors. These Planning Sections, 22 in number, tend to an area of quarter to half-a-million acres each and are numbered and named, commencing from the North …
[…]" (p. 5)

"*In Part II 'Prescriptions', it will be found that the whole of the forest area is covered by 5 year proposals, with sustained yield proposals wherever practicable.*" (p. 6)

Part I (c) : Sylvicultural Considerations
"*Regeneration on most forest types in W.A. follows with comparative ease, any trade cutting of Jarrah and Karri conducted under treemarking and controlled top disposal operations, but it is generally considered that particularly with Jarrah some canopy must be maintained for reasons of both sylviculture and economics.*

Both Jarrah and Karri, therefore, are treemarked under a selection or a Group Selection System with a restriction upon the size of the openings, which may be permitted, in the canopy. There is, however, a growing school of thought favouring a uniform system in Karri which may influence planning in the future. On this subject experiments are in hand.

Under the present sylvicultural and economic restriction on falling and logging the forest naturally lends itself to cutting cycles of 30 to 40 years representing the approximate time taken for Jarrah trees of 72" girth to reach the economic log girth of 90" and under this system it is seldom that all trees over 90" can be removed without reducing unduly the cover needed for the young crop or without sacrificing trees of vigorous growth.

Thus the timber available for removal in any 30 to 40 year cutting cycle is a percentage only of the total stand. […]

Apart from these sylvicultural considerations, it is necessary in some areas which are deficient in the 72" to 90" girth classes to hold vigorous … Karri trees over 144" girth for management purposes, in order to provide a cut for the second or third cutting cycle.

These considerations, together with economic factors, discussed in Part 1 (d) govern the general rule adopted of providing, wherever possible, major forest subdivisions on which a township depends, with sufficient forest to guarantee a life of 30 years on the first cut under treemarking. In some cases the whole area is held under permit, and in other cases, a Working Plan area or group of areas is reserved for a project under the prescriptions.

During 1956-60 extensive inventory work aided by Air photogrammetry was carried out by Working Plans staff with the result that much more accurate figures are now available for the volumes of timber in the main areas of forest and this data makes it possible to adjust many of the permit areas in the interests of sustained yield for major centres." (p. 10)

Part I (d) : Economic Considerations

"*Economic considerations today demand that with increasing State population, the whole of the State Forest must be brought under protection and to the increment bearing stage as soon as possible, and to this end any expansion of the industry must be placed in the virgin forests of the far South, rather than being permitted to cut more than the sustained yield from the already heavily cut Northern portions of the Forest.*

In considering the total cut per annum permissible from State Forests, the most important economic consideration is the fact that there will not, for further generations, be more than about 4 million acres of merchantable forest, whereas today there are 5 million, as listed in paragraph 1 (a), together with large areas of private property which once cut may be lost to timber production." (p. 11)

"*This consideration led to the policy which has been followed that State Forest should be conserved and cutting directed as far as possible to areas being cleared for agricultural settlement and to areas of Private Property with timber reserved to the Crown. Such conservation, however, is not longer applicable and sawmilling in virgin areas is an essential first step in bringing the forest under management.*

Thus, whatever cut per annum may be determined for State Forest, it is desirable to place as much of it as practicable in the virgin areas of the far South as soon as economic conditions permit." (p. 12)

"*The Karri Forest being of very different height and composition and being a relatively small portion of the forest areas needs to be considered in greater detail than the Jarrah and Wandoo forests.*[…]" (p. 12)

Part I (e) : Discussion Of The Forest Capital and the Permissible Cut

"*In Forestry 'par excellence' the calculation of the yield and the determination of the cut are more or less synonymous terms, and the calculation implies a wealth of statistics on the volume standing in the forest and its rate of growth under proved systems of sylviculture and management, followed by mathematical and economic calculations of no mean order.*

In a young country with large areas of virgin forest inaccessible except on foot and with little knowledge of the ultimate growth statistics which follow from the practice of sylviculture, a full calculation of the permissible cut

in the mathematical sense is not possible. It is still necessary, however, to 'determine' the cut using whatever information is available, and if necessary, overcutting in order to open up forest areas to provide finance for their protection and expansion and to remove overmature and damaged trees which are a diminishing asset.

A discussion followed by a decision, rather than a calculation, must still remain the basis of determining the permissible cut for Western Australia, and prescriptions must retain elasticity in view of the lack of precise data." (p. 13)

Part I (f) : Assessment Figures and Definitions

"*Throughout this Working Plan, assessment figures quoted vary considerably in their reliability since, although the whole area of the plan has had some assessment, pre-War practice was to assess only those trees which the assessor considered marketable in this district at the date of the assessment.*

During the post-war period, more reliable data arose from Permanent line and Temporary line assessment, but it was not until 1954 that full air photo interpretation and new field book was introduced which aimed at recording all trees of all species over 60" G.B.H. and classifying them as to their estimated percentage recovery and at the same time making an inventory of growing stock below 60" G.B.H.

This latter work has covered mainly the Southern portion of the State, and is based upon field assessment lines covering one-third to one-half per cent of the forest area on each Working Plan area. Although this figure appears low compared to olden day strip line methods giving 2 ½ % to 5% ground coverage, it is considered that the accuracy of assessment is superior to even 5% ground coverage, particularly in forest areas of varigated pattern such as the Karri region." (p. 16)

"*The marketable loadage is the gross marketable loadage over 60" G.B.H. exclusive of Marri, and this is further sub-divided into 'Available loadage' and 'Acceptable loadage'.*

These terms are defined as: -

'<u>Available loadage'</u> – The volume, exclusive of Marri, which the Forests Department is prepared to treemark during a cutting cycle under sylvicultural control, provided there is a prescription for such cutting.

<u>'Acceptable loadage'</u> is a percentage of the loadage which it is anticipated mills in the district will take under today's economic conditions. It can be assumed, of course, that while the acceptable loadage today is sometimes as low as 50% of the gross loadage, this percentage will increase with the years." (p. 17)

"*<u>Sustained Annual Yield.</u> (S.A.Y.)*
This term is used frequently and means the safe yield of acceptable mill logs of over 60" G..B.H. over the period of adjustment necessary to bring the forest to normality. This period is not of fixed length as it depends upon the time taken to remove non-growing stock. Thus on some areas the S.A.Y. may be as low as 10 cubic feet per ac. Per annum, whereas at some future date it could be as high as 50 cu.ft." (p. 17)

"*<u>Terms used in Sub-division</u>*
The term 'Planning Section' has been adopted as neither the old Working Plan areas nor their present grouping can be regarded as constituting working circles in the rigorous sense.

