

**Proposals to amend the 1987 Forest Management  
Plans and Timber Strategy and proposals to meet  
Environmental Conditions on the Regional Plans  
and the WACAP ERMP**

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**Department of Conservation and Land Management**

**Report and recommendations  
of the Environmental Protection Authority**

**Environmental Protection Authority  
Perth, Western Australia  
Bulletin 652  
October 1992**

## THE PURPOSE OF THIS REPORT

This report contains the Environmental Protection Authority's environmental assessment and recommendations to the Minister for the Environment on the environmental acceptability of the proposals.

Immediately following the release of the report there is a 14-day period when anyone may appeal to the Minister against the Environmental Protection Authority's recommendations.

After the appeal period, and determination of any appeals, the Minister consults with the other relevant ministers and agencies and then issues his decision about whether the proposals may or may not proceed. The Minister also announces the legally binding environmental conditions which might apply to any approval.

## APPEALS

If you disagree with any of the assessment report or recommendations you may appeal in writing to the Minister for the Environment outlining the environmental reasons for your concern and enclosing the appeal fee of \$10.

It is important that you clearly indicate the part of the report you disagree with and the reasons for your concern so that the grounds of your appeal can be properly considered by the Minister for the Environment.

## ADDRESS

Hon Minister for the Environment  
18th Floor, Allendale Square  
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PERTH WA 6000

## CLOSING DATE

Your appeal (with the \$10 fee) must reach the Minister's office no later than 5.00 pm on 23 October, 1992

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## Summary and recommendations

The Environmental Protection Authority (EPA) has reviewed forest management proposals by the Department of Conservation and Land Management (CALM) for 1992 onwards. CALM is now the direct manager of timber harvesting rather than, as previously, the controller of timber companies. The last review by EPA was in 1987 when five to ten year management plans were examined.

The 1992 proposals are outlined by CALM in the following documents:

- Proposals to Amend the 1987 Forest Management Plans and Timber Strategy and Proposals to Meet Ministerial Conditions on the Regional Plans and the WACAP ERMP
- Management Strategies for the South-West Forests of Western Australia : A Review - Draft for Public Comment
- A Nature Conservation Strategy for Western Australia - A Draft for Public Comment
- National Estate Values in the Southern Forest Region, South West Western Australia

These documents were all subject to public review under CALM's legislation. The first was also jointly reviewed as part of this environmental assessment.

The Authority received more than 1000 submissions from the public and organisations during the public review of the proposals by CALM.

The recent Resource Assessment Commission Forest and Timber Inquiry and the Ecologically Sustainable Development Working Groups Report on Forest Use provided a very useful framework within which to consider a number of the proposals. In addition, the Authority was guided by comments made in its earlier assessments of the WA Chip & Pulp Co Pty Ltd proposal to continue the woodchip export industry and the 1987 Forest Region Management Plans and Timber Strategy.

The Authority convened a Technical Advisory Panel (TAP) to provide expert advice on specific issues and employed a forestry expert, Dr Ken Shepherd of the Australian National University, to review CALM's documentation. In addition, CALM provided detailed responses to the issues raised in public submissions and also a response to questions posed by the Authority to the Technical Advisory Panel.

These proposals, the additional information made available through the process of public review, as well as answers to specific questions asked of CALM by the Authority, and advice provided by the Technical Advisory Panel, have formed the basis for this assessment. All the additional information is included in appendices to this report.

CALM has proposed a new overall forest management objective:

*"To manage the native forests of the south west of Western Australia, in consultation with the community, so that they provide the values required by society while sustaining indefinitely their biological and social diversity."*

The Authority considers this a laudable objective which would appear to provide for the range of the community's expectations for their forests.

The forest review can be separated into proposals for management of karri forest and proposals for the jarrah forest.

### The Karri Forest

In the karri forest major changes were introduced almost 20 years ago with clearfelling yielding logs separated into timber for sawlogs, timber for wood chipping and other wood. Clearfelling enabled better regeneration and provided more efficient forest harvesting, increased forest growth rate and integration of management. Over those 20 years a series of environmental conditions have been put in place and it is now considered that the operation is environmentally acceptable. There is an excellent system of conservation reserves in the karri forest based mainly on EPA Red Book Recommendations of the 1970s.

As part of the original woodchip proposal road, river and stream reserves were devised to protect visual amenity, wildlife and stream water quality. In the present proposals the major change proposed by CALM is to redistribute the road, river and stream reserves to enhance stream protection at the cost of the width of road reserves. CALM has proposed that a sophisticated form of visual amenity assessment for determining road reserves be the basis of such redistribution, and the EPA has recommended to the Minister for the Environment that this change is environmentally acceptable subject to some recommendations being carried out. Another acceptable change is the proposed creation of additional conservation reserves.

