Assessing the Sustainability of Native Forest Management

Karri and Jarrah Forests in Western Australia

Leonie van der Maesen
May 1999

1st Edition May 1999.
Reprinted (with additions) October 1999.
Information from this booklet may be reproduced providing the source and the author are acknowledged.

Part I

ASSESSING THE SUSTAINABILITY OF NATIVE FOREST MANAGEMENT

Karri and jarrah forests in Western Australia

Adapted Feb.1999 from

Leonie van der Maesen, "Assessing the Sustainability of Native Forest Management: Developing a Methodology", October 1998

Part II

Alex Syme, "Background Notes and Comments Concerning CALM's Forest Management and RFA issues", February 1999

Position Regarding the Regional Forest Agreement May 1999

May 1999 Blackwood – Greenbushes Friends of the Forest Newsletter, Editorial

- **RFA Overview 9th May 1999**
- **Is your money helping to Woodchip our Forests?**

Letter to the Premier – Leonie van der Maesen May 5th 1999

Table: Loss of Previously Approved Reserves from the Jarrah Forest September 1999

CONTENTS

Part I

Preface 5

Acknowledgements 6

Executive Summary 7

Assessing the Sustainability of Karri and Jarrah Forests 9-14
- Background

  Physical features, Soils, Climate, Hydrology, Salinity, Impact of salinity on biodiversity, Biodiversity, Biodiversity in forest regions, Dieback, Fire, Water resources

Research Process 14
- Area under study 15
- Conduct of Study

  Methods, Reasons for remote sensing, aerial photography, ground-truthing 15-17

Forests of Western Australia 18-22
- Jarrah forests, Difficulties regarding identification of old-growth jarrah forest, Karri forest, Old-growth karri forest, Conservation requirements, Regrowth karri forest, Difficulties with regard to regrowth karri, Alternatives to logging jarrah and karri: Plantations Advantages of plantation farming

Ecological Sustainability of the Forest Ecosystem 23-26
- Ecological sustainability, Role of government agencies, Conflict over forest issues, Regional Forest Agreement

Economic Considerations: Forest Industries 27-30
- Tourism, Non-timber forest products, Employment profile and export value of the timber industry, Woodchipping, Japanese corporations involved in the woodchip trade, Potentential woodchip trade: Plantations

Summary of Results of Investigation 30-32
- Concerns regarding CALM management, Final warning, Recommendations

Appendices
- Appendix 1 33-34
- Appendix 2 35-49

- Appendix 3 50-52
- Appendix 4 52-52
- Appendix 5 53-54
- Appendix 6 55-67

Bibliography 68-71

Part II 72-87

Alex Syme, Background notes and comments, February 1999

- CALM's method of dividing Southern Forest Regions, Types of logging and comments, Fire management and abuse, Sustained Yield, Allowable Cut and Maintenance of the Ecological Processes and comment, plus attachments.

Position regarding the W.A. Regional Forest Agreement as this went to press. May 30th 1999.

- Editorial Blackwood – Greenbushes Friends of Forest Newsletter Mary Frith, May 1999. 88-91
- Analysis of RFA signed May 4th by Federal and State Leaders, Overviews by Conservation Council of WA and WA Forest Alliance. 92-99
- Is your money helping to Woodchip our Forests? Friends of the Earth magazine 'Chain Reaction', Anthony Amis. 100-102

Letter to the Premier
Leonie van der Maesen May 5th 1999 103-105

September 1999
Table: Loss of Previously Approved Reserves from the Jarrah Forest.
Mary Frith. 106-107

PREFACE

AUTHOR'S COMMENTS

The study entails field-work during 2 months of each year in the south-west of Western Australia together with desk-work at the University of Utrecht, 1992-98. Due to the great complexity of this issue and the recent political developments, this investigation will be continued.

It must be noted that no funds have been available for this extensive study, except during the first year when travel expenses were paid for by Milieudefensie (Friends of the Earth, Netherlands). Milieudefensie financed costs, faxes, etc. (1991-1995) as well as funding publications such as 'Cash and Karri' etc.

The Dutch Public Works Department funded the 'Dutch Mission' in 1993 when scientists came from Utrecht University. The purpose of this investigation concerned an important decision: 'To buy or not to buy' timber from Western Australia. Being aware how the Western Australian agency Conservation and Land Mangement (CALM) and timber industry would react, the results had to be assessed by independent organisations. These costs, the purchase of satellite images, salaries, travel and accommodation of members of the Dutch Mission may have cost about $AU1 million.