It will be found from the prescriptions, however, that many of the main Planning Sections are approaching the requirement for 'Working Circles' and at the 1965 revision following some adjustments the term 'Working Circle' in the sense of an area devoted to a sustained yield and under a separate Working Plan will be adopted for some of the areas of permanently dedicated forest now described as Planning Sections, but even after 1965 it is unlikely that some of the larger areas of Virgin Forest could properly be regarded as Working Circles." (p. 18)

Part II : Prescriptions For Future Management
Part 2 (a) : Objects Of Management And Period Of The Plan
"*The main object of the Working Plan remains, as it always has been, to stabilise the Timber Industry; including both sawmilling and other forms of utilisation to ensure continuity of operations, regular employment for the men engaged, and long life for the timber trade and the communities and industries dependent upon it; and by so doing, to bring the cutting of the forests to a sustained yield basis.*" (p. 19)

"*While the main object of management of the State Forests is to ensure that such areas are brought on to the basis of sustained yield, this desideratum cannot be accurately obtained until more precise data is available on the forest inventory and the rate of growth of species, and until the whole of the potential State Forest area is dedicated, under fire protection and in thrifty condition sylviculturally. This position could be reached by 1970.*

The approximate permissible cut can at any period be calculated only in the light of current knowledge of many factors, and frequent revisions of the Working Plan are necessary as further data comes to hand." (p. 19)

Part 2 (b) : Determination and Regulation Of The Cut and Issue of Cutting Rights
"*Apart from determining the cut, a regulation or distribution of the cut is necessary.*

This regulation of the cut includes, not only the determination of the gross cut, but also the actual distribution of the cutting. The retention of existing mill towns is an important factor. The necessity to cut and protect large virgin areas which are not bearing net increment has to be taken into account, together with the fact that over the past four decades the gross permissible cut on permits issued has never been realised due to losses of mills by fire, to labour shortages and to periods of trade recession." (p. 20)

"*The importance of the correct distribution of the cutting, as previously mentioned, must be stressed as although the gross cut can be substantially increased, it is evident that to ensure sustained yield on the cut over forest north of the Preston Valley, some centres must face a reduction of cut and the additional cutting must come from Virgin forests South of this line.*" (p. 21)

Part 2(c) : Detailed Prescriptions For Planning Section
(i) Summary of Part 2(c) Prescription
"*The cutting of the Jarrah, Karri and Wandoo forests of permanent land tenure as prescribed in this working Plan is now considered to be below the sustained yield potential of the State Forests.*" (p. 22)

"*All Planning Sections of permanent tenure are covered by prescriptions which permit of sustained yield within each section itself, or alternatively, the plan prescribes the action necessary to bring about adjustments within a 5 year period to accomplish this end. Areas are held in reserve pending greater refinement of assessment work, which will enable more precise calculations to be made by 1965.*" (p. 22)

"*Large planning sections of virgin forest nearing two million acres are now available for sawmilling, on a sustained yield basis, additional to the established centres, and while an early start on these areas is desirable in the interests of forest management, it is unlikely that the economics of the timber trade and the time factor for planning will permit of full development during the 5 year period of this plan. These areas will have the advantage of being planned on a sustained yield basis from the outset guided by the knowledge gained during the history of forestry and sawmilling in the cut-over portion of the forest.*" (p. 22)

Part 2 (d) (i) : Sylviculture and Protection
"*The regeneration and protection of State Forests is supervised by Officers-in-Charge of Divisions, governed by policy as laid down in the Foresters' Manual and periodic instructions. Work is superintended by Specialist officers.*

The basis of our Sylvicultural work is that the regeneration shall be the result of the fellings themselves and cuttings are controlled to this end as well as for considerations of management.

Close control of treemarking on permits under the 'selection' system ensures the retention of growing stock and its protection during falling operations. Advance burning before milling and top disposal operations after milling, ensure a new stocking of the openings by natural regeneration either from seed or from advanced growth.

Sylvicultural treatment required for special areas is the subject of instructions from the Conservator.

Top disposal and regeneration of all areas of forest cut over in the past are up-to-date, and, subject to the delaying of Top Disposal Burning in a few cases awaiting a seed year, the whole of the country cut over annually by sawmills receives this treatment. Cut over areas of approximately 2 million acres, apart from minor portions, are satisfactorily stocked with regrowth.

Current policy and explanations of sylvicultural work is summarised in …

'Second growth karri forest' by J.C. Meachem, 1954.

[…]
Fire protection is the responsibility of Divisional and District Officers assisted by the Fire Control Superintendent and his Staff. The permissible cut for future cutting cycles is intimately connected with the success or failure of fire protection and its extension into new areas. It is based upon controlled burning in Autumn, Winter and Spring months, and early suppression of fires in Summer. Its extension into areas at present unprotected is proceeding rapidly." (p. 25)

"*Temporary assessment lines run on each quarter's cutting by the treemarkers themselves assist to keep them aware of the loadages marked and trees retained by them and provide data for Divisional Office and Head Office checks against the quarterly and annual cutting records.*

Permanent growth study plots are established as required and serve the dual purpose of recording the loadage remaining per acre for future use and or providing the basis for growth studies for management purposes.

Quarterly Trade Operations summaries from Divisions also record areas cut over within and outside State Forest, and loads obtained by species together with records of sylvicultural work and protection." (p. 26)

FORESTERS' MANUAL – 1960

Foresters' Manual : Field Administration. 1960

District
"*15. (a) Two sets of 'district' plans mounted and marked 'Set A' and 'Set B' have been prepared for each division or isolated district, showing alienated land, timber reserves, permits, etc.* […]" (p. 11)

"*(b) Every six months the officer in charge of the division or district holding district plans should forward to head office in the plan case the set he holds, which will be replaced immediately by an up to date set from head office.* […]" (p. 11)

Land Inspection
"*59. All applications received by the Lands Department for land within timber districts are referred to the Forests Department for report. In certain cases there is sufficient information available in head office from past inspection reports, special assessments, etc., to enable a reply to be sent to the Lands Department. In the majority of cases, however, it is necessary to obtain further information by field inspections. The primary object of such inspections is to ensure:*
(1) That good quality forest suitably situated shall be retained for dedication as State Forest;

(2) That the alienation of land shall not interfere with the economic management of State Forest as a result of the loss of necessary water supply, access routes, etc.; […]" (p. 20)

Field Notes

"*66. Field notes will be entered in the same way as for A.P.I. and quarterly assessment. As he paces or chains along the classification line, the inspection officer must enter, at 10 chain intervals-*
(a)marketable log timber over 90 inches girth;
(b)marketable log timber under 90 inches girth;
(c)timber removed; …
(All the above figures are to be given as loads per acre in the round, full volume measure.
(d)notes on piles, poles, regrowth, understorey, and ground vegetation;
(e)descriptive notes of soil types;
(f)other information under the headings in the field book – especially marri.

67. Attention is drawn to the necessity for qualifying such descriptions as 'poor', 'open', 'good', 'sparse', 'scattered', 'dense'. In themselves, these terms have very little meaning, and particulars concerning average heights, number of stems per acre, and similar information are essential. […]" (p. 21)

Forest Types

"*72. Forest type boundaries are to be noted in the field book so that area of each type can be calculated later and the appropriate assessed volume per acre applied to obtain a total loadage figure.*

The forest type is determined by the forest species with the greatest number of stems. If more than about 20 per cent of the stems consist of a second or third species, this is also listed. […]" (p. 22)

Stocking

"*74. Give details of the distribution of age classes, for example:-*

Open pole stand
Mainly large and over-mature trees.
All classes present.
All classes present but poles malformed because of fire damage
Open, malformed forest mainly below 60 in. G.B.H.
Appears to be mature.
Larger trees malformed apparently by fire. Saplings and poles are of better form due to absence of fire.