## **The Jarrah Forest**

CALM's proposals for the jarrah forest involve major changes to forest management in Western Australia - the most significant since the extensive forest clearfelling of large areas of the forest in the 1930s. These changes have been progressively implemented by CALM over the last five years. Both Dr Ken Shepherd and the Technical Advisory Panel have commended CALM's conservation objectives in forest management as being the best in Australia. They also highlight the extensive nature of the jarrah forest proposals by CALM and the need for caution and the necessity to leave room to change if these proposals produce unacceptable impacts.

Historically the jarrah forest has been treated conservatively since the major disturbances of the 1930s. Most of the timber harvesting activities, and most of the forest disturbances, have been directed towards the wetter western one third of the forest (high rainfall zone). This portion was quite productive and had less environmental uncertainties associated with it.

Since the 1930s, the Jarrah forest has been cut for timber by selecting a small number of large trees from a mixed forest. This can be compared with the karri forest where clearfelling has become the norm over the last 20 years. The jarrah forests have previously not been clearfelled because, unlike the karri forests, jarrah does not 'self thin'. The many young seedlings in a karri forest regenerating after clearfelling compete for light which leads to self thinning. Jarrah forests re-grow to dense pole stands at 20 to 30 years, have no mechanism for self thinning and require imposed thinning or they grow more slowly. In the past, clearfelling of jarrah has been avoided because there has been no economic way of imposing that thinning through management. The new proposal sees gap creation, a process similar to clearfelling, and other intensive management techniques as becoming the common silvicultural technique in the jarrah forest. This imposes a long term requirement for on-going thinning.

Intensive harvesting in the central and eastern jarrah forest has been avoided in the past because of the risk of salt intrusion into soils and streams. With clearing of native vegetation there is a rise in groundwater table which may bring salt from deep in the soil to the surface. This process has led to extensive salinisation in agricultural areas in Western Australia. This is not such a problem with clearfelling of karri because of the lower levels of salt stored in the soils beneath karri forests. In this 1992 proposal CALM proposes intensive logging and extensive clearfelling over time in much of the central and eastern forests on the basis that regrowth of forests will occur quickly enough to prevent significant or long term increases in salinity.

Another important factor in jarrah forest management is disease control. Much of the central and eastern jarrah forest has been largely protected from forest logging activities, and certainly from intensive logging activities, by restrictions because of the risk of jarrah dieback. Jarrah dieback is a soil-borne disease caused by the fungus *Phytophthora cinnamomi*. The present proposal is to have extensive and intensive harvesting operations in the areas once largely protected by forest quarantine restrictions.

## **Sustainable Yield**

The 1987 predictions for sustainable yield of jarrah were for a constant yield of saw mill logs until 1992, thence decreasing to about two thirds of that level by 1997. As a consequence of a re-evaluation of the jarrah forest inventory and the adoption of new definitions of acceptable grades for saw logs, CALM now proposes to maintain the 1992 levels of 1st grade sawlogs to the year 2002 and beyond, in perpetuity.

CALM also identifies in this 1992 proposal as much again of other logs or forest residue as the total identified for milling. There is no specific market identified for this product, although presumably some small part of this is to be allocated to the silicon smelter in compliance with current supply contracts. The EPA believes that there should not be a permanent on-going substantial commitment to the use of this other wood in this Timber Strategy. Such a commitment would lock the State into long term acceptance of the new forest structure and the new intensive production with insufficient flexibility to adapt management in the light of new information or changes in community expectations.

### **Precautionary approach**

The EPA recognises the excellence of the system of conservation reserves in the jarrah forest and the extension of conservation reserves in the Southern Forest Region following the review by the Australian Heritage Commission (AHC) and CALM. The EPA recognises that the system of conservation reserves provides the cornerstone of forest conservation in Western Australia. However the EPA also recognises that the present proposals for jarrah forest harvesting would see a radical restructure of the production forest outside conservation areas.

The EPA further recognises that production forestry is the major objective for use of multiple use forest outside conservation areas, and in general the CALM proposals are based on the best available research and information. None-the-less the research information relating to operational aspects of the new forest harvesting is somewhat incomplete and there is uncertainty relating to a number of issues including salinity response, the effect of the salinity response, the localised faunal impacts, and to dieback interaction with intensive harvesting, particularly in the central and eastern areas where there are higher risks of salinity impacts.