To avoid any confusion about financing, the author did not receive a salary for this investigation, nor for travel expenses (from Europe to Australia), fieldwork, expenses, e.g., production of reports and their distribution. As an Australian living abroad, with university facilities, she felt committed to inform Governments, other Non Governmental Organisations (NGO's), as well as importers of timber, why karri and jarrah timber should not be bought.

There is a great deal of misinformation about the management of the forests in Western Australia provided by CALM and the timber industry. This year, 1998, the timber industry spent $AU500,000 on a propaganda campaign on TV advertising on commercial channels. They distributed glossy pamphlets to European and US timber importers to promote the sale of karri and jarrah timber, claiming the production of the timbers to be sustainable. CALM has even produced a fake green certification label. Under current management it is difficult to imagine an independent certification/accreditation for timber from Western Australian native forests being put in place.

To counteract this misinformation, there must be scientific data, such as that obtainable from satellite images, and sound fieldwork methods. A link between those who are campaigning to save the forests and scientists from independent institutions is badly needed.

Therefore the investigation in Western Australia is a much-needed study. It is being conducted with few resources but with the co-operation and support of the local community, and many friends.

Leonie van der Maesen, October 1998

ACKNOWLEDGEMENTS

In Western Australia I would like to thank many people: my acting fieldwork assistant and secretary Mary Fawkes, who drives me to my study areas and provides my board of lodging free of charge every year. My reviewers and supporters Dr Beth Schultz, Jim and Mary Frith, Janet Ristic and Bertus Streppel. Central Map Agency DOLA Department of Land Administration Western Australia for permission to use aerial photographs.Also many staff members of the Universities and Institutes who prefer not to be mentioned for obvious reasons.

In the Netherlands I would like to thank: The 'Heart for Wood' team of Milieudefensie, Friends of the Earth, Netherlands. Especially Drs Eric Wakker for co-ordinating the study. The Public Works Department (RWS) for initiating this study but especially for making a brave decision.

At the University Utrecht, Dr Hans Riezebos for supporting me and Dr Steven de Jong for processing the satellite images. Yvonne Groenendaal MSc, for scanning photographs and processing NDVI's.

Cartographic laboratory for producing the map interpretation. Drs Hennie Schans for making the special Excel programme. Drs Brigit Stelder for printing the satellite CD ROM images. I am very much indebted for the assistance of the technical staff of the Electronic Laboratory, Ing. Bas van Dam and Marcel Maarseveen. Kees Klawer Chemical Laboratory, and the staff of the Faculty Automatisation Facilities for printing the CD ROM images in colour. I am grateful to Maria Gatzoura for her work on the Adobe Photoshop and Arcedit.

Of course, not to forget, my mentor who taught me a great deal Dr Pieter Augustinus.

EXECUTIVE SUMMARY

Western Australian forests are unique in the world. For a variety of reasons, including unbroken Gondwanan associations and isolation from the rest of continental Australia, these forest ecosystems display remarkable levels of endemism and biodiversity. Human impact, e.g., clearing, burning, logging, mining and the introduction and spread of pests and disease, is causing considerable disturbance and fragmentation.

In 1991 the Dutch Government adopted a policy aiming to end, as soon as possible, the claim on primary forest for timber production. Hydraulic engineers used mainly the tropical hardwood *azobé* derived from Cameroon for the construction of canal linings, floodgates and bridges. The Department of Public Works and Water Management had been approached by various timber companies, such as the Western Australian company Bunnings, with offers of alternative timber derived from non-tropical countries. It was suggested that karri could be an alternative.

The purpose of this investigation was to collect data concerning the ecological sustainability of forest management in the jarrah and karri forests of south-west Western Australia. This investigation commenced in 1992 and still continues. During the period between 1992-1995 the study was commissioned and co-ordinated by Vereniging Milieudefensie (Friends of the Earth, Netherlands). Afterwards, due to the great complexity of the issue and its suitability as a case study, the project was extended by the author as a private initiative.