Note the presence or absence of advance regrowth or regeneration and also the species." (p. 22)

Fire Damage

"*75. Give notes to indicate the extent to which the forest has suffered from fire. For example:-*

Epicormic shoots up all stems.
Crowns severely damaged at intervals in the past.
Good crowns and no evidence of severe fires.
Give date when estimated last burnt." (p. 22)

Piles and Poles

"*76. Give number and species over 50 ft. If they are over 60 in. G.B.H. the volume will be assessed.*" (p. 22)

Land Inspection Report

"*82. From these notes the inspecting officer will complete the information required on land inspection report Form F.D. 89. It is important to note that separate loadages and particulars are required for each timber type.*" (p. 23)

Recommendations

"*85. F.D. 89 calls for recommendations from the inspecting officer under four headings-*

(1)for immediate alienation;
(2)alienation subject to marketable timber being reserved for the Crown;
(3)reserved until marketable timber removed;
(4)for permanent dedication as State forest.

An officer making a recommendation under these headings must remember that present-day timber values are not the only guide and that considerable thought needs to be given to the area under consideration, as decisions made today may have far-reaching affects in the future.

Some of the many factors which need consideration are-
(1)the necessity for preserving lines of access for hauling and fire control;
(2)the question of fire lines and the State Forest boundaries;
…(4) the effect of an alienation upon fire hazards in the locality;
(5)where areas are distant from State Forest it must be kept in mind that timber reserves, even if the timber is of low present-day value, should be held for settlers' requirements in the future.

The remarks column of the report provides space in which to set out reasons for the recommendation made." (p. 24)

REGULATIONS - 1957

Forest Regulations. 1957.

PART IV. - REGULATIONS
General.
"*122. Where it appears to the Conservator that a permit holder or licensee, either by himself or his employees, is -*

(a) causing damage to growing trees or other forest produce;
(b) not utilising trees felled or other forest produce obtained to the best advantage;
(c) causing waste of timber in felling operations by felling trees at too great a height above ground level;

the Conservator may require payment by the permit holder or licensee of a sum equal to the estimated value of the damage to such trees or other forest produce, or of the loss on the timber or other forest produce wasted, and the amount so required to be paid may be recovered by the Conservator from the permit holder or licensee by action in any court of competent jurisdiction.

123.A timber worker or other person causing damage to growing trees or other forest produce, or not utilising trees felled or other forest produce obtained to the best advantage, or who in felling operations causes waste of timber by felling trees at too great a height above the ground level, shall be guilty of a forest offence." (p. 19)

WORKING PLAN – 1956

General Working Plan 1956, Jarrah, Karri & Wandoo (Original) and Planning Section Data : Working Plan No. 79 (1956-1960)

Introduction and Summary of Principal Prescription, Object and Period of the Plan
"*The object of the Plan, as stated at greater length in Part II, is to stabilise the Timber Industry; to ensure continuity of timber getting operations, and in so doing, ultimately to bring the cutting of the forests in units known as 'working circles' to a sustained yield basis.*" (p. 3)

Part 1 : Summary of Facts and Discussions
Part 1a : Forest Area, Ownership and Subdivisions
"*In a Working Plan dealing with an area of the extent of over 6 million acres, it is necessary to have sub-divisions of the area in order to have units which may be discussed in relation to assessment, sylviculture, management and economics.*

The generally accepted ideals of working circles and logging sections cannot be followed in a young country where there is insufficient mapping and assessment of the area under consideration, and in this State previous plans adopted 'Working Plan areas' as units, about 70 of these areas being defined.

These units have a history and records under the previous Working Plans, and although they are not an ideal sub-division, it is considered desirable to adhere to them with, in some cases, their breakdown to sub-units, A.B.C. etc. They are in no way to be regarded as Working Circles.

In previous plans, prescriptions for cutting dealt with each Working Plan area separately, but in this plan it is considered better to group the areas into 'Planning Sections'.

In designing these 'sections' the main criteria used were:-
[…]

(c) to provide units for which some general forest description was possible, although this latter requirement conflicted to some extent with the other factors. These Planning Sections … tend to an area of quarter to half-a-million acres each and are numbered and named, commencing from the North, as follows:-

1. Moore River-Serpentine River.
2. Toodyay-Mundaring.
[…]
12. Jarrahwood-Blackwood River.
[…]" (p. 5)

Part 1(c) : Sylvicultural Considerations
"*Regeneration follows with comparative ease, any trade cutting of Jarrah and Karri conducted under treemarking and controlled top disposal operations, but it is generally considered that particularly with Jarrah some canopy must be maintained to ensure that the young growth does not fork at an early age.*

Both Jarrah and Karri, therefore, are treemarked under the Group Selection System with a restriction upon the size of the openings, which may be permitted, in the canopy.[…]

Under the present sylvicultural restriction on falling and logging the forest naturally lends itself to cutting cycles of 30 to 40 years representing the approximate time taken for Jarrah trees of 72" girth to reach the economic log girth of 90", and under this system it is seldom that all trees over 90" can be removed without reducing unduly the cover needed for the young crop or without sacrificing trees of vigorous growth.

Thus the timber available for removal in any 30 to 40 year cutting cycle is a percentage only of the total stand.
[…]
Apart from these sylvicultural considerations, it is necessary in virgin areas which are deficient in the 72" to 90" girth classes to hold vigorous … Karri trees over 144" girth for management purposes, in order to provide a cut for the second cycle of 30 to 40 years." (p. 10)

"*Economic considerations today demand that with increasing State population, the whole of the State Forest must be brought under protection and to the increment bearing stage as soon as possible, and to this end any expansion of the industry must be placed in the virgin forests of the far South, rather than being permitted to cut more than the sustained yield from the already heavily cut Northern portions of the Forest.*" (p. 11)

"*This consideration appears to suggest that for the immediate future State forest should be conserved and cutting directed as far as possible to areas being cleared for agricultural settlement and to areas of Private Property with timber reserved to the Crown. Such conservation, however, is not to be taken to extremes, as sawmilling in virgin areas is an essential first step in bringing the forest under management.*

Thus, whatever cut per annum may be determined for State Forest, it is desirable to place as much of it as practicable in the virgin areas of the far South." (p. 12)

Part II : Prescriptions for Future Management
Part 2 (a) : Objects of Management and Period of the Plan
"*The main object of the Working Plan remains as it always has been, to stabilise the Timber Industry; to ensure continuity of operations, regular employment for the men engaged, and long life for the timber trade and the communities and industries dependent upon it; and at the same time, to bring the cutting of the forests to a sustained yield basis.*" (p. 19)

"*While the main object of management of the State Forests is to ensure that such areas are brought on to the basis of sustained yield, this desideratum cannot be accurately obtained until more precise data is available on the forest inventory and the rate of growth of species, and until the whole of the potential State Forest area is dedicated, under fire protection and in thrifty protection and in thrifty condition sylviculturally.*

The approximate permissible cut can at any period be calculated only in the light of current knowledge of many factors, and frequent revisions of the Working Plan are necessary as further data comes to hand.

