

## Deferred Forest Area Report

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## Foreword

This Deferred Forest Report is substantially based on a report jointly by Officers of the Commonwealth Forests Task Force and Western Australian officials. It is released following consideration by the Commonwealth Cabinet of its position in relation to Deferred Forest Agreements and Scoping Agreements for Regional Forest Agreements, to provide factual and analytical background to those decisions. Because it was necessary for the Commonwealth to make its position known to Western Australia and the community on these matters, and to allow a reasonable time for Western Australia to make its decisions in response to the Commonwealth position, this report has not been considered and approved by the Western Australian Cabinet. Accordingly, any view or prospective policy, as distinct from existing policy, that is attributed to Western Australia, is subject to any necessary consideration and approval by Western Australia, and the conclusions of this report cannot be considered necessarily to reflect the views of Western Australia. The Commonwealth thanks Western Australia for the co-operation of its Officers in the preparation of the report, and the considerable resources of time, money, professional expertise and information that it has made available.

The Report has also benefited immeasurably from the input of those in the community who responded during the consultation period. This has enabled amendments to the draft report, and has provided guidance to officials as they have explained the studies that they undertook.

Finally, the Commonwealth wishes to record its appreciation of the Scientific Advisory Group appointed by the Chief Scientist, Professor Michael Pitman OBE which provided advice on a number of issues.

## **Executive Summary**

### **Deferred Forest Assessment process**

1. The National Forest Policy Statement (NFPS) sets out broad conservation and industry goals for the management of Australia's forests agreed between the Commonwealth, State and Territory Governments.
2. Under the NFPS, Governments agreed to a framework and process for carrying out comprehensive assessments of the economic, social, environmental and heritage values of forest regions. Once completed, Comprehensive Regional Assessments (CRAs) will provide governments with the information required to make long-term decisions about forest use and management. It will be possible to complete a national comprehensive, adequate and representative (CAR) reserve system which will safeguard biodiversity, old growth, wilderness and other natural and cultural values of forests. At the same time it will be possible to identify the optimal use and management of areas outside the reserve system.
3. The Commonwealth and Western Australian governments have commenced the process to enable them to negotiate an agreement setting out their obligations in relation to each forest region - a Regional Forest Agreement (RFA). Such an Agreement would give industries the certainty necessary to make the investment decisions which will underpin sustainable industry development, besides providing a firm basis for the management of conservation through CAR reserves and complementary off-reserve management.
4. In March 1995, the Commonwealth Government proposed a strategy to provide interim protection for high conservation value forests in the period pending the finalisation of Regional Forest Agreements (between two and five years, depending on the region), as well as releasing draft Commonwealth criteria for CAR reserves. Following public comment final proposed Commonwealth criteria were released in July 1995.
5. Deferred Forest Assessments have been undertaken to assess current levels of reservation of old growth, biodiversity and wilderness values and to identify additional forest areas that may be required for a CAR reserve system ('deferred forest areas'). Careful consideration was also given to the preservation of reserve design options and the impact on National Estate listed areas.
6. The Deferred Forest Areas (DFAs) identified in this report are those that the Commonwealth believes should be set aside to enable a CAR reserve system to be developed through the DFA. Future reserve options will not be foreclosed if the State agrees to the Commonwealth's proposals.
7. A Deferred Forest Agreement will set out the key obligations of the Commonwealth and Western Australian Governments for management of and access to deferred forest and wood production areas. The agreements will also incorporate a mechanism for review of the designation of the areas if this is necessary due to exceptional circumstances.

### **Criteria for determining interim protection**

8. A key element of each RFA will be the establishment of a comprehensive, adequate and representative (CAR) forest reserve system. While national reserve

criteria have yet to be agreed between the States and Commonwealth Governments, the Commonwealth has developed criteria which were used for the Deferred Forest Assessment process. Using these criteria, the Commonwealth aimed to ensure that sufficient suitable areas were set aside as DFAs to enable the following indicative national benchmarks to be met in CAR reserves through the RFA:

- (i) a broad benchmark of 15% of the pre-1750 distribution of each forest community to be protected within the reserve system;
- (ii) retention in reserves of at least 60% of existing old growth, increasing up to at least 90% and where practicable 100% for rare old growth; and
- (iii) protection of 90%, or more wherever practicable, of high quality wilderness which meets minimum size thresholds.

9. In nominating areas to be set aside from logging in the DFA, the Commonwealth has aimed to ensure that it will be possible to develop well designed and integrated reserves, through the ensuing RFA process. This means that more areas are required to be set aside at this stage than would be necessary simply to meet minimum quantitative criteria.

10. Where appropriate the role of 'off-reserve management' in meeting conservation objectives was recognised and taken into account.

11. The Deferred Forest Assessment process sought to maximise the protection of national estate values, threatened and rare species and the extent to which forest communities were represented across their geographic range ('representativeness').

12. The Deferred Forest Assessment process also sought to maximise conservation values while minimising the economic and social costs.

### **Consultation process**

13. A State only Draft DFA Report was released initially for a three week period of public consultation. This period was extended to five weeks to ensure that all interested groups and individuals could make their submissions and to allow officials to fully consider all concerns raised during the consultations, prior to the revision of the DFA reports and the final decision. Over 500 submissions were received nationally, 82 from Western Australia.

14. Western Australia also provided maps and information during the consultation period to key stakeholders. Joint Commonwealth and WA technical discussions and negotiations continued during the consultation period and key stakeholders were advised of joint outcomes toward the end of the process.

### **Summary of Outcomes: Western Australia**

15. The Commonwealth has concluded on the basis of the Deferred Forest Assessment report for Western Australia and the conclusions of the Scientific Advisory Group that, besides the minimum high priority identified areas needed to meet Commonwealth reserve criteria benchmarks identified in the Report, areas should be put aside to enable reserve selection and design issues to be fully considered in the development of a Regional Forest Agreement. The

Commonwealth has concluded that this is best achieved by precluding logging in the National Estate over the period of the DFA. Accordingly, the Commonwealth has asked that these areas be deferred from harvesting for two years, or until an RFA is completed if that is earlier.

## **Region**

16. The DFA boundary in Western Australia is the area known as the south west forest region, covering the forest management regions of Swan, Central and Southern Forests. The assessments covered all tenures to determine the pre-1750 baseline distribution and current distribution but did not include private property for estimates of distribution of old growth forest.

17. Forests cover some 2.1M hectares (0.1%) of Western Australia. Approximately 64% of the publicly owned native forest is managed for timber production. The balance is in a variety of nature conservation tenures.

## **Biodiversity**

18. The Commonwealth proposed several biodiversity criteria in its reserve criteria, one of which was a broad quantitative benchmark that of the order of 15% or more (depending on individual circumstances including extent and the level of threat) of the pre-European extent of each forest type should be protected in reserves. In the preparation of this report, the reservation level of two broad forest type groups - jarrah and karri - was assessed against estimates the pre-1750 distribution of these forest communities by Beard (1981) for jarrah and Bradshaw and Lush (1981) for karri. The jarrah forest was sub-divided into four sub-regions ie north and south of the Preston River, further split into high and low rainfall zones.

19. Reservation levels of other forest types were not determined in the DFA because no pre-1750 mapping was available. The extent of harvesting of these types was assessed and it was concluded that the extent of harvesting was minimal and ensured that options for reservation would not be foreclosed pending finalisation of a RFA.

20. The biodiversity assessments indicate that, of the harvested species, Western Australia retains approximately 72% of pre-1750 distribution (jarrah 71% and karri 82%).

21. Both these broad forest types met the Commonwealth's benchmark of 15% overall reservation in formal reserves. The sub regional analysis showed that the area of jarrah forest in formal reserves was reasonably well represented across its geographic range, the lowest level of reservation being in the northern high rainfall zone. Following the recommendations of the Commonwealth Scientific Advisory Group, least reserved jarrah vegetation complexes in the north were assessed for extent of intersection with logging plans over the DFA period. Ninety four to one hundred per cent of these communities would be available for reserves if required at the conclusion of a RFA.

22. An additional reservation analysis was conducted in the Southern Forest Region for four forest community types (karri, mixed karri, jarrah and mixed jarrah). All four communities were well represented in the formal reserve system across the region.

## Old growth forests

23. An assessment of old growth reservation was made for north and south jarrah forest types and karri forest type using the Commonwealth old growth criteria.

24. In the southern region, some of the larger road, river and stream informal reserves were included in the old growth assessments. The Commonwealth Scientific Advisory Group (SAG) accredited these individual informal reserves where they demonstrated special significance such as linkages, fauna habitat, protection of communities or heterogeneity and added to the representativeness of the formal reserve system. The assessment of informal reserves will be refined in the light of additional information gathered during the CRA.

25. In the southern region deficits of 1,080 ha of old growth karri and 28,190 hectares of old growth jarrah was identified in relation to the Commonwealth's 60% benchmark. Old growth sufficient to meet this deficit has been identified in a number of National Estate sub-areas. These sub areas would be incorporated in the Commonwealth's proposed area to be excluded from harvesting. They are identified in the mapping associated with this report and would form a high priority for further consideration for addition to formal reserves. These areas would enhance the representative distribution of reserved old growth in the southern forest.

26. In the northern region, given past land use history, the only options for old growth reservation in meeting the Commonwealth's benchmark were the informal reserves with the exception of the narrow stream reserves.

27. In the northern region, old growth jarrah is rare (5% of existing forest), hence at least 90% was required to meet Commonwealth benchmarks. 5,700 hectares of old growth jarrah was identified to meet the 90% minimum. This does not intersect with areas planned for logging in the short run.

28. The 5,700 has been deferred pending finalisation of a RFA.

## Wilderness

29. The wilderness assessment was carried out using the Commonwealth reserve criteria benchmark of 90% or more where practicable of high quality wilderness exceeding the national minimum threshold level of 8,000 hectares.

30. No wilderness areas within the forest zone were identified which met this threshold. The largest areas of high wilderness quality are all already in reserves.

## National estate

31. The National Estate places in the Southern Forests Region of Western Australia have been identified through a joint AHC/CALM Regional Assessment conducted in 1992. For the remainder of the DFA region, ie Central and Swan regions, existing national estate areas have been identified through *ad hoc* nomination and assessment.

32. The national estate values relating to old growth forest, wilderness and biodiversity of vegetation communities will be fully protected for the period of the DFA, and in turn will enable the Commonwealth to meet its reserve criteria levels, if the State enters into the Agreement proposed by the Commonwealth.

33. The Western Australian Government has given an undertaking not to log in places in the Register or Interim List of the National Estate during 1996. The Commonwealth has requested that WA extend this undertaking to preclude logging of National Estate places and including the Jane and Giblett blocks and the excision within the Sharp block, until the end of 1997 or until an RFA is completed if that is earlier. In this way the full suite of National Estate values, as well as old growth necessary to meet the Commonwealth's minimum standards, and reserve design options will be fully protected.

### **Threatened species**

34. Threatened species distributed in forested habitats have management procedures, practices and recovery plans in place which address the requirements of the Commonwealth *Endangered Species Protection Act 1992*.

### **Social and economic impacts**

35. In the southern forest region, there will be minimal social or economic impacts of the DFA given that rescheduling has been possible and there has been no removal of resource (in quality or quantity). The DFA identified in the northern region is outside current planned harvesting areas and hence there will be no rescheduling required or social or economic impacts in that region.

## **Background to Deferred Forest Assessment**

### **1. Introduction**

The competing demands of conservation and industry in Australia's forests have been a contentious and long standing issue. The National Forest Policy Statement (NFPS ) agreed by the Commonwealth and all States and Territories provides the framework on which to realise the vision of ecologically sustainable management of Australia's forest, including a range of sustainable forest based industries.

An integral component of the NFPS is a process of joint Comprehensive Regional Assessments (CRAs) leading to the negotiation of Regional Forest Agreements (RFAs) between State and Commonwealth governments, including a review of the existing reserve system and forest management to ensure that Australia has in place a national Comprehensive, Adequate and Representative (CAR) forest reserve system and ecologically sustainable management of the forest estate. In some regions finalisation of RFAs may take some time, given the level of assessments envisaged under the CRA process, in others it is expected that RFAs could be rapidly completed given the extent of existing information and previous assessments of the forests. In the interim the Commonwealth, in a position paper released in March 1995 sought agreement of States to a process to identify, on a regional basis, those forest areas in current wood production tenures that may need to be set aside from logging so as not to foreclose options for their possible inclusion in a Comprehensive, Adequate and Representative (CAR) reserve system.

In Western Australia's case, these areas are known as Deferred Forest Areas (DFAs). The process is an interim one, designed primarily to ensure that sufficient reservation options are available at the completion of the detailed CRA studies that will lead to the establishment of RFAs. These interim arrangements will enable the 1996 woodchip licences to be considered in a regional context pending the establishment of a CAR reserve system.

The assessments were undertaken on the best information that was available and accessible. The DFA took account of the Commonwealth and JANIS draft position papers on CAR reserve criteria. The two sets of criteria differ in some respects, notably where quantitative benchmarks were applied, however, the deferred forest assessment always ensured that the higher reservation benchmark could be met from the deferred areas. High priority was given to ensuring that the needs of endangered and threatened species could be met. Wherever possible, qualitative reservation criteria were applied, such as representativeness criteria and reserve design considerations, although the application was, of necessity limited. The process did not propose specific reserve inclusions, but ensured that there were sufficient options to add more areas to the existing reserve system if this were to be an outcome of the detailed assessment to be undertaken in the RFA process.

This report provides details of the results of the Deferred Forest Assessment review conducted in Western Australia as a joint State-Commonwealth exercise.

### **2. CONSULTATION**

Several meetings were held with stakeholder groups (WA Conservation Council, Forest Protection Society, Forest Industries Federation of Australia, Alcoa and Worsley Alumina and the Australian Workers Union) during the early stages of

Deferred Forest Assessment to determine major issues that needed to be addressed.

The draft Western Australian Deferred Forest Assessment report was released by the State for a three week comment period. As a result of the high level of response to the draft document this period was extended by a further two weeks. The consultation process was initiated with a series of briefings for national stakeholder groups, followed by meetings in Perth for state stakeholder groups. The joint Commonwealth and WA technical discussions and negotiations continued during the consultation period and key stakeholders were advised of joint outcomes toward the end of the process.

During the comment period, detailed information, assembled and developed for use in the Deferred Forest Assessment including maps, was provided to stakeholders to assist in the provision of a combined response to the draft Deferred Forest Assessment document.

Comment was sought on the appropriate application of the reserve criteria and the extent that relevant information had been taken into account. Comments on the Commonwealth criteria had been sought and taken into account during their development earlier in 1995 and comments on the draft JANIS document were being sought through a separate process.

The Commonwealth provided limited funds to representatives of peak State conservation groups, Forest Protection Society (community group) and unions in each of the relevant States. This funding was to assist groups to consult with members, travel to meetings with the Commonwealth, or to engage consultants to provide expert advice.

The Deferred Forest Assessment process and report has been improved by the input received from stakeholder groups during consultation on the draft. Issues raised during the consultation process are addressed in the relevant sections of this report. Responses to the issues have included reference to the WA technical group for further analysis and amendments where required. Some issues were referred to the Commonwealth Scientific Advisory Group (SAG). The relevant responses have been incorporated in this report. Issues raised that are beyond the scope of the Deferred Forest Assessment will be incorporated into the next stage of forest assessments (CRA/RFA). Over 500 submissions were received nationally with 82 specific to Western Australia. A list of submitters is provided at [Appendix 5](#).

### **3. POLICY FRAMEWORK**

Under the National Forest Policy Statement (NFPS), the State and Commonwealth Governments agreed to a framework and process for comprehensive regional assessments leading to Regional Forest Agreements (RFAs). The RFAs will prescribe areas to be reserved for conservation, areas available for commercial production and guidelines for the ecologically sustainable management of the forest estate. As a negotiated process, RFAs are intended to meet the obligations and objectives of both the State and Commonwealth Governments.

The Commonwealth's principal involvement in forest issues derives from the Commonwealth's *Export Control Act 1982* which regulates the export of woodchips and unprocessed wood. In assessing applications for export licences under the *Export Control Act 1982*, the decision maker is required to ensure that a range of Commonwealth obligations are met (see section 3.2 below).

The Deferred Forest Assessment has identified areas that may be needed for inclusion in a CAR reserve system. The DFAs will form the basis for consideration of environmental matters in the issuing of woodchip export licences until the RFA is completed.

### **3.1 National**

#### **3.1.1 National Forest Policy Statement (NFPS)**

The Commonwealth and all State and Territory Governments have endorsed the NFPS. This Statement sets out the measures to be undertaken to ensure the community obtains a balanced return from all forest uses by:

- providing for a Comprehensive, Adequate and Representative forest reserve system which will protect old growth forest, wilderness and biodiversity;
- development of an efficient, value adding, internationally competitive and ecologically sustainable wood products industry;
- providing for a range of other forest values including water supply, tourism, and recreation in an ecologically sustainable management framework;
- coordination of decision making between the Commonwealth and the States and Territories;
- the expansion of hardwood and softwood plantations; and
- assistance to communities faced with structural adjustments as a result of the implementation of these measures.

#### **3.1.2 CRAs/RFAs**

RFAs are agreements between the States/Territories and the Commonwealth and recognise the range of economic and environmental obligations of both tiers of government have regarding the long term management and protection of forest values in specific regions. RFAs will bring stability to the timber industry by guaranteeing a sustainable resource base, whilst at the same time ensuring the protection of Australia's biodiversity through a CAR reserve system. A discussion paper on RFAs, outlining Commonwealth obligations, was released for public comment in March 1994 and a Commonwealth position paper on the undertaking of CRAs and negotiation of RFAs was released in March 1995.

In May 1995 the Premier of Western Australia invited the Commonwealth to participate in a RFA and commence the Deferred Forest Assessment, treating the south-west forests as a single region. A Steering Committee and a Technical Committee, comprising Commonwealth and Department of Conservation and Land Management (CALM) staff were established.

#### **3.1.3 JANIS Reserve Criteria**

Following signing of the NFPS, an intergovernmental Technical Working Group on Reserve Criteria was established in 1993 to draft the national criteria required by the NFPS, under the Joint Australian and New Zealand Environment and Conservation Council (ANZECC)/Ministerial Council on Forestry, Fisheries and Aquaculture (MCFFA) NFPS Implementation Sub-committee (JANIS). The Technical Working Group comprised representatives from state forestry and conservation agencies and CSIRO.

The Working Group's draft report, containing a set of proposed reserve selection criteria, was released for public comment in July 1995. The Working Group has

now considered all public submissions and has met with the Commonwealth Scientific Advisory Group (SAG) to discuss outstanding issues.

### **3.1.4 Regionalisation (including Interim Biogeographic Regionalisation of Australia)**

As recommended in the Commonwealth Reserve Criteria position paper DFAs were developed on a regional basis. For the purposes of the Deferred Forest Assessment and RFA the south west forests were considered as one region. (See Maps).

The Interim Biogeographic Regionalisation for Australia (IBRA) was developed by compiling the best available continental scale data and information about each State and Territory, including field knowledge, published resource and environmental reports, biogeographic regionalisations, and continental data sets. The IBRA amalgamates existing regionalisations for each State and Territory, drawing on similarities across State and Territory borders. The IBRA was developed for a specific use and it is acknowledged that it cannot be the sole criterion for allocating conservation priorities.

There are 2 IBRA regions in Western Australia in the current draft regionalisation. The IBRA regions may be used in the broad context of Comprehensive Regional Assessments in WA.

## **3.2 Commonwealth**

### **3.2.1 Commonwealth Reserve Criteria**

The Commonwealth produced a discussion paper in March 1995. After a public consultation period the Commonwealth published a position paper on reserve criteria in July 1995. The criteria in the Commonwealth position paper draws on the work of the JANIS Technical Working Group and was developed with the advice of a Commonwealth Scientific Advisory Group.

The criteria adopted by the Commonwealth Government include a range of qualitative criteria and a series of quantitative benchmarks for biodiversity, old growth and wilderness:

a broad benchmark of 15% of the pre-1750 distribution of each forest community to be protected within the reserve system (See Section 5);

retention in reserves of at least 60% of existing old growth, increasing up to 100% for rare old growth (See Section 6); and

protection of 90% or more wherever practicable of high quality wilderness (See Section 7).

The criteria recognise the role of off-reserve management in meeting conservation objectives, such as threatened species (See Section 9).

The Deferred Forest Assessment has been undertaken taking account of the Commonwealth and JANIS criteria. The Western Australian Government has not determined its final position on reserve criteria and does not necessarily endorse the draft JANIS or the Commonwealth criteria.

### **3.2.2 Endangered Species Protection Act**

The *Endangered Species Protection Act 1992* (ESP Act) provides the legislative basis for Commonwealth responsibilities with regard to the conservation of endangered species and communities and the amelioration of the processes that threaten them.

### **3.2.3 Environment Protection (Impact of Proposals) Act**

The DFA process has been designated as "environmentally significant" under the Commonwealth *Environment Protection (Impact of Proposals) Act 1974* (EP(IP) Act) and referred to the Commonwealth Environmental Protection Agency (EPA). In accordance with the administrative procedures under the EP(IP) Act, the EPA will advise the Commonwealth Minister for the Environment regarding the Deferred Forest Assessment, including any changes following stakeholder consultation, prior to the Commonwealth making its final decision on the DFAs.

### **3.2.4 Australian Heritage Commission Act**

The Australian Heritage Commission has a statutory obligation under *The Australian Heritage Commission Act 1975* to identify the National Estate and the Commonwealth has an obligation to take into account the effect of its actions on the National Estate. This obligation is recognised in the National Forest Policy Statement (NFPS) and the Commonwealth reserve criteria paper. While the Commonwealth Reserves Criteria paper does not explicitly address the issues of reservation standards for national estate values, the Commonwealth Deferred Forest Assessment position paper indicates that the reserve system should incorporate, and where possible, maximise the inclusion of these values.

National estate values include old growth, wilderness and biodiversity, as well as a wide range of other values including cultural values.

The Register of the National Estate is intended to be a comprehensive list of places with national estate value, not a representative list. A comprehensive regional assessment provides an excellent opportunity to systematically identify national estate values in a region. It is not expected that all national estate places can be protected but it is essential that these values are considered in Commonwealth decision-making.

### **3.2.5 Export Control Act**

The Commonwealth Export Control (Hardwood Wood Chips) Regulations (the Regulations) made under the *Export Control Act 1982* control the exports of woodchips to ensure that:

by the year 2000, wood chips derived from native hardwood forests are exported only if they are from a region to which a Regional Forest Agreement applies;

the volume of annual exports of hardwood wood chips derived from areas to which a Regional Forest Agreement does not apply is subject to a national ceiling;

areas that are, or may be, needed to establish a comprehensive, adequate and representative national forest reserve system are protected;

adverse effects on the environment of obtaining the wood chips are minimised;  
and

investment in value-added production in forest industries and other related industries is encouraged.