During this period of extensive study, four reports were published. On the basis of the results, the Dutch Government released the text of its decision not to purchase karri timber unless it can be provided with a certificate ensuring its production from **other** than old-growth forest (see Appendix 4, p52). At the same time, the Dutch Interdepartmental Work Group on Tropical Timber has supported this study's suggestion and stated: "It might be asked, should forests like those of karri and jarrah rather be saved from human exploitation altogether because of their uniqueness?" (Dept. of Public Works and Water Management, 1996). It also stated: 'The remaining native forests in Western Australia should be placed on the World Heritage List'.

The scientific community, local population and conservationists in Western Australia have co-operated fully with the investigation. They unanimously urged Dutch timber consumers not to buy karri and jarrah timber derived from these non-sustainably managed old-growth forests.

On the basis of information from studies of satellite images, aerial photographs and subsequent groundtruthing, it is evident that extensive areas have been clearfelled or intensively logged or cleared for roads and gravel pits and only sometimes regenerated.

The adequacy of the present conservation reserves in protected areas to maintain the biodiversity of native forests is seriously questioned. It has been estimated that only 7.5% of the pre-European settlement karri forest and less than 2% of the pre-European settlement jarrah forest are in secure, internationally recognised category of reserves.

Logging activities continue in high conservation value old-growth forest, interim-listed on the Register of the National Estate. This listing occurred as a result of a joint Australian Heritage Commission/CALM assessment.

Present forest management is not ecologically sustainable. Old-growth forest is now too rare and too valuable to be clearfelled and destroyed, especially when the main products are low-value commodities such as woodchips and charcoal.

From a socio-economic perspective, logging in native forests cannot be considered sustainable. The timber industry has a declining workforce whereas the tourism industry shows rapidly increasing levels of investment and employment.

Until all the options for forest use are fully considered, no logging should take place in areas of recognised high conservation value, so that at least these remaining irreplaceable areas of forest are not destroyed.

A proposal should be made to place the remaining native forests in Western Australia on the World Heritage List.

ASSESSING SUSTAINABILITY OF KARRI AND JARRAH FORESTS

BACKGROUND

Western Australia is the largest state of Australia. It is about one-third of the continent and lies between south latitude 14° and 35°. Its area is about 2.6 million km^2. Eighty-five percent of the 1.6 million inhabitants live in the south-west. Nearly 70% of the State is arid (Conacher, 1983). (see Appendix 6 Plates 1a and 1b, p55 and 56).

Physical Features

Topographically, Western Australia can be divided into two unequal parts - the Great Plateau and the coastal plains. The southern part of Western Australia includes some of the oldest rocks on earth and forms a subdued landscape of deeply weathered profiles. The limited relief belies a rich variation in landform and soils that reflects its ancient and varied history. South-west Western Australia consists predominantly of a gently undulating plateau 250-350m above sea level, without marked relief, a monotonous landscape broken only by occasional granite domes and tors. The low elevation of the plains results in poor drainage, ill-defined watercourses and extensive areas of swampland which are either permanently or seasonally wet. The ancient and complex geological history is marked by leaching and erosion, deposition and laterization of the land surface over a long period. Extensive sandplains mantle the uplands.

Soils

Differences in organic matter content, litter layer, top soil structure/consistence and biological activity are important. Being the medium for root growth, soil is a vital part of all ecosystems. Damage to soil means damage to the ecosystem. Forest soil can be degraded physically by logging and biologically and chemically by fire. Soil compaction due to logging machinery is the most difficult soil damage to rehabilitate.

Climate

In the south-west forests, the climate is cool Mediterranean characterised by a high winter rainfall and a marked summer drought. There have been oscillations in recent times. According to Wardell-Johnson and Horwitz (1996) summer months show a trend towards increasing aridity. However,

the rainfall data graphs do not indicate this trend in the short term (see Appendix 2 for discussion of results).

Hydrology

Land characteristics reflecting the hydrology are basically derived from environmental factors such as landform, geology and climate. These include rainfall, runoff and discharge of the catchment area, deep percolation, groundwater depth, presence of aquifers, etc. Hydrology should be a very important consideration in decision-making concerning forest land use. The hydrological regime may change drastically when the natural forest is disturbed or clearfelled. This is very definitely the case in the karri/marri/ jarrah forest. Both on- and off-site effects need to be considered. Changes in hydrological regimes have been researched extensively, resulting in a number of models. An example of such a model is the ILWIS 'water module' (Meyerink et al., 1988).