The determination of a permissible cut has also to be considered in the light of severe losses from fire in virgin forests over the past 3 decades, which losses are still occurring and which have become more apparent as these areas become more fully known. Such areas can be held as reserves for the future, only in theory, unless they are placed under protection, and the introduction of sawmilling becomes necessary as a means to the end of having them 'roaded' and protected." (p. 19)

Part 2 (b) : Determination and Regulation of the Cut and Issue of Cutting Rights
"*This regulation of the cut includes, not only the determination of the gross cut, but also the actual distribution of the cutting. The retention of existing mill towns is an important factor. The necessity to cut and protect large virgin areas which are losing volume by uncontrolled fire has to be taken into account, together with the fact that over the past three decades the gross permissible cut on permits issued has never been realised due to losses of mills by fire, to labour shortages and to periods of trade recession.*" (p. 20)

Part 2 (c) : Detailed Prescriptions for Planning Section
(i)Summary of Part 2(c) Prescriptions
"*All Planning Sections of permanent tenure are covered by prescriptions which permit of sustained yield within each prescriptions which permit of sustained yield within each section itself, or alternatively, the plan prescribes the action necessary to bring about adjustments within a 5 year period to accomplish this end. Areas are held in reserve pending greater refinement of assessment work, which will enable more precise calculations to be made by 1960.*" (p. 22)

"*During the 5 year period of this plan, it is confidently expected that forest assessment and knowledge of growth rates will reach a high standard and that in the 1960 revision of this Working Plan, sustained yield prescriptions will set a standard for the management of Eucalypt forests under Working Circles.*

Part 2 (d) : Miscellaneous Prescriptions
Part 2 (d) (i) Sylviculture and Protection
"*The regeneration and protection of State Forests is supervised by Officers-in-Charge of Division, governed by policy as laid down in the Foresters' Manual and superintended by senior officers.*

The basis of our Sylvicultural work is that the regeneration shall be the result of the fellings themselves and cuttings are controlled to this end as well as for considerations of management.

Close control of treemarking on permits under the 'selection' system ensures the retention of growing stock and its protection during falling operations. Advance burning before milling and top disposal operations after milling, ensure a new stocking of the openings by natural regeneration either from seed or from advanced growth.

Sylvicultural treatment required for special areas is the subject of instructions from the Conservator.

Top disposal and regeneration of all areas of forest cut over in the past are up-to-date, and, subject to the delaying of Top Disposal Burning in a few cases awaiting a seed year, the whole of the country cut over annually by sawmills receives this treatment. Cut over areas of approximately 2 million acres, apart from minor portions, are satisfactorily stocked with regrowth.

Current policy and explanations of sylvicultural work are summarised in the following papers.

'Second Growth Karri Forest' by J.C. Meachem, 1954.

[…]

Fire protection is the responsibility of Divisional and District Officers assisted by the Fire Control Superintendent and his Staff. The permissible cut for future cutting cycles is intimately connected with the success or failure of fire protection and its extension into new areas. It is based upon controlled burning in Autumn, Winter and Spring months, and early suppression of fires in Summer, and its extension into areas at present unprotected is proceeding rapidly." (p. 25)

Part 2 (d) (ii) : Working Plan Control and Records

"*Annual cutting coupes for each Sawmill Permit are approved by the Conservator or his representative.*" (p. 25)

"*Areas cut over quarterly by each mill are recorded on progress plans at field offices, and this information is transferred annually to the record plans at Head Office showing areas cut over for the year, species and loads obtained and a record of the area of each permit remaining to be cut over.*" (p. 25-26)

"*Temporary assessment lines run on each quarter's cutting by the treemarkers themselves assist to keep them aware of the loadages marked and trees retained by them and provide data for Divisional office and Head Office checks against the quarterly and annual cutting records.*

Permanent assessment lines are established as required and serve the dual purposes of recording the loadage remaining per acre for future use and of providing the basis for growth studies for management purposes.

Quarterly Trade Operation summaries from Divisions also record areas cut over within and outside State Forest, and loads obtained by species together with records of sylvicultural work and protection.

With the foregoing information available, the Management Branch incorporates such information as is necessary in the Detailed Annual Report and the Conservator's Annual Report to Parliament. These reports, together with the plans, assessments and tables abovementioned form the records necessary for forest management and the information for periodical revision of the Working Plan." (p. 26)

FORESTERS' MANUAL – 1956

The Foresters' Manual. Part III Fire Control (South-West – 1956). 1956

The Importance of Fire Control
"*745. The problem of fire control is intimately bound up with the questions of reforestation and afforestation and the ultimate success of the Department's efforts in these projects is largely dependent on a strong measure of public sympathy and co-operation in attacking the fire problem.*

746. Of almost equal importance is the proper use of controlled fires in silvicultural and protective operations." (p. 5)

LEGISLATION – 1954

Forests. No. 43 of 1954

"*AN ACT to amend the Forests Act, 1918.*

[Assented to 8th December, 1954]

[…]
1. (1) This Act may be cited as the Forests Act Amendment Act, 1954." (p. 193)

Part V.- Financial Provisions
Revenue and Expenditure
"*9. Section forty-one of the principal Act is amended-*

(a) by substituting for the word, 'Three-fifths', being the first word in subsection (2), the word, 'Nine-tenths'; and

(b) *by adding after the word 'concessions' being the last word in subsection (5), the words, 'but shall not include rents derived from dwellings'*." (p. 195)

FORESTERS' MANUAL - 1953

The Foresters' Manual. Part II, Reforestation and Sylvicultural Operations (Jarrah and Karri). 1953

Operations : Jarrah and Karri
Problems and Methods of Regeneration.
"*618. Foresters need to keep before them at all times the fact that their work is primarily to increase the yield of the forests. Forest management, sylviculture and protection accompanied by efficient utilisation of the mature and overmature trees are necessary to contribute to this end*." (p. 5)

"*619. In Western Australia, we are fortunate in having as our two main species, Jarrah and Karri, which regenerate comparatively easily following trade cutting, but this very fact may frequently cause foresters to lose sight of the importance of studying carefully the effects of burning, treemarking for trade cutting, seed trees, seed years and other sylvicultural problems. The aim is that the regeneration shall be the result of the fellings themselves.* […] *Subsequent establishment of seedlings in the blanks takes place for a few years until complete stocking is secured. Karri regrowth is from seed*." (p. 5)

"*621. Natural regeneration of the forest follows the opening resulting from trade cutting, and treemarking therefore, is the first step in regeneration operations, apart from precautionary measures such as advance burning*." (p. 5)

Sequence of Operations

"*622. The sequence of operations, according to existing practice In Western Australian forests to ensure regeneration of the forest is as follows:-*

(a) Advance burn.
(b) Treemarking.
(c) Trade cutting of the older age classes.
(d) Top disposal.
(e) Regeneration operations if necessary.