### **3.2.6 Social and Economic Considerations**

A key element of all RFAs is the incorporation of potential industry and community implications into consideration of CAR options. The National Forest Policy Statement firmly established as a national goal the development of an internationally competitive forest products industry. In this context the Commonwealth has obligations relating to efficient resource use and management, industry policy, employment, and regional growth and development. An integral part of this is the consideration of the effects on essential services and the vitality of forest dependant communities.

## **3.3 Western Australian Forest Policy Framework**

### **3.3.1 Conservation and Land Management Act**

The *Conservation and Land Management Act 1984* (CALM Act 1984) established the Department of Conservation and Land Management and the controlling bodies, the Lands and Forest Commission (LFC) and the National Parks and Nature Conservation Authority (NPNCA).

In relation to forest management one of the principle features of the Act is the provision for management plans.

The LFC and NPNCA are responsible for the preparation of management plans in accord with section 56 of the Act. The objective of the management plans is to achieve or promote the purpose for which the land is vested, as follows:

- (a) indigenous State forest or timber reserves, to achieve the purpose, or combination of purposes, of conservation, recreation, timber production on a sustained yield basis, water catchment protection, or another purpose prescribed in regulations;
- (b) State forest or timber reserves planted with exotic species, to achieve the optimum yield in production consistent with the satisfaction of long-term social and economic needs;
- (c) national parks and conservation parks, to fulfil so much of the demand for recreation by members of the public as is consistent with the proper maintenance and restoration of the natural environment, the protection of indigenous flora and fauna and the preservation of any features of archaeological, historic or scientific interest;
- (d) nature reserves, to maintain and restore the natural environment, and to protect, care for, and promote the study of indigenous flora and fauna and to preserve any feature of archaeological, historic or scientific interest; and
- (e) in the case of other land referred to in section 5(g), to achieve the purpose for which the land was vested in the controlling body, eg. conservation, recreation and other purposes.

Public participation in the management planning process is provided for, with a minimum two-month period during which written submissions will be considered.

### **3.3.2 Wildlife Conservation Act**

The objective of the *Wildlife Conservation Act 1950* is the protection of indigenous flora and fauna throughout the State.

Administration of this Act, hence the conservation and protection of indigenous flora and fauna, is a statutory function of the Department of CALM.

Where any indigenous flora or fauna are considered to be at some level of risk with respect to their continued survival (ie. they are considered to be threatened), the Minister may declare them as likely to become extinct, or rare, or otherwise in need of special protection.

### **3.3.3 Mining Act and Mineral-Based Agreement Acts**

Mining and exploration can have considerable impact on forest management. At present the major minerals mined on forest land are bauxite, coal, mineral sands, gold and tin.

The *Conservation and Land Management Act 1984* (CALM Act) does not preclude land managed by the Department from mining or major development projects.

The Agreement Acts are administered by the Minister for Resource Development. The CALM Act does not impose restrictions on mining or development projects subject to the Agreement Act. The requirements for mining and development projects with respect to land managed by CALM are stated in the *Mining Act 1978* and the individual Agreement Acts.

Under the Mining Act the concurrence of the Minister of the Environment and in some cases the approval of Parliament must be obtained before mining can proceed on other categories of land managed by CALM. The Department is involved in drawing up conditions for mining on land that it manages.

### **3.3.4 Timber Strategy**

*Timber Production in Western Australia - A Strategy to Take WA's South-West Forests into the 21st Century* was published in 1987 with the Forest Regional Management Plans.

The Timber Strategy contained several key points.

- Adequate forest areas representative of all major ecosystems will be set aside for conservation and recreation, from which logging is excluded.
- The remaining forest areas will be managed to maximise multiple use including water supplies, recreation, sustainable timber production and wildlife conservation.
- Every hectare of forest logged will be regrown.
- The cost of regrowing, establishing and managing native forest and exotic pine plantations will be paid for by the timber industry.
- The yield from timber production will be regulated so it can be sustained indefinitely.

- Logs will be processed to get the best value from each log, so that employment and economic benefits for Western Australia will be maximised.
- All forest management operations on crown land will be managed by CALM.

The Strategy forecast that more wood will be used for high-quality products, more timber will be extracted from logs using improved techniques, and more wood will be available from increasingly productive hardwood regrowth forests and the States developing pine forests.

### **3.3.5 Forest Management Plan 1994-2003**

During 1991 CALM conducted a comprehensive review of the 1987 Forest Management Plans and proposed a range of outcomes in a Draft Forest Strategy, published in 1992. The review took into account the results of a new inventory of the jarrah forest, a review of the system of road, river and stream zones and an assessment of National Estate values for the Southern Forest Region. The review also took account of recommendations of the Ecologically Sustainable Development Forest Working Group and the Resource Assessment Commission.

The main changes proposed as a result of the review were:

- an increase of 120 000 hectares to the nature conservation reserve system to ensure it represented the full range of ecotypes;
- expansion of the stream reserve system to ensure all stream environments throughout the forest were protected with a zone of undisturbed vegetation, thereby distributing old growth forest throughout the landscape;
- the setting of structural goals to ensure the proportion of forest dominated by old trees does not fall below 40 per cent; and
- the introduction of visual resource management to protect high quality scenic areas.

A final Forest Management Plan was published in 1994 following extensive public submissions and consultation and a review under the Environment Protection Act. The Plan included a determination of the annual sustainable timber resource for allocation and a series of ministerial conditions.

### **3.4 Compliance and Monitoring**

The NFPS recognises the need for management of public native forests outside the reserve system to complement the objectives of nature conservation reserve management. Governments have agreed to develop a set of principles of forest practices to ensure the objective of ecologically sustainable management is met.

Codes of practice will be revised, or developed, to conform with these national principles. Monitoring and compliance mechanisms will be a major consideration in achieving off-reserve management.

An independent monitoring unit has been established in the Commonwealth Department of Primary Industries and Energy to implement new monitoring arrangements for woodchip export licence conditions. The unit will work in close cooperation with the State in the development and implementation of monitoring programs.

## **4. ANALYTICAL FRAMEWORK FOR THE DEFERRED FOREST ASSESSMENT**

## **4.1 Policy Background**

The aim of the Deferred Forest Assessment process was to ensure sufficient options for completion of a CAR reserve system by identifying the likely areas that may be required through a broad preliminary analysis. The Deferred Forest Assessment involved a preliminary conservation assessment of forested areas in the south west forest region against the reservation benchmarks of the Commonwealth and JANIS criteria described in Sections 3.2.1 & 3.1.3.

The forest values assessed were wilderness, old growth and biodiversity (both forest vegetation types and rare and threatened species). National Estate values and places were considered during the synthesis of information.

The preliminary assessments undertaken for the Deferred Forest Assessment form a first step towards the development of CRAs during which a far broader range of forest values will be examined. CRAs will develop methodologies to apply and provide outcomes for all the criteria proposed by the Commonwealth that will lead to a Regional Forest Agreement. It is intended that issues raised by stakeholders during the Deferred Forest Assessment process that are outside the scope of these preliminary assessments will be addressed in the Deferred Forest Assessment and CRA/RFA process.

Socio-economic considerations were based on knowledge of the industry and estimates of volume in the possible DFA areas. Further details on the preliminary socio-economic assessments are provided in Section 10 of this report. As for the conservation assessments, more detailed and extensive studies of socio-economic issues will be undertaken as part of the CRA/RFA process.

## **4.2 Region Boundary**

The boundary of the study area for the DFA is a boundary which includes all of CALM's three administrative regions (Swan, Central Forest and Southern Forest) in the south-west of Western Australia (See [Map 2](#)). This boundary encompasses 93 per cent of the jarrah forest (as mapped by Beard, 1981) and 98 per cent of the karri forest (as mapped by Bradshaw and Lush, 1981). The eastern outliers of the karri forest at the Porongorups and Mt Manypeaks are not included in the study area, however, all of the State forest available for timber production, is included.

The region is known as the 'south-west forest region'.

The region boundary may be reviewed for the Regional Forest Agreement.

## **4.3 Tenures and Forest Categories managed CALM**

The system of classification, reservation and vesting which applies to lands, including forest lands, and waters managed by the Department of Conservation and Land Management is described in detail in [Appendix 1](#).

The CALM Act as amended in 1991 lists seven categories of land to which the legislation applies. These are:

- (i) State Forest
- (ii) Timber Reserve
- (iii) National Park

- (iv) Conservation Park
- (v) Nature Reserve
- (vi) 5(g) Reserve
- (vii) Miscellaneous Reserve

In addition, the Department also manages land held freehold in the name of the Executive Director.

#### **4.4 Information availability**

The data sets used in the analysis of forest values in the Deferred Forest Assessment were the best available information at the State wide level in the time frame set for the Deferred Forest Assessment. Digital information was sourced from CALM and Australian Heritage Commission datasets. These datasets have different resolutions of accuracy. In interpreting results of overlaying the datasets using the GIS, account needs to be taken of the resolution of the component data.

The application of the Commonwealth criteria to examine conservation options for species and populations, with particular reference to fauna, were beyond the scope of the DFA. Before the criteria can be employed in a regional assessment of forests it is essential that detailed quantitative procedures are specified and that these are scientifically based, explicitly defined and formally agreed to by all relevant parties.

The key issues restricting the inclusion of fauna aside from rare and threatened species in the DFA were:

- the time-frame and preliminary nature of the DFA assessments;
- agreed methodologies to operationalise the Commonwealth biodiversity criteria;
- agreed decision rules for allocating priority species for assessment; and
- the adequacy of existing data to provide a consistent approach to assessment across all study areas.

#### **4.5 DFA Working Groups**

##### **4.5 1 DFA Technical Working Group**

The technical assessment work on which this report is based was carried out jointly by Commonwealth and Western Australian agencies during the period July 1995 to September 1995.

The following agencies participated in the assessment.

Commonwealth:

- Australian Nature Conservation Agency (ANCA)
- Australian Heritage Commission (AHC)
- Bureau of Resource Sciences (BRS)
- Department of Primary Industries and Energy (DPIE)
- Department of the Environment, Sport and Territories (DEST)
- Australian Bureau of Agricultural and Resource Economics (ABARE)
- Department of Prime Minister and Cabinet

Western Australia:

Department of Conservation and Land Management (CALM)

The technical data management and presentation work was mostly undertaken by the Western Australian Department of Conservation and Land Management.

#### **4.5.2 DFA Steering Committee**

The technical work was directed by a joint Steering Committee which included representatives of those agencies listed above which participated in the technical assessment.

#### **4.6 Commonwealth Scientific Advisory Group**

The Commonwealth's Scientific Advisory Group (SAG) was formed to advise the Government on the development of the Commonwealth's position paper on Criteria for National Forest Conservation Reserve (July 1995).

The Group was re-established to advise on issues arising from the application of the Commonwealth's reserve criteria during the DFA process. Four references to the SAG involved Western Australia, one considered the appropriateness of the forest type classification used in Western Australia, another looked at old growth reservation levels in southern jarrah and the two others examined biodiversity and old growth aspects of administrative reserves for the purpose of their accreditation in the Deferred Forest Assessment.

#### **4.7 Western Australian Scientific Panel**

The Western Australian Government established a Scientific Panel to review the issue of the contribution of the larger riparian and road reserves to a CAR reserve system. Details of their findings on this issue are found in Sec 6.2.3.

#### **4.8. Mechanisms for Protection of Conservation Values**

##### **4.8.1 Reserve Classification and IUCN Management Categories**

For the purposes of the DFA, areas were considered to be reserved if they occurred within land for which one of the primary management objectives is biodiversity conservation and which is not currently available for timber harvesting.

The following lists the current Western Australian tenures which fell in either of two categories:

1) Secure reserves, which includes National Parks, Conservation Parks, Nature Reserves, 5g Reserves and Miscellaneous Reserves; or

2) Informal reserves, which have a lesser level of protection, but which nevertheless are recognised formally, either in legislation, or through the administrative powers of the managing authority. It has been agreed that these areas are protected from timber harvesting during the life of the Deferred Forest Assessment. DFA accredited informal reserves are calculated from the total informal reserves minus deductions for those not accredited by the Commonwealth Scientific Advisory Group.

Details of the purposes of the land tenures is given in [Appendix 1](#)

The management regimes for dedicated reserves in Western Australia described above may be equated to protected area management categories defined by the IUCN Commission for National Parks and Protected Areas (1994).

The IUCN management categories relevant to the tenure and purpose of forest lands in Western Australia are Categories I, II, IV and VI defined as:

The area of 'formal reserves' quantified in the [tables](#) which follow in subsequent sections of this report include only IUCN Categories I and II.

Informal reserves (also known as administrative reserves or non statutory reserves) also form part of the nature conservation reserve system in Western Australia.

#### **4.8.2 Timber Harvesting Plan/Off Reserve Management**

Planning for timber harvest in the south-west forest region involves the coordination of pre-harvest activities which have lead times in some cases of up to five years before harvest commences. These activities include:

- dieback photography
- dieback mapping
- dieback demarcation
- seed forecasting
- regeneration surveys
- advance burning
- coupe concept plans
- road plans
- rare flora surveys
- road selection
- road construction
- coupe demarcation

The sequencing and integration of these activities is a complex planning task. Many factors influence where timber is harvested in any given year, these include: strategic fire protection buffers, permanent exclusion zones, temporary exclusion zones, protection of national estate values, visual resource management zones and silvicultural objectives for each forest stand.

The maps accompanying this report show areas available for timber harvest. Much of these areas are not available either in the short-term or the long-term because of these constraints.

A Code of Logging Practice and a Manual of Logging Specifications are applied to all timber harvesting operations in Western Australia's native forests. The Code and the Manual form part of a hierarchy of compliance mechanisms applicable to timber harvesting operations controlled by CALM.

The Forest Management Regulations (1993) contain provisions for registration of timber workers, identification of tree fellers and identification of log timber. Penalties apply to felling of trees outside approved coupes, unauthorised removal of log timber, failure to complete log delivery notes and many other regulations pertaining to timber harvesting.

Individual log supply contracts are negotiated between CALM and logging contractors. The Code and the Manual form an integral part of all log supply contracts and all forest produce licences. Breaches of the Code or the Manual are breaches of the contract or the licence. The Code also applies to operations on any private property where CALM is responsible for management of the timber harvesting operations.

CALM has established a Management Audit Unit which will check compliance with the Code and the Manual and other prescriptions and administrative procedures. Management monitoring procedures and performance indicators are also being developed

#### **4.9 Key Issues Arising from Public Consultation**

The comments received over the consultation period could be broadly grouped into two classes of submitters - those that considered any further reduction in industry access to forests unwarranted and those that considered the environmental assessments inadequate.

Submissions from conservation groups and conservation oriented individuals covered a wide range of concerns. Issues raised included the coarseness of the forest type analysis, exclusion of minor forest types, accreditation of informal reserves, confusion between gross and net assessments, incomplete wilderness assessment, less optimal selection of deferred areas and need to modify benchmarks to account for the rarity of karri old growth and refine the definition of old growth. Many issues have been addressed in this report: for example, the analyses and description of methods have been clarified, other forest types addressed and some analysis of the level of foreclosure reservation options. One of the key scientific issues, the forest type classification, was referred to the Commonwealth Scientific Group and the recommendations adopted. Many issues raised were more appropriate for consideration during the development of the Regional Forest Agreement. These issues include the consideration of the old growth definition, further review of informal reserves classification of forest types.

Submissions from industry and community organisations were concerned primarily that social and economic considerations be given due weight in the assessment period and that the consequences of reducing access to resource be properly considered in decisions on environmental protection.

Several submissions were received from groups and individuals associated with uses of forest land other than wood production. These submissions were noted and the need for early involvement of the full range of stakeholders during the CRA/RFA process is accepted. Comprehensive analyses of non-wood values and activities of forest areas will be undertaken as part of the CRA/RFA process.

### **5. BIODIVERSITY**

#### **5.1 Commonwealth Criteria**

The Commonwealth CAR reserve criteria position paper defines a broad benchmark of 15 % of pre-1750 distribution of each forest community to be protected within conservation reserves on a regional basis. The JANIS reserve criteria paper recommends a benchmark of 10 % of pre-1750 distribution. For the purposes of the Deferred Forest Assessment the reservation analysis adopted the Commonwealth criteria as the higher benchmark.

## 5.2 Methods and Data Sets

### Forest Types

The dominant forest types in the south-west forest region are the wet sclerophyll karri (*Eucalyptus diversicolor*) and dry sclerophyll jarrah (*E. marginata*). Other forest and woodland types also occur in the region. These include tuart (*E. gomphocephala*) and wandoo (*E. wandoo*).

Other eucalypts occur in mixture as codominants with those listed above, or occasionally in pure form. These include marri (*E. calophylla*), yarri (*E. patens*), red tingle (*E. jacksonii*) and yellow tingle (*E. guilfoylei*), which associate with both jarrah and karri and powderbark wandoo (*E. accedens*) which associates with wandoo and jarrah at the drier end of its range. *E. rudis* (flooded gum) lines the banks of major creeks and rivers.

### Aerial Photo Interpretation (API) Maps

The most accurate source of forest community information available is that using aerial photographic interpretation (API) of the Forests Department of Western Australia 1:15 40 scale photographs. API of Crown land hardwood forests in the south-west was completed in the period 1956-1966. This scale allows patches of about two hectares to be discriminated. These API data have been incorporated into CALM's Forest Management Information System (FMIS) database.

The classification is based on standard characteristics such as stand structure, crown cover and codominant height. The presence of tree species is recorded where it constitutes more than 20 per cent of the larger trees.

Additional classification of heathland (flats), non forest, thick scrub, fire damaged forests and senescent forest was also undertaken. This information was used to discriminate forest types from 'non forest' in the assessments.

### Forest Management Information System (FMIS)

The Forest Management Information System (FMIS) is a grid-cell based computer system for storing thematic maps, overlaying them, and extracting area statements. The maps for each 'theme' (eg tenure, forest vegetation type, or river watershed) are stored independently.

The cell size is approximately 140 metres square, which gives it an area of about two hectares. All map information is input and stored in eight kilometre square blocks of grid-cells, based on the Australian Map Grid coordinate system. The map data for the south-west forest region covers an area of about two million hectares. The main function performed by the system is map overlay and subsequent extraction of area statements and scale plots.

#### 5.2.1 Karri Forest

##### 5.2.1.1 Present Distribution

Karri forest occurs in the extreme south-west of the area south of a line from Nannup in the north-west through Manjimup to the Frankland River in the south-east. It extends further eastwards to Denmark, Torbay and Albany, but in this area it is confined to within 15 to 20 km of the coast. Two main outliers occur,

one on soils derived from coastal limestone at Karridale, the other on soils derived from weathered granite on the Porongurup Range north of Albany. Smaller outliers occur at Yallingup, Margaret River, Black Point, Rocky Gully and near the south coast adjacent to Mt. Manypeaks. Karri is largely confined within the 1100 mm isohyet (Christensen, 1992).

The karri occurrence in relation to soil types and topographic position is also very predictable. For example, in the Donnelly River valley karri occurs only in valley bottoms and lower slopes. In the Walpole area and along the D'Entrecasteaux coast karri occurs prominently in the uplands, with a sharp ecotone to jarrah or heathland vegetation. This is described in Bradshaw and Lush (1981).

Karri forest occurs in three distinct areas:

- (i) the west coast and a small number of outliers to the east as far as Lake Jasper,
- (ii) the main karri belt, east of the Darling Scarp to Irwin Inlet, and
- (iii) the south coast, which is a more patchy distribution of karri forest east of Irwin Inlet to Mt. Manypeaks and north to the Porongurup range.

The Porongurup Range and Mt Manypeaks outliers occur outside the boundary of the study area.

#### **5.2.1.2 Pre-1750 Distribution**

A number of previous reports estimating the original extent of the karri forest were described by CALM (1992). These reports were based on coarser information and over-estimated the original extent of karri forest.

The best source of information available is that using aerial photographic interpretation (API) of the Forests Department of Western Australia 1:15 840 scale photographs of the 1960s. This scale allows patches of about two hectares to be discriminated and thus gives a good estimate of the *net* area of karri forest. The interpretation of cleared karri forest within the main karri belt was done in 1981, using the 1960s photos, as part of the study by Bradshaw and Lush (1981). An estimate was also made of the original area of the outliers Bradshaw (pers comm.). It was estimated that at the most 5000 hectares of karri forest previously occurred on cleared freehold land in the Karridale area. Most of the karri forest that was cleared, was by ring-barking, and these trees were clearly visible on the photos. Therefore, most areas of cleared karri forest could be clearly identified by the presence of these dead trees. Additionally, for cleared areas where dead trees had been removed, interpretation of areas of cleared karri forest was done by assuming that the pattern of distribution of karri continued across the cleared boundary with the same relationship to landform as was present in the nearby forest.

An alternative source of available information from which to estimate the pre-European distribution of karri forest is that based on the work of Beard and Smith in compiling the vegetation survey of Western Australia. Smith mapped vegetation structure formations over the entire karri forest areas at a scale of 1:250 000. These maps show the various vegetation structure formations on *uncleared* land. No attempt is made to estimate the distribution of original vegetation structure formations at the 1:250 000 scale.

The 1:250 000 scale maps have been generalised by Beard (1981) to show the original vegetation at a scale of 1:1 000 000. Beard and Sprenger (1984) used the 1:1 000 000 scale maps of original natural vegetation and calculated areas of vegetation units by counting squares on an overlay grid in which each square represented an area of 200 hectares. It should be noted that most occurrences of karri forest are in patches of 10 hectares or less. The 1:1 000 000 scale map is clearly of the *gross* forest area, and as well as karri forest there are many non-forest and jarrah-marri forest areas included in the area mapped as 'tall forest'. Beard attributes the 'tall forest' category to mainly karri, with some jarrah and marri. Transparent overlays which showed alienated land, reserves and vacant Crown Land were used to estimate the area of each original natural vegetation unit that was cleared. Beard assumed reserves and vacant Crown Land were not cleared, and that all alienated land was cleared. Beard and Sprenger (1984) estimate the current area and the original area of karri forest. However, they note in their text 'Our karri figure ... is inflated by generalisations at the 1:1 000 000 scale including areas of other forest and non-forest types'.