Salinity

The clearing of native vegetation has been the main cause of the increase of salinity in Western Australia. In Australia the primary source of salt is from the ocean via rainfall. Salt, mainly sodium chloride, has been carried inland by prevailing winds and deposited on the land in small amounts 20-200 kg/ha/year in rainfall and dust (Hingston and Gailitis, 1976 in: Report to the Minister for Primary Industry, 1996). The change from deep-rooted plants or trees to shallow-rooted crops reduces evapotranspiration and interception of salt. The excess water eventually drains to the groundwater system, to establish seepage at the soil surface which discharges into streams (Williamson, 1990).

Salinity will further increase due to continued logging activities in the south-west of Western Australia where salinity has already become a major environmental hazard. A high proportion of the remaining water resources of the south-west has been affected by agricultural development and excessive logging. The felling of trees has allowed water tables to rise and bring salt to the surface. The possibility of decreasing rainfall due to the Greenhouse Effect has become a real concern to the authorities (Schofield et al., 1988).

In the EPA (Environmental Protection Authority) Bulletin 652 (1992) it is stated: "There is considerable uncertainty on the effects of salinity increases on aquatic environments within the forest of South West Australia". In their conclusion they state that the land is under

considerable pressure and that in the past some of the pressures have resulted in severe salinity problems.

In the south-west of Western Australia, **of the 25 million hectares of land previously covered by native perennial vegetation almost 18 million hectares have been cleared.** "Groundwater levels in one of the experimental catchments, deliberately cleared to study the process leading to salinity, rose dramatically after clearing. Watertables rose by as much as 20 metres" (Beeston, et al, 1994 in: Report to the Minister for Primary Industry, 1996).

Impact of salinity on biodiversity

It has been recognised that the flora and fauna have been affected by salinity. This applies to the native biota across the landscape, wetlands and other low lands. The beds and banks of 80% of the region's rivers and streams are seriously degraded. The degradation of wetlands is well advanced but has not been recorded so far. It appears that, without remedial action, this situation will become even worse (Report to the Minister for Primary Industry, 1996).

Biodiversity

Biodiversity can be defined as the sum of all the plant, animal and micro-organisms. It has three levels: genetic, species and ecosystem. The basic unit of biodiversity is the species. Each different kind of organism is a member of a species. Species are grouped in genera (singular: genus). Biodiversity is the most vulnerable, least resilient, natural resource. Under natural conditions, it is strongly dependent upon habitat. Retaining biodiversity as a natural resource requires conservation of sufficiently large areas of living communities, with as many habitats as possible and over a long time. Human land use such as forest clearing affects biodiversity through the destruction of entire ecosystems.

Australia has a rich and unique flora and fauna and is home to about 450,000 species or 7% of the world's 6 million species of plants and animals. However, Australia has the highest mammal extinction rate in the world (Walker, 1992).

In Western Australia, according to scientists, there is a lack of systematic survey of the region and, therefore, an inability to predict all sites of exceptional richness or importance for biodiversity conservation. Hence, the 'precautionary principle' (see Appendix 1) should be a vital component

of all forest management. Where it is not applied, the biota is compromised and unforeseen environmental damage is needlessly done. For example, road works constructed as part of a fire protection strategy, including aerial prescribed burning, were carried out on a site near Walpole in 1988. As a result, erosion occurred from a deep sands into peat swamp in an area called Boronia Road. This road had not been previously surveyed for biodiversity. Subsequently, a new taxon of frog with a distribution of less than 0.05 km^2 was discovered in the area. This is Australia's most geographically restricted known habitat (Horwitz, 1997, affidavits).

In October 1994, six months after the species' discovery and **before** details on the species' distribution, breeding biology, fire susceptibility or habitat requirements were known, CALM conducted a prescribed burn. This resulted in almost 50% of the frog's habitat being burned and, in many areas, the structure of the organic soils was damaged.

Prelogging surveys should be required as baseline collection exercises for monitoring purposes. These have not been conducted in most areas to be logged. Without these surveys, an environmental impact assessment process is largely ineffectual because an EIS (Environmental Impact Statement) is reliant on predisturbance information. The logging may lead to irreversible impacts on many components of forest biodiversity (sworn affidavits of scientists, 1995).

