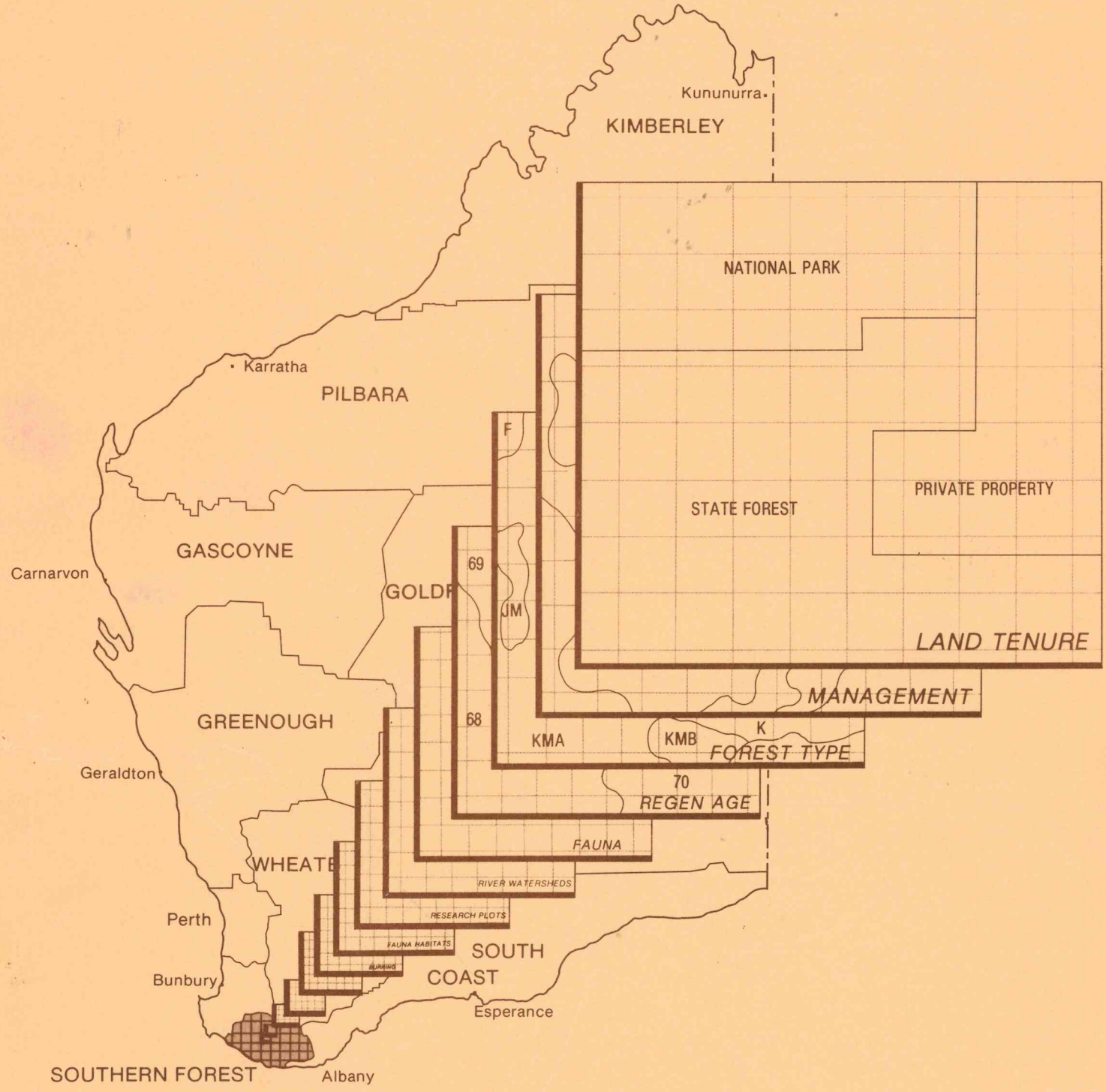
Southern Forest Region

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT W.A.

KARRI FOREST TOUR



KARRI FOREST MANAGEMENT TOUR FOR SENIOR STAFF OF THE DEPARTMENT OF CONSERVATION & LAND MANAGEMENT

ITINERARY

DAY 1

0815	Manjimup Office. Briefing	- Land use
		- Planning
		- Yield
		- Protection
		- Silviculture
		- Industry Control
1130	Depart Manjimup.	
	Stop 1: Nursery	
1215	**Stop 2:** One Tree Bridge	
	LUNCH	
1300	Depart One Tree Bridge	
	Stop 3: Pine Creek Road	- Selection Cut
	Stop 4:	- Even Aged Regrowth
	Stop 5:	- Seed Trees & Pure Marri
	Stop 6: Quartz Road	- Even Aged Regrowth
	Stop 7: Donnelly River	
	Stop 8: Beavis	- Recent Logging
	Stop 9: Big Brook	- Thinning
1700	Arrive Manijmup	
2000	Evening discussion	

DAY 2

0815	Depart Manjimup	
0845	Arrive Pemberton Office	
	Briefing - Inventory, Mapping & Computing:-	
		- F.M.I.S.
		- Karri Inventory Program

- Research:-
  - Karri Thinning*
  - Seed Orchards
  - Fuel Reduction burning in Regrowth Karri*
  - Ecological Research

1030 Depart Pemberton

1045 Warren Block

Stop 1: Fuel Reduction Burning Plots

Stop 2: Early Thinning (13 Year Old Karri)

1230 L U N C H

1315 Return to Manjimup

1400 Arrive Manjimup

Return to Perth

(* = Briefing in the field)

DAY 1.

DAY 2.

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SCALE 1:100,000

Day 1 _____

Day 2 ----------

KARRI FOREST TOUR

Briefing Notes

INTRODUCTION

This briefing and tour has been designed to introduce senior staff of C.A.L.M. to those aspects of karri forest management previously undertaken by the Forests Department. Land use and logging of karri forests is a controversial issue and since a number of staff in C.A.L.M. have not had a close association with it, these are the aspects which will be emphasised during the tour.

THE SOUTHERN FOREST REGION

Manjimup is the administrative centre of the region which comprises three districts - Manjimup, Pemberton and Walpole covering 520,000ha of crown land. A Research station, Inventory office and Regional workshop are also located at Manjimup.

Staff consists of:-

- professional	18
- field and technical staff	85
- National Park Rangers	5
- wages employees	102
- mechanics & apprentices	16

There are 12 major sawmills drawing sawlogs from the Region which together with some smaller mills are expected to cut 411,500m^3/ann from State Forest of which 52% will be karri (1985). The chipmill will use 580,000m^3 of round wood from State Forest plus Private Property logs to produce 679,500 tonnes of chips. In addition mill waste is chipped at 4 mills to produce 75,000 tonnes of chips.

Other major industries are intensive agriculture, beef and sheep.