(f) *Permanent assessment lines.*" (p. 5)

"*627. By cutting in accordance with the group selection system regeneration can be assured and conditions are provided for the satisfactory development of the regrowth.*

628. Standards, for the guidance of officers engaged in treemarking, will be detailed by a Regional Forest Officer and it is essential that officers doing treemarking should realise the important part their work plays in inducing a new crop. Vigorously growing immature trees, whether occurring in groups or isolated, must on no account be marked for cutting.

629. Officers must realise that it is obviously not good forest practice to remove an existing good immature tree or group of such trees to make room for a new crop which will take much longer to reach maturity. It will be realised that definite girth measurements are not an indication of maturity but girth standards are used as a guide to the treemarker. Officers entrusted with the important work of treemarking will receive personal instructions from senior officers on the subject."
(p. 6)

Top Disposal

"*639. This operation of vital importance to protection and regeneration is dealt with under "Fire Control." In most cases today, this operation completes the work necessary to ensure the establishment of the new crop.*" (p. 7)

Karri Regeneration

"*641. Karri regeneration is dependent on the fall of seed on the mineral soil after logging and top disposal operations. A burn, when the trees carry adequate seed, is followed by abundant regeneration. A burn when seed is deficient is followed only by a dense growth of scrub species which take possession of the site, and may effectively prevent Karri from re-establishing itself with future seed crops. Karri seeds fairly heavily at irregular intervals of three, four or even five years, and the seed may stay on the tree for two summers, but will fall during the third. It is important therefore to ensure that the trees carry adequate seed, before burning the tops from trade cutting. Thus, while top burning in the following year may yield good regrowth, any burning In the following year or two, may result in only an unstocked of scrub.*" (p. 7-8)

"*642. Officers will therefore observe closely the development of buds, flowers, fruits and seeds on Karri in their area, an include notes on such development in their Quarterly Statement to the Divisional office.*

643. The sequence of operations will be similar to that out in paragraph 622 for the Jarrah forest, except that:-

1.It is not always possible to get an advance burn of all the Karri cutting area. It is important to appreciate that a fierce advance burn may bring down the seed and thus start germination of seedlings , which would later be killed in the top disposal burn.

2.For the first and second year after formation of I good seed crop, autumn top burning will be followed by abundant regeneration.

3.For the third year after seed formation, a spring burn may be followed by adequate regeneration, but as the remainder of the seed will fall during the summer, an autumn burn will destroy much of the seed the ground, and inadequate regeneration will result.

4.If a fresh crop of seed is not produced after three years, it is desirable to hold the top burning for one two years until abundant seed is again available. This will require careful planning in advance to ensure the area of 'tops' is well protected by fire-breaks advance burns." (p. 8)

Thinning

"*645. The purposes of thinning are, where possible, to cut for sale those trees which will otherwise die in the struggle for existence-in the growing stand, also to effect by selection, among the stems, some improvement in the constituent members of the crop and to provide increased growing space for those trees remaining. The Jarrah and Karri forests are comparatively open forests even for Eucalypts. Those trees which are desirable piles and poles for trade purposes, are the best trees in the forest and are therefore those which should be retained to form the future crop. Only a very limited thinning for some poles, chiefly from the sub-dominant trees, is therefore possible in the Jarrah and Karri forests.*[…]" (p. 8)

Temporary Assessment Lines
(Quarterly Assessment)

"*650. All treemarkers, at the close of each quarter, are required to assess a portion of the area cut over and to forward the results of this work to the D.F.O., who summarises the work for various permits and forwards to Head Office with the Quarterly Report.*
651. The objects of these assessments are:-
(a) To inform the D.F.O. and the treemarker himself of the volume he is removing and the volume he is retaining per acre.
(b) To inform Head Office for management purposes and working plan calculations.
(c) To provide data for future use with air photos interpretation.
[…]
653. The Department requires to have on record for application to air photo interpretation, a number of heights of co-dominant trees throughout all parts of the forest." (p. 9)

"*655. The information required for each tree is:-*
(a) Girth at stump height – state whether under bark or over bark.
(b) Total height of tree
(c) Length of log recovered.
(d) Length from ground level to the fork, i.e., the total bole length.
[…]
657. Where permanent lines are being established under direction of the Regional Officer, within the quarters cutting, there is no need to do temporary line work, but figures must be supplied to Head Office with the Quarterly Summary." (p. 10)

Permanent Assessment Lines
Section 1- First Assessment

"*658. Following on trade cutting, it is necessary to establish permanent plots or assessment lines on which the remaining trees are measured periodically to provide data for growth studies and forest management. Permanent lines in lieu of plots have been adopted as standard practice in this State.*

659. Uniformity in all details in all Divisions is important in this work in view of the long term nature of the studies depending on the first measurements." (p. 10)

NOTE: REFER TO TEXT FOR DETAILS OF:
Selection of Starting Point
Poling the Line
Pegging the Line
The Assessment
Tree Classification

682. Standing Trees
A. […] [Karri] over 108 in. [in GBH])
"*(i)Trees retained as growing stock (or will be retained where bush not previously treemarked). Sometimes only fair trees are retained because there is nothing better.*

(ii)Trees held for special reasons. In tree-markedbush this includes logs held-
(a) To prevent damage to immature growth.
[…]
(iv)Trees not at present exploitable. […]" (p. 12-13)

B. Karri Trees between […] 72in.-108in. [G.B.H.].
"*(i)Growing stock for the future.*
(ii)Trees that could be removed-too defective for future growing stock.
(iii)Trees not at present exploitable because of defects (volumes will be calculated)." (p. 13)

C. Trees between 60in. and 72in. G.B.B. *(Karri likewise).*
"*(i)Dealt with in same manner as B.*
(ii) " " " "
(iii) " " " " (p. 13)

D. Under 60in. G.B.H. Piles and Poles (tree classes)
"*When above 60in. G.B.H. engineers' piles and poles will be classified according to their girth class, but the letter 'E' will be added in the class columns, e.g., BI (E).*" (p. 13)

Engineers' Piles and Poles
Poles (all species)
"*Minimum length 20ft.*
Minimum crown diameter 6in.
Maximum crown diameter 9in." (p. 13)

Piles (all species)
"*Minimum length 20ft.*
Minimum crown diameter 10in.
Maximum crown diameter 16in.

Record position, crown diameter and length of engineers' piles and poles. For others down to 24in. G.B.H. record number only, but not on a separate line-see specimen page of field book." (p. 13)

683. Removed Trees
Karri.
"*Over 108in. over bark-Rl.*
Under 108in. over bark-R2.
[…]" (p. 13)

NOTE: REFER TO TEXT FOR DETAILS ON THE FOLLOWING:
687. Survey Ties.
688. Air Photo Interpretation (A.P.I.)

"689. **SyIvicultural Condition**.-*At the end of each 20 chain give a brief summary of 'sylvicultural condition.' e.g.-*
Dense saplings 30ft. high.
Dead tops.
Badly fire damaged.
Good poles.