Biodiversity in the Forest Regions

The jarrah and karri forests of Western Australia's south-west are unique among Australia's eucalypt forests in terms of their biodiversity. The jarrah forest is home to about 240 species of mammals, birds, reptiles, frogs and fish, while about 230 fauna species live in the karri forest. Animals now extinct or under threat in other parts of the country still thrive in these forests, including the woylie, tammar wallaby, quenda, chuditch, western ring-tail possum and numbat. While vertebrate species are reasonably well-researched, very little is known of most invertebrates and micro-organisms that make up by far the greatest number of species.

Dieback

Dieback is a slow-moving epidemic caused by a destructive root disease called *Phytophthora cinnamomi*. It occurs in native jarrah as well as in cultivated areas. In Western Australia, 15 species of the *Phytophtora* genus have been recorded. In warm and wet weather *P. cinnamomi* has

the ability to produce a large number of infective motile spores which move autonomously in saturated soils. Suitable conditions are experienced on at least some days in every year in south-western Australia (Podger, James, Mulcahy, 1996). The dieback-affected areas decrease in an eastward direction (Shearer and Tippett, 1989).

In 1975 it was estimated that the fungus had infected an estimated 187,200 ha of State forests and timber reserves and was thought to be spreading at the rate of 20,000 ha per annum (Shea, 1975; Conacher, 1983). Contamination is caused by activities such as roading, logging trucks and mining. Also bushwalkers and animals may spread the disease. Dieback is deadly to over 1000 plant species in forest and heathland. It is a serious threat to jarrah trees as it slows their growth and can cause death. What is more serious is the fact that the present intensive logging prescription aggravates the spread of dieback. Removal of over-storey allows water table rise and increases ground temperature giving perfect conditions for dieback spread in the spring. The period when jarrah is susceptable to the disease is thereby lengthened.

Fire

Fires in or near forest areas of Western Australia were common prior to European settlement in 1829. Aboriginals used fire in small patches. Wild uncontrolled fires of the past have played a role in the development of the jarrah forest ecosystem (Bell et al., 1989). In Western Australia, the number of fires fluctuates but averages about 250 each year, of which about 18% are caused by lightning (CALM, 1992). According to one National Park ranger, some prescribed burning carried out by CALM (fire bombing or by hand) escapes and causes wildfires (pers.comm, 1996). Many fires are caused by human carelessness and arson (CALM annual reports).

Some scientists and conservationists object strongly to the frequency of the many prescribed burnings practised by CALM. CALM claims that it is generally necessary to protect life and property. In the jarrah area, this is supposed to occur every 5 to 6 years and in the karri forest every 7 to 9 years (Christensen and Abbott, 1989). Scientists and conservationists claim that this is harmful to the ecosystem, especially to the litter/decomposer layer and the infrequently seeding flora. In addition, they claim that burnings frequently occur more often than recommended.

Water Resources

In the Mediterrean climate of south-west Western Australia with its long annual summer drought, water supply is important. Forest catchments supply about 200,000 million litres of water for domestic and industrial use in the Perth-Bunbury area.

The Western Australian Water Resources Council is very concerned about the quality of future water resources. The recent updating of the water resources inventory indicates that only 48% of the divertible surface water is fresh, 16% is marginal and 32% is saline (Report to the Minister for Primary Industry, 1996).

RESEARCH PROCESS

The research which informs this document was conducted during the years 1992-98. Information was collected both in the field and by means of aerial photographs and satellite images.

The International Tropical Timber Organisation (ITTO) definition for the sustainable management of forest land was used as a basis for the research in the absence of any international agreements for sub-tropical forests. The ITTO definition follows:

"the process of managing permanent forest land to achieve one or more clearly specified objectives of management with regard to the production of a continuous flow of desired forest products and services without undue reduction of its inherent values and future production and ***without undue undesirable effects on the physical and social environment****".*

The research therefore had a broad all-encompassing base embracing both environmental and human considerations. Multi-disciplinary scientific research was conducted in co-operation, as far as possible, with local communities, conservationist groups and the timber industry.

Forest management was the focus, addressing the basic question: Is the current forest management sustainable? This was broken down into numerous sub-questions, such as:

- Is it scientifically correct to claim that native forest can be logged as long as new trees are planted?
- What are the effects of logging, clearfelling and regeneration burns on the natural environment?