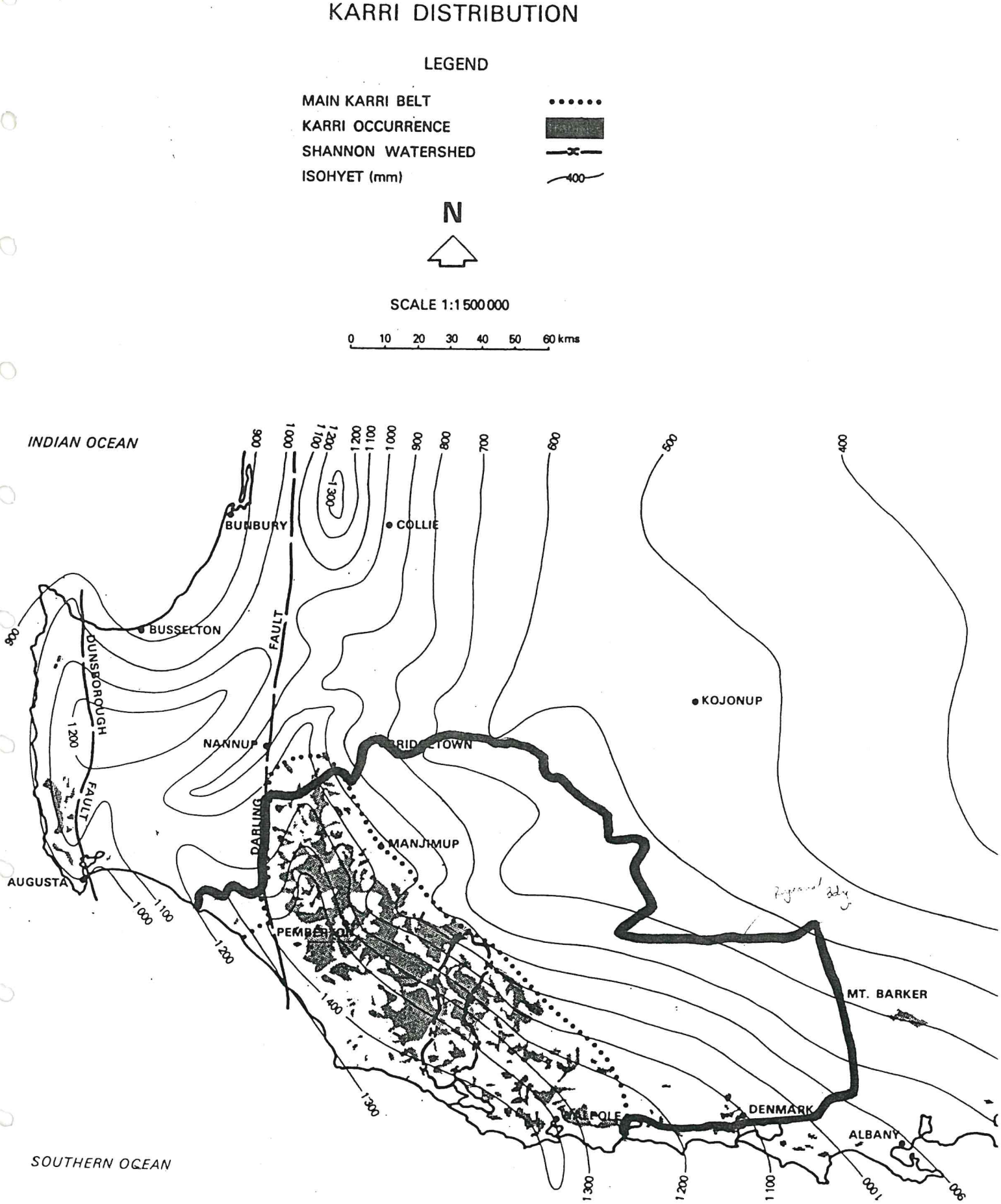
Tourism is a relatively small industry but growing steadily.

Other than small local supplies there are no major active water catchments.

KARRI OCCURRENCE

Within the main belt, karri does not occur in large continuous tracts but in discrete stands where favourable soils occur. The stands of karri are interspersed with jarrah and jarrah-marri forests and treeless flats and swamps (Table 1).

KARRI DISTRIBUTION



REGIONAL BOUNDARY

TABLE 1: VEGETATION TYPE IN THE MAIN KARRI BELT

	CROWN LAND *Hectares*	PRIVATE PROPERTY *Hectares*
Pure Karri	59,000	2,500
Karri mixed with other species.	104,000	7,500
Cleared Land (previously karri).	2,500	33,000
Cleared Land (previously Other Type).	2,000	26,000
Other Forest	200,000	14,000
Other native vegetation.	135,500	15,500
Mobile dunes	10,500	150

FOREST USES

The forest area is divided into a number of priority uses. These are summarised below for the main Karri belt.

LAND USE WITHIN MAIN KARRI BELT (AFTER SHANNON RESERVATION)

	PERCENTAGE			
	KARRI FOREST	OTHER	TOTAL	PURE VIRGIN KARRI
FLORA, FAUNA, LANDSCAPE				
* (a) Preservation (incl. Shannon)	17.6	15.5	16.2	24.7
(b) Fauna Management	0	0	0	0
(c) Silviculture	3.7	1.5	2.2	0.1
* Recreation	1.1	0.3	0.6	0
* Road, River & Stream	15.0	7.7	10.0	13.2
Scientific Research	2.4	0.7	1.3	2.1
Catchment Protection	0	0.3	0.2	0
Forest Protection	1.5	6.8	5.1	4.2
Wood Production	49.5	34.7	39.4	30.6
* National Park & Proposed National Park	8.0	30.5	23.3	23.0
Other Crown Land	1.2	2.0	1.7	2.1
TOTAL CROWN LAND	167,236ha 100%	353,368ha 100%	520,604ha 100%	26,047ha 100%
TOTAL OF *	41.7%	54.0%	50.1%	60.9%

Plus Private Property = 98,096 ha

PLANNING

The basis for planning is the multiple use concept, expressed in terms of priority uses. (The overriding objective is to maintain the entire forest as a viable conservation unit and not, as seen by some people, as separate areas of exclusive use, each being viewed as separate islands which must be viable in its own right).

MANAGEMENT OBJECTIVES FOR MANAGEMENT PRIORITY AREAS

FLORA, FAUNA AND LANDSCAPE

a) Preservation - to maintain the area in as near natural condition as possible.

b) Silviculture - to maintain a stable forest community by creating a forest representing all ages within its life cycle.

c) Management - to undertake management to improve or maintain specific values - eg: particular animals in Perup Fauna Priority area.

RECREATION

To manage for forest based recreation in areas of particular recreational interests.

ROAD, RIVER AND STREAM RESERVES

Reserved for a variety of purposes including aesthetics, recreation, water protection, diversity for flora and fauna.

CATCHMENT PROTECTION

To manage in a way which will not risk the water quality (salt and sedimentation) in areas of active or sensitive catchments. (Logging is not necessarily precluded but is secondary).

SCIENTIFIC

To manage for particular scientific experiments. The priority may change if and when the experiment is completed but they are generally long term studies.

PROTECTION OF FOREST VALUE

Managed for the full range of values more or less in equal priority.

WOOD PRODUCTION

Managed to produce todays and future timber needs. These are managed on a minimum rotation of 100 years to maximise conservation, aesthetic, and recreational values throughout most of these areas at any one time.

The logic behind the selection of these areas and more detailed management strategies are contained in "Conservation of the Karri Forest".