*CALM's Aerial Photographic Interpretation of 1:15 840 scale aerial photographs was used to estimate the net area of pre-European distribution of karri forest.*

## **5.2.2 Jarrah Forest**

### **5.2.2.1 Present Distribution**

Jarrah forest occurs in a band approximately 60 km wide from Gingin in the north to Albany in the south. The height and density of the jarrah forest declines from west to east as a consequence of diminishing rainfall. East of the 900 mm rainfall isohyet the vegetation of the broad valleys becomes an open forest of wandoo and flooded gum, with jarrah and marri on the ridges.

### **5.2.2.2 Pre-1750 Distribution**

The early work of Diels (1906) recognised that, apart from the more obvious east-west trend, a north-south trend in species distribution is evident within the jarrah forest and is also reflected in the structure and composition of the forest.

A number of previous reports estimating the original extent of the jarrah forest were described by CALM (1992). These previous reports were based on coarser information and over-estimated the original extent of jarrah forest.

The best source of information available is based on the work of Beard (1981) in compiling the vegetation survey of Western Australia. Beard or Smith (1972-74) mapped vegetation structure formations over all of the jarrah forest areas at a scale of 1:250 000. Smith mapped the Collie, Busselton-Augusta and Pemberton-Irwin Inlet mapsheets, and Beard mapped all other mapsheets. Smith's maps show the various vegetation structure formations on *uncleared* land and he makes no attempt to estimate the distribution of original vegetation structure formations at the 1:250 000 scale. In contrast, Beard's 1:250 000 maps are of the original natural vegetation structure formations.

Smith's 1:250 000 scale maps have been generalised by Beard (1981) to show the original vegetation at a scale of 1:1 000 000. Beard and Sprenger (1984) used the 1:1 000 000 scale maps of original natural vegetation and calculated areas of vegetation units by counting squares on an overlay grid in which each square

represented an area of 200 hectares. The maps (both 1:250 000 and 1:1 000 000) are clearly of the *gross* forest area, and many non-forest areas are included in the area mapped as forest. Transparent overlays that showed alienated land, reserves and vacant Crown Land were used to estimate the area of each original natural vegetation unit that was cleared. They assumed reserves and vacant Crown Land were not cleared, and that all alienated land was cleared.

CALM has digitised the relevant Beard 1:250 000 mapsheets and Beards generalised 1:1 000 000 mapsheets of Smith's 1:250 000 maps.

*These maps were used as the primary data to estimate the gross area of pre-European distribution of jarrah forest.*

### **5.2.3 Other Forest Types**

It was agreed that for the DFA only two forest types - jarrah forest and karri forest would be assessed. These are the only two forest types where any significant wood production activity occurs. Other forest types will be assessed in the RFA, however comment on both the present level of distribution and the level of foreclosure of further reservation options is provided in the following section. No maps are available of the pre-1750 distribution of other forest types.

#### **Yarri (*E. patens*) also known as WA Blackbutt**

Yarri is mainly found in riparian communities and in addition to being protected in dedicated reserves it is very well protected in the river and stream reserve system. Yarri is harvested to only a minor extent, with some 1100 cubic metres of sawlogs harvested annually from Crown land, which is less than 0.2 per cent of the standing volume. Options for protection of yarri will not be significantly foreclosed over the next two years. Significant areas of yarri also exist on private property.

#### **Marri (*E. calophylla*)**

Marri occurs in mixture with jarrah, karri and wandoo. Occasional pure stands of marri are found within the main karri forest envelope. These are well protected in dedicated reserves. These pure marri stands are routinely excluded from timber harvest where they are encountered.

As logging coupe plans are prepared during the Deferred Forest Assessment period CALM will check the intersection of proposed timber harvest with National Estate values maps for pure marri forest, and through coupe planning will exclude from logging those areas which contain such values.

#### **Wandoo (*E. accedens* & *E. wandoo*)**

On the eastern edge of the jarrah forest, wandoo and powderbark wandoo form a woodland restricted to low rainfall areas (600-850mm). This forest/woodland type is estimated to cover approximately 110 000 hectares on lands managed by CALM. Whilst extensive timber harvesting once occurred in the wandoo forest, only 600 cubic metres of wandoo sawlogs was harvested in 1993/94 (CALM Annual Report). It is estimated that no more than 100 hectares of wandoo forest will be logged (mostly as a selective logging of regrowth forest) each year during

the RFA preparation. This is less than 0.1 per cent of the wandoo forest and represents a negligible level of foreclosure of options.

### **Tuart (*E. gomphocephala*)**

Tuart forms a woodland on the western coastal plain on soils derived from limestone. Nearly all of the tuart woodland on Crown land is within conservation reserves and no tuart timber is harvested.

### **Tingles**

Yellow Tingle (*E. guilfoylei*), Red Tingle (*E. jacksonii*), Rates Tingle (*E. brevistylis*)

Tingles occur in the extreme south of the geographic range of jarrah and karri forests in the highest rainfall and least seasonal part of the forest. The three Tingle species are very well protected in the dedicated reserve system and Yellow Tingle is the only one of the species harvested for timber to any significant extent. One hundred per cent of the known occurrence of Rates Tingle is protected in reserves and 98 per cent of Red Tingle is protected in reserves. Yellow Tingle is estimated to occur over 36 000 hectares with 23.6 per cent protected in dedicated reserves. It is estimated that another 15 per cent is protected in administrative reserves (Wardell-Johnson and Coates, in prep.). The Western Australian Minister for the Environment has recently asked CALM to further protect Yellow Tingle in Crown land tenures available for timber production. CALM will be developing operational guidelines to avoid timber harvesting in areas where Yellow Tingle is predominant in the stand. Options for further protection of Tingle *spp.* will not be significantly foreclosed over the next two years given the low level of harvesting on Crown land (less than 50 cubic metres of sawlogs in the last three years).

### **Sheoak (*Allocasuarina fraseriana*)**

Sheoak forms an understorey species and is protected in dedicated reserves. It is harvested to only a minor extent with some 1600 cubic metres of sawlog harvested annually from Crown land. This is less than 0.06 per cent of the standing gross bole volume within State forest so that options for protection of this species will not be significantly foreclosed over the next two years.

### **Other Forest Tree Species**

Other forest tree species which occur in the DFA region include Yate (*E. cornuta*), Buttergum (*E. laeleii*), Flooded Gum (*E. rudis*), Bullich (*E. megacarpa*), Mountain Marri (*E. haematoxylon*), Red-flowering Gum (*E. ficifolia*), Peppermint (*Agonis flexuosa*) and Warren River Cedar (*A. juniperina*). These species are well protected in dedicated reserves and are not generally harvested in routine timber production operations. Options for protection therefore, will not be significantly foreclosed over the next two years.

## **5.3 Results**

### **5.3.1 Analysis of 'Pre-1750' Distribution of Forest Types**

The analysis of pre-1750 distribution of jarrah forest estimates (tables) (Table 2) that 71% of pre-1750 jarrah forest remains. That is, 29% has been cleared since European settlement.

The area in formal reserves meets both the Commonwealth's (15%) and the JANIS (10%) reservation benchmarks.

The analysis of pre-1750 distribution estimates that 82% of pre-1750 karri forest (tables) (Table 3) remains. That is 18% has been cleared since European settlement.

The area in formal reserves meets both the Commonwealth's (15%) and the JANIS (10%) reservation benchmarks. In addition, there are large areas in the informal reserve system. There is, however, no need to consider informal reserves for the pre-1750 analysis. On this analysis no forest areas need to be deferred from timber harvesting so as not to foreclose options for a future CAR reserve system.

### **5.3.2 Sub Regional Analysis - Jarrah Forest**

Due to the broad geographic extent of the jarrah forest type it was considered desirable to undertake a sub-regional analysis (tables) (Table 4) to check whether the reserves in the jarrah forest adequately covered the geographic range and environmental gradients within the region.

Many authors have described the influence of climate, landforms and soils in determining the distribution of plant communities in the south-west forest area (Diels, 1906; Havel, 1968; Christensen, 1992). Rainfall is the most obvious east-west climatic gradient to utilise for this purpose. The evaporation gradient which operates in a north-south context is another primary influence on forest vegetation.

The 1000 mm rainfall isohyet was used to segregate high and low rainfall strata. The Preston River, with an eastward extension, was used to segregate the north-south evaporation gradient.

The area of jarrah forest in the formal reserve system in three of the sub-regions of the jarrah forest is above 10% demonstrating a reasonable spread of reservation across the geographic extent of jarrah forest types. The formal reservation level in the high rainfall northern jarrah is less than other regions although extensive informal reserves increase the level of protection.

For the high rainfall northern jarrah sub-region, the spread of formal reserves appears to cover the geographic range in that region. Informal reserves provide a practicable method of protecting additional areas within this sub-region. Informal reserves on 4th order and higher order streams (150400m wide) are estimated to comprise at least 40 per cent of the total area of Informal reserves in this sub region (based on data for the Southern Forest Region).

### **5.3.3 Forest Community Analysis - Southern Forest Region**

In order to check that particular forest communities are adequately distributed in reserves across the region, a forest community analysis was considered desirable

where data was available. The FMIS dataset was used to define four forest community types: jarrah, mixed jarrah, karri and mixed karri. This analysis could only be conducted for the southern Forest Region (tables) (Table 5). No equivalent data is available for the Central Forest and Swan Regions.

Since the analysis tabulated below is based on the present distribution of forest communities, for which there are no maps of pre-1750 distribution, the estimated benchmark for reservation was based on the extent of clearing of the broad forest types estimated in the pre-1750 analysis (Section 5.2.1.2 & 5.2.2.2) (refer to page 14 of the Commonwealth Reserves Criteria Paper).

Some 18 per cent of the karri forest is cleared, equating to a Commonwealth benchmark of 18 per cent of existing forest for the two karri forest community types. Some 28 per cent of the jarrah forest in the Southern Forest Region is cleared, equating to a Commonwealth benchmark of 22 per cent of existing forest for the two jarrah forest community types.

The current distribution shows that each of the forest communities in the Southern Forest Region are very well represented in the formal reserve system and that the area of each forest community exceeds the Commonwealth benchmark. There are also very large areas within informal reserves. No forest areas need to be deferred from timber harvesting so as not to foreclose options for a future CAR reserve system.

#### **5.3.4 Vegetations Complexes With Less than 10% Representation in the Formal Reserve System**

The issue of forest type disaggregation was referred to the Scientific Advisory Group. The SAG concluded that in the establishment of the DFAs, the precautionary principle should be paramount and should ensure that no poorly reserved forest communities are planned for logging during the Deferred Forest Assessment period.

The SAG also concluded:

'It is that it is unlikely that a more appropriate forest classification could have been used (for Western Australia) in the Deferred Forest Assessment timeframe. The SAG considers that disaggregation of types along the lines of a Havel classification needs to be addressed in the RFA process, but that this option was not realistic in the Deferred Forest Assessment timeframe. There appear to be no alternative interim measures that could be applied while the RFA studies are underway. A precautionary step would be to ensure that no poorly reserved forest communities are planned for logging during the DFA period. The application of the 15% rule should be used for all sub-regions in the DFA process to avoid the possibility of foreclosing options during the RFA process. Where the Commonwealth has agreed with the State to use a 10% basis to assess reservation levels within the broad geographic regions encompassed by the forest type, while maintaining the 15% level for the type as a whole then the precautionary step to avoid foreclosing on representativeness during the DFA would be to assess the logging plans to ensure that the level of logging would not foreclose options for further reservation of poorly represented communities as identified by Havel.'

The advice to maintain 15% in sub-regions as well as in the forest type as a whole takes a precautionary approach to representativeness because it is known

that the broad sub-regions contain a number of forest communities (as identified by Havel) that can be mapped at the appropriate scale.

CALMs' Forest Management Plan for 1994-2003 identifies a number of vegetation complexes which have less than 10% representation in the formal reserve system. The 1996 logging plan has been checked for the occurrence of logging in these vegetation complexes. Logging in 1996 is planned to occur in three of these vegetation complexes, namely Dwellingup, Lowden and Yarragil (minimum swamps). Ninety four per cent of the distribution of the Dwellingup (H) complex will not be logged in 1996, ninety six per cent of the Lowden complex, and ninety five per cent of the Yarragil (minimum swamps) complex will not be logged in 1996.

There are no significant foreclosure of options for these vegetation complexes to be included to a greater extent in a future reserve system, if necessary.

## **6. OLD-GROWTH FOREST**

The Commonwealth approach to old growth is based on the National Forest Policy Statement (NFPS) definition. The Commonwealth supports a regional approach to the development of old-growth methodologies and has endorsed the methodologies developed in Victoria by Woodgate et al (1994) as being one appropriate way to operationalise the NFPS definition for the DFA assessments. The definition of old-growth and its application to identifying old growth areas will be reconsidered during the CRA process and the RFA.

### **6.1 Commonwealth criteria**

The National Forest Policy Statement (1992) defines old growth forest as:

'Forest that is ecologically mature (the upper stratum or overstorey is in the late mature to over-mature growth phases) and has been subjected to negligible unnatural disturbance such as logging, roading and clearing.'

The Commonwealth's position paper describes a sliding scale for old growth reservation with the level required dependent on the percentage of the existing area of each forest community that is old growth. This sliding scale was used for the interim reservation of old growth under the Deferred Forest Assessment process.

#### **6.1.1 Old-growth Criteria for Widespread Forest Types**

The Commonwealth also recognises that the rarity or abundance of old growth may also need to be established in absolute terms, based on the remaining area of the forest type as a whole.

*'In the case of a forest type that is still relatively widespread and retaining large contiguous areas of old growth, for example, a somewhat lesser amount than that calculated from strict application of the linear scale, may prove adequate.'* (p19)

Western Australia's position for the Deferred Forest Assessment is that the southern jarrah forest is relatively widespread and retains large contiguous areas of old growth, therefore jarrah old growth should be protected at the percentage

levels prescribed in the Commonwealth Reserves Criteria Paper less 10 per cent. This issue was referred to the SAG. The SAG concluded,

*'The Group accepts that jarrah is a widespread species and is the dominant or codominant canopy species in the old growth areas under consideration. The Group agrees that the extensive nature of jarrah would warrant consideration under the flexibility criteria for old growth reservation benchmarks. However, the Group agreed that it would need to be satisfied either that the broad jarrah forest type is relatively homogenous in terms of structural and floristic diversity or, if the forest type is heterogeneous, that this heterogeneity is well sampled in the existing reserve system. The SAG considered that the information available was insufficient to disaggregate sub-units that might better reflect the biodiversity of the jarrah forest.'*

The SAG was unable to come to any conclusion either way on the basis of the available information and more information was required to properly consider the issue. The old growth jarrah benchmark is an issue that will be reconsidered in the preparation of a RFA.

Western Australia disagrees with this assessment but has agreed to apply the Commonwealth's criteria on old growth on a no prejudice basis for the purposes of the Deferred Forest Assessment.

## **6.2 Methods and data sets**

### **6.2.1 Availability of Maps and Data Sets**

The approach taken by Woodgate *et al.* (1994) in East Gippsland, Victoria was examined to determine its suitability for application in the south west forests. The identification of old growth in that study relied on combining datasets for 'forest growth stage' and 'disturbance'.

There is no broadscale mapping of forest growth stages in Western Australian forests and no mapped datasets which could be used as a surrogate for growth stage. The only types of disturbance for which mapped datasets exist are agricultural clearing, timber harvesting and roading. Anecdotal and qualitative information exists for past grazing and mining. The methods employed for this assessment are consistent with, and build on, the previous joint work carried out by CALM and the AHC (CALM/AHC 1992).

Logging records are only available for CALM-managed land tenures and so the old growth analysis was restricted to this land base. The history of land allocation in the south west coupled with anecdotal information indicates that it is likely that very little old growth forest remains on other Crown land or private property.

The minimum patch size for old growth used in the following analyses is two hectares, which is the grid cell size used in the FMIS system. The data used is correct as at December 1993.

The area of old growth forest is dynamic. As the effects of past disturbance diminishes and as trees reach the mature and senescent growth stages, new areas of old growth will be recruited. Other areas will cease to be old growth forest due to the effects of wildfires, windstorms, timber harvest or other disturbances.

### 6.2.2 Definition of Jarrah and Karri Old-growth

Several options for defining jarrah old growth were considered, however given the limitations in disturbance data and difficulties in verification, options other than 'virgin' forest were discounted. 'Virgin' forest provides the best available surrogate for old growth forest, according to the NFPS definition, for the Deferred Forest Assessment.

Due to the absence of mapped data pertaining to tree age and the nature of past disturbance, especially timber harvest, in the karri forest, 'virgin' forest is the only suitable surrogate for old growth forest for the Deferred Forest Assessment.

### 6.2.3 Accreditation of Road, River and Stream reserves (Informal reserves)

Both the NFPS and its implementation group (JANIS) state that informal reserves contribute to the reserve system. The NFPS states:

*'The nature conservation objectives are being pursued in three ways. First, parts of the public native forest estate will continue to be set aside in dedicated nature conservation reserve systems to protect native forest communities, based on the principles of comprehensiveness, adequacy and representativeness. The reserve system will safeguard endangered and vulnerable species and communities. Other areas of forest will also be protected to safeguard special areas and to provide links where possible between reserves or other protected areas. (NFPS 1992 p9)*

For old growth forest protection the Commonwealth's Reserve Criteria paper states that at least 40 per cent of the protected old growth should be in **dedicated** conservation reserves, indicating that the balance (20-50 per cent) can be protected in informal reserves.

The Commonwealth and WA could not agree on the extent to which informal reserves would be accredited and it was agreed to refer the issue to the SAG.

Prior to the consultation period, the SAG found that the system of informal riparian and road reserves in Western Australia made a definite, though non-quantifiable, contribution to the protection of conservation values in the south-west forests but that significant questions remain as to the ability of linear reserves to maintain the full range of attributes present in these forests in perpetuity.

The SAG recommended that a step-wise application of decision rules should govern the acceptance of linear areas as meeting CAR principles. As a precautionary measure, the SAG recommended that a buffer be added to the outer margins of all linear reserves considered for inclusion in CAR reservation benchmarks during the period of the Deferred Forest Assessment.

The Commonwealth's concern in relation primarily to edge effects has led to a deduction of the area of narrow linear reserves (60 metre wide 1st, 2nd and 3rd order riparian reserves and 200 metre wide road reserves) from the total area of formal and informal reserves.

The Commonwealth was prepared to adopt the SAG advice and accredit old growth forest within the larger riparian and road reserves provided that CALM

could demonstrate that they provided 'special significance' for representativeness. CALM subsequently provided detailed documentation on a number of these larger linear reserves.

The SAG undertook an investigation of the larger riparian and road reserves that CALM had nominated for their contribution to special significance. They concluded that portions of these reserves were likely to contribute to a CAR-based reserve system. For the Deferred Forest Assessment, the SAG accredited, partially accredited or conditionally accredited all of the large riparian reserves in the southern region of WA. Four of the large riparian reserves were accredited or conditionally accredited in the Central region. Sixteen of the 25 road reserves were accredited, partially accredited or conditionally accredited in the southern region of WA.

A deduction of 25 per cent of the area of 400 metre wide road reserves for karri and 15 per cent for jarrah for internal edge effects has also been made. The area of old growth forest which contributes towards meeting the benchmarks is therefore the sum of the area of old growth within formal reserves plus the area of old growth within 'DFA accredited informal reserves'. The area of 'DFA accredited informal reserve' is calculated from the total informal reserves minus the deductions outlined above. The resulting area has been termed the accredited reserve area.

Western Australia does not agree with the findings of the Scientific Group and this issue will be further considered in the RFA.

### **Western Australian Scientific Panel**

The Western Australian Government established a Scientific Panel to review the issue of the contribution of the larger riparian and road reserves to a CAR reserve system.

This Panel concluded that the conservation reserve system identified and proposed by the Western Australian Government, which includes a mixture of formal and informal reserves, meets the defined Commonwealth criteria in full. It further concluded that the larger riparian and road reserves clearly provide special significance and representativeness to the total reserve system in the forests of Western Australia.

The Panel also recommended that the retention of the total informal reserve system is a necessary requirement for the preservation of mature forest attributes in Western Australian forests. In relation to possible negative impacts of edges on linear reserves, the Panel was of the opinion that the Commonwealth position is vastly overweighted for the Western Australian situation and there is no justification for the buffering or discounting that the Commonwealth sought.

Notwithstanding the different positions of Western Australia and the Commonwealth this report presents the old growth data in the format the Commonwealth have requested, and interim protection arrangements are proposed below to satisfy the Commonwealth position.

CALM has undertaken to ensure that timber harvest will not foreclose options for wider informal reserves during the period of development of the Regional Forest Agreement.

This issue of the contribution towards benchmarks and the configuration of informal reserves will be reconsidered in the development of a RFA.

## **6.3 Results**

### **6.3.1 Analysis of Old-growth Karri Forest**

The analysis (tables) (Table 6) indicates that an additional 1 080 ha of old growth karri forest is required to meet the Commonwealth 60 per cent benchmark. The arrangements for interim protection of additional karri old growth areas is described in section 10.1.

### **6.3.2 Analysis of Old-growth Jarrah Forest**

The distribution of jarrah old growth is significantly different in the northern jarrah forest compared to the southern jarrah forest due to the historical pattern and progression of timber harvest. Hence old growth is rare in the northern jarrah forest and relatively common in the south. For this reason the jarrah old growth assessment was divided into northern and southern, with the Preston River dividing the two regions (tables) (Table 7).

In the northern forest at least 5 760 hectares of old growth jarrah would be required for additional protection to meet the minimum of 90 per cent protection for rare old growth. The practicability of reserving close to 100 per cent of the northern jarrah old growth was explored. The options for rescheduling were investigated. CALM forest managers advised that no other areas within a reasonable transport distance had had sufficient pre logging preparation to provide alternative resource. The economic and social impacts of removing access to the resource were assessed (see Section 10) to inform the decision on the practicability of greater than 90 per cent protection.

In the southern forest 28 190 hectares of old growth jarrah is required to meet the Commonwealth 60 per cent benchmarks. The arrangements for interim protection of additional jarrah old growth areas are described the area is described in Section 11.1.

### **6.3.3 Identifying Deferred Forests Areas for Old-growth**

#### **Southern Forest**

An additional 28 190 ha of jarrah and 1080 ha of karri old growth were required in order that the Commonwealth CAR benchmarks were met. The Commonwealth's position paper on Deferred Forest Assessments (April 1995) recommended maximising inclusion of National Estate places when considering options for the interim protection of forests. With this in mind national estate places, (containing the national estate value "B1 undisturbed forest and woodland") and jarrah or karri old growth as identified on the FMIS were examined for suitability for addition to a possible CAR reserve system.