Area under study

The focus area of the study was limited to the areas in the south-west of Western Australia, regarded by the logging companies and State Government as still viable for the extraction of the native timber jarrah and karri. This is the only area in the world where this timber is found, and the only remaining area in Western Australia where sufficient stands of suitable girth and quality for timber milling are still available.

The CALM map (See Appendix 6, Plate 1b, p56), indicates the location of the area concerned. As can be seen, large areas have been cleared over the last 200 years for agriculture.

Some areas of so-called 'State Forest' are not, in fact, supporting forest but are coastal wetlands and sand dunes. This point of clarification is important as the accompanying maps (Appendix 6, Plate 2a and 2b, p57,58) show. There is confusion regarding this in the maps produced by CALM which gives a misleading impression as to the extent and area of native forest remaining in the south-west of Western Australia.

Conduct of Study

During the years 1992-1998 the researcher, Leonie van der Maesen, spent 2 months in the field in company with appropriate local experts from the different areas under study. During this time, systematically selected areas were traversed, carefully observing, measuring and documenting details of the trees, their size, characteristics, health and vigour and response to burnings and regrowth programs. The total ecosystem and environment was also studied as far as possible, with a view to assessing the survival of biodiversity in relation to logging. Accompanying under-storey and plant life, insects, invertebrates, animals and birds were observed for changes and signs of threat to their survival and health. Auger drilling and soil and water samples were taken for analysis. Interviews were conducted with local people including timber workers, CALM foresters, tourist employees, farmers and local timber mill management.

Numerous visits to government agencies, universities, institutes and conservation organisations in Western Australia, as well as court hearings regarding the threat to the forests, also informed the research.

In addition, aerial photographs and satellite images were obtained and analysed as the basis for map compilation. These maps were then

ground-truthed in the field for their accuracy. (see Appendix 6, Plate 2b p58 and 4a,b,c p60-62 5a,b,c p63-65).

In the latter part of the study, 1995-98, the terms of reference were broadened to encompass in particular the study of regrowth areas of karri, with a view to determining the suitability of trees and period required to provide sawn timber of suitable dimensions.

Detailed information of methods and some of the documentation is provided in Appendix 2 (pp35-49). **Further information can be obtained from Leonie van der Maesen's additional publications. (see bibliography)**

Reasons for remote sensing, aerial photographs and ground-truthing

For extensive areas, field surveys are often not feasible and in many cases remote sensing is a very useful tool, particularly in the south-west and southern forest areas which are not accessible because of their difficult terrain or because access is not permitted when logging activities are in progress. Temporary exclusion areas are also dieback-risk areas (DRA), where entry without a permit is prohibited.

However, there are also disadvantages, e.g., remote sensing only provides information about areas previously logged or logging in progress. It does not give information about parameters such as climate, vegetation type, topographical characteristics. It is therefore crucial to conduct ground-truthing in the field to collect more information.

The aim was to analyse the images of various time scales (1987-1996), detect logging activities over a specified time and analyse the levels of disturbance due to logging activities, that is observing the spatial activities of logging activities. The degree of the modification of the landscape, fragmentation, buffer zones and riparian zones could be documented.

In cases such as that in Western Australia, where governmental agencies are very hesitant to produce reliable information about the areas in conservation or the extent of logging and where, in addition, they deny any environmental damage due to logging, these remote sensing images and aerial photograph are an excellent tool to assess the actual situation in the field, even for a layperson.

LANDSAT or MSS imagery provides a synoptic view of large areas, presented on a constant scale. Various combinations of spectral bands

offer the opportunity to select the most differentiated ones for vegetation and land use interpretation.

Aerial photo-interpretation maps however, show physiographic units, thereby giving an overview of the ecological variations in the area. Of particularly interest is the fact that these colour photos can be obtained on CDROM. The disadvantage is that they cover a smaller area (Touber et al., 1989).

Satellite images, in combination with aerial photographs, gave a clear picture of what is actually happening in the field. This is extremely valuable, particularly because many areas are not accessible. Government regulations create the so-called temporary exclusion areas which means that if anyone enters, for any unauthorised purpose, they will be arrested and fined. This is despite the fact **that these areas are publicly-owned State forests**. This prohibits any monitoring of logging activities by independent observers.