PRODUCTION FORESTS

Production from Karri forests is carried out within the framework of long term yield predictions aiming at a minimum of 100 year rotation, and minimum yield of 100,000m^3/annum. Because about $\frac{1}{3}$ of the Karri forest was allocated to uses other than production in recent times, severe reductions in permissible cut were required and these reductions have been taking place since 1980, according to the program indicated in Figure 1.

The subsequent decision to reserve the remainder of the Shannon has reduced the resource of Karri even further. This has resulted in the consideration of several alternative strategies.

a) Maintain programmed levels for a time till Karri sawlogs run out. Fill this gap by:-

   i) replacing the resource with pine for a time

   OR ii) reducing rotation length to 64 years (Figure 2)

   OR iii) remove other areas from the reserve system to replace the resource foregone in the Shannon.

OR

b) Reduce the level of Karri cut to a level which can be sustained (Figure 3). No firm decision has been made by the Government.

Short term (4 year) rolling logging plans are prepared by the Department to take account of a whole variety of operational constraints - these include:-

1. The need for integration of logging to produce the required amount of sawlog and chipwood from the same area each year.

2. Dieback quarantine.

3. Strategic fire protection (discussed later).

4. Regeneration requirements.

5. Coupe size and dispersal

   and many others.

Detailed plans and prescriptions are prepared for the current year. Actual performance and yield is monitored annually and used to make adjustments to future plans.

FIGURE 1.

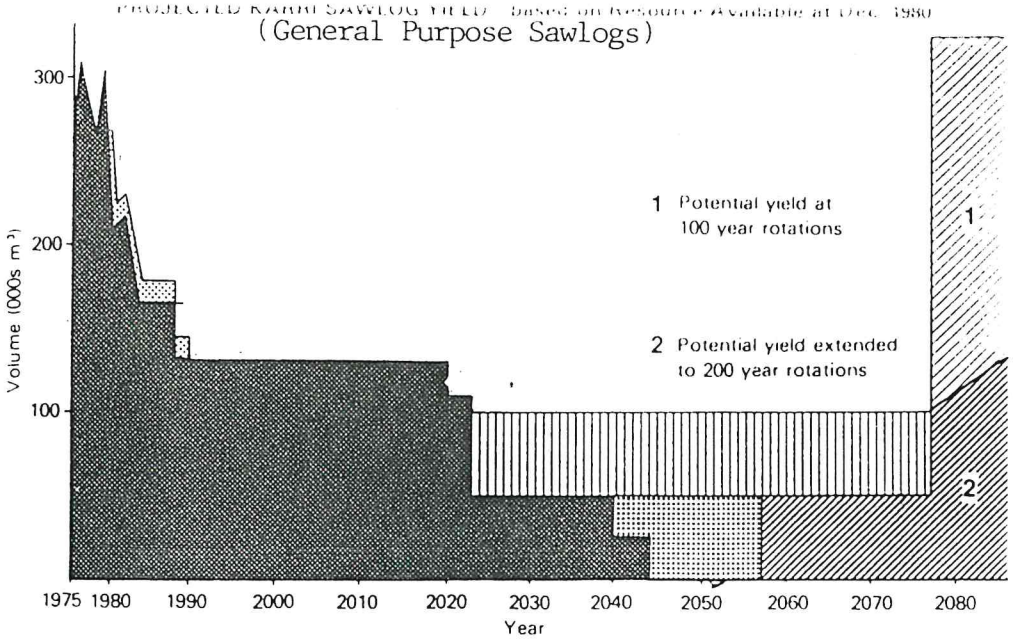


FIGURE 2.

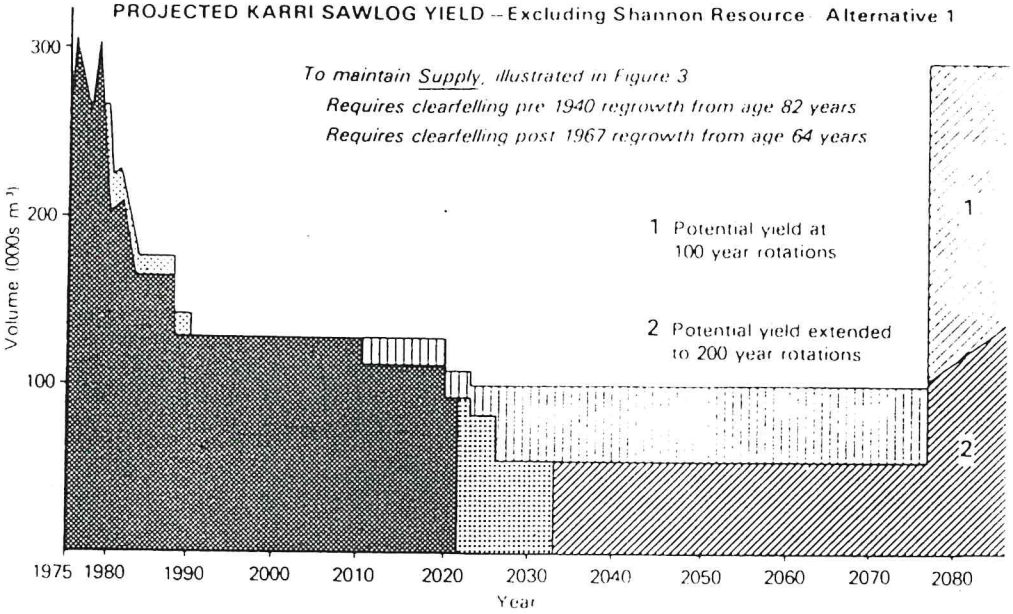
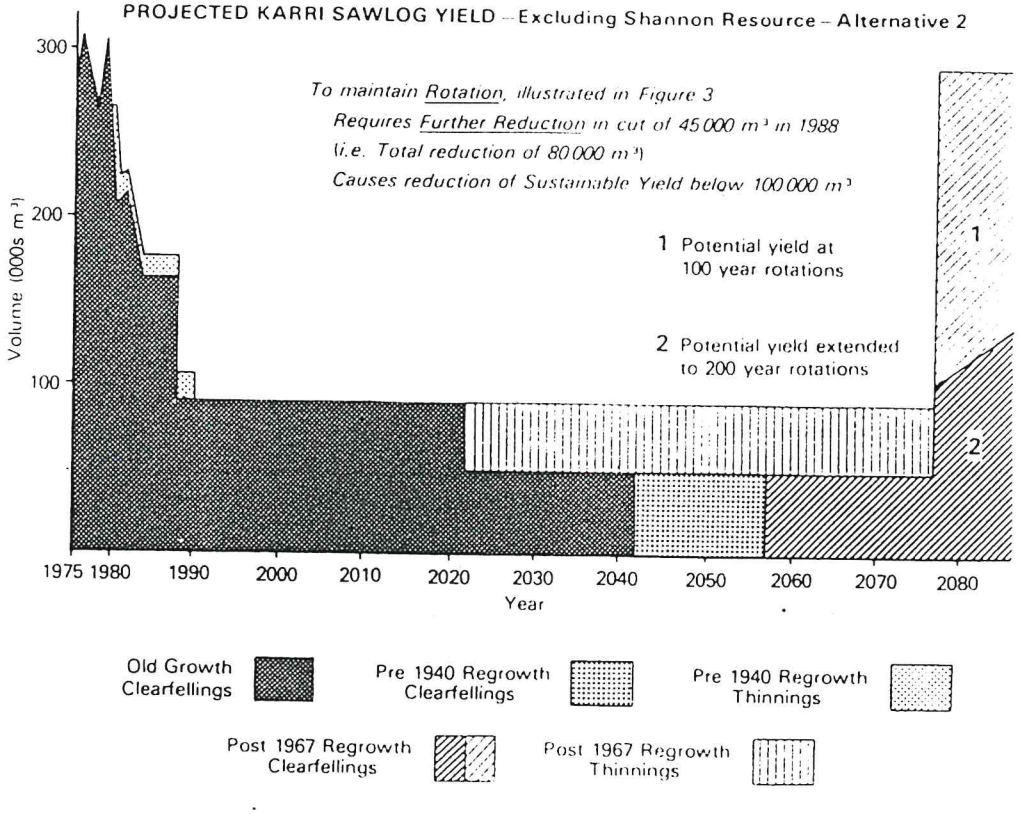


FIGURE 3.