The total area of old growth jarrah and karri in these national estate places in the southern forest is considerably greater than the area required to meet the benchmarks. The decisions on the subset of the National Estate places to include as DFAs were made with the aim of adding to the representativeness of the existing reserve system on the basis of representativeness and reserve design

principles outlined in the Commonwealth reserve criteria position paper (p26), and known variation in the jarrah and karri old growth.

Criteria included increasing the geographic coverage of old growth representation, improving links between existing reserves, enhancing the contiguity of old growth representation and increasing old growth representation where old growth was locally rare.

In choosing the final set of DFAs, consideration was given to the extent of pre logging activities, including roading, that had already been undertaken in the National Estate sub areas. Areas that had a higher rescheduling cost as a consequence of the pre logging activities already undertaken were avoided if the exclusion of these areas did not compromise the environmental objectives of the assessment outcomes.

### **Northern Forest**

Eighty per cent of old growth in the northern jarrah forest is protected in formal and informal reserves. This is below the Commonwealth benchmark of 90 percent protection of old growth, and necessitated an area of at least 5 760 ha of old growth jarrah forest to be deferred from timber harvesting in 1996 and 1997. Due to the scarcity of old growth in upland locations in the northern jarrah forest, deferred forest areas were chosen to achieve a wide distribution of remaining upland old growth forest.

#### **6.3.4 DFA Areas in the Southern Forests Region**

The following [tables](#) list the areas chosen to meet the old growth benchmarks for jarrah and karri.

### **Northern forest**

The areas that would need to be deferred in the northern forest to meet the 90 per cent benchmark are shown in the maps accompanying this report.

### **6.3 5 Conclusions**

The results of the old growth assessment showed that a total of 35 030 hectares of old growth in the south west forests would need to be deferred pending finalisation of the RFA. National Estate sub areas comprising 28,390 ha of jarrah old growth and 1210 ha of karri have been identified as DFAs in the southern forest region. A minimum 5 760 ha of old growth jarrah would need to be deferred from harvesting in the northern forest region.

In addition to the DFAs identified for karri old-growth there will be little foreclosure of options by timber harvesting in old growth forest in relation to the available area pending finalisation of a RFA. About 98 per cent of the old growth karri forest will still be available for a future reserve system, if necessary, after the next two years.

The total area of old growth karri forest is 83 500 hectares. All informal reserves are shown. None are available for timber harvesting. ([Graph 1](#))

In addition to the DFAs identified for jarrah old growth there will be little foreclosure of options by proposed timber harvest in old growth jarrah forest in relation to the available area, pending finalisation of a RFA. About 98 per cent in the southern forests and 94 per cent in the northern region of the total area of old growth jarrah forest will still be available for a future reserve system, if necessary, after the next two years.

The total area of old growth southern jarrah forest is 281 890 hectares. All informal reserves shown. None are available for harvesting. ([Graph 2](#))

The total area of old growth Northern Jarrah forest is 41 190 hectares. All informal reserves shown. None are available for timber harvesting. ([Graph 3](#))

The definition of old growth was a key issue raised during the consultation period and will need to be considered further for the RFA.

Submitters have argued that selection cut forests should also be included in the old growth definition.

The extent that selection cut forests may be included in the old growth definition is one of several issues that will need to be considered in choosing an appropriate old growth definition for different forest types. Other matters include disturbances other than timber harvesting that may change the character of old growth .

Without pre-judging the outcomes of a review of the definition of old growth the level of foreclosure of reserve options by harvesting lightly logged forest has been assessed.

In jarrah and karri forests, stands that have been harvested with gaps less than one hectare could be considered to be lightly harvested. These stands have been mapped and quantified (Bradshaw in prep.).

It is estimated that 35 400 hectares of karri forest, previously selection cut, exists in all CALM management tenures. The level of foreclosure of forests in this structural condition is approximately 700 hectares per annum. Ninety eight per cent of the lightly selection cut karri forest will be available for attainment of Commonwealth Reserve Criteria at the conclusion of the RFA.

An estimate of lightly cut jarrah forests, based on forest structure is 550 000 hectares. The level of foreclosure of forest in this structural condition is approximately 5 000 hectares per annum. Ninety-nine per cent of the lightly selection cut jarrah forest will be available for attainment of Commonwealth Reserve Criteria at the conclusion of the RFA.

## **7. Wilderness**

### **7.1 Commonwealth Criteria**

The Australian Heritage Commission's National Wilderness Inventory (NWI) has been adopted as the national method for assessing wilderness values. Under the NWI, wilderness quality is calculated by assigning values to land against the following factors:

- remoteness from settlement
- remoteness from access

- apparent naturalness
- biophysical naturalness

These indicators are combined to develop an overall indicator of relative wilderness quality. The various indicators constitute a database which, when supplemented with specific purpose data, may be useful for diverse purposes such as identifying wilderness, using various size thresholds, assessing impacts of proposals (eg road construction) and forecasting effects of management measures (eg road closures, restoration).

## **7.2. Methods and Datasets**

CALM applied the NWI model to the south-west forest region using CALM datasets for themes such as roads and disturbances. AHC officers checked the application of the model and coding of data.

Two processes for the assessment of wilderness quality were undertaken. The Commonwealth's preferred method was to apply a size threshold across all areas which were identified as having an NWI rating of 12 or more. CALM's preferred method was to apply a size threshold across areas which were identified using separate ratings thresholds for each of the four NWI components. This method was used to assess wilderness quality in East Gippsland and Central Highlands in Victoria in the joint studies undertaken by The Australian Heritage Commission and the Victorian Department of Conservation and Natural Resources. (AHC/CNR, 1994).

Initially, maps of NWI were produced using a one kilometre grid cell size. While this scale of data provided an overall view of the distribution of NWI 12 or greater wilderness, it was felt that a finer resolution was required in order to accurately identify wilderness areas. Further investigations using a grid size of 500 metres were therefore undertaken which enable wilderness areas to be assessed.

CALM's preferred size threshold was 10 000 hectares, while the Commonwealth preferred 8000 hectares. In undertaking the assessment of wilderness, both size thresholds were investigated. In addition, the separate NWI component threshold methodology preferred by CALM was also investigated. A sensitivity analysis using a range of thresholds for each indicator was undertaken to determine the effects of the thresholds on wilderness quality.

Applying the different methodologies allowed the separate analyses to inform the overall assessment of wilderness quality in the three regions.

Western Australia does not agree with the Commonwealth's criteria for wilderness reservation but has agreed to apply the Commonwealth's criteria on wilderness on a no prejudice basis for the purposes of the Deferred Forest Assessment.

## **7.3 Results**

The result of the applications of both CALM and the Commonwealth's preferred methodologies is that no wilderness areas were identified in the south west forests.

## **7.4 Conclusions**

It was agreed that the final determination of thresholds will be undertaken in the RFA.

## **8. NATIONAL ESTATE**

### **8.1 Consideration of the National Estate in the DFA**

In addition to the Commonwealth reserve criteria (old growth, wilderness and biodiversity), national estate values include:

- other natural values (eg natural processes, richness and diversity, scientific reference sites and geological and geomorphological sites); and,
- cultural values (eg archaeological sites, art sites, buildings and other structures, sites of historic events, sites associated with prominent historical figures, places of values to their communities).

Harvesting operations will be excluded from national estate places in the southern forests for 1996. The Commonwealth has requested that WA extend this undertaking to the end of 1997 or until a RFA is completed whichever is sooner.

### **8.2 Adverse Effects on National Estate Values**

The level of adverse effect of harvesting on national estate values, in a regional context, depends on such factors as:

- intensity of harvesting proposed;
- sensitivity of the particular values of the affected place; and,
- level of regional protection of those values in reserves, protected areas and other protection mechanisms.

These adverse effects will, to a large extent, be minimised at the operational planning level and through locally appropriate protection mechanisms.

Where the national estate values covered by the Commonwealth reserve criteria are

adversely affected by a harvesting proposal but the Commonwealth reserve criteria benchmarks are achieved, the AHC considers that the effect is not likely to be regionally significant.

National estate values not covered by the Commonwealth reserve criteria will be protected to varying degrees over the life of the interim protection measures. Some values are protected coincidentally along with Commonwealth reserve criteria values. Within the context of the outcomes of the DFA process some are coincidentally protected across the region.

Where the Commonwealth reserve criteria benchmarks have been achieved, the AHC considers that the equivalent national estate values to be regionally protected.

### **8.3 AHC Statutory Advice**

The AHC will provide advice on two Commonwealth decision-making processes:

- consideration of the DFA reports and associated agreements; and,
- consideration of woodchip export licences for 1996.

## **8.4 National Estate and CRA**

The Commonwealth believes that a full analysis of national estate values should be undertaken in each forest region as an essential step in the development of a robust RFA.

The Commonwealth's reserve criteria paper specifies that, when considering options for the interim protection of forests, the inclusion of national estate places should be maximised.

To maximise the consideration of national estate values within the DFA, the use of national estate was seen as a method for ensuring that any areas of potential 'deficit' against Commonwealth criteria could be located in areas where additional reservation formed meaningful additions to existing reserves.

The method used for maximising the inclusion of national estate is detailed in the Section 6.3.3.

## **9. THREATENED SPECIES**

Threatened Species that are known to occur in Western Australian forests and their habitats are managed as outlined in [Appendix 2](#) These procedures address the requirements of the Commonwealth *Endangered Species Protection Act 1992*. These procedures include the preparation of recovery plans, and the recognition of forest practices and planning procedures which are in place.

A detailed report was released in October 1995 for public comment. It is at [Appendix 2](#) of this report. Several issues been raised in the consultation period. These issues will be a high priority for early consideration in the RFA.

## **10. SOCIAL AND ECONOMIC ISSUES**

### **10.1 Industry and Community Issues**

#### **10.1.1 Economic Impact Assessments**

An assessment of economic values was conducted to determine possible economic and social impacts of protecting as close as possible 100 per cent of the remaining old growth forest in the Northern Region.

The area of old growth jarrah that would be required to reach 100 per cent protection is part of the Bell and Bednall forest blocks. The coupes in these forests contain an estimated 196 800 m<sup>3</sup> of harvestable logs, with around 11 per cent of these being pulplogs. In terms of final product value, an estimated \$31.5 million of timber products could be produced from the sawlog volumes based on the current product mix, while an estimated \$2 million of woodchips could be produced from sawmill residues and pulplogs from these coupes. A further \$5.9 million of other wood products could be produced from jarrah charcoal logs and other sawlog residues.

CALM have advised that 50 percent of logs from the identified areas would have been recovered in each of 1996 and 1997. It is expected that some rescheduling

of harvesting operations to meet the pullog volumes is possible, however, this would be likely to impose additional planning costs and roading operations.

The average annual volume of Jarrah sawlogs and veneer logs in the identified areas, however, is the equivalent of around 11 per cent of all jarrah harvested in 1994-95. CALM officers have indicated that rescheduling is not a possibility for the Bell and Bednall forest blocks areas over the period 1996 and 1997.

The first grade Jarrah sawlogs from the Bell and Bednall forest blocks area are scheduled for delivery to the Yarloop sawmill. Reduced supply of first grade sawlogs is expected to have a severe impact on the operation of this mill. CALM officers have indicated that such a reduction would represent a substantial reduction in throughput to this mill, and hence severely reduce its economic viability.

### **10.1.2 Community Impact Assessments**

As part of the social impact assessment component of the DFA process, six regional case studies were undertaken in forestry regions across Australia. The studies found that a number of features characterised communities largely dependent on forest industry, including relatively low education and training levels, narrow employment experience and opportunities and low household income of workers, a high degree of community stability (eg limited mobility, dependent children and high home ownership) and the concentration of the communities in small rural townships. Due to their limited resources to make adjustments to their employment and lifestyles these individuals and communities would be highly vulnerable to changes in resource access and industry structure that may result from the DFAs and RFAs. There is evidence that stress was emerging in some communities as a result of past forest use decisions and uncertainty and insecurity over future employment.

Forest communities are often concentrated in small rural townships, and services are likely to come under pressure if any significant population decline occurs. Education and health services are seen as particularly vulnerable.

Communities most vulnerable are those with a relatively low degree of economic diversity, where many small contractors, logging companies and direct suppliers to the forestry industry are directly dependant, while small retail, wholesale and service businesses are reliant upon the forest industry for a large proportion of their income.

Many of these features are typified by the township of Yarloop, in the Mornington Region of Western Australia. A detailed summary of the Yarloop social impact case study is in [Appendix 3](#).

The township of Yarloop is characterised by a relatively narrow economic base and is largely reliant on the timber industry for its economic activity and most individuals are involved in the industry in some way. The Yarloop sawmill provides direct employment for 91 people and is the largest employer in the town. Employees of Alcoa also reside within the town and this accounts for 7.3% of the town's employment being based in the mining sector.

The community assessment indicates that the Yarloop township would be significantly affected by any cutbacks to logging coupes in the Mornington Area.

## **10.2 Forest Industry Structural Adjustment Package**

The purpose of the Forest Industry Structural Adjustment Package (FISAP) is to facilitate structural change within the native forest industry sector to accommodate changes in the availability of the production forest resource and assist the development of a long term ecologically and economically sustainable forest industry.

In this context, the elements of the FISAP are designed to cushion the adverse impacts on businesses and workers employed in the native forests industry sector which have been directly adversely affected by the outcomes of the DFAs/RFAs and to provide incentives for businesses remaining in the industry to increase the level of value added processing.

In response to the potential impacts of the DFAs and RFAs on workers, businesses and communities, on 3 October 1995 a paper outlining the major elements of a general assistance package was distributed for comment, prior to developing the detail of a structural adjustment package.

The package is outlined in detail in [Appendix 4](#).

## **10.3 Other Resource Issues**

The focus of the Deferred Forest Assessment is on commercial sawlog and chipwood forest harvesting operations. Within the period of the interim protection measures, the impact of other activities such as mining, beekeeping, miscellaneous minor forest products such as firewood and fence posts, and grazing are generally unlikely to foreclose options for a comprehensive, adequate and representative (CAR) reserve system, although these land uses continue to be subject to the relevant Commonwealth and State environmental legislation.

Mining is a very significant land use in the Deferred Forest Assessment region, particularly in the bauxite rich areas of the northern Jarrah forest. In most cases, exploration and mining activities are locally intensive and, during the period of the DFA, it is unlikely that substantial extensive activities will occur that will not be subject to detailed environmental impact assessment under relevant State and Commonwealth legislation. On this basis mining access to deferred areas will not be restricted as a result of the DFA. Mining will be considered in CRAs along with other land uses.

## **10.4 Aboriginal rights**

Aboriginal rights will not be restricted as a consequence of the DFA process, however it is recognised that such rights will need to be explicitly addressed during the CRA/RFA process and that appropriate consultation mechanisms need to be developed to ensure stakeholder involvement.

## **Outcome of DFAs**

The assessments carried out for protection of biodiversity and wilderness values revealed that no forest areas need to be deferred from forest harvesting so as not to foreclose options for a CAR reserve system.

The attribute where a difference was found against the Commonwealth's criteria was for old growth jarrah and karri forest. The areas for deferral were determined on environmental criteria with the aim of choosing those areas that would best add to the conservation values of the existing reserve system (Section 6.3.3).

The parallel aim of the Deferred Forest Assessments was to minimise the social and economic impacts of deferring areas. Where rescheduling was possible deferral of areas could be made without impacting on the availability of resource, although there would be costs incurred through the rescheduling operations. Rescheduling costs also were minimised without compromising environmental objectives. Where rescheduling was not possible, as in the northern jarrah old growth, the final DFA outcomes were informed by the social and economic assessments undertaken of the potential impacts of removing the timber resource (Section 10).

### **11.1 Protection of Deferred Forest Areas**

Western Australia has maintained options to meet the proposed Commonwealth reserve criteria benchmarks for old-growth, wilderness and biodiversity benchmarks from publicly owned forests.

#### **Northern Jarrah Forest**

I) Given the significant economic and social impacts of obtaining 100 per cent protection of old growth in the northern jarrah forest the 90 per cent benchmark was considered the highest practicable. A difference of 5 760 hectares was identified to meet the 90 per cent reservation benchmark in the northern jarrah forest.

As an interim protection arrangement this area of jarrah old growth forest north of the Preston River will be deferred from timber harvest during the RFA preparation.

CALM will issue instructions to forest planners in the Swan Region and Central Forest Region to exclude these areas of jarrah old growth forest from coupes planned for timber harvest during 1996 and 1997 or until the RFA is completed, whichever is the sooner.

#### **Southern Jarrah Forest**

II) A difference of 28 190 hectares was identified between the Commonwealth 60 per cent benchmark and the accredited reserve area for the old growth in the southern jarrah forest.

As an interim protection arrangement 28 390 hectares of old growth jarrah forest will be deferred from timber harvesting within national estate places in the southern jarrah forest.

Sufficient large contiguous areas of old growth jarrah, representative of the geographic range, can be found in the following national estate places and sub areas:

**Table 1 Old growth jarrah in National Estate sub areas**

<b>National Estate Place</b>	<b>Sub Area</b>
Bow River	Irwin
Deep	South Weld
Denbarker	Hay
Frankland	Collis
Giblett-Hawke	Lower Donnelly
Giblett-Hawke	S.W. Carey Brook
Roe	Long
Shannon	Dordagup
Roe	Mt Roe
Crowea	Crowea
Deep	Weld
Shannon	Poole
<b>Total</b>	<b>28 390 ha</b>

III) A difference of 1 080 hectares was identified between the Commonwealth 60% benchmark and the total accredited reserve area for old growth karri forest.

As an interim protection arrangement 1210 hectares of old growth karri forest will be deferred from timber harvesting within National Estate places.

Sufficient additional large areas of old growth karri can be found in the following national estate places and sub areas.

**Table Old growth karri forest in National Estate sub areas**

<b>National Estate Place</b>	<b>Sub Area</b>
Giblett-Hawke	Lower Donnelly
Shannon	Dordagup
<b>Total</b>	<b>1210 ha</b>

The areas of jarrah old growth forest in the twelve identified national estate sub areas (and karri from the two identified national estate sub areas) will be excluded from timber harvest during 1996 and 1997 or until the RFA is completed which ever is the sooner.

Minor clearing of old growth jarrah forest may be necessary in these national estate sub areas, during the RFA period, and fire protection.

IV) In relation to riparian and roadside reserves, CALM will ensure that options for a CAR reserve system are not foreclosed during the DFA period by restricting

timber harvest to only one side of stream, river or road reserves during that period or by providing an additional buffer to these reserves or by discounting the contribution of these reserves.

V) as an additional precautionary measure the Commonwealth has requested Western Australia to extend the moratorium on logging in any National Estate place until the end of 1997 or until an RFA is signed, whichever is the sooner

## **11.2 Issues for Consideration in the Preparation of a RFA**

There are a number of issues which arose during the Deferred Forest Assessment, which will need to be addressed by the governments during the preparation of a Regional Forest Agreement. These issues include:

- Region boundary and utilisation of IBRA regions
- Definition of forest
- Definition of old growth forest - clarification of disturbance and growth stage data
- Benchmark for old growth forest
- Assessment of forest types, other than jarrah and karri
- Contribution of administrative reserves to CAR values
- Forest types on all land tenures
- Completion of the National Wilderness Inventory
- Finer scale of biodiversity assessment
- Methodology for wilderness assessment, including thresholds for individual wilderness indicators
- Reserve criteria to be used.

## **12. DEFERRED FOREST AGREEMENT**

A [Deferred Forest Agreement](#) will ratify the key obligations of each Government in respect of the outcomes of the Deferred Forest Assessment. It will include obligations for management of and access to deferred areas and will incorporate a mechanism for review of the DFAs designated by the agreements should this be required by exceptional circumstances.

## **13. MAPS**

Summary [maps](#) A3 size are attached to the end of this report. The scale of the maps is approximately 1:500 000. The maps show existing national parks and formal reserves, Deferred Forest Areas and remaining forest on public land. Due to technical difficulties it has not been possible to show informal reserves in the northern jarrah forest.

## **14. IMPLEMENTATION OF THE NFPS**

### **14.1 Development of CRAs/RFAs**

It is emphasised that the Deferred Forest Assessment process provides an interim arrangement to ensure that options for a CAR reserve system are not foreclosed by logging activities whilst the CRA and RFA process is completed for each region.

CRAs will encompass studies covering old growth, wilderness, biodiversity, endangered species, national estate values, world heritage values, social impacts

(including community needs and values) and economic values of the forested areas. Once complete, the CRA will allow the development of long-term management arrangements through the negotiation of RFAs between the Commonwealth and States, taking into account the full range of social and economic benefits and costs of alternative forest use options.

### **14.1.1 Scoping Agreements**

To progress the CRA/RFA process, Commonwealth and State officials have drafted [Scoping Agreements](#) which will commit Governments to proceed to the negotiation of RFAs and to establish processes and timetables for their completion. It is expected that RFAs will be completed over the next one to three years, depending on the availability of data.

The Scoping Agreements specify the studies and processes which will constitute the environmental, economic and social components of the Comprehensive Regional Assessments. They also determine a process for the accreditation of each party's data and processes and provide for agreement on codes of forest practice and other management arrangements for forests within RFA boundaries.

### **14.2 Wood and Paper Industries Strategy**

The [Wood and Paper Industries Strategy](#) will provide a basis for the future development of both plantation and native forest-based industries. In doing so, it will complement both the RFA process, which will determine the resource available to the native forest-based industries, and the structural adjustment package, which will address the needs of those adversely affected by the constraints which the RFAs will place on access to native forests.

The Strategy complements the DFA/RFA processes by creating further avenues for promoting ecologically sustainable management of forest resources and increasing the value added to the resource by domestic processors. In addition, it focuses on expanding and fully utilising Australia's plantation resources, and improving regional employment and training opportunities. It is also proposed that a Wood and Paper Industry Council, chaired by the Minister for Industry, Science and Technology with members from industry, unions and government, be established to progressively implement and further develop the Strategy.

### **14.3 Woodchip Export Licences**

The DFA provides the basis for the Commonwealth consideration of environmental considerations in issuing woodchip export licences for 1996 with the surety that areas made available for harvesting, pending finalisation of RFAs, will not compromise the ability to develop a comprehensive adequate and representative reserve system and that other Commonwealth obligations are met.

The decision on export licence approvals rests with the Federal Minister for Resources who will have regard to the outcomes of the DFA process, advice from the Federal Minister for the Environment, Sport and Territories and from the Australian Heritage Commission in making a determination on export licence applications for 1996.