690. **Understorey.-***At the end of each 20 chain give brief notes on understorey over 10ft. high, e.g., merchantable sheoak, dense banksia.*

691. **General.** -*Leave one line break in booking to indicate:-*

(a) End of each five chain.
(b) Change of forest type.
(c) Change of site quality.
(d) Change from virgin cut-over bush.
(e) Block boundaries.

NOTE: REFER TO TEXT FOR DETAILS ON THE FOLLOWING:
Field Book.
Method of Measurement
Log Length
Total Height
Painting
Calculation of Volumes
Equipment Required
Plans Identifying Sections of Line Run
Field Books and Head Office Work
Assessors' Journals

Information from Head Office
"*721. Each field book will, after computation, be summarised normally in 50 chain sections, i.e., 10 acre units, unless distinct forest type changes occur when the summaries will be made to conform with types.*
722. This information will be sent to the D.F.O. or District Forester concerned who should, as necessary, pass information to the assessor or other officers concerned." (p. 18)

Section 2 – Re-Assessment
"*723. In re-assessment, the main object is to ascertain the growth rate of the forest. Re-assessments will be made at intervals of not less than 10 years.*" (p. 18)

NOTE: REFER TO TEXT FOR DETAILS ON THE FOLLOWING:
Increment Calculation
Trees to be Remeasured
Booking During Remeasuring
Locating the Line to be Remeasured
Field Assessment
Measurement of Standing Timber (see Permanent Assessment of Meridian Lines for new classification)

FORESTERS' MANUALS - 1950

The Foresters' Manual, Part I. General District Work (South-West). Section 2. The Timber Trade. 1950

"*115. A pile and pole licence in the form F.D. 202 must be obtained in all cases before piles or poles are cut. Licenses will be issued only to persons holding definite orders for the supply of piles or poles for use within the State who may be required to produce their orders or satisfactory evidence thereof. The term and area for which the license is issued must be clearly shown on the form. In no case should a license be issued for more than three months.*

116. Pile and pole licenses will in all cases set out the minimum and maximum crown diameter of the poles and/or piles authorised to be obtained. […]" (p. 15)

Exemptions to work on Private Property
"*144. Exemption to enable operations being conducted exclusively on private property will only be granted subject to the permit holder agreeing to keep a record of his operations and submit returns monthly in the same manner as is required by the Regulations when operating on Crown lands.*" (p. 18)

The Foresters' Manual. Part I. General District Work (South-West). Sections 5. 6. 7. Administration and Land Inspection. 1950

District Plans
"*425. (a) Two sets of 'district' plans mounted and marked 'Set A' and "Set B' have been prepared for each division or isolated district, showing alienated land, timber reserves, permits etc. The colouring has been carried out in accordance with the schedule pasted on the back of each plan.* […]" (p. 7)

"*(b) Every six months the officer in charge of the division or district holding district plans should forward to head office in the plan case the set he holds, which will be replaced immediately by an up-to-date set from head office.*[…]" (p. 7)

Land Inspection
"*459. All applications received by the Lands Department for land within timber districts are referred to the Forests Department for report. In certain cases there is sufficient information available in head office from past inspection reports, special assessments, etc., to enable a reply to be sent to the Lands Department. In the majority of cases, however, it is necessary to obtain further information by field inspections. The primary object of such inspections is to ensure –*
(1) that good quality forest suitably situated shall be retained for dedication as State Forest;
(2) that the alienation of land shall not interfere with the economic management of State Forest as a result of the loss of necessary water supply, access routes, etc.;
(3) that marketable timber in excess of the quantity required by a settler to effect necessary improvements on land selected shall not pass from the ownership of the Crown or be destroyed in the process of clearing, etc." (p. 13-14)

Form of Inspection Report
"*460. In all cases where no special instructions are issued, a complete report on printed form F.D. 89 is required. When submitting a land inspection report on this form, no forwarding letter is required.* […]" (p. 14)

Method of Inspection
"*462. As he paces along the classification line, the inspecting officer must enter, at 10-chain intervals-*
(a) marketable log timber over 90 inches girth;
(b) marketable log timber under 90 inches girth;
(c) timber removed.

(All the above figures to be given as loads per acre in the round, full volume measure.)
(d) notes on piles, regrowth, understorey and ground vegetation, and descriptive notes of soil types.

As he passes from one type to the next, a line must be drawn in the notebook and separate records kept of the loadages and vegetation on each type." (p. 14)

Recommendations
"*468. F.D. 89 calls for recommendations from the inspecting officer under four headings-*
(1) for immediate alienation;
(2) alienation subject to marketable timber being reserved to the Crown;
(3) reserved until marketable timber removed;
(4) for permanent dedication as State forest.

An officer making a recommendation under these headings must remember that present day timber values are not the only guide and that considerable thought needs to be given to the area under consideration, as decisions made today may have far-reaching affects in the future.

Some of the many factors which need consideration are-
(1) the necessity for preserving lines of access for hauling and fire control;
(2) the question of fire lines and the State Forest boundaries;
(3) the value of the land to the Forests Department as a mill site, a water point, an overseer's headquarters, or a camp for employees;
(4) the effect of an alienation upon fire hazards in the locality;
(5) *where areas are distant from State Forest it must be kept in mind that timber reserves, even if the timber is of low present day value, should be held for settlers' requirements in the future.*" (p. 15)

WORKING PLAN – 1945

Working Plan No. 67 : Jarrah, Karri & Wandoo Working Plan Area. 1945

Chapter II : Objects of Management
"*The purpose of the Working Plan has always been to stabilise the Timber Industry to ensure continuity of operations, regular employment for the men engaged, and long life for the timber trade which has been so important in the development of the South West.*" (p. 2)

Chapter III : History
"*The approval of the Jarrah and Karri Working Plans in 1929 and 1927, respectively, was an attempt to correlate all Working Plans and to place the timber industry of Western Australia as a whole on a regulated yield basis. Prior to that date, the volume of timber cut was controlled only by the number and size of the milling plans which happened to be established at any particular time.*" (p. 3)

"*Using a 45-year cutting cycle, figures obtained from the stocktaking were used as a rough basis of the calculation, which was to spread the growing stock over 72" B.H.G. over the next 45 years, in the expectation that the immature trees would provide for the cut at the end of that time.* […] *For Karri, 15 years only were taken, with a cut of 150, 000 loads per annum, but it was appreciated that although Karri could not be expected to last indefinitely, there was a considerable volume of Karri not used in the calculation.*[…]" (p. 3-4)

Chapter IV : Calculation of the Cut
"*A revised estimate shows there are now available for general sawmilling –*
[…]
Karri *5, 253, 000*
[…]

This volume on the basis of a 30-year cutting cycle will provide an annual cut of 600, 000 loads more or less according to the actual location of the mills. At the end of 30 years it is intended that a second cutting cycle, though perhaps with a considerably reduced cut, can begin." (p. 5)

"*A cut of 600, 000 loads in the round means an output, on a 33-1/3% recovery basis, of approximately 200, 000 loads, or 10 million cubic feet in the square.* […]" (p. 5)

Chapter V : Prescription
"*The problem of regulation of the cut includes not only the actual volume to be cut and the relationship between that and the volume to be left as growing stock, but also the actual distribution of the cut. This becomes progressively much more important as the years go on, when the retention by one mill of insufficient country for, say, 40 years becomes an influential factor. For this reason, the cut must be set out by mills, which will form the basis of any future regulation, rather than by a comparison of total volume and annual cut.*

It must be noted, also, that certain assumptions have to be made regarding the degree of utilisation which will be achieved in the trade cutting, and also in the rate of growth that can be expected from the immature growing stock.