SILVICULTURE

The silvicultural system used for Karri is:-

1. Clear felling with seed trees.

2. Clear felling and planting.

3. Clear felling and seeding.

Planting or seeding is used between seed years (approx 5 year cycle) to provide a more balanced logging and regeneration program as well as reducing the fire risk of "tops" which would be held for several years. Artificial seeding is used to a limited extent because of the cost of seed. Specialised seed production areas are planned to overcome this problem.

Following germination assessments refilling is carried out in the following winter if required. Landings and snig tracks are ripped by the industry and planted with jiffy pot stock.

Even aged regrowth stands which result will be thinned several times during their rotation. Present planning provides for a rotation length of 100 years or longer. At the present time commercial thinning is being carried out in 55 year old stands as a routine operation.

Wood chipping is an integral part of the silvicultural program - its purpose is twofold:-

a) in stands being cut for sawlogs, to remove trees unsuitable as sawlogs to allow for proper regeneration of the stand.

b) in regrowth stands to facilitate commercial thinning of small and low grade logs to promote the growth rate of the remaining stand.

The output of chipwood is governed by the areas being cutover for sawlogs plus the area requiring thinning.

TABLE 2:

RELATIVE COSTS AND RETURNS OF SILVICULTURAL SYSTEMS

1984 ROYALTY V REGENERATION COSTS			
		WITH WOODCHIPPING PER HA	WITHOUT WOODCHIPPING PER HA
INCOME	ROYALTY (For average yield)		
	SAWLOG - 80m^3/ha @ $11.70	$936	$936
	CHIPWOOD - 150m^3/ha @ $3.15	$472	-
	TOTAL	$1408	$936
COSTS	REGENERATION		
	Option 1. Seed Trees	$140	$195
	Return/ha	$1268	$741
	Option 2. Hand Planting	$289	$384
	Return/ha	$1119	$552
	Option 3. Hand Seeding	$195	$250
	Return/ha	$1213	$686

INDUSTRY CONTROL

The control of logging operations emphasizes two main requirements - MAXIMUM UTILIZATION OF LOG RESOURCES and PROTECTION OF THE ENVIRONMENT.

UTILIZATION

All logging operations are now integrated and log products segregated on bush landings are:-

General Purpose Sawlogs
Salvage Sawlogs (two grades)
Marri Sawlogs
Batten Sawlogs
Peeler Logs
Bridge Timbers
S.E.C. Poles
Chiplogs

Integrated logging reduces production costs and therefore improves utilization. No logs go to the chipmill before salvage sawmillers are offered the opportunity to select and purchase logs. Forest officers are involved in all stages of log segregation as well as minimising waste in the bush by checking long butting, stump heights etc.

Logging progress is controlled by a detailed inspection programme of "fallers blocks" ensuring utilisation and environmental protection are satisfactory.

ENVIRONMENTAL PROTECTION

Soil Damage Through Logging

A rigid control system is in place to eliminate excessive soil disturbance caused by moist soil logging activities. To compliment this there has been seen by industry the need for larger stockpiles of logs to be obtained in dry soil conditions, so that the requirement for winter logging areas has been considerably reduced.

The forest areas where moist soil disturbance is caused (landings and snig tracks) are now all fully rehabilitated (except for certain strategic snig tracks left open for coupe access), with the timber industry undertaking the earthwork, and the planting/seeding operations being done by this Department.

Erosion Control

In all logging areas the planning phase considers soil types, slope, vegetation cover, the intensity of proposed operations in determining the most appropriate timing for the logging operation. During logging buffers are maintained around areas of high erosion risk, and machine movements are monitored in "special care zones" identified prior to logging. Following logging cross drains and erosion barriers are placed along snig tracks, and landings and snig tracks are rehabilitated.

Erosion control also is given due attention in the planning and implementation of other works such as road and footpath construction and maintenance.

Crop Tree Damage Control

Monetary penalties are imposed for falling or snigging damage to crop trees marked for retention.

Maintenance of Water Quality

Formal buffers on rivers and streams provide vegetation filter strips during logging operations, with narrow informal buffers being maintained in other sensitive locations, including the low rainfall salinity risk zone. During road construction and maintenance operations detailed prescriptions are prepared to ensure only minimal disturbance occurs at stream crossings.

Landscape

During logging operations the shape of cutting boundaries is designed to minimise the operation's impact on the area's landscape. Buffers currently excluded from cutting exist along most major public roads (although some buffer logging trials are currently in progress), and sensitive roadsides and other areas are cleared up to prevent short term aesthetic disturbance.

Disease Control

All logging operations, particularly those inside D.R.A.'s, use elaborate disease location maps to minimise the spread of Phythopthora s.p. as a result of the machine movements associated

with logging. Every phase of the logging operation, including soil rehabilitation is then planned to prevent transfer of the dieback disease to new sites.

Every other operation which potentially involves earth movement is stringently prescribed to prevent disease spread, with operations being concentrated in times of dry soil conditions wherever possible.

Flora and Fauna

Apart from the established areas of public land reserved for the protection of flora and fauna, many special habitat areas on land used primarily for other purposes are set aside from operations to protect flora and fauna. Examples of these include swamps, rocks, lakes and stream side zones.

Noxious and Non Declared Weed Control

Noxious weed control in particular is a high priority in this Region. The Agricultural Protection Board are now our contractors, and once the annual control programme is jointly planned, they are responsible for carrying out all operations with an annual budget of approximately $50,000. The current priority is for blackberry control work in the Warren Valley, and this will in time shift to the blackberry infestations in the Donnelly Valley.

During these control procedures all of our chemicals use requirements are adhered to, and the only real area of difference between ourselves and the A.P.B. is the standard of access track required to treat infestations near streams. We prefer a lower standard of track, and this aspect of the programme is currently being resolved.

FOREST REGENERATION

Nursery

The West Manjimup Nursery produces over 1 million open rooted karri and marri seedlings every year, in addition to a wide variety of container stock, most of which are used for catchment rehabilitation works. The Nursery is becoming increasingly mechanised, and disease hygiene has a high priority attached to it.

Seed Collection

Seed collection from karri and various understorey species (to aid mainly in mining and landing rehabilitation) peaks in the early months of each year. Our total karri seed stock at present is 306kg (approximately sufficient for 2 years of direct seeding all non seed tree coupes), and one of our major short term challenges is to define effective and cost efficient karri seed collection techniques, which will enable us to collect increased quantities of karri seed before our karri seed production areas start producing the large quantities expected.