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## **Appendix 1: Vesting, Tenure and Purpose of Land Managed by CALM**

**The following describes the system of classification, reservation and vesting which applies to lands, including forest lands, and waters managed by the Department of Conservation and Land Management.**

### **CATEGORIES OF LAND MANAGED BY THE DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT**

The CALM Act as amended in 1991 lists seven categories of land to which the legislation applies. These are:

- (i) State Forest
- (ii) Timber Reserve
- (iii) National Park
- (iv) Conservation Park
- (v) Nature Reserve
- (vi) 5(g) Reserve
- (vii) Miscellaneous Reserve

In addition, the Department also manages land held freehold in the name of the Executive Director.

Public participation in the management planning process is provided for, with a minimum two-month period during which written submissions will be considered.

### **THE CONTROLLING BODIES AND THE DEPARTMENT**

The proclamation of the Conservation and Land Management Act in 1985 established two controlling bodies (the National Parks and Nature Conservation Authority and the Lands and Forest Commission) in which land is vested. The Act also established the Department of Conservation and Land Management which is responsible for management of the land vested in the controlling bodies.

The membership of the controlling bodies is representative of the many community interests associated with the lands vested in them.

### **VESTING AND MANAGEMENT**

State forests and timber reserves are vested in the Lands and Forest Commission (LFC). National parks, conservation parks and nature reserves are vested in the National Parks and Nature Conservation Authority (NPNCA). 5(g) Reserves and miscellaneous reserves may be vested in either body.

The Department is responsible for management of lands vested in the Authority and the Commission. Management is carried out according to government policies, and as specified in management plans submitted by the controlling bodies and approved by the Minister for the Environment.

### **Tenure**

'Land tenure' is the term used to describe the form of right, or title to land. The two broad classes of land tenure are private land and Crown land. Crown lands

which are managed by the Department fall into two broad categories: reserves and State forests.

## **SECURITY OF TENURE OF LAND**

In Western Australia, the security of tenure of Crown land reserves varies, depending upon whether the reserve is Class A, B or C.

A Class reserve - tenure can be changed only by agreement of both Houses of the Western Australian Parliament.

B Class reserve - tenure can be changed by the Governor of Western Australia on the recommendation of the Minister, without approval by Parliament. However, the reasons for any change must be reported to Parliament by the Minister for Lands.

C Class reserve - tenure can be changed by the Governor, on the recommendation of the Minister. However, any changes must be published in the Government Gazette.

This system therefore determines the degree of difficulty involved in changing the tenure of Crown land.

Most national parks and nature reserves are A Class reserves. However, some national parks and nature reserves were given B or C Class status when they were created many years ago and this status has persisted.

The security of tenure of State forest is the same as that of an A Class reserve. State forest is not a 'reserve', and therefore is not classed A, B or C. However, any change to the tenure of a State forest requires the agreement of both Houses of Parliament.

Land for which no management plan exists is to be managed by the Department in accordance with the purpose of the land, as specified in section 56 of the Act. In the case of national parks, nature reserves and conservation parks which do not have a management plan, only necessary operations may be undertaken. These operations are defined as 'those that are necessary for the preservation or protection of persons, property, land, flora and fauna or for the preparation of a management plan'.

## **TENURE CATEGORIES**

The categories used for the classification of tenure are described in detail here. The descriptions have been compiled from the CALM Act, the three Forest Regional Management Plans of December 1987, the Forest Management Plan 1994-2003 and various management plan documents.

In the following the terms **Land Act (1933)** reserve and **Crown reserve** are used interchangeably, and have the same meaning. Also the convention of capitalising the tenure categories has been adopted for emphasis and consistency and to avoid confusion with other interpretations, e.g. Timber Reserve under the CALM Act versus Land Act timber reserve (Crown reserve with purpose 'Timber').

### **(i) State Forest**

Within the meaning of the CALM Act, land categorised as *State Forest* is Crown land reserved under the CALM Act which:

- immediately before the commencement of the CALM Act was dedicated as a *State Forest* under the *Forest Act 1918*.. (On the proclamation of the CALM Act all of these lands were automatically vested in the Lands and Forest Commission.);
- After the commencement of the CALM Act is reserved or set aside and vested in the LFC for the purpose of *State Forest*.;

*Vesting:* Lands and Forest Commission.

*Security:* Identical to A Class Land Act (1933) reserves, in that the agreement of both Houses of Parliament is required before tenure can be changed.

*Management Purpose:* One or more of the following purposes:

- (a) conservation
- (b) recreation
- (c) timber production on a sustained yield basis
- (d) water catchment protection
- (e) other purpose prescribed by the regulations

*Identification:* *State Forest* Number.

*Established by:* Forest Act (1918), superseded by CALM Act (1984). Amended (1991)

*Act Reference:* Sections 5(a), 6(1)(c), 55 1(a).

### **(ii) Timber Reserve**

Within the meaning of the CALM Act, land categorised as *Timber Reserve* is Crown land which:

- immediately before the commencement of the CALM Act was dedicated as a *Timber Reserve* under the Forest Act 1918. (On the proclamation of the CALM Act all of these lands were automatically vested in the Lands and Forest Commission);
- after the commencement of the CALM Act is reserved or set aside and vested in the LFC for the purpose of *Timber Reserve*.

*Vesting:* Lands and Forest Commission.

*Security:* Similar to C class.

*Management Purpose:* One or more of the following purposes:

- (a) conservation
- (b) recreation
- (c) timber production on a sustained yield basis
- (d) water catchment protection
- (e) other purpose prescribed by the regulations

*Identification:* Forest Department (FD)/CALM timber reserve number.

*Established by: Forest Act (1918), superseded by CALM Act (1984). Amended (1991)*

*Act Reference: Sections 5(b),.6(2)(c), 55 1(a)*

*Comment: Land Act (1933) land reserved for the purpose of 'Timber' and vested in the Executive Director is included under Miscellaneous Reserves.*

### **(iii) National Park**

Within the meaning of the CALM Act, land categorised as *National Park* is land reserved under the Land Act (1933), which:

- Immediately before the commencement of the CALM Act was a *National Park* under the *National Parks Authority Act 1976*.. (On the proclamation of the CALM Act all of these reserves were automatically vested in the National Parks and Nature Conservation Authority (NPNCA).)
- After the commencement of the CALM Act is vested in the NPNCA for the purpose of *National Park*.

*Vesting: NPNCA.*

*Security: A, B or C Class.*

*Management Purpose: Wildlife and landscape conservation, scientific study, preservation of features of archaeological, historic or scientific interest, together with recreational enjoyment by the public.*

*Identification: By name (whether named 'officially' or otherwise) or by individual Crown Reserve(s) forming the *National Park*.*

*Established by: Land Act (1933).*

*Act Reference: Sections 5(c), 6(3)(c).*

*Comment: The inclusion of the phrase 'National Park' in the name of a reserve does not imply a tenure of *National Park* within the meaning of the CALM Act. Examples of this are Crown Reserve 20215 which has a purpose of 'National Park' and vested in the Shire of Albany, and Crown Reserve 32601 which has a purpose of 'National Park and Historic Building' and jointly vested in the National Trust and the Executive Director of CALM.*

### **(iv) Conservation Park**

Within the meaning of the CALM Act, land categorised as *Conservation Park* is land reserved under the *Land Act (1933)* which:

- Is vested in the NPNCA for the purpose of *Conservation Park*.

*Vesting: NPNCA.*

*Security: A or C Class.*

*Management purposes: Identical to *National Park*.*

*Identification:* By name (whether named 'officially' or otherwise) or by individual Crown Reserve(s) forming the *Conservation Park*.

*Established by:* *Land Act (1933)*.

*Act Reference:* Sections 5(ca), 6(4).

*Comment:* *Conservation Parks* differ from *National Parks* only in their significance, size or condition. They are managed as if they were *National Parks*. The difference is that these areas do not have major national or international significance, are relatively small, or the landscape or biota have been affected by past land use.

### **(v) Nature Reserve**

Within the meaning of the CALM Act, land categorised as *Nature Reserve* is land reserved under the *Land Act (1933)* which:

Immediately before the commencement of the CALM Act was a *Nature Reserve* under the *Western Australian Wildlife Authority Act 1950* and vested in the Western Australian Wildlife Authority, either solely or jointly.

On the proclamation of the CALM Act all of these reserves were automatically vested, solely or jointly, in the National Parks and Nature Conservation Authority (NPNCA).

After the commencement of the CALM Act is vested in the NPNCA for the purpose of *Conservation of Flora or Fauna*, or both *Flora and Fauna*.

On the proclamation of the *CALM Amendment Act 1991* (amendment number 20 of 1991) was an unvested *Nature Reserve* under the *Western Australian Wildlife Authority Act 1950*. (These were automatically vested in the NPNCA.)

*Vesting:* National Parks and Nature Conservation Authority.

*Security:* A, B or C class.

*Management Purpose:* Wildlife and landscape conservation, scientific study and preservation of features of archaeological, historic or scientific interest.

*Identification:* By name (whether named 'officially' or otherwise) or by individual Crown Reserve(s) forming the *Nature Reserve*.

*Established by:* *Land Act (1933)*.

*Act Reference:* Sections 5(d), 6(5)(c).

*Comment:*

### **(vi) 5(g) Reserve**

Within the meaning of the CALM Act, land categorised as *5(g) Reserve* is land reserved under the *Land Act (1933)* which:

Is vested in the NPNCA or the Lands and Forest Commission (LFC) that is not a *National Park*, *Conservation Park*, *Nature Reserve*, *Marine Park* or *Marine Nature Reserve*.

Immediately before the commencement of the CALM Act, was vested in, or under the control and management of, the National Parks Authority but not as a *National Park*. (On the proclamation of the CALM Act all of these reserves were automatically vested in the National Parks and Nature Conservation Authority (NPNCA).)

*Vesting:* Lands and Forest Commission or National Parks and Nature Conservation Authority.

*Security:* Normally B or C class.

*Management Purposes:* These reserves have a wide variety of purposes, but normally are related to recreation, wildlife conservation and historical features. As with Timber Reserves, this classification is often transitional, and on further evaluation the classification can be changed to a more appropriate one.

*Identification:* Crown Reserve number.

*Established by:* *Land Act (1933)*.

*Act Reference:* Section 5(g).

*Comment:*

#### **(vii) Miscellaneous Reserve**

Within the meaning of the CALM Act, land categorised as *Miscellaneous Reserve* is land reserved under the *Land Act (1933)* which:

- Immediately before the commencement of the CALM Act was vested in a former departmental head or authority and is not covered by any of the classifications (i) to (vii). (On the proclamation of the CALM Act all of these reserves were automatically vested in the Executive Director.)
- After the commencement of the CALM Act is vested in the Executive Director and is not a *5(g) Reserve*.

*Vesting:* Executive Director.

*Security:* A, B or C Class.

*Management Purposes:* Various

*Identification:* Crown Reserve number.

*Established by:* *Land Act (1933)*.

*Act Reference:* Sections 36, 38.

*Comment:*

#### **RESERVE CLASSIFICATION AND IUCN MANAGEMENT CATEGORIES**

The management regimes for dedicated reserves in Western Australia described above may be equated to protected area management categories defined by the IUCN Commission for National Parks and Protected Areas (1994).

The IUCN management categories relevant to the tenure and purpose of forest lands in Western Australia are Categories I, II, IV and VI defined as:

**Category I Strict Nature Reserve/Wilderness Area: protected areas managed mainly for science or wilderness protection:**

Areas of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological feature and/or species, available primarily for scientific research and/or environmental monitoring.

Large areas of unmodified land, or slightly modified land, or land and water, retaining their natural character influence, without permanent or significant habitation, which are protected and managed so as to preserve their natural condition.

**Category II National Park: protected area managed mainly for ecosystem protection and recreation:**

Natural area of land and/or sea, designated to:

- (a) protected the ecological integrity of one or more ecosystems for this and future generations;
- (b) exclude exploitation of occupation inimical to the purposes of designation of the area; and
- (c) provide a foundation for spiritual, all of which must be environmentally and culturally compatible.

**Category IV Habitat/Species Management Area: protected area managed mainly for conservation through management intervention:**

Area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species managed for the sustainable use of natural ecosystems.

**Category VI Managed Resources Protected Areas:**

Areas managed for the sustainable use of natural ecosystems.

**Table 1: - IUCN categorisation for forest lands in Western Australia**

<i>Land Category (CALM Act)</i>	<i>IUCN Category</i>
State forest	VI
Timber reserve	VI
National park	II
Conservation park	II
Nature reserve	I
5g reserve	II and VI
Miscellaneous reserve	I, II and VI

The area of 'formal reserves' quantified in the tables which follow in subsequent sections of this report include only I and II.

## **PRINCIPLES FOR 'INFORMAL' RESERVES TO BE INCLUDED IN A CAR FOREST RESERVE SYSTEM**

The Commonwealth Reserves Criteria Paper proposed a set of principles for the inclusion of forest reserves other than those in the 'dedicated' reserve system (IUCN categories I, II and IV).

The criteria required for inclusion are:

- they contain and are managed for conservation values which unequivocally contribute to the CAR system;
- they have a sound basis in legislation (for example, management plans required under legislation);
- there is the provision of opportunity for public comment on changes to reserve boundaries, and decisions on their establishment and alteration are politically accountable;
- they are able to be accurately identified (on maps);
- they are of sufficient area and adequate design to contribute to the continued viability of the values they seek to protect.

Some of these reserves could have flexible boundaries that might change over time to reflect forest dynamics and the effects of climate change but the conservation 'rules' that determine the area and vegetation type and structure required should remain constant. (*Commonwealth of Australia, 1995*)

The National Forest Policy Statement (1992) defined 'Nature Conservation Reserves' as areas of publicly owned land, including forested land, managed primarily for nature conservation and providing multiple benefits and uses such as recreation and water catchments but excluding wood production. The riparian, diverse ecotype and travel route zones designated in south-west forests meet the NFPS definition.

## **ANALYSIS OF HOW INFORMAL RESERVES MEET THE COMMONWEALTH'S CAR RESERVES CRITERIA**

The Forest Management Plan 1994-2003 identifies three types of 'informal' reserves from which timber harvesting is excluded. Travel route zones, 200 metres to 400 metres wide along level 1 and level 2 travel routes; riparian zones 60 metres to 400 metres wide along all streams, valley headwaters and seepage areas; diverse ecotype zones around wetlands, heath, sedge, herb and woodland communities.

It is impractical for these zones to be included as part of the dedicated reserve system because of the huge cost and difficulty of surveying the boundary of these sites for the purpose of gazettal.

### **Conservation values which contribute to the CAR system**

Riparian ecosystems (sites with high moisture and high nutrient status) have special importance for species richness and abundance in a range of vertebrate fauna (Wardell-Johnson *et al.*, 1991). These sites provide a critical source of diversity within a forest system.

Sites lowest in the topography are most valuable for the spectrum of bird species found in any particular forest type and include greater numbers of individuals

than upland sites. Sites lowest in the landscape are also valuable for other vertebrate groups and for invertebrate conservation. Many known vulnerable species tend to be found only in lowland habitat and these sites need to be priority areas in wildlife conservation (CALM, 1992)

In the karri forest, small mammals reach their highest numbers (species and individuals) in sites low in the topography (Christensen and Kimber, 1975). The water rat (*Hydromys chrysogaster*) and the quokka are most common in these sites.

Endangered and threatened fauna that favour riparian habitat include Orange-bellied Frog, Chuditch, Western Ringtail Possum and White-bellied Frog. Species on the Western Australian list that favour riparian habitat include Southern Brown Bandicoot, Tammar Wallaby, Karri Minnow, Short-nosed Snake, Red-eared Firetail.

Sites lowest in the profile are most valuable for the full spectrum of amphibians found in the karri forest including species restricted to these sites (e.g. the frog *Geocrinia lutea*; Wardell-Johnson and Roberts, 1991). All reptiles known in the karri forest also occur in stream zones including two that are most common there (*Chelodina oblonga* and *Egernia luctuosa*).

The aquatic invertebrate fauna of the karri forest is imperfectly known, but research in the jarrah forest in the south-west of Western Australia (Bunn, 1986; Bunn *et al.*, 1986) suggest that 200-300 species of macro-invertebrate and a large number of smaller animals occur. Many of the species are endemic to Western Australia, and probably a considerable number including Gondwanan relicts are restricted to the karri forest.

Eight species of native fish occur in karri forest streams, seven of which are endemic to south-western Australia. Shelter is important to most species of fish, largely because it provides refuge from the current, and they tend to congregate where log jams or changes in stream contour provide this.

Informal reserves make an essential contribution to the adequacy of the total reserve system, which is essential for a reserve system which aims at a reservation level of 10-20 per cent. Informal reserves provide essential corridors and links between the dedicated reserve system areas. Historical evidence and observation indicates that informal reserves remain viable in the short-term, and rapid regrowth of areas adjacent to the reserves ensures that long-term viability is maintained.

Retained linear strips of mature karri forest have been shown to provide very important nature conservation values. Wardell-Johnson and Williams (in press) showed a very slight and temporary reduction, attributable to timber harvesting, of the total detection of birds in narrow remnants versus sites near the edge of wide remnants. There was no significant impact on any individual species of bird. The retained mature forest had a strong positive effect on the bird community in the adjacent logged forest. The results demonstrated a slight and temporary negative edge effect on the bird community within the retained linear strip, which was more than balanced by a major positive edge effect on the bird community within the adjacent logged forest.

Research has indicated that to be effective in protecting water quality, stream buffers should protect both permanent and ephemeral streams, including headwater seepage areas and spring heads, and should extend along the entire

stream length (Borg *et al.* 1987; Borg *et al.* 1988; CALM, 1992). CALM's stream reserves are much wider than necessary for the protection of water quality and are designed for broad nature conservation values (CALM, 1988).

Riparian zones also protect significant areas of old growth forest. Timber harvest prior to 1940 largely excluded stream zones because of the railway formation and extraction systems employed in logging. Riparian zones therefore contain a high proportion of their area as old growth forest.

The variable minimum width of riparian zones according to stream order is presented in the table below:

<i>Stream Order</i>	Width either side (approx.) (m)	Total width (approx.) (m)	Minimum width either side (m)
First	30	60	20
Second	30	60	20
Third	30	60	20
Fourth	75	150	50
Fifth	200	400	100
upwards			

The selection of the boundary of riparian zones requires field officers to identify and demarcate the distinctive riparian vegetation to be excluded from timber harvest. In many cases the width of the riparian zone is much (where it exists) wider than the minimum width prescribed according to stream order. Where stream terraces are identified, they are fully protected by the zone width.

In addition to riparian zones, there are a large number of sites of exceptional importance because of habitat diversity. For example, areas of heathland, sedge and herb vegetation, rock outcrops, swamps, lakes, wetlands and woodland formations can have outstanding species richness (Hopper *et al.*, 1992; Wardell-Johnson and Christensen, 1992).

These sites often represent ecotones between major landscape features. Ecotonal features are known to be significant and valuable sites for wildlife conservation (Wardell-Johnson *et al.*, 1991).

Travel route zones which are between 100 metres and 200 metres wide and often several kilometres in length also provide for important nature conservation values. They are often representative of upland sites because of the tendency for major roads to be located on ridgelines. They also contain old growth forest values and habitat components such as hollows for birds and mammals which require them. These zones also provide corridors which link catchments.

Informal reserves are critical for the conservation of floral biodiversity. Most rare flora species occur in informal reserves. Granite outcrops, diverse ecotypes and riparian areas are the prime habitats for these species (Kelly *et al.* 1990, Hopper *et al.* 1992). Three species of endangered flora and nine species of vulnerable flora occur in riparian areas within multiple use State forest. Riparian areas sample a very large range of both overstorey and understorey vegetation types

and road reserves increase the representation of upland vegetation types (Havel 1975, Hedde *et al.* 1980, Strelein 1988).

Much more variation occurs in riparian vegetation communities than in upland areas. To be comprehensive and representative it is therefore important that the reserve system has some bias towards riparian areas.

Strips of retained forest are able to serve several roles which large blocks cannot (Taylor, 1990). By spreading the undisturbed forest over a wider area, more diverse types of habitat can be retained. A broader range of species can be catered for and their value in providing refuge will be maximised. This can be particularly important for invertebrate species with poor dispersal ability. Informal reserves provide old growth forest characteristics throughout the landscape. Nest sites are then provided close to feeding sites, and these areas provide sites from which rapid recolonisation of regrowth areas can occur.

Harris and Scheck (1991) argue that a managed, interconnected system of protected areas that utilises movement corridors is better than a system of dispersed protected areas with no connected corridors.

The nature conservation value of the riparian, diverse ecotype and travel route zones is enhanced by the sympathetic management of adjoining forest which is subject to timber harvest, but is also managed to preserve the extent of flora and fauna (Christensen, 1992).

Nesting hollows are the principal nature conservation value of old growth forest. Recent studies have shown that logging of jarrah forest has had little impact on the availability of hollows. These studies have also shown that very few hollows are used, therefore, hollows are not a limiting factor for the fauna.

The informal reserves require only minor variations to normal forest management to maintain the biological and old growth values that they protect. During timber harvest operations, entry of logging equipment is excluded from these zones, unless specifically authorised by a forest officer. Thinning and removal of dangerous trees is permitted in travel route zones. In most cases the riparian zones and diverse ecotype zones are kept free of fire when regeneration burning is carried out in adjacent coupes.

### **Basis of legislation**

The Conservation and Land Management Act as amended in 1991 requires that management plans will be prepared for indigenous State forests, specifying the purpose or combination of purposes to be one or more of the following:

- (a) conservation;
- (b) recreation;
- (c) timber production on a sustained yield basis;
- (d) water catchment protection; or
- (e) other purpose prescribed by the regulations.

CALM's current Forest Management Plan (FMP) for south-west forests was approved by the Lands and Forest Commission and the Minister in accordance with the requirements of the Act. The security of purpose of the riparian zones, diverse ecotype zones and travel route zones which are specified in Chapter Two of the FMP has been addressed by Ministerial Conditions imposed by the Minister

for the Environment under the requirements of the Environmental Protection Act (1986). The Minister has specified in Conditions 5 and 6 that these reserves **shall remain unharvested in perpetuity** and **shall remain protected from timber harvesting and associated activities in perpetuity**.

### **Opportunity for public comment and political accountability for changes to reserve boundaries**

The CALM Act specifies that draft management plans will be released for public comment for a minimum of two months. During the drafting of the FMP (1994-2003) a comprehensive program of seminars, public workshops and briefings to key stakeholders was implemented. The joint CALM/ AHC study of the national estate values in the Southern Forest Region, which was prepared concurrently with the FMP, was also released for public comment for a period of three months. The public submissions received on the Draft FMP were summarised, analysed and published. Many recommendations arising in public submissions were incorporated into the final FMP.