The estimates of the cut in the second and third decades are only tentative and given as a guide. They will be subject to correction at revisions of the Plan. Although a cut of more than 600, 000 loads has been estimated and shown on the schedule, the actual cut during the war will be only about 450, 000 loads, and it will take some time after the war's end to reach the prescribed cut." (p. 8)

REGULATIONS - 1935

Forest Regulations, 1935

General
"*124. Any timber worker or other person causing damage to growing trees or other forest produce, or not utilising trees felled or other forest product obtained to the best advantage, or who in felling operations causes waste of timber by felling trees at too great a height above the ground level, shall be guilty of a forest offence.*" (p. 1240)

WORKING PLAN – 1927

General Working Plan for Karri Forests (Original) : Working Plan No. 40 (1927-1937)

Rotation
"*This Plan can only be considered sound until such time as the areas to be permanently dedicated as State Forests for the growing of Karri as a regular crop are finally decided, when the permissible cut will need to be adjusted.*" (p. 3)

Reforestation Proposals
"*No reforestation operations shall be undertaken on any cut over Karri country until a complete Working Plan is prepared for the specific area concerned. The statement hereunder is intended to indicate only the rate such work should proceed and area necessary to provide a sustained yield of Karri timber to replace existing stands of virgin Karri. If, as a safe estimate, it is allowed that a yield of 3, 000 cubic feet per acre of Karri timber may be expected on a rotation of 100 years, it will be necessary to cut over 1, 000 acres annually to secure 3, 000, 000 cubic feet of log timber.*

This area multiplied by the rotation of 100 years will require 100, 000 acres of State Forests carrying Karri timber to provide for sustained yield.

Pending the collection of more complete data the objective to be aimed at in this connection shall be accepted as –

(a) Area of prime Karri country to be dedicated as State Forest – 100, 000 acres.

(b) Area of cut over Karri forest to be treated for regeneration – 1, 000 acres.

Although early steps are necessary to provide for the dedication of the area specified in para. (a), the extent of which regeneration work is feasible will depend on the extent to which cutting operations during the period of the plan are carried out on land to be subdivided for settlement after the timber is removed compared with the volume obtained from State Forests." (p. 5)

Provision for Revision and Relation to Karri Working Plans for Specified Areas

"*Should the Government decide that in order to provide land for closer settlement, steps shall be taken to accelerate the rate of removal of the marketable Karri timber from any specified area of Timber Reserve or Crown land, a report shall be prepared setting out the effect such additional cutting will have on the limited reserves of Karri timber, and in the event of the Government deciding to proceed with such proposal, this Working Plan shall be amended forthwith.*

As areas of Karri forest dealt with in this Plan are dedicated State Forest or gazetted Timber Reserves under the 'Forests Act, 1918', steps shall be taken to make a more complete topographical survey and volume assessment.

The results of such work shall be set out in a more detailed Working Plan for each forest, provided such Plan shall not conflict with the general provisions specified in this Plan. If the assessment indicates a need for revision of the schedules of this Plan sufficiently great to affect the allowable annual cut, such amendment shall be included forthwith and not held over until the periodic revision at the end of 10 years." (p. 5)

FORESTERS' MANUAL -1927

Amendment to The Foresters' Manual. Parts I. 1927

[

NOTE: INCLUDED AS INSERT IN THE FORESTERS' MANUAL. PART I. GENERAL DISTRICT WORK (SOUTH-WEST). 1926

"*1. By deleting paragraphs 84, 85 and 86, and inserting in lieu thereof the following:-*

84. Except in the case of Working Circles where regeneration operations are in progress (see para. 85 as amended) the cutting of piles and poles is confined to-

(1) townsite reserves and country that has been or is in process of being made available for group or other settlement, subject to the reservation of timber;

(2) country that is not required to be set apart for permanent dedication as State Forest or Timber Reserve, i.e., country that may be released for settlement in the near future, after the timber has been removed." (p. 1)

FORESTERS' MANUAL - 1926

The Foresters' Manual. Part 1. General District Work (South-West). 1926

"*84. As a general rule the cutting of piles and poles on Crown lands is confined to townsite reserves and country that is being made available for group or other settlement, or country that is not to be set apart for permanent reservation as State forest.*" (p. 33)

"*When the holder of a sawmilling or hewing permit granted over group settlement country or any country in process of alienation desires to cut piles and poles, he must apply to the forester for a permit stating the number and dimensions of the piles and poles to be cut.*[…]" (p. 33)

"*92. Except where tree marking has been carried out, under-size trees can be cut on timber leases and permits only after permission in writing has been obtained from the Conservator …"* (p. 35)

"*Only Jarrah and Karri trees of 90 inches in circumference measured over the bark at four feet three inches from the ground may be cut by a permit holder, except in special circumstances. Possible exceptions are as follows:-*
[…] *(2) Sparsely timbered country outside the prime timber belt on which it is never likely to prove economical to carry out forest operations. On this class of country, especially where it is likely to be alienated after being cut over, foresters should recommend that the permit-holders be allowed to cut on a face. Such recommendations will only be given effect to after a re-inspection to be arranged by Head Office.*" (p. 35)

"*97. A permit holder must operate continuously and comply with all conditions of his permit, unless exempted by the Conservator.* […]" (p. 36)

"*When a permit holder is desirous of operating exclusively on private property for a definite period, he must apply in the usual way for exemption from the conditions of his permit setting out the private property locations on which he wishes to operate.* […]" (p. 36)

Exemption to enable operations being conducted exclusively on private property will only be granted subject to the permit holder agreeing to keep a record of his operations and submit returns monthly in the same manner as is required by the Regulations when operating on Crown lands.