Our current karri seed cost is $2,500 per kg cleaned, and this

is a major deterrent to the use of more operationally effective regeneration techniques such as broadcast seeding.

Jarrah Regeneration

Apart from landing and snig track rehabilitation where jarrah is planted in dieback free jarrah forest areas, the major jarrah regeneration technique is still the use of naturally occurring advance growth, and seedling regeneration. An intensive research programme is currently analysing our alternatives in this area.

Karri Regeneration

The use of seed trees is promoted whenever possible, but when natural seed is not available to regenerate a coupe, hand planting of open rooted seedlings is still the most commonly used method. However it is far more labour intensive than the alternative artificial seeding methods (hand broadcast, aerial or spot sowing), and if the cost of collecting karri seed can be reduced then we will be promoting a greater mix of regeneration techniques.

The use of seeding techniques should also lessen our dependence on nursery sowings (with all the consequent costs and risks), and would also free many salary and wages staff resources for other tasks.

In 1986 aerial seeding of karri will be undertaken over 200ha of karri coupes inside D.R.A., in an attempt to maintain the integrity of our disease management strategies.

Softwood Forests

The pine establishment programme has exceeded 400ha per annum in this Region for the past 3 years (including 1986). We are now actively preparing plantation management plans, and updating our P.O.C.S. records so that we will be able to keep pace with an expanding plantation maintenance programme.

Current land holdings will allow us to plant about 600ha after 1986, and at present it is hoped the Softwood Sharefarming Scheme will contribute the balance to 500ha per annum. The first 3 properties to be seriously considered by both ourselves and owners for this Scheme are currently undergoing costing and annuity preparation, and there is some chance that over 100ha will be planted under the Sharefarming Scheme in 1986.

FIRE MANAGEMENT

Fuel Reduction

Our primary fire protection strategy is based on fuel reduction by burning, which becomes more economical as burn sizes reach 5,000 to 10,000ha (majority done using an aircraft). This strategy requires that large areas of mature forest (or other vegetation types) are available for burning, and increasingly with the impact of logging and regeneration, and the increasing complexity of fuel distribution necessary to achieve other management objectives, this is not the case.

The Regional protection strategy is now based on a series of strategic burning buffers, which will be large enough for aerial

burning. No logging (and therefore regeneration) occurs in these strips until the intervening areas have been logged, and the resulting regeneration is old enough to be prescribed burnt. Once this occurs the burning buffers are shifted to the already logged areas and progressively the first burning buffers are logged and regenerated.

Our greatest strategic problem is the increasing fuel reduction burning workload, caused firstly by larger numbers of smaller, less regular burns, and secondly by the increasing diversity of burn types to meet different management objectives. This increasing workload has placed great stress on our available resources, and will inevitably lead to instances of reduced standards unless we apply ourselves to the task of identifying our real priorities in this area and concentrating on them.

The first of the pure karri regrowth stands resulting from mid 1960's clear felling have now reached the stage where they can be fuel reduction burnt, and some very pleasing results have been obtained in operational trials.

Fire Suppression

Apart from the fire prevention measures inherent in our fuel reduction burning programme, and the controls of the Bush Fires Act, our suppression activities rely on rapid detection through spotter aircraft (with occasional fire tower backup), and the retention of a well trained, equipped and informed fire suppression force.

INTEGRATION

The key to the success of the operation is integration of the various policies and practices. This requires relatively detailed planning over a 20 year time span within a longer term outline plan. Such planning is critical to provide sufficient forewarning of policy changes which may be required to prevent irreconcilable conflicts. This has been made more critical in recent times due to changes in the available resource base.

While this integration has been carried out with considerable success in Karri management, a good deal more work is required to bring jarrah management to the same level.

The complexity of these factors and the planning involved led to the development in this region of the Forest Management Information System. A data base incorporating some 45 attributes for the entire region has now been completed and the system is in constant use for planning purposes.

FIELD INSPECTION

DAY 1

STOP 1: MANJIMUP NURSERY

The Manjimup Nursery raises eucalypt seedlings for a number of requirements. Each year, up to 2.5 million open-rooted seedlings are raised for the reforestation of cutover karri and karri-marri coupes within the Southern Region.

Container grown seedlings are raised for difficult sites such as compacted landings, snig tracks and gravel pits. Some 500 000 containerised seedlings are provided for the Departments rehabilitation work on these sites. Another 600 000 plants are raised for the PWD project in the Wellington catchment which involves the reforestation of re-purchased farms with the aim of reducing the salination of soils and streams within the Catchment.

The nursery has been designed to allow for further expansion should this be necessary in future. It is envisaged that a large increase in demand will occur from farmers wishing to replant their farms for shade, shelter, soil protection and wood production purposes.

OPEN-ROOTED SEEDLINGS

Open-rooted seedlings are raised in long narrow beds within plots that cover some 3 to 4 hectares. The beds are specially prepared and treated to provide a disease free and weed free environment for rapid early growth. Following seeding in November/December, young germinants are kept constantly moist by regular watering with a fine mist spray. The seedlings are gradually hardened to ensure maximum survival after outplanting, by reducing the watering, and by a regime of regular root pruning. The latter results in a fibrous root system and toughened shoot development which are necessary for successful transplanting from the nursery to the field. By the start of June, the plants average 20 to 25cm in height. They are then progressively lifted and transported to the planting sites where they are hand planted by the Department of Conservation and Land Management Crews during the wet winter months.

The success of this method of raising plants can be gauged from their high field survival rates (better than 90 percent) and their moderate production costs (3-4 cents each).

CONTAINERISED STOCK

Approximately 1.1 million seedlings consisting of 70 different eucalypt species are being raised in peat (jiffy) pots for outplanting on harsh and difficult sites each year. The species being raised include fast growing eucalypts for wood production, salt tolerant trees for saline areas, and shade and shelter trees as well as ornamentals for landscape and aesthetic purposes.

The soil mix used consists of medium course sand, mature sawdust and some peat plus calibrated additions of fertilizer components. The soil is mechanically mixed and poured into peat pots, and then steam sterilized to eliminate pathogens and weeds. Sowing is also done mechanically using a vacuum plate process which allows up to 10 000 pots to be sown in an hour. Trays of sown pots are transported to the growing areas where they are regularly watered and if necessary, treated for fungal infections. The water is chlorinated and strict hygiene precautions are observed in all facets of the operation to ensure disease-free plants throughout the nursery.

Containerised plants are delivered to their various destinations (as far as Narrogin) by a large pantechnicon trailer capable of carrying 55 000 plants at a time.

SEED

A range of seed is extracted, cleaned and stored at Manjimup.

The seed extraction plant is capable of handling eucalypts, pine and many scrub seeds. It can be programmed to automatically provide a range of heating and tumbling sequence. Manual handling is minimized.

A highly efficient dry dewinger for P radiata seed has been built. Tests are underway to determine if it can also successfully dewing the more sensitive P pinaster seed without damage.

Seed is cleaned and graded with a laboratory seed cleaner. From 1985 it is proposed that seed be stored locally in the cool stores, with records being maintained by the central seed store.