CALM's FMP is also subject to the requirements of the EPA Act. The EPA Act provides for proponents to make reports available for public review and requires that proponents respond to submissions made to the Environmental Protection Authority. Reports by the Authority are released to the public and decisions by the Authority are subject to appeal. The implementation of proposals is subject to published conditions and subsequent audit and monitoring. CALM must report publicly on compliance with Ministerial Conditions applied to the FMP in 1997 and 2002. The EPA Act prescribes penalties for non-compliance.

### **Identification on maps**

The system of riparian zones, diverse ecotype zones and travel route zones is currently being digitised in CALM's Geographic Information System (GIS). This work has been completed for the Southern Forest Region and is well progressed for the Central Forest and Swan Regions. These zones can be depicted on maps at a variety of scales upon request. The zones are not routinely depicted on 1:50 000 maps sold to the public.

The area of the informal reserves is as follows:

Travel route zones 18 710 hectares  
Riparian zones 152 175 hectares \*  
Diverse ecotype zones 200 000 hectares \*

\* Estimate only for Swan and Central Forest Regions (*CALM, 1994*)

### **Design and continued viability**

The issue of size and contribution to nature conservation values has been discussed in the first principle above. The viability of the reserves has been monitored during the past 20 years. A system of road, river and stream reserves has been implemented in a different configuration for the past two decades. Timber harvest, including broadscale clearfelling in karri forest has been completed in many forest blocks up to 2000 hectares in size, where the only mature forest remaining exists in the road, river, stream and diverse ecotype reserves. There is no evidence that these reserves have suffered damage or decline which will affect their long term viability and ability to protect the nature

conservation, hydrologic and aesthetic values they were designed for. Blocks such as Sutton, Brockman, Gray and Poole provide illustration as to the long term efficacy of the system of reserves in the south-west forests.

The maintenance of the attributes for which the informal reserves have been set aside will be monitored as described in Chapter 4 of the FMP 1994-2003.

### **Management protection through contracts, codes of practice and enforcement**

The protection of travel route zones, riparian zones and diverse ecotype zones is specified in CALM's logging contracts (Contracts to Supply), 'Code of Logging Practice' and 'Manual of Logging Specifications'. Penalties apply for non-compliance.

CALM has recently established a Management Audit Unit, which has a specific role to ensure that policies, procedures, prescriptions, and codes are applied as intended.

The system of riparian zones, diverse ecotype zones and travel route zones in the State forests of Western Australia clearly meet the five Commonwealth criteria and will be included in the evaluation of a CAR reserve system in south-west forests.

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## **Appendix 2: The conservation of threatened species**

### **Outline of relevant legislation, policies and management plans in relation to forestry management and endangered taxa conservation**

#### **Introduction**

This report outlines the legislative mechanisms, administrative and operational procedures in place or proposed for the protection of threatened species in the South West Forests.

The Commonwealth and Western Australia have agreed on an approach to be implemented for the consideration of threatened species in the Deferred Forest Area (DFA) process that addresses the requirements of the Commonwealth *Endangered Species Protection Act 1992*. This approach includes the following:

- the inclusion of appropriate broad licence conditions in all woodchip export licences that provide for the protection of species listed under the ESP Act.
- the implementation of detailed processes and practices that support those conditions, which as far as possible, utilise existing State mechanisms.

Recognising that the preparation, and formal adoption under the ESP Act, of recovery plans for species listed under the ESP Act will be an outcome of the Regional Forest Agreements, the Commonwealth and Western Australia will continue to work cooperatively on the preparation and implementation of recovery plans for Western Australian forest species.

#### **Endangered Species Protection Act 1992**

The Commonwealth Government, through the Australian Nature Conservation Agency (ANCA), is responsible for the administration of the ESP Act. The ESP Act has a schedule of nationally vulnerable and endangered species and endangered ecological communities and requires that these are taken into account in all Commonwealth actions and decisions. At this stage the schedule contains vascular plants and vertebrates only, limiting its action to these species.

It does this through a link to the Commonwealth *Environment Protection (Impact of Proposals) Act 1974* (EPIP Act) whereby any action which could threaten with extinction or significantly impeded the recovery of a listed species or community is considered to be environmentally significant in terms of the EPIP Act, and requires environmental impact assessment.

As the export of woodchips from Western Australia requires a Commonwealth decision to issue a licence under the *Export Control Act 1982* the Commonwealth is required to consider listed species and communities in issuing those licences. To date this has been effected by the inclusion of conditions in woodchip export licences which provide for the protection of species and communities listed under the ESP Act, and the assessment of individual proposals.

#### **Recovery and Threat Abatement Plans**

Recovery Plans, together with Threat Abatement Plans, are the principal means outlined under the ESP Act for addressing species conservation requirements.

Recovery Plans provide for the research and management actions necessary to stop the decline and support the recovery of species to maximise their chances of long-term survival in nature. Threat Abatement Plans provide for the research and management actions necessary to reduce the impact threatening processes have on taxa and communities. ANCA is yet to finalise any Threat Abatement Plans.

For species listed under the ESP Act that occur on Commonwealth areas, the Commonwealth must prepare a recovery plan within the prescribed time limits. Where a species occurs on State areas, the Commonwealth must seek the cooperation of the State with a view to the joint preparation of a recovery plan. For species that do not occur on Commonwealth areas, the Commonwealth may adopt a recovery plan prepared by a State agency.

The Commonwealth, through the ANCA, and CALM will continue to work cooperatively on the preparation and implementation of recovery plans for Western Australian species. To avoid duplication District Flora Plans and Interim Wildlife Management Guidelines will be utilised as far as possible for species recovery action and as the basis of recovery plan preparation.

To date Recovery plans have been prepared for the Chuditch (Orell and Morris 1994), Woylie (Start *et al*, 1994), Numbat (Friend, 1994), both the White and Orange bellied Frogs (Majors *et al*, 1992) and a recovery plan for the Western Ringtail Possum is in preparation.

It is recognised that an effective recovery plan approach needs to make appropriate information available to stakeholders and the public to bring about the necessary support for the process.

### **Western Australian legislation**

The Department of Conservation and Land Management is directly responsible for the management of publicly owned forests in Western Australia through the operation of the *Conservation and Land Management Act 1984* (CALM Act). The CALM Act also specifies that the Department of Conservation and Land Management is responsible for the administration of the *Wildlife Conservation Act 1950* (WC Act). The long title of the CALM Act is '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.' The long title of the WC Act is 'an Act to provide for the Conservation and Protection of Wildlife'.

The CALM Act also created 'controlling bodies', the 'Lands and Forest Commission' and 'National Parks and Nature Conservation Authority', which perform the functions of policy review and development and to be vesting bodies for forests and timber reserves, and nature conservation reserves, respectively.

Under the CALM Act the Department of CALM is required, among other things, to manage timber harvesting operations in publicly owned forests in accordance with Government approved management plans, to promote and encourage the development of the forest production requirements of the State, and to undertake any project or operation for that purpose.

The WC Act provides that all native flora may be declared protected. In practice all native flora is generally protected throughout the State and is the property of the Crown on all Crown lands, until lawfully taken. On private property, the

ownership rights to flora rest with the property owner. The same Act provides that all native fauna is generally protected throughout the whole of the State and is the property of the Crown on all lands until lawfully taken. The WC Act also provides that the Minister for the Environment may specially protect native fauna (Section 14 (2)(ba) and flora (Section 23F) taxa. Specially protected fauna and flora may include taxa that are rare, or likely to become extinct or otherwise in need of special protection. Specially protected flora taxa are referred to under the WC Act as Declared Rare flora. There is no such legislated title for specially protected fauna.

In order to provide more detail of the basis for CALM management of public lands and waters and guidance for direction and development of management operations, CALM has developed a series of Policy Statements and Administrative Instructions and also Management Programs and Plans for forests, national parks, nature reserves, flora and fauna.

CALM Policy Statements 9 (CALM 1992a) and 33 (CALM 1991a) cover Departmental operations in relation to conservation of specially protected flora and fauna, respectively, in the wild, and create the titles 'threatened flora' and 'threatened fauna' to cover the various taxa declared by the Minister to be specially protected due to some threats of possible future extinction. In addition to these policies, the Department has also produced Administrative Instructions (AI) 24 (CALM 1987) and AI 44 (CALM 1992b) covering conservation and protection of threatened flora and threatened fauna, respectively, in departmental operations. The Forest Management Plan 1994-2003 (CALM 1994a) has been produced by the Lands and Forest Commission, to provide a framework and vision for the management of multiple use forests. Individual region, reserve and taxon management plans and programs have also been developed providing an increased level of detail on management objectives, actions and monitoring arrangements.

### **Comparison and Treatment of State Threatened Taxa Listings and Commonwealth Endangered Species Protection Act Schedule**

The State lists of threatened flora and fauna are not identical to the Commonwealth Endangered Species schedule. Differences arise because there are different criteria for listings at the State and Commonwealth levels and also because the State and Commonwealth lists have been reviewed at different intervals.

The most recent notice of Declared Rare (Threatened) Flora for Western Australia, was published in the Government Gazette of 27 June 1995. This list comprised 272 taxa determined to be threatened with extinction within Western Australia (excluding 39 presumed extinct fauna also included in the Gazette notice). Following further field surveys three taxa listed on the Endangered Species Protection Act Schedule 1, have been determined to be not in threat of extinction and have been deleted from the State threatened list. These taxa are *Caladenia integra*, *Grevillea cirsiifolia* and *Grevillea saccata*.

These taxa are being referred to the Endangered Flora Network of the Australian and New Zealand Environment and Conservation Council (ANZECC) for consideration of removal from the National threatened flora list. As the ESP Act schedules are required to take account of ANZECC this is the appropriate mechanism whereby taxa not considered threatened by the State can be eventually delisted from the ESP Act.

The most recent notice of Specially Protected (including threatened) Fauna was in the Government Gazette of 8 April 1994. All ESP Act endangered and vulnerable taxa are specially protected under the State notice.

In terms of ESP Act flora and fauna management prescriptions, CALM proposes that the best strategy to follow is for CALM to treat any ESP Act listed taxa (as the ANCA advises CALM) in the same manner as threatened taxa under the WC Act.

### **Conservation of Declared Rare (Threatened) Flora in Departmental Operations- as Applicable to Conservation of Commonwealth ESP Act Schedule Taxa in Deferred Forest Assessment Areas**

CALM Policy Statement No. 9 'Conservation of Threatened Flora in the Wild' (CALM 1992a) and the associated Administrative Instruction No. 24 'Protection of Endangered Flora in Departmental Operations' (CALM 1987) provide the framework for CALM's management of threatened flora. These statements are augmented by the Forest Management Plan 1994-2003 (CALM 1994a) in relation to CALM's forest management operations. Both of these documents are currently under review. Management Programs (defined as including Recovery Plans) for Threatened Flora are also prepared pursuant to Policy Statement No. 44 'Wildlife Management Programs' (CALM 1992b).

Priorities for threatened flora research and other operations are considered pursuant to CALM Policy Statement No. 50 'Setting priorities for the conservation of Western Australia's threatened flora and fauna' (CALM 1994b).

In addition to its legal and policy obligations CALM also maintains a priority flora list which includes plant taxa, listed according to priority codes:

- that have recently been removed from the schedule of Threatened Flora; or
- that have been adequately surveyed and are considered to be naturally uncommon but under no apparent threat through identifiable factors; or
- that are poorly known and hence there is insufficient information for reasonable assessment to be made of their status, in terms of possible inclusion on the Threatened Flora list.

The priority flora are also specially considered in terms of CALM's operations planning and preparation of management prescriptions and programs. Special efforts are made, involving surveys and research, in relation to the poorly known flora to determine if they should be added to the Threatened Flora list.

It is important to recognise that because of the comparatively uniform habitats of commercially harvested forest areas in relation to heathlands and other areas of the south-west, comparatively very few threatened plant taxa occur in those areas. Indeed, the vast majority of Declared Rare Flora (DRF) taxa that are known to occur in the overall forest regions, actually occur in the vicinity of streams, heaths, rock outcrops etc., and not in the open tall forest areas. Some submissions dispute this and the matter will be further considered during the CRA.

The major actions undertaken by CALM for threatened flora conservation and protection in relation to the Deferred Forest Assessment are:

- the identification of taxa that are threatened with extinction;
- the listing of threatened taxa as Declared Rare Flora under the WC Act;
- field location and marking of populations of threatened flora;
- surveys for populations of threatened flora. Some submissions queried the adequacy of such surveys and the matter will be further considered during the CRA;
- maintenance of a computerised Declared Rare (Threatened) Flora Database, comprising information on location and size of all known populations of DRF;
- maintenance of rare flora population locations on operations mapping and planning systems;
- nominated Threatened Flora Officers whose duties include ensuring that Policy Statement 9 and AI 24 are complied with in operations;
- operation of Threatened Flora Recovery Teams, that have been formed for the Southern Forest Region, Central Forest Region and Swan Region, with the task of preparing and implementing threatened flora management programs (Recovery Plans) for the management of all threatened flora within those regions.
- identification, reservation and management of conservation reserves to protect areas of high nature conservation value, including populations of threatened flora; and
- protection, under the Forest Management Plan, of areas of special biological value as either River and Stream (Riparian) Zones or Diverse Ecotype Zones. Travel route zones also afford special protection.
- comprehensive planning and hygiene constraints to minimise the risk of spreading dieback.
- control of environmental weeds in forests.

As mentioned above, CALM has formed Threatened Flora Recovery Teams for each of the three forest regions and also has individual threatened flora officers nominated within the forest regions and districts.

Threatened flora officer duties are under review, but under AI 24, include:

- checking that prescriptions for operations are in accord with CALM Policy Statement No. 9 and AI 24;
- the updating and maintenance of local and central records of threatened flora populations and locations, including ongoing field surveys for new populations of threatened flora;
- operating in a public advisory/extension capacity with regard to threatened flora; and,
- conducting staff training on threatened flora, as required.

The Regional Threatened Flora Recovery Teams are involved in the preparation and implementation of regional threatened flora management programs, termed recovery plans. These plans provide a source document covering the basic biology, flowering period, distribution (population locations) and habitat requirements of each threatened (and priority) flora taxon within the region. Information is also included on the known responses to disturbance (including fire), susceptibility to Phytophthora Dieback, management (including monitoring) requirements, research requirements and references. The plans are implemented by the recovery teams which report annually on their progress. Another function of the recovery team is to undertake, or oversee the undertaking of surveys to locate other populations of threatened flora, as far as is possible within resource constraints. The three forest region recovery teams have the following representation.

Swan Region Threatened Flora Recovery Team	Central Region Threatened Flora Recovery Team	Southern Region Threatened Flora Recovery Team
CALM	CALM	CALM
<ul style="list-style-type: none"> <li>· Region - 4 officers</li> <li>· Wildlife Branch</li> <li>· Science and Information Division (SID)</li> <li>· WA Threatened Species and Communities Unit (WATSCU)</li> </ul>	<ul style="list-style-type: none"> <li>· Region - 3 officers</li> <li>· SID</li> <li>· WATSCU</li> <li>· a consultant</li> </ul>	<ul style="list-style-type: none"> <li>· Region - 6 officers</li> <li>· SID</li> <li>· WATSCU</li> </ul>
Others <ul style="list-style-type: none"> <li>· Local Government</li> <li>· Volunteers</li> </ul>	Others <ul style="list-style-type: none"> <li>· WA Department of Agriculture</li> <li>· a volunteer</li> <li>· Local Government</li> </ul>	Others <ul style="list-style-type: none"> <li>· 2 Volunteers</li> </ul>

NB. Composition of committees varies according to specific needs.

In the process of planning for forestry management operations, CALM routinely consults maintained records of flora surveys and known populations of Threatened Flora and avoids damage to these populations. The strategy followed encompasses reference to the results of past targeted surveys, an ongoing program of targeted surveys, marking of threatened flora populations, and operations of regional threatened flora recovery teams and threatened flora officers. Combined with the other actions outlined previously, this strategy is seen as an efficient means of conserving threatened flora. Operations which are determined to have a likelihood of significant permanent impacts on vegetation such as roading and creation of firebreaks are seen as requiring additional special survey for possible impacts on populations of Threatened Flora. In these situations specific additional surveys are required to be undertaken in the areas proposed to be impacted, in order to verify if there will be impacts on any Threatened Flora. Under current operational practices, if management activities of the kind outlined above, involving permanent destruction of flora habitat, are determined to be likely to impact on Threatened Flora, consideration must be given to either relocating the planned operations so as to avoid the Threatened Flora or application must be made to the Minister for the Environment for

permission to take Declared Rare (Threatened) Flora, pursuant to Section 23F of the WC Act.

Permits to take DRF are granted by the Minister, where he is satisfied that the taking will not result in a significant increase in the chances of that taxon becoming extinct. Essential considerations are therefore the relative significance of the population of DRF to be affected to the overall conservation of the taxon (i.e. in relation to other known populations) and the level of impact proposed for that population (proportion of plants to be involved and degree of severity of impact to those plants, ie. ability for regeneration, or regrowth after impact).

The strategies outlined above are seen as efficient means of ensuring the conservation of threatened flora taxa throughout the Deferred Forest Assessment region.

## **Status of Flora Taxa Listed in Schedule 1 of the Commonwealth Endangered Species Protection Act**

### **Part 1 - Taxa that are endangered**

An overview of the status, distribution and management arrangements in place for each of the flora taxa listed as endangered in the *Endangered Species Protection Act 1992* and occurring within the Deferred Forest Assessment region is provided below. (Species names followed by "ms" have not yet had their species description published.)

### **Part 2 - Taxa that are vulnerable**

An overview of the status, distribution and management arrangements in place for each of the flora taxa listed as vulnerable in the *Endangered Species Protection Act 1992* and occurring within the Deferred Forest Assessment region is provided. (Species names followed by "ms" have not yet had their species description published.)

## **Conservation of Threatened Fauna in Departmental Operations - as Applicable to the Conservation of Commonwealth ESP Act Schedule Taxa in Deferred Forest Assessment Areas**

CALM Policy Statement No. 33 'Conservation of threatened and specially protected fauna in the wild' (CALM 1991a) and Administrative Instruction No. 44 'Protection of endangered and specially protected fauna in Departmental Operations' (CALM 1990) provide the framework for CALM's management of threatened fauna. These statements are also augmented by the Forest Management Plan 1994-2003 (CALM 1994a) in relation to CALM's forest management operations. As for the flora statements, both of the above fauna documents are currently under review. Management Programs (Recovery Plans) for Threatened Fauna are also prepared pursuant to Policy Statement No. 44 'Wildlife Management Programs' (CALM 1992b).

Priorities for threatened fauna research and other operations are considered pursuant to CALM Policy Statement No. 50 'Setting priorities for the conservation of Western Australia's threatened flora and fauna' (CALM 1994b).

The major actions undertaken by CALM for threatened fauna conservation and protection in relation to the Deferred Forest Assessment are:

- the identification of taxa that are threatened with extinction;
- the listing of threatened taxa as specially protected fauna under the WC Act;
- surveys for populations of threatened fauna;
- maintenance and development of a central computerised threatened fauna locational database;
- maintenance of information on known populations of threatened fauna on operations, mapping and planning systems;
- nominated threatened fauna officers whose duties include ensuring that Policy Statement 33 and AI 44 are complied with in operations;
- establishment and operation of recovery teams for development and implementation of recovery plans;
- protection of critical habitat elements, such as den logs and tree hollows, in timber harvest prescriptions;
- establishment and management of conservation reserves to protect habitats of threatened fauna;
- protection of areas of special biological significance from significant disturbance as either River and Stream (Riparian) Zones or Diverse Ecotype Zones. Travel route zones also afford special protection.
- research into pest animal control.
- issue of pre-logging surveys.

CALM has established 12 recovery teams for threatened fauna, each with CALM as well as non-CALM representatives. These teams have prepared, or are preparing recovery plans for the identified taxa, in most cases in association with ANCA, covering each of the ESP Act endangered fauna taxa dependent to some extent on the major forest areas. It is the duty of the teams to ensure that the recovery plans are implemented and that the taxa nominated are recovered from their threatened status. In order to achieve this, recovery plans identify key habitat areas, survey requirements and management actions necessary to assist recovery. The make-up of the recovery teams relevant to the Deferred Forest Assessment is detailed.

<b>Recovery Team</b>	<b>CALM</b>	<b>Other</b>
<i>Bettongia penicillata</i> (Woylie)	SID Regions WATSU Wildlife Branch	ANCA SA Dept of Environment and Natural Resources
<i>Myrmecobius fasciatus</i> (Numbat)	SID Regions WATSU Wildlife Branch	ANCA World Wildlife Fund Perth Zoo SA Dept of Environment and Natural Resources
<i>Geocrinia alba</i>	WATSU	Uni of Western

(White-bellied Frog) and <i>G. vitellina</i> (Orange-bellied Frog)	SID District Manager Wildlife Branch	Australia Landholders ANCA Shire Threatened Species Network
<i>Dasyurus geoffroii</i> (Chuditch)	WATSU SID Wildlife Branch	ANCA World Wildlife Fund Perth Zoo Alcoa
<i>Pseudocheirus</i> <i>occidentalis</i> (Western Ringtail Possum)	SID Regions WATSU	Western Australian Museum

In the process of planning for forest management operations CALM routinely consults maintained records on known populations of threatened fauna, obtained from targeted forest fauna surveys. The level of survey has been queried in submissions and will be further considered during the CRA.

While there are no habitat protection provisions under the WC Act and therefore no legal requirement to obtain any permits to impact on threatened fauna habitat, planners take account of known populations in the planning of reserve areas and areas to be excluded from timber harvesting and roading. The strategy followed encompasses reference to the results of past targeted surveys, ongoing targeted surveys and operations of threatened fauna recovery teams.

A key threatening fauna conservation action is the ongoing development of a conservation reserve system which is representative of vegetation types occurring throughout the forest and thus covering the habitat elements for the fauna. Where endangered or vulnerable (ie. threatened) taxa populations are known to occur, special reservation is made for them. This is relevant for the Numbat and Woylie for which the Perup Nature Reserve was principally established. In the Forest Management Plan 1994-2003 reservation has been proposed for a portion of Witchcliffe Forest Block to enhance protection of the White-bellied Frog. Other land management options to protect threatened fauna habitat include creation of Diverse Ecotype Zones and River and Stream (Riparian Zones) described in the Forest Management Plan, 1994-2003. Riparian zones are known to be important foraging habitat of the Chuditch. Furthermore, critical habitat elements, such as tree hollows and den logs, are protected under timber harvest prescriptions. The jarrah harvesting prescription provides for the retention of habitat trees and den logs where these may be limiting (CALM 1991b).