When only partial exemption from the conditions is required, to enable a permit holder to operate on private property and Crown lands simultaneously, application must be made to Head Office and the approval of the Conservator obtained. […] *If approval is given the permit holder and the forester are notified in writing, and the responsibility then rests with the forester to see that a proper check is kept on the operations to protect the revenue of the Department.*[…]" (p. 36-37)

"[…] *In addition to above precautions detailed field inspections must be made in each case.*" (p. 37)

"*Under no circumstances will a continuing or general permission to cut on private property simultaneously with Crown lands be granted.*" (p. 37)

"*104.* […] *Works which involve considerable outlay are performed under the supervision of the Public Works Department, who insert in all specifications prepared by that Department a proviso that timber within one mile of the work can be obtained free of royalty on application to the Forester-In-Charge of the district, provided that the contractor fells only such trees as are marked by the forester for the purpose …*" (p. 38)

"*107. With reference to other poles which employees of the Postal Department or the line contractor, as the case may be, desire to obtain from Crown lands, outside the cleared strip, it will be necessary to obtain from the forester a local pole permit in the form F.D. 202.* […]" (p. 39) [an amendment made in pencil so that "*permit"* reads "*P.P. Licence"*]

Timber Inspection
"*110. All applications for inspection of timber should be lodged with the Forester-in-Charge of the district in which the timber is situated. The Forester-in-Charge is responsible for the satisfactory carrying out of this work …*" (p. 40)

"*112.* […] *It is the duty of every forester to see that area under his control is worked to the best advantage and cut out with the least possible waste of timber.*" (p. 40)

"*114.* […] *They will, however, see that, in the case of new business, inspection returns are forwarded to Head Office as soon as possible* …" (p. 41)

"*124. All hewn timber obtained from Crown lands must be inspected y an officer of the Forests Department.*" (p. 43)

District Plans
"*291. Two sets of district plans mounted and marked 'Set A' and 'Set B' have been prepared for each district, showing alienated land, timber reserves, permits, etc.* […] (p. 71)

Every three months the Officer-in-Charge of the district should forward to Head Office in the plan case the set he holds, which will be replaced immediately by an up-to-date set from Head Office. […]" (p. 72)

"*293. The field plans will be inspected from time to time by the Divisional Forest Officer.*" (p. 72)

Land Inspection
"*319. The object of reference to, and subsequent inspection of land by, officers of this Department is to ensure-*
(a) That prime forest country shall be retained for dedication as State Forest.
[…] *(c) To provide that the alienation of land shall not result in the depreciation of the value of adjacent timber country by depriving such timber country of water supply for milling purposes, access, etc.*"(p. 78)

"*320.* […] *A sketch plan of the area must be endorsed on the report.* […]" (p. 78)

Detailed Inspection
"*323. To be carried out where the preliminary reconnaissance indicates the timber stocking of the area is by no means even such as where the timber occurs in belts or patches.* […]" (p. 79)
"[…] *the forester will make entries in his note book as follows:-*
Loads, marketable timber, over standard size.
Loads, marketable timber, under standard size.
Loads, useless.
Loads, removed.
Notes re piles, poles, re-growth, etc.
[…}*They will serve, however, to enable the forester to divide the block into timber belts according to the loadage carried. The following plans will indicate what is required.'* (p. 79)

Permanent Reservation
"*326. Permanent Reservation. – Prime timber country carrying Jarrah and Karri in reasonably pure formation. In arriving at any conclusion concerning the principal species (Jarrah or Karri), the timber removed, the over-sized timber and the under-sized timber should be taken into consideration. Ocular estimates in the past have usually resulted in a considerable under-estimation of the loadage of timber per acre. The classification plans show the loadage of over-sized timber only* […]

Other factors as set out in the standard form of land inspection report, F.D. 89, need, however, to be taken into consideration in making recommendations, but the principal determining factor remains the question as to whether Jarrah or Karri occurs in reasonably pure formation. Among other considerations which may justify a recommendation that an area be included in a State Forest are –
[…]
(4) The protection of the forest from dangerous fire hazards." (p. 83-84)

327. Temporary Reservation
"*327. Temporary Reservation* - […] *Officers must bear in mind the drastic alterations which have taken place during the last decade, in the class of bush and type of log which it has been regarded as economically possible to work,* […]" (p. 84)

LEGISLATION - 1920

Appropriation, 1920-21. No. 34 of 1920

Schedule I.
Improvement and Reforestation of State Forests : Working Plan No. 1
"*Covering all that country within the prime jarrah belt south of the Eastern Railway to the southern boundary of the Jarrahdale concession, the portion to be taken in hand first being the destroyed forest of the Goldfields Water Supply Catchment Area near Mundaring. The work for 1920-21 to include:-*

> *Sylvicultural operations over the destroyed forests and road-making to enable the marketing of firewood which will be cut according to sylvicultural requirements.* […]" (p. 147)

Working Plan No. 3
"*Covering all that country held under coal mining leases in the Collie district and such adjoining country as may be necessary for the provision of an adequate supply of mining timber for the coal mining industry in the Collie district.*

The work for 1920-1921 to include:-

> *A timber survey to determine the extent of existing supplies. Sylvicultural operations, especially over those areas from which all the mining timber has been extracted.* […]" (p. 148)

Classification
"*The classification of the timber lands of the South-West is a necessary forerunner of reforestation work. Three camps of classifiers and compassmen are in active operation and 1920-21 should see the major proportion of this work completed.*" (p. 148)

LEGISLATION - 1919

Forests Act No. 8 of 1919

"*AN ACT to provide for the better Management and Protection of Forests.*

[Assented to 3rd January 1919.]" (p. 117)

Part I. – Preliminary
"*1. This Act may be cited as the Forests Act, 1918.*" (p. 117)

Working Plans
"*31. (1.) The Conservator shall, from time to time, prepare working plans for each State Forest and timber reserve.*

(2.) Such plans shall, subject to existing rights under concessions, leases and permits, regulate the management of each State forest and timber reserve respectively for a period not exceeding ten years, to be stated on the plan.
[…]
(4) Every working plan shall be subject to the approval of the Governor, and when so approved shall have effect; and shall not be altered except on the recommendation of the Conservator." (p. 126-128)

Part V. – Financial Provisions
Revenue and Expenditure
"*41. (2.) Three-fifths of the net revenue of the department, to be certified by the Under Treasurer, shall in every financial year be placed to the credit of a special account at the Treasury, and shall form a fund for the improvement and re-forestation of State forests and the development of forestry, and such fund may be expended by the Conservator with the approval of the Minister without any other authority than this Act.*

Provided that a scheme for such expenditure shall be submitted annually to and shall be subject to the approval of Parliament." (p. 130)

Part VII. – Offences, and General Provisions
"*45. Any person who, without lawful authority, fells, cuts, injures, destroys, obtains, or removes in, on, or from any State forest, timber reserve, or other Crown land any forest produce shall be guilty of a forest offence, and liable, on conviction, to imprisonment for not exceeding one year, or to a penalty not exceeding one hundred pounds.*" (p. 136)

"*50. Any person who commits or attempts to commit or aids or abets any person who commits or attempts to commit any of the following offences shall be liable to imprisonment for not exceeding one year or to a penalty not exceeding fifty pounds:-*" (p. 137)

"*73 (2) The planting of trees, approved by the Conservator, on not less than five acres of any land acquired under the conditional purchase provisions of the Land Act, 1898, shall be deemed an improvement within the meaning of that Act, and the conservation and improvement, to the satisfaction of the Conservator, of indigenous timber already growing on any portion of land acquired under the conditional purchase provisions of the Land Act, 1898, may, with the approval of the Minister for Lands be deemed an improvement within the meaning of that Act.*" (p. 144)