FORESTS OF WESTERN AUSTRALIA

Most of Western Australia's native forests grow in the south-west of the State, between Perth and Denmark. These forests produce a wide variety of essential resources, both tangible and intangible. The timbers provide useful products and income for Western Australia. The forests provide an increasingly popular environment for recreation, within easy reach of major cities and towns. Tourism and honey production are important industries.

Catchment areas which supply high quality water for the most populated areas of the State are found throughout the forests and conservation areas. They are set aside to ensure the long-term survival of native wildlife and plants and also provide an invaluable scientific and educational resource (Statistical Yearbook of W.A., 1991).

The Crown (State) owns 1.8 million hectares of forest. A government agency, the Department of Conservation and Land Management (CALM) manages these forests.

Jarrah forests

Natural jarrah (Eucalyptus marginata) forests grow to 40m in height with a closed canopy and occur on fossil laterites. In the drier areas, the forests reach a height of 12-24 m and are more open. In the wet areas of tall forest, especially in the valleys, a lower tree layer up to 13m high occurs in association with Banksia grandis, Casuarina fraseriana and Persoonia elliptica (Beadle, 1981).

The jarrah tree has a straight bole (15-18m) and can reach diameters of up to 2m. Jarrah is slow growing, averaging 1-2 cm increments in diameter per decade (Abbott and Loneragan, 1986 in Dell and Havel, 1989). The jarrah trees may reach an age of up to 1000 years (Abbott and Loneragan, 1983). (See Appendix 6, Plate 3 p59).

Jarrah trees have a complex root system including 'sinker' roots that penetrate to 30 m., drawing water from a great depth and transpiring it into the atmosphere.

Difficulties regarding identification of old-growth jarrah forest

It has been estimated, by the author, that the original (pre-European) extent of jarrah forest (including jarrah-tingle and jarrah-marri) was

3,300,000 ha (CALM claims 2,784,000). Estimated current extent of old-growth forest (i.e. 'ecologically mature and negligibly disturbed') is 500,000-540,000 ha (CALM claims 271,000 ha). The extent of old-growth currently protected in genuine conservation reserves is unknown (CALM claims 122,140 ha or 4.4% of its estimated pre-European jarrah forest).

According to the Comprehensive Regional Assessment report prepared for the Regional Forest Agreement (RFA), the identification of old-growth forest was difficult (p.15). The Regional Forest Agreement Taskforce used CALM's logging records to map the area of 'virgin' jarrah forest. The areas they identified came to about 250,000 ha. CALM has reduced the area, excluding most selectively-logged jarrah forest from its estimated old-growth forest. This enables them to meet the Commonwealth JANIS criteria while protecting only a minimum area of old growth (see Appendix 3 pp50-52).

Karri forests

Karri (Eucalyptus diversicolor) is the second-tallest eucalypt in Australia, reaching a height of about 88m (usually 40-70m) and a girth of 7m. It is not buttressed. The tallest karri tree ever measured was 104.2m, recorded in 1901. The tree grows relatively fast; annual diameter increases of 90-130mm have been recorded. The forest is two-layered - a towering tree layer 40-70m high with a more or less closed canopy, and a tall shrub layer, 3-7m high of mesomorphic or semi-xeromorphic plants (Beadle, 1981).

Karri occurs in a band about 40 km wide extending from Nannup to Nornalup largely within the 1100mm rainfall isohyet. Its outside limit is in small outliers at Porongorup, Mt. Manypeaks and Rocky Gully, where rainfall is supplemented by local run-off (Christensen, 1992 in Maesen, v.d.,1994). In the extreme south-west there is a small inlier of wet sclerophyll eucalypt forest association which is dominated by karri.

Old-growth karri forest

In 1992, CALM produced a document which stated that there were 84,000 ha of 'virgin' karri forest. It has been estimated that the original (pre-European) extent of karri forest was about 400,000 ha (including karri-tingle and karri-marri). CALM's estimated current extent of old-growth forest (i.e. 'ecologically mature and negligibly disturbed') is about 90,000 ha. It claims that 40,000 ha of virgin karri is retained in conservation areas. This study has estimated that virgin karri, currently protected in

genuine conservation reserves is 29,000 ha. (see Appendix 2, p44) The rest is marked for clearfelling in the near future. Total karri forest already clearfelled is in excess of 57,000 ha. Between 1600-2000 ha are clearfelled each year (CALM Annual Report 1996/97). [For further discussion of 'old growth forest' see p26.]