Planning of operations to avoid key threatened fauna habitat and management of these areas pursuant to recovery plans and other management programs is seen as an effective means to ensure protection of threatened fauna habitat areas within forests. CALM has also developed a major program of fox control throughout forest areas, with the aim of increasing the abundance and range of threatened and rare fauna taxa. Wherever control has been carried out populations of small to medium sized animals (Chuditch, Woylie, etc.) have increased dramatically (Friend 1990, Morris *et al.* 1995). Further details of these operations are included under the discussion of Operation Foxglove (see below).

Another major CALM initiative for threatened fauna is translocation in accordance with Policy No. 29 'Translocation of Threatened Flora and Fauna' (CALM 1995) and, in particular, the creation of Fauna Reconstruction Sites as detailed therein.

CALM has already experienced considerable success with the reintroduction of threatened fauna taxa including Woylies and Numbats into forest areas.

## **Status of Fauna Taxa Listed in Schedule 1 of the Commonwealth Endangered Species Protection Act**

### **Part 1 - Taxa that are endangered**

An overview of the status, distribution and management arrangements in place for each of the fauna taxa listed as endangered in the *Endangered Species Protection Act 1992* and occurring within the Deferred Forest Assessment region is provided below.

The Chuditch, Numbat and Woylie have all been the subject of detailed biological and ecological research. The jarrah forest contains the majority of the Chuditch population and a Recovery Plan has been published and is being implemented (Orell and Morris, 1994). Recovery Plans have also been prepared and are being implemented for the Orange-bellied and White-bellied Frogs, the Numbat and Woylie. A recovery plan for the Western Ringtail Possum is in preparation.

A study has commenced in the southern jarrah forest examining silvicultural systems that will achieve broad forest sustainability, that is wood production with wildlife habitat values retained, especially for the Chuditch, Numbat, Western Ringtail Possum and Woylie.

### **Part 2 - Taxa that are vulnerable**

An overview of the status, distribution and management arrangements in place for each of the fauna taxa listed as vulnerable in the *Endangered Species Protection Act 1992* and occurring within the Deferred Forest Assessment region is provided below.

## **Key Threatening Process for Endangered and Vulnerable Taxa**

Another important aspect of managing endangered and vulnerable flora in timber harvest operations is the minimisation of the threatening process 'dieback', a disease resulting from infection by species of *Phytophthora* of which *P. cinnamomi* is the most destructive.

Dieback caused by *P. cinnamomi* is listed as a Key Threatening Process under the ESP Act. Accordingly the ANCA is required to prepare a national Threat Abatement Plan for Phytophthora by 1999, and it is proposed to commence the plan in 1996. ANCA is currently liaising with CALM with respect to the Threat Abatement Plan to ensure that its preparation is nationally coordinated and that it meets the objectives of the ESP Act.

Identify actions to be implemented by the draft Threat Abatement Plan, and their estimated duration and cost including, but not limited to:

- mapping and predicting the spread of infestation.
- diagnostic testing for the identification of Phytophthora in situ.
- use of control agents such as phosphorous acid, including research into mode of action and techniques of application.

- hygiene guidelines, regulations or codes of practice for roading, walking tracks, soil and gravel movement, forestry operations, nurseries, vehicle movement, mining operations, flower picking operations, fire fighting operations and other activities that cause the spread of Phytophthora.
- the role of germplasm banks (seed and tissue) for species at risk from Phytophthora.
- research to determine species and ecological communities susceptible to Phytophthora, where they are currently not affected.
- research into breeding for resistance or tolerance of susceptible species and ecological communities. research into genetics and biological control of Phytophthora.
- monitoring to determine impact of Phytophthora in long term infested ecological communities.
- land management and land use guidelines to reduce the spread of Phytophthora and to isolate disease free areas.
- community awareness and involvement in Phytophthora control
- public education programmes.
- integrated management of Phytophthora including multiple control strategies.

The CALM strategy to minimise the artificial spread of the pathogen entails:

- Quarantining the forest for up to three years to allow the existing infections to manifest themselves.
- Mapping the forest to identify disease location.
- Applying a structured analysis process to operations (including logging) to quantify the risk of introducing, spreading or intensifying disease and the impact on the vegetation if it is introduced.
- Prescribing the timing and nature of the operations to make the risk acceptable. This includes dry soil operations, 'split phase' logging, cleaning down equipment, compartmentalised operations and the provision of log stockpiles.
- Monitoring the effectiveness of these operations in containing dieback spread in time.
- For threatened or vulnerable flora susceptible for Phytophthora sp. and at risk through existing infections 'Phosphonate' is being used to protect individuals from destruction. No species associated with forest areas have required this treatment.

## **Predation by the European Red Fox: Operation Foxglove**

This is the major factor threatening a number of endangered and vulnerable fauna and CALM is dealing with it by a massive fox baiting program, named Operation Foxglove.

Operation Foxglove has the following objectives:

- To significantly reduce and maintain at low levels populations of foxes to:
  1. allow the expansion of existing populations of native fauna vulnerable to predation;
  2. allow the successful translocation of fauna taxa which have recently declined in the northern jarrah forest;
  3. ensure the viability of these communities in perpetuity.
- To allow the effective integration of fauna management with other uses and management strategies applied to the northern jarrah forest.
- To promote the cooperative fox baiting of adjacent land holdings.

An area of 670 000 hectares, mainly between Mundaring and Collie, is being baited for control of foxes. Operation Foxglove incorporates a research component, where monitoring of fauna populations is undertaken in areas subjected to four experimental treatments (i) control which is unbaited, (ii) baited twice per year, (iii) baited four times per year, and (iv) baited six times per year.

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## Appendix 3: Morington Region Social Impact Case Study

### Yarloop

The township of Yarloop is characterised by a relatively narrow economic base and is largely reliant on the timber industry for its economic activity. The Yarloop sawmill provides direct employment for 91 people and is the largest employer in the town. Employees of Alcoa also reside within the town and this accounts for 7.3% of the town's employment being based in the mining sector.

In Yarloop the major focus for additional economic activity is the Bunnings Sawmill. Since 1993 Bunnings have invested \$6 million dollars in the mill, providing pre-drying equipment and building a wood veneer plant. Bunnings are proposing to upgrade the mill with a further \$15 million of investment mainly for the purchase of new kilns and equipment which can add value to the wood products. No woodchips are produced from the Yarloop mill. Bunnings is also considering making additional significant investment related to the sawmill. These investments have currently been put on hold until the outcome of the DFA process is known. Bunnings management have indicated that they are relatively optimistic about the future of the industry and the Yarloop mill in particular. However they did indicate that the Board of Bunnings were becoming increasingly reluctant to approve any investment in new products or equipment until the current uncertainty has been resolved. This has implications for training and research and development.

The other economic activity which provides employment for residents of Yarloop is the Alcoa Wagerup refinery. These residents also expressed concern about the DFA process and perceive it as a direct threat to the mining industry because most mining leases are within State Forest boundaries. These residents indicated that they saw clear links between the two industries and in Yarloop there was clear evidence that individuals involved in the mining industry were involved in the same community organisations as timber industry workers.

- Yarloop townsite would be significantly affected by any cutbacks to logging coupes in the Morington Area. The town is reliant on the timber industry and most individuals are involved in the industry in some way. There are few alternatives for employment in the townsite and most businesses have developed with the timber mill and receive income from it. Many employees who reside in the town have skills which are specific to the timber industry and many have worked in the timber industry all their working life. Their ability to gain employment elsewhere is limited by their lack of training for other activities.
- Yarloop Primary School estimated that 20 families would be directly affected by any cutbacks at the sawmill. This represents at least 40-50 of the children attending the Yarloop Primary School which has 120 students.
- This indicates that the level of stress which would be experienced by these households, should a change occur, is likely to be high.
- The vulnerability of the communities in the Morington Area to impacts created by any future reduction in logging areas is determined by a consideration of all the factors discussed above. There are many residents who are employed by the timber industry and associated industries such as mining and tourism who will be directly affected by any further changes. Towns like Collie and Yarloop which are highly dependent on these industries can be expected to show significant signs of stress. Recent changes to the mining industry in Collie created significant unemployment and community stress and is an important illustration of the vulnerability of that community.

Yarloop is a relatively small community which is dependent on the timber industry and mining. It would be vulnerable to any changes which may result from the DFA or RFA process. Temporary closure of the mill would have an immediate impact on the Yarloop community and cause major disruption to the operation of Bunnings' domestic timber production in Western Australia.

## **Appendix 4: Forest Industries Structural Adjustment Package**

### **Structural Adjustment**

The purpose of the Forest Industry Structural Adjustment Package (FISAP) is to facilitate structural change within the native forest industry sector to accommodate changes in the availability of the production forest resource and assist the development of a long term ecologically and economically sustainable forest industry.

In this context, the elements of the FISAP are designed to cushion the adverse impacts on businesses and workers employed in the native forests industry sector which have been directly adversely affected by the outcomes of the DFAs/RFAs and to provide incentives for businesses remaining in the industry to increase the level of value added processing.

In response to the potential impacts of the DFAs and RFAs on workers, businesses and communities, on 3 October 1995 a paper outlining the major elements of a general assistance package was distributed for comment, prior to developing the detail of a structural adjustment package.

### **Rescheduling Assistance for States**

This element is directed at providing assistance to States to facilitate access to native hardwood forest coupes into which forestry operations are being rescheduled as a direct result of the Deferred Forest Assessment and/or RFA processes.

### **Labour Adjustment for Employees and Self-Employed**

For enterprises which intend to remain in the native hardwood forests based industry sector but which need to retrain staff, assistance may be provided through the DEET Training and Skills (TASK) program.

For workers, including the self-employed, displaced from the native hardwood forests based industry sector as a direct result of the Government's DFA and RFA decisions, a specific Labour Adjustment Package (LAP) similar to the packages available in the passenger motor vehicle and textile, clothing and footwear industries will be established.

The LAP is designed to improve access to jobs outside the native hardwood forests based industry sector for workers, including the self-employed, retrenched from that industry sector and may include:

- vocational training generally for 52 weeks, but up to 78 weeks in special circumstances;
- wage subsidies to employers outside the affected sector; and
- relocation assistance to another area to commence a job or undertake formal training, including travel (fares) assistance, removal expenses and legal fees for the sale/purchase of a home, but not including compensation for the non-sale of a home.

LAP clients who wish to start a new enterprise outside the native hardwood forests based industry sector may also access the New Enterprise Incentive Scheme on the basis of individual eligibility.

### **Restructuring Assistance**

This element is directed at providing assistance for forest industry businesses in the native hardwood forests based industry sector and their employees who are willing and able to move to new value adding opportunities within the same sector or elsewhere in the forest industries.

Assistance measures that may be considered include;

- the DEET TASK program to reduce the loss of skilled employees;
- Commonwealth business assistance programs; and
- consultancy grants to assist firms with advice on restructuring company operations and upgrade business management skills.

### **Business Exit Assistance**

This element is directed at assisting businesses in the native hardwood forests based industry sector to either diversify into other industries or to exit from the native hardwood forests based industry sector.

### **Community and Social Adjustment**

This element is directed at providing community and social adjustment assistance and may involve:

- providing free and confidential advice on financial and personal matters from trained counsellors employed by local community groups (similar to the services provided for farming communities by the Rural Counselling Service); and
- appointment of Liaison Officers to regions affected by structural adjustment in the native hardwood forests based industry sector to promote understanding of the assistance measures available and to facilitate take-up by those persons or businesses who are eligible.

### **Regional Adjustment**

Regional adjustment assistance may be provided through existing Commonwealth programs.

## Appendix 5: List of Individuals and Organisations involved in Public Comment

Boral Timbers  
Cape to Cape Alliance  
Coffs Harbour Hardwoods Trading Pty. Ltd.  
Forest-based Communities of North East New South Wales  
Gisbourne Timber Products  
M. Webb Bros. Pty. Ltd.  
Merriman's Local Aboriginal Land Council  
Murrah/Mumbulla Residents' Group  
President, Northcliffe Forest Protection Society Ltd.  
Warren Environment Group  
Whian Whian Heritage & Environment Network  
Mr Philip Achurch, Western Australia Small Business & Enterprise Assoc. Inc.  
Mr R.J. Adams, Bunnings Forest Products Pty. Ltd.  
Mr John Adamson, Bombala & District Development Association  
Ms Julie Alderson, private  
Mr Brad Alfred, Davies Knox Chartered Accountants  
Mr Steve Allen, The Wilderness Society - Illawarra Branch  
Mr Peter Allen, private  
Mr Paul Amar, Northern Rivers Regional Economic Development Organisation Inc.  
Mr Tim Anderson, private  
Ms Anita Pike, Forest Protection Society Ltd.  
Mr T. Armstong, private  
Ms Rachel Armstrong, private  
Mr Paul Arnold, Circular Head Council  
B. Arnott, private  
Ms Penelope Atkinson, private  
Mr Robert Atkinson, private  
Mr Doug Aumann, Forest Protection Society Ltd.  
Ms Vanessa Badham, private  
Mr Roger Bailey, New South Wales Farmers' Association  
Ms Karen Bailey-Smith, Richmond Environmental Network  
Dr Robert Bain, National Association of Forest Industries Ltd.  
Messrs Bain, Dorber and Ms Loydell, New South Wales Forest Products Association - National Association of Forest Industries - Forest Protection Society Ltd.  
Mayor J.H. Baldwin, Bombala Council  
Mr Michael Baluit, private  
Mr Barclay, private  
Mr Allan Barden, Forest Protection Society Ltd.  
Mrs Irene Barnard, private  
Mr Fred Benecke, New South Wales Apiarists' Association Inc.  
Ms Susan Bennett, Casino Timber  
Mr Julius Bertock, private  
J. Bevan, private  
Mr Peter Beverland, Australian Timber & Trusses Pty. Ltd.  
Mr Paul Biggs, Institute of Foresters of Australia Inc. - Western Australia Division  
Mr David J. Bills, North Limited  
Mr T. Bird, Forests & Forest Industry Council of Tasmania  
Ms Joan Birkett, private  
D. Blackwood, Forest Protection Society Ltd.  
Mr Gary Blackwood, Forest Protection Society Ltd.  
M.A. Blackwood, Forest Protection Society Ltd.  
Ms Leonie Blain, Clarence Valley Conservation Coalition Inc.

Ms Leonie Blain, private  
Mr Mike Blake, National Party of Australia - New South Wales Branch  
Ms Tara Bonham, private  
Ms Jessica Bowden, Clarence Environment Centre  
Mr Ben Bowman, private  
Ms Robyn Brake, private  
Mr Linton Briggs, The Federal Council of Australian Apiarists' Association  
Mr Donald Britton, Britton Bros. Pty. Ltd.  
Ms April Bromfield, Ellendale Environmental Landcare Group  
Mr Shaun Bromfield, private  
Mr Gene L. Browder, Worsley Alumina Pty. Ltd.  
Ms Jane's Brown, private  
Ms Karen Brown, Tasmanian Aboriginal Land Council Aboriginal Corporation  
Mr Ron Brown, private  
Mr Floyd Browne, private  
Mr Bruce, private  
Dr Stehan Bruggisser, private  
Ms Margaret Bruggisser - Atkin, private  
Mr John Brumby, Leader of the Opposition - Victoria  
Ms Linsey Buck, private  
Ms Maggie Burke, private  
Mr Buster Burton, private  
Mr Tim Cadman, Native Forest Network  
Mr Julian Calver, Calver, de Witt & Taylor  
Dr Michael Calver, Biological Sciences - Murdoch University  
Ms Edna Cameron, private  
Ms Leonie Cameron, private  
Mr David Cater, National Parks Association of NSW Inc. - Hunter Branch  
Mr Robert Caufreur, private  
Mr Ian Chalk, Forests & Forest Industry Council of Tasmania  
Mr Julian Chapple, private  
Mr Barry Chipman, Forest Protection Society Ltd.  
Ms Megan Chisholm, private  
Ms Bianca Christoff, private  
Mr Simon Clark, South East Forests Conservation Council  
Mr Don Clingan, private  
Ms Shelley Cohn, Bendigo & District Environment Council  
Dennis Cole & Faye Pollack, private  
Mr Geoff Coles, Parks & Wildlife Service - Freycinet District  
C. Colli, C.O.P Transport  
C. Colli, Colli & Sons Timber & Hardware  
Mr Harry Connors, Harry Connors Pty. Ltd.  
Mr Roger Cook, private  
Mr Steve Cook, The Big Scrub Environment Centre Inc.  
Mr Bob Cooper, The Wilderness Society - Illawarra Branch  
Dr Stephen Cork, CSIRO - Division of Wildlife & Ecology  
Dr Alec Costin, private  
Mr Cam Cox, Forest Protection Society Ltd.  
Mr Peter Coxhead, Launceston Environment Centre Inc.  
Ms Ann Coyle, private  
Ms Ruth Crago, private  
A. Crawford, private  
J. Crawford, private  
Mr C. Crisp, private  
J.W. Croke, Queensland Sawmills Pty. Ltd.  
Mr Simon Cubit, Tasmanian Traditional & Recreational Land Users Federation Inc.  
Mr Alan Cummine, Australian Forest Growers

Mr Ray Curo, private  
Ms Mary Cusack, Spencer Gulf Environmental Alliance Inc.  
Mr Michael Daley, private  
Mr Tim Daly, The Australian Workers' Union  
Ms Mary Dalyell, private  
Mr Craig Darlington, Conservation Council of the South East Region & Canberra  
Mr John Davenport, private  
Mr Richard Davis, private  
Mrs Bev de Rusett, private  
Ms Rose Degenhard, private  
Ms Marilyn Dellapina, private  
A. Delliou, Forest Rescue  
Mr Tom Dennis, Northern Rivers Regional Development Board Inc.  
Mr Rex Direen, Southern Forests Community Group  
Mayor Cyril Dixon, Waratah-Wynyard Council  
Mr Richard Donaghey, private  
Ms Donna Green, private  
Cr D.P. Donnelly, Glen Innes Municipal Council  
Ms Carran Doolan, private  
Mr Col Dorber, Australian Logging Council Limited  
Mr Col Dorber, NSW Forest Products Association Ltd.  
Mr Royce Dorney, Newell's Creek Sawmilling Co. Pty. Ltd.  
Mr Don Driscoll, University of Western Australia - Department of Zoology  
Mr John Duggan, Clarence Valley Local Government Committee  
Mr John Duggan, Ulmarra Shire Council  
Mr Rodger Dunn, private  
Mrs Pat Durman, National Parks Association - Macarthur Branch  
B.D. Earl, Tenterfield Shire Council  
Mr Steve Eckersley, Gough & Gilmour  
Mr Peter Elias, private  
Ms Susan Elks, Bongil Bongil National Park Support Group  
Mr P.J.D. Ellery, Chamber of Mines and Energy of Western Australia Inc.  
Ms Christine Elliott, private  
Mr Max S. Elliott, private  
Mr Mark Evans, private  
T.S.R. & P.J. Evans, private  
Mr Patrick Eyre, private  
Mr Len Ferguson, Coastline Timbers Pty. Ltd.  
Mr Peter Fisher, Boral Timber Division  
Ms Elizabeth Fitzpatrick, private  
Mr Jim Flaherty & Ms Jo Kelly, private  
Mr Errol Fletcher, Errol Fletcher Engineering  
Ms Mary Forbes, Forest Protection Society Ltd. - Gloucester Branch  
Mr Norm Forbes, Queensland Timber Board  
Mr Allan Ford, Ford Timbers  
Mr Nolan Alder Fox, private  
Mr T. Frith, Bridgetown Greenbushes Friends of the Forest  
Ms Rhonda Froggatt, private  
Mr James Fuller, private  
Ms Lisa Gaul, Forest Protection Society Ltd.  
Mr John Gibson, private  
G. & L. Gill, North East Forest Alliance  
Mr Alex Gilmore, Southern Cross University  
Mr Cirillo Giovanetti, Giovanetti Transport Pty. Ltd.  
Mr James Gooding, private  
Mr Clive Gordes, private  
L.G. Gordon, L.G. Gordon Pty. Ltd.