OTHER DEVELOPMENTS

Operation trials are being undertaken to determine the feasibility of large scale (up to 1 million) raising of select P radiata for stem cuttings and fascicle shoots.

STOP 2: RECREATION MANAGEMENT PRIORITY AREA - ONE TREE BRIDGE & FOUR ACES

Managed with a priority for recreation, the One Tree Bridge MPA occupies 666ha adjacent to the Donnelly River. It encompasses an interesting historic feature, a series of picnic spots, walk trails and scenic drives, access to several kilometres of prime river and notable stands of karri. It is one of several areas designated as Recreation priority in the karri region, totalling 3000ha, to which can be added over 50,000ha of roadside Amenity Reserve.

STOP 3: Pine Creek Road - Selection cut karri regeneration burn 1967. Clear felling karri commenced pre 1930 approximately to 1940. Selection cutting practiced 1940 to 1967. Clear felling 1967 onwards. Chipping started in 1975.

The selection system was introduced for the following main reasons:-

(a) Inability to sell small size karri logs.

(b) Need to increase the area of activity to open up fire control access and to salvage fire damage material.

(c) Previous association of clear felling with subsequent alienation for agriculture - a very real political pressure.

Reasons for abandoning selection felling include:-

(a) Difficulty of managing the second felling cycle into established regeneration , including felling and subsequent regeneration burning.

(b) Difficulties with initial regeneration burn, protection of retained crop trees.

(c) Difficulties experienced with the broadscale nature of activities associated with selection felling operations, viz. approx. twice the area is covered per annum.

(d) Deterioration of retained stems and suppression of regrowth. Veteran trees affect the regrowth in an area 4 times their own crown area. For every 5% veteran crown cover there is a 10% reduction in regrowth volume. At 20% veteran crown cover the influence becomes overlapping with even greater effects.

STOP 4: **(a)** Cut to Seed Trees but planted because of predicted low seed supply. Burnt 1970.

(b) Cut to Seed Trees and regeneration burnt 1976. (Not Chipped).

STOP 5: **(a)** Seed Trees - details on signboard - Marri/Karri stand. Over more than half its occurrence, karri occurs in mixture with marri. To achieve successful karri regeneration following felling the marri must be removed. The Woodchip Industry allows this to be carried out economically.

STOP 5: (b) Pure marri stand.

STOP 6: Quartz Road - cut to seed trees and regeneration burnt in 1967.

STOP 7: **DONNELLY RIVER**

The recreational value of the river and its associated reserve is illustrated here. The option to log some of these areas in lieu of the Shannon is not possible in areas such as this because of the steepness of the topography.

STOP 8: **BEAVIS 3**

Current logging to seed trees (with clearfelling on steeper areas).

STOP 9: **BIG BROOK REGROWTH FOREST**

Cutting for the Pemberton Mill began in 1913. Up until the mid 1920's areas cut over were alienated to private property. With the advent of the Forests Act and dedication of State Forest, clear felling in Big Brook and Treen Brook forests in the 1920's and 30's was regenerated to evenaged Karri regrowth. These stands are now 45 - 55 years old and the regrowth is being thinned commercially for the first time. This is considered to be a good example of the compatibility of production and recreation and conservation.

THINNING PRESCRIPTION

The current commercial thinning is later than the optimum age for a first thinning in Karri. The lack of residue market and a suitable logging technique has prevented commercial thinning until the 1980's.

The thinning prescription is based on co-dominant height and stand basal area and is selected from the table below:

CO-DOMINANT HEIGHT (M)	BA RETAINED (M)
<29	Don't Thin
29 - 31m	8
32 - 34	10
35 - 37	12
38 - 41	14
42 - 45	16
Over 45	18

Because of concern for possible wind damage in newly thinned areas cutting is done in wide strips across the prevailing wind direction with unthinned forest buffers between.

It can be expected that the regrowth produced today on a similar site will be up to 40% more productive. This is because of assured full stocking and the removal of the veteran trees which suppress regrowth.

LOGGING METHOD

Trees for removal are felled manually with small chainsaws. 6 - wheel forwarders (1 Volvo, 1 Timberjack) collect logs using the self-loading grapple. Logs (approx. 8 tonnes per forwarder) are extracted to roadside where they are loaded directly onto a waiting semi-trailer or an empty slip-trailer. Small roadside stockpiles are necessary but double-handling is minimized.

Final bunching of scattered logs is performed by a Bell 3 wheel grapple logger. This machine is light, easily manoeuverable and inexpensive. It has proved to be an excellent innovation in efficient logging technique.

CONTRACTUAL ARRANGEMENTS

Because of the variety of saleable produce and marketing arrangements resulting from the thinning operation the Forests Department is the principle logging contractor.

PRODUCTION

The range of produce includes Chipwood (to W.A.C.A.P.); Sawlogs for tile battens (to Monier, Busselton) and Peeler logs (to Wesfi), Perth).

The contract is based on a production of 175m^3 of logs per day (40,000m^3 per year). To date the products have averaged 70% Chipwood, 28% Tile batten sawlogs, 2% Peeler logs.

Approximately 350ha per year (120m^3/ha) will be thinned, and sufficient regrowth for 10 years thinning is available.

Approximately $1,000 per ha is generated from log royalty and logging profit.

The future management of the regrowth forests is a question which concerns many people. Having reached an economic rotation at 40 years (primarily for pulpwood) or 80 - 100 years (for sawlogs) the whole gamut of options is open, ranging from clearcutting and regeneration through to long term "preservation" allowing them to regrow into forests probably identical to the virgin stands which exist today. Our primary management objective today is to provide a healty, viable and intact forest estate upon which the generations of the future can exercise any options they choose. If, as some suggest, the primary forest values in the future are for protection (eg. catchments, flora and fauna

resources), aesthetics and recreation for large urbanised populations, then stands like this may well be allowed to grow on until their biological rotation is reached - probably at about age 200-300 years. Alternatively, the people of the future may simply be unable to "waste" such a valuable and renewable resource for their sawnwood, pulp or energy requirements.

It is therefore imperative that management policies adopted today do not foreclose on likely options for tomorrow. The cornerstones of our current policies in this regard are seen to be:-

(i) Maintenance of the present Forest Estate, increase it if possible,

(ii) Regulation of the cut and control of the Timber Industry,

(iii) Regeneration of cutover stands,

(iv) Preservation of virgin stands to account for values not found in regrowth forest,

(v) Maintenance of optimum growth rates through intermediate thinnings and protection from wildfire,

(vi) Encouragement of multiple use, both in terms of the forest as a whole and individual sections of it.

BRIEFING AND FIELD INSPECTION

DAY 2

FOREST MANAGEMENT INFORMATION SYSTEM

FMIS is a map based information system, which is used to generate

- strategic information - for use in planning;
- management information - e.g. preparation of logging plans;
- responses to parliamentary, public and internal enquiries.

The system automates procedures which have always been used by land managers, but at a speed, depth of detail and reproducibility not possible by the use of manual methods.

The system consists of

a) a very large data base of maps, covering many different land classifications, and

b) computer programmes which

   - extract maps from the data base and manipulate the data;
   - print the areas and descriptions of generated land categories;
   - plot maps, to any required scale, of composite land classifications.

The procedure automated by FMIS is basically the production of composite maps by map overlaying, and is now being operated routinely by staff in the regional offices.