Conservation requirements

According to the Australian Academy of Science, areas of 4000 ha appear to have a relatively good chance of achieving their conservation objectives, though areas larger than 20,000 ha may be necessary for macropods.

"Old-growth needs to be conserved because once destroyed, old-growth and the habitats for other species that it creates, cannot be recreated in less time than it takes for the longest lived trees to reach maturity.. As a broad benchmark, 15% of the pre - 1788 (European) distribution of each forest community should be represented in statutory conservation reserves" (National Forest Conservation Reserves, Commonwealth Proposed Criteria; A discussion paper, 1995).

Regrowth karri forest

There are now about 60,000 ha of even-aged regrowth karri. Karri is regenerated after clearfelling the original karri/marri/jarrah. These regrowth areas vary between 0 to 100 plus years (see appendices CALM's Annual Reports). Regeneration generally follows within 2 years of clearfelling. Presently a maximum of 80 ha is clearfelled in any one area. After logging and burning, seed trees are left to drop their seed or nursery-raised seedlings are planted by hand or by broadcasting seed. For many years, about two-thirds of karri regeneration was done by handplanting. Now handplanting is used almost exclusively. In 1996, of the 1,560 ha of karri regenerated after clearfelling, only 3 ha were by natural seed fall. Later the dense young stands are thinned to promote the growth of the retained crop trees.

Difficulties with regards to regrowth karri

Very important observations were made regarding regrowth karri. The incidence of *Amillaria luteobubalina* infection appears to be causing the death of many saplings.This is confirmed in scientific reports. Bullseye borer damage is also reported to be of concern in some karri stands. The

borer causes structural damage to the wood and introduces brown stain fungi and insects.

Another problem observed was that only karri seedlings are planted in areas which originally hosted mixed species. These areas have their own specific soil conditions different from single species karri areas. The reason for this selected planting is that karri grows faster than other species and therefore gives a quicker economic return.

In addition, factors such as climate - for example, the changing pattern of summer rain - may have an influence on the growth of karri trees. Hence, there is no guarantee that these regrowth trees will ever reach maturity. Nor will the regrowth trees have the same quality as the original trees. Millers claim that this regrowth timber has been subject to too much stress and is therefore difficult to mill.

It is clear that to log a tree over 500 years old and replace it with a seedling is not 'sustainable management' in the environment of the south-west of Western Australia. The implications for biodiversity are also serious. Trees, even 100 years old, do not have the hollows needed by some birds and animals. The youngest karri tree observed with a hollow was 168 years old.

Alternatives to logging jarrah and karri: Plantations

There is a great deal of debate in Australia as well as in other parts of the world about the benefits and particularly the great damage that plantations have on the ecology of the country. In Western Australia, however, they provide an alternative to native forest logging as long as the plantations are established on previously cleared land. In Western Australia, plantations have the important environmental benefit of lowering water-tables and lessening the threat of salinity on land that has been cleared of all its deep-rooted species in an attempt to pursue what has proved to be unsustainable agriculture.

The Forest Stewardship Council (FSC) nevertheless demands that an independent assessment should be conducted before plantations are established. The present plantation process requires that the area is ploughed and treated with herbicides. Seedlings are planted and fertilisers are applied. Species are softwood: *Pinus radiata* and *Pinus pinaster*. These can be harvested after 30 years for *P. radiata* and 40 years for *P. pinaster*. Exotic species, *E. globulus* (Tasmanian bluegum), *E. viminalis*

(Manna gum), *E. botryoides* (Southern mahogany), *E. saligna* (Sydney blue gum), are also used.

CALM and the timber company Wesfarmers/Bunnings are the owners and/or managers of these plantations. More recently, the Korean corporation Hansol Forest Products and Japan's biggest pulp and paper manufacturer, Oji, have become involved in growing bluegum to produce woodchips for export.

Advantages of plantation farming/agroforestry

Clearing land for farming has caused massive salt problems and eutrophication of coastal inlets. Planting trees on farms to agroforest lowers the water table, preventing salinisation. Very importantly, agroforestry uses the surplus fertiliser left on farmland and prevents phosphates reaching waterways and degrading them. Agroforestry could be important for farmers and millers throughout Australia if its landcare benefits were recognised and promoted.