S. Gorrell, private  
Mr Alan Gray, Wombat Forest Society  
Ms Liz Gray, Koala Coalition  
Mr Mark Greenhill, Construction, Forestry, Mining & Energy Union - New South  
Wales Branch  
Mr Alan Greensill, New South Wales Logging Association  
Mr Alan Greensill, private  
Mr Alan Greensill, Tenterfield Logging Pty. Ltd.  
Mr Denis Greensill, Greensill Bros Pty. Ltd.  
Mr Barrie Griffiths, North East Forest Alliance - Hunter Region  
Dr Stephen Gulliford, Beechworth Environment Group  
L.G. Gunson, private  
Guy, private  
A. Guyer, private  
Ken & Kay Gwynne, private  
Mr Robert Hadler, National Farmers Federation  
Hainsworth & Rattray, private  
Ms Emma Hamilton, private  
Graeme & Narelle Hammond, Hammond Logging Pty. Ltd.  
Mr Colin Handley, private  
Mr Henry Handley, private  
Ms Sarah Handley, private  
Mr Geoff Hannon & Ms Anne Lee, private  
Mr Frank Harrison, Hastings Municipal Council  
Mr Reg Hartley, private  
Ms Sarah Harvey, Lower Hunter Environment Group  
Mr Warren Hastings, private  
Ms Susan Haworth, private  
Mr Greg Heberle, private  
Mr Vin Heffernan, Vin Heffernan Pty. Ltd.  
Mr John Hellmers, Friends of Goonengerry Sanctuary  
Mr Paul Herbert, Paul Herbert Timbers Pty. Ltd.  
Mr John Hermans, private  
Mr Petrus Heyligers, private  
Mr Simon Hickson, private  
Ms Sue Higginson, private  
Mr Michael Hill, Byanda Enterprises Pty. Ltd.  
Mr Nicholls Hobbs, private  
Mr Marshall Hodgekiss, National Parks Association - Three Valleys Branch  
Mallika Hodges, private  
Holy Goat Ranch Inc., private  
G. Hooper, L.T. Doland Pty. Ltd.  
Mr Peter Horden, Kalang Landcare  
Ms Carmen Hordern, private  
Mr Pierre Horwitz, Edith Cowan University - Department of Environmental  
Management  
Ms Antoinette Hughes, private  
Ms Patricia Hughes, private  
Mr Robert M. Humphreys, Hallmark Oaks Pty. Ltd.  
Ms Amanda Hunt, private  
Ms Deborah Hunter, Wild Cave Tours  
Mr G. Norman, Huon Victorian Association of Forest Industries  
J.D. Hurley, Brown & Hurley  
Ms Joan Jenkins, Greens  
Ms Janelle Johnston, Drake Environment Protection Group  
Ms Kirsty Jones, private  
Ms Lusa Jones, private

M.J. Jones, Forest Protection Society Ltd.  
Mr Michael Jones, The National Parks Association - Three Valleys Branch  
Mr Paul M. Jones, private  
Mr Toby Jones, private  
Mr Theo Jongen, private  
Ms Sue Kalab, private  
Mr David Kanaley, Caldera-Nightcap Ecologically Sustainable Tourism Inc.  
Mr Alastair Kay, Ulitarra Conservation Society  
Ms Tania Keller, private  
D.R. Kelly, Department of Resources Development  
Mr Ian Kennedy, private  
Mr Michael King, private  
Mr Cam Kneen, Forest Industries Federation - Western Australia  
Mr Ken Langley, Langley's Timber Sales Pty. Ltd.  
Mr Ken Langley, Northern Rivers Sawmillers' Co-operative  
Mr Keith Latham, private  
Mr Geoff Law, The Wilderness Society  
L. Lewis, private  
Mr Geoffrey & Ms Lois Loftus-Hills, private  
Mr C.R.A. Long, private  
Ms Moana Love, private  
Mr David Lovegrove, private  
Ms Frances Lowe, private  
Mr Peter Ludowici, Friends of Goonengerry Sanctuary  
Mr Michael Lynch, Tasmanian Conservation Trust Inc.  
Mr Sam MacFarlane, private  
J. Macgregor-Skinner, private  
Mr Alec Marr, National Forests Campaign Working Group  
Ms Helen Martin, East Gippsland Shire Council  
C.B. Mason, Fry's Creek Sawmilling Company  
Mr John G. Matthews, W Tree Walks  
Mr Ronald & Ms Valerie Maxwell, Friends of Mallacoota Incorporated  
M.E. McDougall, Midway Wood Products Pty. Ltd.  
Mr Gavan McFadzean, Friends of the Earth - Fitzroy  
Ms Paula McKay, private  
S.A. McKinnell, McKinnell's Pty. Ltd.  
Ms Carole McKinney, Forest Discovery Tours  
N.S. McLeod, Gloucester Shire Council  
Mr Andrew McMaster, Forest Protection Society Ltd. - Circular Head Branch  
Ms Ainslie McMillan, private  
Mr K.A. Mendoza, private  
Mr James Meredith, Urbenville Progress Association  
Ms Isabel Merisik, private  
Ms Gillian Mews, private  
Mr Fritz Michelin, South East Timber Association Inc.  
Ms Katherine Miles, private  
Mr David Milledge, Wildlife Ecologist  
Mr Ken Miller, Forest Protection Society Ltd.  
R. & L. Minchin, private  
Taurie Mitchell, private  
A. Mitchell, private  
Ms Heather Mitchell, Public Land Council of Victoria  
Ms Catherine Moore, Braidwood Greens  
Ms Kylie Moore, private  
J.A. Morgan, private  
Ms Marilyn Morgan, Manjimup Aboriginal Corporation  
P. Morgan, National Parks Association of NSW Inc. - Clarence Valley Branch

R. Morgan, private  
Mr Michael Moriarty, private  
Associate Professor Robert G.B. Morrison, private  
Dr J.G. Mosley, Peak Environmental Enterprises & Conservation Centre of  
Australia  
Mr Keith Muir, Colong Foundation for Wilderness Ltd.  
Ms Trudi Mullett, private  
Mr Peter Murphy, Preston Environment Centre  
J. Murray, South Coast Friends of the Forest  
Mr Ullan Murray, private  
Mr Glenn Nagy, private  
Mr Michael Neville, private  
Mr R.L. Newman, R.L. Newman & Partners - For/Env.& For.Products Consultants  
Ms Cassie Newnes, private  
Dr Raymond Nias, World Wide Fund for Nature Australia  
Mr Geoff North, private  
Dr I. North, private  
J. North, private  
Ms Melissa North, private  
L.J. Notaras, J. Notaras & Sons Pty. Ltd.  
S.J. Notaras, J. Notaras & Sons Pty. Ltd.  
Mr R. O'Connor, Tasmanian Farmers & Graziers Association  
Mr Michael O'Grady, private  
Mr S. O'Loughlin, Slater Contracting (Eden) Pty. Ltd.  
Mr Peter Olson, private  
Ms Lyn Orrego, North East Forest Alliance  
Ms Doreen Owens, private  
Mr Winston J. Oxenbridge, private  
Ms Margaret Parkin, private  
Ms Linda Parlane, Environment Victoria Inc.  
Ms Shirley Parnaby, private  
Ms Sita Parson, North East Forest Alliance  
Mr Phil E. Paxman, private  
Ms Bridgid Pearse, private  
Mr Jonathon Pedley, private  
Mr Stan Pelczynski, private  
E.D. Pereira, A.S. Nicholas & Sons Pty. Limited  
Mr Peter Simons, private  
Ms Paula Peters, private  
G. Phillips, private  
Mr Martyn Phillips, The Coastwatchers Association Inc.  
K.T. Pidcock, Big River Timbers Pty. Ltd.  
R.D. Pigg, Nymboida Shire Council  
Mr Trevor Pike, Bellingen Environment Centre  
Mr Angus Pollock, Australian Paper Limited  
Mr Tom Port, Nambucca Shire Council  
Mr Des Power, private  
Mr Prahara, private  
Ms Kathryn Price, private  
Ms Angela Pritchard, private  
Mr Dailan Pugh, North East Forest Alliance  
S.J. Quain, private  
Mr Hurford, R.J. Hurford's Building Supplies Pty. Ltd.  
Mr Brian Rabbitt, Kempsey Timbers Pty. Ltd.  
Mr Ray Ralph, Forest Protection Society Ltd.  
Mr Iain Rankin, private  
Mr Harry Recher, National Biodiversity Council - University of New England

Ms Jill Redwood, Concerned Residents of East Gippsland  
Ms Anne Reeves, National Parks Association of NSW Inc.  
Mr Toby Reid, private  
Mr John Reynolds, Victorian Chamber of Mines Inc.  
Mr Andrew Ricketts, Reedy Marsh Forest Conservation Group  
Ms Alison Roberts, private  
Ms Patricia Robertson, Forest Protection Society Ltd.  
Mr Peter Robertson, Conservation Council of Western Australia Inc.  
Mr T. Rock, Culoul Sawmill  
Ms Kitty Rodwell, private  
Mr Peter Rodwell, Rodwell Logging Co. Pty. Ltd.  
Mr Alastair Ross, Rubicon Coast & Landcare Inc.  
Mr Arnold Rowlands, Tasmanian Conservation Trust  
W.S. Rudd, Midway Sawmill  
A.T. Russell, "Walks and Talks"  
Ms Susie Russell, North East Forest Alliance  
Mr David Ryan, New South Wales Division of The Institute of Foresters  
Mr Leon Ryan, private  
Mr Paul Ryan, Bird Observers Club of Australia  
Mr Ian Satchwell, Minerals Council of Australia  
Ms Kathryn Scholes, private  
A.W. & D.J. Seccombe, private  
Mr R.B. Semmens, private  
Ms Lyn Serventy, Leeuwin Conservation Group Inc.  
Mr Shahid, private  
K.P. Sheridan, New South Wales Agriculture  
Mr Charles Sherwin, Victorian National Parks Association Inc.  
Ms Trishala Shub, Mt. Roland Landcare Group Inc.  
Mr Peter Simon, private  
Mr Richard Sims, Upper Hunter Timbers Pty. Ltd.  
Mr Graham Sinden, private  
Mr Michael Slaggett, private  
Mr Graham Slessar, Alcoa of Australia Limited  
Mr Linden L. Sly, Sly Bros. Pty. Ltd.  
Mr Colin G. Smith, private  
Ms Donna Smith, private  
Ms Melissa Smith, private  
N.J.C. Smith, Wildlife Preservation Society of Queensland - Capricorn Branch  
Mr Ray Smith, The Council of the City of Grafton  
Mr Richard Smith, private  
Phyl & Terry Smithurst, private  
Mr J.C. Sparkes, Harris-Daishowa (Australia) Pty. Ltd.  
Mr Peter Stace, New South Wales Agriculture  
Mr Rodney Stagg, Meander Resource Management Group  
Mr Robert M. Stephen, private  
D.J. Stevens, private  
Mr Allan Stewart, Tablelands Sawmills Pty. Ltd.  
O. & A. Stokes Hughes, Forest Protection Society Ltd.  
Mr Stuart Sutton, private  
Mr Alex Syme, Western Australian Forest Alliance  
Clarice Tainsh, private  
Mr John Taylor, Friends of Jane Inc.  
Ms Sasha Taylor, private  
Mr Stephen Taylor, private  
J. Tedder, North Coast Environment Council  
Mr Robin Tennant Wood, Cooma Greens  
J.R. Thomas, private

W.J.T. & R.L. Thomas, private  
Mr Daryl Thompson, Clarence Environment Centre  
Mr Tim Thorncraft, North East Forest Alliance  
Lionel E.H. & M.M. Timms, private  
B.K. Tomalin, Forest Protection Society - Nundle Branch  
Mr Glynne Tosh, private  
Mr Glyyne Tosh, Forest Protection Society Ltd.  
Ms Trish Townsend, Forest Protection Society - Western Australia Branch  
Mr Barry Traill, Environment Victoria Inc.  
Mr Malcolm Trudgen, B.Sc. Consultant Botanist  
Mr John Venturoni, Forest Protection Society Ltd.  
Ms Monika Wagner, private  
Mr Clive Waite, Forest Protection Society Ltd.  
Mr Jim Walker, private  
Mr Sid Walker, Nature Conservation Council of New South Wales  
Ms Joy Wallace, The Summerland Greens  
Professor Rob Wallis, Field Naturalists Club of Victoria  
Mr Peter Warrilow, private  
Ms Jane Wasley, private  
Mr Shane Watkins, private  
Ms Edith Watters, private  
D.G. Wauchope, Towamba Progress Association  
R.J. Waugh, Thora Sawmilling Pty. Ltd.  
Cr John Wearne, Shires Association of New South Wales  
M. Wehr, Severn Shire Council  
Mr Patrick Weir, The BIG Forest Rally  
Ms Yoona Welling, private  
Mr Brian Wheeler, Forest Protection Society Ltd.  
Mr Brett White, private  
Mr Michael Whitelaw, private  
Mr David Whitrow, Tasmanian Minerals Council Limited  
Mr Rod Whittle, Augusta-Margaret River Friends of the Forest  
Mr Geoff Wilkinson, Forest Protection Society Ltd - Southern Tasmanian Branch  
Mr Jim Williamson, private  
Mr Ishtar Wilson, private  
Ms Wendy Wilton, Wilton Logging Pty. Ltd.  
Mr John R. Winter, Prospectors and Miners Association of Victoria Inc.  
C. Winterlun, private  
Mr Cory Woods, private  
Mr Ken Woodward, private  
Mr Peter Wright, Australian Conservation Foundation  
Mrs Sandra Yates, Forest Protection Society Ltd. - Yarloop Branch  
Mr T.J. Yates, Yates Bros (Stratford) Pty. Ltd.  
Mrs Marnie Yeates, private  
Mr Brian Young, private  
Mr Dimitri Young, private

## Tables

**Table 1: IUCN categorisation for forest lands in Western Australia**

Land Category (CALM Act)	IUCN Category
State forest	VI
Timber reserve	VI
National park	II
Conservation park	II
Nature reserve	I
5g reserve	II and VI
Miscellaneous reserve	I, II and VI

**Table 2: Pre-1750 distribution - jarrah forest (data on a 'gross' basis)**

Forest Type - jarrah	hectares	% reserved
Area of pre-1750 distribution	3 122 000	
Area of current distribution	2 224 000	
Area in formal reserves	481 700	15.4
Area in informal reserves	124 800	4.0
Area in formal and informal reserves	606 500	19.4
Area required to meet Commonwealth benchmark	468 300	
Additional area required to meet Commonwealth benchmark	Nil	

**Table 3: Pre-1750 distribution - karri forest (data on a 'net' basis)**

Forest Type karri	hectares	% reserved
Area of 'pre-1750' distribution	231 400	
Area of current distribution	190 000	
Area in formal reserves	53 600	23.1
Area in informal reserves	27 200	11.7
Area in formal plus informal reserves	80 800	34.8
Area required to meet Commonwealth benchmark	34 710	
Additional area required to meet Commonwealth benchmark	Nil	

**Table 4: Sub-regional analysis - jarrah forest (data on a 'gross' basis)**

	Northern jarrah <1000mm		Northern jarrah >1000mm		Southern jarrah <1000mm		Southern jarrah >1000mm		TOTAL	
	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%
Area of pre-1750 distribution	910 300		433 300		1 147 000		631 400		3 122 000	
Area in formal reserves	192 300	21.1	34 600	8.0	142 500	12.4	112 300	17.8	481 700	15.4
Area in informal reserves	27 900	3.1	24 300	5.6	38 100	3.3	34 500	5.5	124 800	4.0

Area in formal plus informal reserves	220,200	24.2	58,900	13.6	180,600	15.7	146,800	23.2	606,500	19.4
Commonwealth target % to be reserved		10		10		10		10		15
Area required to meet Commonwealth target	91,030		43,330		114,700		63,140		468,300	
Additional area required to meet Commonwealth target	Nil		Nil		Nil		Nil		Nil	

**Table 5: Forest community analysis - Southern Forest Region (data on a 'net' basis)**

	Karri		Jarrah	
	karri community type (% reserved)	mixed karri community type (% reserved)	jarrah community type (% reserved)	mixed jarrah community type (% reserved)
Area of current distribution (hectares)	90 950	92 590	302 990	294 240
Area in formal reserves	26 860 (29.5%)	22 540 (24.3%)	102 770 (33.9%)	71 840 (24.4%)
Area in informal reserves	13 380 (14.7%)	13 730 (14.8%)	10 410 (3.4%)	24 810 (8.4%)
Area in formal plus informal reserves	40 240 (44.2%)	36 270 (39.2%)	113 180 (37.4%)	96 650 (32.8%)
% of forest type cleared	18	18	28	28
Commonwealth benchmark % to be reserved (based on % cleared)	18	18	20	20
Area required to meet Commonwealth benchmark	16 400	16 700	60 600	58 800
Additional area required to meet Commonwealth benchmark	Nil	Nil	Nil	Nil

**Table 6 & 6A:- Old growth analysis - karri forest (data on a 'net' basis)**

	hectares	%
Extant distribution of karri forest	190 000	
Area of old growth in all CALM-managed tenures	83 500	
Old growth as a % of extant distribution		44
Commonwealth benchmark % to be protected		60
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Area of old growth in all CALM-managed tenures	83 500	
Area required to meet Commonwealth benchmark	50 100	
Area of DFA accredited 'informal reserves'	8 220	
Area of formal plus DFA accredited informal reserves	49 020	
Additional area required to meet Commonwealth benchmark	1 080	

**Tables 7 & 7A: Old growth Analysis - jarrah forest (data on a 'net' basis)**

	Northern (Hectares)	Southern (Hectares)
Extant distribution of jarrah forest	773 700	940 500
Area of old growth in all CALM-managed tenures	41 190	281 890
Old growth as % of extant distribution	5.3	30
Commonwealth benchmark % to be protected	90 to 100	60
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Extant distribution of jarrah forest	773 700	940 500
Area of old growth in all CALM-managed tenures	41 190	281 890
Area required to meet Commonwealth benchmark	37 070 to 41 190	169 130
Areas of DFA accredited 'informal reserves'	17 440	19 010
Area of formal plus DFA accredited informal reserves	31 310	140 940
Additional area required to meet Commonwealth benchmark	5 760 to 9 880	28 190

## Part 1: Taxa that are endangered

Endangered Taxon	Occurs in State	Protection*	Comment
Anthocercis gracilis	Yes	1	Occurs near Mundaring Weir, Dandalup and in John Forrest National Park
Caladenia busselliana ms	No	1	Occurs near Marybrook in the Central Forest Region
Caladenia viridescens ms	No		Occurs near Dunsborough in the Central Forest Region
Calytrix breviseta subsp. breviseta	No		Occurs in the Perth metropolitan area only.
Darwinia apiculata	No		Occurs near Kalamunda in the Swan Region
Darwinia ferricola ms	No		Occurs in the Scott River area.
Diuris micrantha	No		Occurs in wet sites on the Swan Coastal Plain.
Dryandra mimica	Yes	1	Occurs in the Whicher Ranger in Central Forest Region and near Kalamunda in the Swan Region.
Epiblema grandiflorum var. cyanea ms	Yes	2	Occurs in wet sites near Walpole in the Southern Forest Region.
Eucalyptus graniticola ms	Yes	2	Occurs on the Darling Scarp in Central Forest Region.
Eucalyptus phylacis	No		Occurs west of Busselton.
Grevillea flexuosa	No		Occurs near Gidgegannup in the Swan Region.
Lambertia orbifolia	No		Grows in an open jarrah woodland near Narrikup in the Central Forest Region.
Meziella trifida	Yes	2	Occurs on the Scott River Plain. The majority of occurrences are in conservation reserves.
Pimelea rara	Yes	1	Occurs near Kalamunda in the Swan Region.
Ptychosema pusillum	No		Occurs near Gingin Brook in the Swan Region.
Pultenaea pauciflora	No		Occurs well to the east of State Forest.
Stylidium scabridum	Yes	1	Occurs near York and Mundaring in the Swan Region.
Thelymitra dedmaniarum	No		Occurs near Gidgegannup in the Swan Region.
Verticordia fimbriolepis subsp. australis	Yes	1	Occurs in granite outcrops near Kent River in the Southern Forest Region.
Verticordia plumosa var. ananeotes	No		Occurs near Busselton in the Central Forest Region

### Notes:

For flora that occurs in State Forest, protection will be by:

1. Implementation of an exclusion zone (Diverse Ecotype Zone) described in CALM's Forest Management Plan, 1994-2003.

2. Implementation of river and stream (riparian) zones described in CALM's Forest Management Plan, 1994-2003.

(The eight species of flora listed as endangered that occur in potential timber harvesting areas are protected by the above protection zones and the processes described above).

## Part 2: Taxa that are vulnerable

<b>Vulnerable Taxon State Forest</b>	<b>Occurs in State</b>	<b>Protection*</b>	<b>Comment</b>
Acacia anomala	Yes	1	Occurs on the western edge of the Darling Scarp in the Swan Region.
Acacia aphylla	Yes	1	Occurs in proximity to granite outcrops near Perth, Mundaring and Northam in the Swan Region.
Anigozanthos humilis subsp. chrysanthus	No		Occurs north of Perth in the Swan Region.
Aponogeton hexatepalus	Yes	2	Seasonal wetlands water plant which occurs in numerous locations in the Swan and Central Forest Regions.
Asterolasia grandiflora	Yes	1	Occurs near Mundaring, Toodyay and York in the Swan Region.
Asterolasia nivea	No		Occurs near Bindoon and Julimar in the Swan Region.
Baekkea arbuscula	Yes	2	The species occurs in several locations in the Southern Forest Region.
Banksia goodii	Yes	1	Grows in sand over laterite in low open woodlands near Walpole in the Southern Forest Region.
Caladenia bryceana subsp. bryceana	No		Occurs near Boyup Brook in the Central Forest Region.
Caladenia caesarea subsp. maritima ms	No		Occurs near Dunsborough in the Central Forest Region.
Caladenia christineae	Yes	2	The species occurs in wet sites in several areas in the Southern Forest Region.
Caladenia dorrienii	Yes	2	Usually occurs on moist valley sites and has populations in Central and Southern Forest Regions.
Caladenia excelsa ms	No		Occurs near Yallingup in the Central Forest Region.
Caladenia harringtoniae ms	Yes	2	The species occurs in wet sites in Southern and Central Forest Regions.
Caladenia huegelii	No		Occurs in association with Banksia woodlands in the Central Forest and Swan Regions.
Caladenia integra	No		Removed from state list due to the discovery of large populations.
Chamelaucium erythrochlorum ms	Yes	2	Occurs south of Busselton in the Central Forest Region.
Chamelaucium roycei ms	No		Occurs near Capel in the Central Forest Region.
Darwinia acerosa	No		Occurs near Mogumber in the Swan Region.
Diuris drummondii	Yes	2	The species occurs in wet sites in the Swan and Southern Forest Regions.
Diuris purdiei	No		Occurs in winter wet depressions on the Swan Coastal Plain.

Drakaea confluens ms	No		Occurs near Boyup Brook in the Central Forest Region.
Drakaea elastica	No		Occurs in the Swan and Central Forest regions.
Drakaea micrantha ms	Yes	1	Mainly found on disturbed areas such as firebreaks in all forest regions.
Eucalyptus arguitifolia.	No		Occurs north of Perth in the Swan Region
Grevillea cirsiifolia	Yes		Removed from state list due to discovery of large populations.
Grevillea saccata	No		Removed from state list due increased populations.
Hemiandra rutilans	No		Unconfirmed occurrence is near Dowerin and York in the Swan Region.
Hydrocotyle lemnoides	No		Occurs in shallow ephemeral freshwater wetlands in the Swan Region.
Kennedia glabrata	Yes	1 and 2	Mostly associated with granite outcrops in the Southern Forest Region. One occurrence in peaty swamp.
Kennedia macrophylla	No		Occurs near Augusta in the Central Forest Region.
Laxmannia jamesii	No		Occurs in coastal areas in the Southern and Central Forest Regions.
Lechenaultia laricina	Yes	2	Occurs near York and Mundaring in the Swan Region.
Lechenaultia pulvinaris	No		Occurs near York in the Swan Region.
Microtus globula	Yes		Has not been recorded for many years. Observations have only been made after hot summer fires in the Southern Forest Region.
Spirogardnera rubescens	No		Occurs near the Brand Highway north of Perth in the Swan Region.
Thelymitra stellata	No		Occurs near Three Springs and Pinjarra in the Swan Region.
Verreauxia verreauxii	Yes	1	Occurs near Mount Dale in the Swan Region.

Notes:

For flora that occurs in State Forest, protection will be by:

1. Implementation of an exclusion zone (Diverse Ecotype Zone) described in CALM's Forest Management Plan, 1994-2003.
2. Implementation of river and stream (riparian) zones described in CALM's Forest Management Plan, 1994-2003.

(The fifteen species of flora listed as endangered that occur in potential timber harvesting areas are protected by the above protection zones and the processes described above).