Each mutually exclusive FMIS data map is termed an 'attribute'. Each attribute in turn is subdivided into codes or specific elements of interest e.g. forest type attribute consists of karri, karri/marri, jarrah etc codes - refer code list. In FMIS it is advantageous always to define codes to the lowest possible denominator ie. pure karri is seperated from karri/marri forest types. Interrogations can then be selective in the manner in which attribute and their codes can be 'overlain' so as to achieve the desired result.

To illustrate the practical application of FMIS, two examples have been chosen:-

(1) To facilitate operational and strategic resource planning - planning boards.

(2) A typical parliamentary question concerning the area of karri within a nominated block.

The Intergraph is a sophisticated computer-graphics workstation, designed for use as

a) a computer - aided cartography and drafting tool, and

...2/.

b) a geographic information system with a potentially large data bank, together with analysis capailities which in a sense complement those of FMIS.

At present, the Intergraph and FMIS reside on different host computers. There are plans, however, to combine them on the same computer, with access to a common geographic and resource data base. The result should be a land management information system of greatly enhanced power and versatility.

FOREST/VEGETATION TYPE

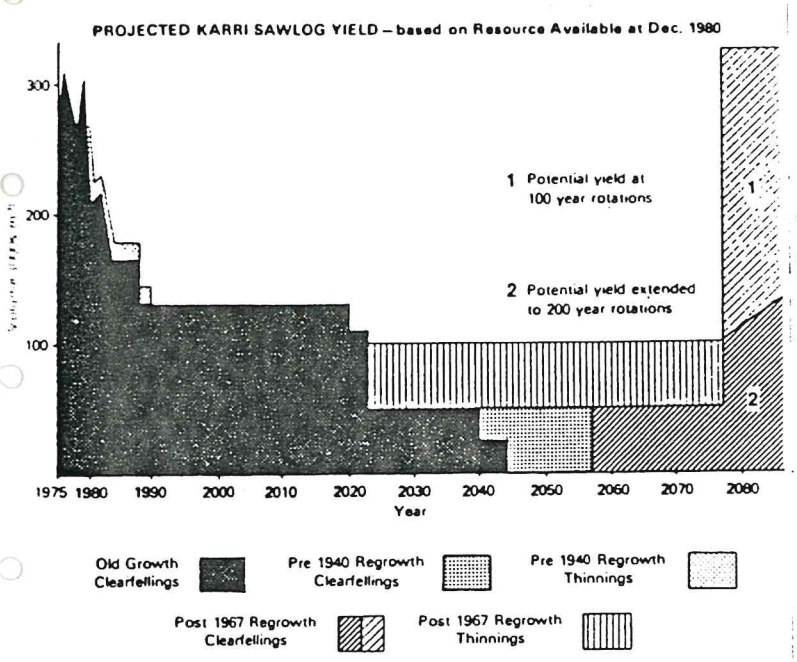
UNCLASSIFIED	/
Pure Karri (New Classification)	1
Karri	2
KM	3
MK	4
MKJ, KMJ, JMK	5
M	6
MJ	7
JM	8
J	9
JYT, YTJ	A
JRT, RTJ	B
Karri, Yellow Tingle, YTK	C
Karri, Red Tingle, RTK	D
K, Rates Tingle	E
K, E. muelleriana	F
Wandoo	G
Yate	H
Bullich	J
Warren River Cedar	K
Pine Plantation - Pinaster	L
Tuart	M
Blackbutt	N
Pine Plantation - Radiata	P
Pasture (Private Property only) N/F in Pasture in SF etc	Q
Lakes, Water	R
Sand	S
Exotic Eucalypts	T
Low Jarrah - $S\frac{1}{1}$, $S\frac{1}{6}$, S_{10}^{1} JC $P\frac{1}{1}$, $P\frac{1}{6}$, P_{10}^{1} JC	U
E. muelleriana	V
E. laeliae	W
Non-forest, scrub, flat, cedar	X
Peppermint, dune vegetation	Y
Euc. Globulus (WACA Planting only so far)	Ø

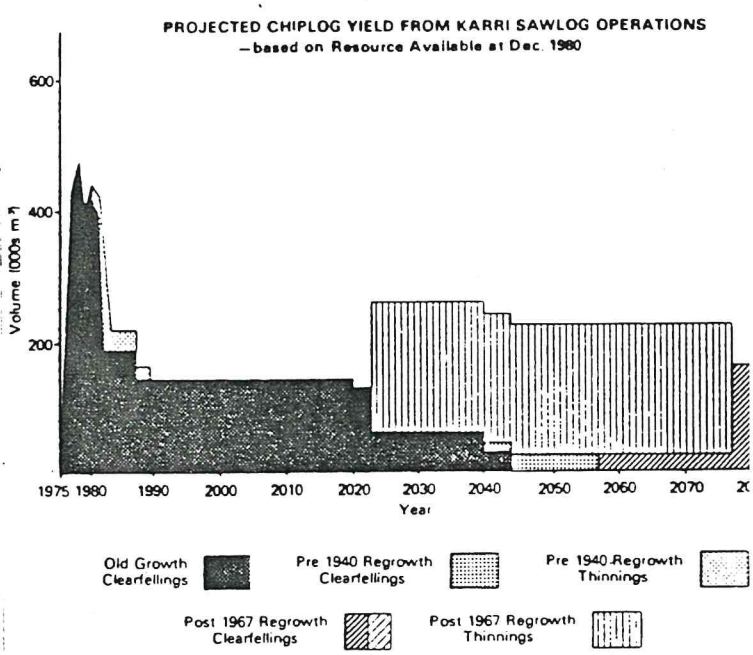
* 1-5, C-F Kar
6-9, A, B Jarr
Q, R, S, U, X, Y N/F
Rest Oth

The Karri Inventory Program

The karri inventory program provides information to assist both operational and strategic level planning for the karri forest estate.

Planning for product-integrated sawlogging within available timber production areas necessitates the collection, analysis and presentation of standing timber estimates. In order to achieve the objective of maximisation of sawlog supply different silvicultural strategies are employed in different forest structures (such as virgin or regrowth forest). The current projected karri yield by forest type is as follows:

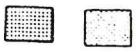




Inventory and Research programmes are co-ordinated to provide the necessary information for implementation of this strategic plan. Current timber assessment programmes and inventory projects include -

OLD GROWTH FOREST (Mixed Age, Selection Cutover or Virgin Stands)

- A management level inventory is undertaken to assess standing timber volumes for preparation of short term (0-4yrs) logging plans which integrate sawlog and chiplog removal.
- A smallwood assessment has been initiated in selection cutover stands (two-tiered) to quantify the availability of sawlog from the regrowth component of these stands.



Pre - 1940 EVEN AGED REGROWTH

- Thinning trials are being monitored to guide development of thinning prescriptions for these stands.
- A post-thinning assessment of these stands is being undertaken as a basis for detailed forest stratification.
- Point-Model Based Sampling (PMBS) is being trialled in regrowth stands to predict both volumes available prior to a thinning and future growth post-thinning.

POST - 1967 EVEN AGED REGROWTH

- A data base of 230 increment plots has been established throughout the Pre-1940 and Post -1967 regrowth forest. These plots are measured periodically and analysis of the data will aid development of a stand growth simulation model for regrowth karri. Such a model will assist evaluation of intermediate and long term planning options for the regrowth forest.
- A suite of projects are underway to assess site quality, thinning responses, and stand dynamics within this forest type.

"KARRI SILVICULTURE RESEARCH"

by

Richard Breidahl
MANJIMUP W.A. 6258

The major areas of work over the past year have been;

1. TREEN BROOK THINNING TRIAL

A large thinning trial was established in a 50 year old karri regrowth stand in Treen Brook. The trial consists of fire treatments, unthinned ($43m^2$/ha), $30m^2$/ha, $20m^2$/ha, $15m^2$/ha and $10m^2$/ha. The 50 year old regrowth stands in Treen Brook and Big Brook are due to be clearfelled when karri sawlog supply is very low. This trial will provide data to enable these stands to be managed for maximum sawlog production. The trial will also provide further silvicultural data for a proposed karri growth model.

2. OPERATIONAL THINNING TRIAL IN YOUNG REGROWTH

An operational thinning trial was conducted in 1972 regrowth in Warren Block to complement a research thinning trial established last year in the same regrowth. The trial has indicated that early commercial thinning may be a viable means of increasing sawlog production from karri regrowth stands.

3. KARRI SEED PRODUCTION AND IMPROVEMENT PROGRAMME

A 5 hectare karri seed orchard consisting of families collected from the Gardner, Weld and Deep Rivers was established. A 10 hectare seed production area was established at Huntley mine site (Dwellingup). These areas along with other S.O.'s and S.P.A.'s will ensure a long term supply of high quality, inexpensive karri seed.

4. REGENERATION PROGRAMME

A fertiliser trial established in winter 1984 has lead to a change in the fertiliser treatment for open rooted karri seedlings. The new treatment 25g/plant of D.A.P. is 50% cheaper than the previous treatment, 65g/plant of Agras.

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The major research proposals for the coming year are;

1. Monitor existing thinning trials.
2. Determine the effect of early operational thinning on prescribed burning.
3. Recommence the karri cuttings research initiated in 1984.
4. Establish a selection cutting trial.

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"ECOLOGICAL EFFECTS OF FOREST OPERATIONS"

by

Grant Wardell-Johnston
MANJIMUP W.A. 6258

EFFECTS OF LOGGING AND BURNING ON THE KARRI FOREST

The main thrust of our work in the karri forest has been in determining the composition site fidelity and foraging ecology of bird communities in relation to forest operations in the karri forest. This study was set up in 1982 in four coupes in Gray forest Block in the Donnelly River system. The first two years of study was designed to determine differences and similarities between sites in vegetation structure and floristics and in bird community composition.

Other long term studies being undertaken in the karri forest include;

1. The effects of a hot fire on small mammal populations. This study was set up in 1971 and burning carried out in two of the three sites in 1972, The most important aspect to emerge from the study was that long term population fluctuations in the bush rat populations occur over and above the effects of a single fire event. A succession of the three most common species of small mammmals in the area (i.e. mice, bush rat and mardo) was observed following the fires. The intention is to encourage division to continue to monitor the populations on a quarterly basis as part of their brief in reserve management.

2. The effects of logging on hollow resting animal species. This study commenced in 1982 in areas of a variety of cutting history. Populations are being monitored by the use of nest boxes. The breeding pattern of the mardo was studied in an area of 14 year old regeneration, where all 36 nest boxes were occupied as breeding sites by this species. The six other sites being monitored have had less use though six species have been observed using the boxes (Owlet nightjar, Rufous treecreeper, Western Rosella, Mardo and two species of bats).

3. Effects of fire regimes on understorey plant species composition. This study was set up in 1970 in an attempt to change the floristics of the understorey by the use of different fire regimes. Plots burnt on a three year cycle have now been burnt five times since the study began though no strong pattern or change has been observed in the plots.

Other studies being carried out in the karri forest include surveys in co-operation with fire research and a study with the School of Zoology, U.W.A. on frog ecology and speciation in the genus Geocrinia.

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Other institutions and interested people are also encouraged to have involvement in ecological research in the karri forest.

FIRE MANAGEMENT IN RESERVES

The main thrust of our work in this area has been in the monitoring of fauna populations in the Perup M.P.A. Emphasis is currently directed in using fire to regenerate thickets suitable as habitat for the Tammar wallaby.

A major emphasis of future work will be directed towards using survey to determine the role of fire in reserve management. This has and will continue to be a co-operative research effort with ecology and fire research and emphasis will in future be placed towards an encouragement of division in monitoring work associated with these surveys.

The running of several field ecology courses at Perup is a major part of our works programme. Our continued involvement in these courses will be necessary although a greater involvement of information branch is being encouraged.

Other institutions and interested people are encouraged to have involvement in ecological research in the Perup. The field station at Perup is an advantage in this regard.

MAJOR REPORTS DURING 1985

"The composition and foraging ecology of a bird community in karri forest in south western Australia" dissertation as part of requirements of a M.Sc in "Forestry and its relation to land management" at Oxford University.

SCHEDULED REPORTS FOR 1986 will include;

1. "Effects of fire regimes on understorey plant species composition".
2. "The effects of a hot fire on small mammal populations in the karri forest".
3. "The distribution and ecology of four species of Geocrinia in south western Australia.
4. "Birds and fire in south western forests".
5. Survey report on fire and fauna in Dryandra forest.

The above include reports with other officers and institutions.

"FUEL REDUCTION BURNING IN KARRI REGROWTH"

by

Lachlan McCaw

Dept. Conservation and Land Management
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Fire is excluded from regenerated karri forest until the young trees have developed sufficient height and bark thickness to withstand an initial burn of low intensity. Current research aims to;

1. define the level of stand development at which prescribed burning could commence,

2. determine conditions and techniques appropriate for burning of young stands.

Regrowth aged 12 and 15 years (mean basal area 20m^2/ha) was burnt operationally during February 1985 using guidelines developed from small plot trials. Wide ignition spacing and stable evening weather conditions resulted in low fire intensities (<300 kW/m) and crown scorch heights below 20 metres. However, higher fire intensities rapidly developed when slope, wind, and close ignition spacing interacted. Intensities above 600 kW/m fully scorched co-dominant trees and caused localised defoliation. Current indications are that 200 - 400 stems/ha of 15cm d.b.h. or greater will remain undamaged and a further 50 - 100 stems will have only minor damage (<100cm^2 in area).

Investigations of regrowth stand dynamics have shown that the dominance status of most trees does not change markedly from age 10 to 20. Stands on good sites have a greater proportion of basal area on large trees than those on poor sites where tree diameter tends to be more evenly distributed. This is significant because of the relationship between diameter and bark thickness.

MAJOR PROJECTS FOR NEXT YEAR

Expand the programme of operational burning to evaluate and improve the current prescription, with emphasis on lighting techniques for irregular shaped coupes and steep country.

Examine fuel and stand characteristics of marri/karri sites, Walpole sites and planted regeneration.

Assist Ian Abbott with studies of insect borers in regrowth.

MAJOR REPORTS DURING 1985

Prescribed burning to manipulate the understorey composition of jarrah forest - a large scale trial (submitted to Australian Forestry).

Behaviour and short term effects of two fires in regenerated karri forest (submitted to C.A.L.M. as Technical Paper).