Furthermore, there is the major question about the long term community acceptability of a significantly restructured forest. The EPA has therefore recommended to the Minister for the Environment that he accept the fundamentals of the CALM proposals as a trial and places conservative caveats which allow room to adapt management should subsequent monitoring and experience show the need to adapt.

Consistent with this precautionary approach the EPA has recommended monitoring of jarrah forest harvesting activities to the satisfaction of an independent monitoring and research committee reporting to the EPA and thence to the Minister for the Environment. The EPA has recommended that funds for this monitoring and research should be provided specifically linked to the sale and contracts of all forest produce.

The establishment of an independent cross-sectoral monitoring and research steering committee is proposed because of the wide range of experience and interest in the potential impacts of the proposed intensification of jarrah forest harvesting. The steering committee approach has been used effectively in the past with regard to the impacts of bauxite mining and the woodchip industry, indeed CALM has acknowledged the benefits of such independent oversight by quoting extensively from Steering Committee Reports in its documentation.

The EPA has recommended some specific constraints to the proximity and nature of logging adjacent to streams in areas identified by the Water Authority of Western Australia where there is a high risk of salinity impact. The EPA has also recommended formalisation of objectives for and the need to define and specify the 30 per cent of jarrah forest designated by CALM for protection within each secondary catchment of the jarrah forest.

### **Recommendation 1**

**The Environmental Protection Authority concludes that;**

- i) the proposals for the karri and karri-marri forest are environmentally acceptable; and could be implemented in accordance with the recommendations in this report and the application of a precautionary approach as outlined in this report; and**

ii) **the proposals in the jarrah and jarrah-marri forest are environmentally acceptable as a trial, since there are a number of uncertainties in predicting their long term environmental impacts. The Authority therefore recommends that they are implemented in accordance with the recommendations in this report and the application of the following general principles:**

- **a precautionary approach;**
- **adaptive and flexible management practices based on research and monitoring of operations;**
- **implementation as a trial with a reassessment by the Environmental Protection Authority after ten years (the period of the Management Plans and the Timber Strategy); and**
- **no commitment of all of the wood resource in the long term.**

#### Conservation through reserves

To ensure that particular conservation values are protected in perpetuity, sufficient land containing those values must be protected by secure land tenure and managed effectively to protect those values. This does not mean that all of the land with those values needs to be protected by this means, but it is critical that a certain proportion of land with these values be protected in this way. This can then be supported by the protection of the values in other places through management which is sensitive to those values.

CALM has proposed substantial increases in the size and distribution of forested areas within the secure conservation estate. Many of these increases have principally focussed on the values associated with old growth forest within the Southern Forest Region, but others such as the proposed Mt Roe National Park reflect other values. Proposals have also been outlined in the Swan and Central Forest Regions. The basis for these proposals has focussed closely on their environmental attributes as well as the adequacy of representation of those values in the existing reserve system. The extension of the AHC/CALM review of national estate values into the remainder of the forest may lead to further proposals.

The increases proposed by CALM provide improved protection of conservation values.

#### **Recommendation 2**

**The Environmental Protection Authority supports the amendments to the conservation reserve estate and recommends that they be implemented.**

#### Protection of areas close to roads, river and streams

The CALM documents contain proposals for protecting other important areas and values in the forests, particularly buffers along roads, rivers and streams, as well as rare, endangered and locally restricted plant and animal species, and diverse ecosystems.

The revision of the existing system of road, river and stream reserves was forecast in 1987 by CALM. The Authority indicated its preparedness to consider a revision that provided for improved protection of environmental values within multiple use State Forest. The proposal put forward in 1992 is slightly different to that outlined in 1987. There are significant improvements to the existing system. The proposal seeks to:

- extend the system of river and stream reserves to all forested portions of the Swan, Central Forest and Southern Forest Regions;
- expand the protected reserves to all levels of streams within those regions
- retain the commitment to exclude harvesting within the river and stream reserves, and mature forest within the road reserves;

- confirm the principle objectives of the reserve system to be habitat protection, fauna linkage, water quality protection, and visual amenity;
- reduce the width of buffers along roads with identified social values; and
- provide for minimum reserve widths and recognise the importance of defining river and stream widths according to site characteristics, particularly ecological boundaries.

The Authority supports the implementation of a revised and protected system of road, river and stream reserves which is based on environmental values, including water quality and wildlife protection.

### **Recommendation 3**

**The Environmental Protection Authority recommends that the revised system of travel route (road), river and stream reserves should:**

- **be implemented, consistent with Recommendation 13 in relation to Intermediate and Low Rainfall Zones;**
- **have an effectiveness monitoring programme (see Recommendation 14);**
- **remain unharvested in perpetuity, except for those portions of regrowth forest within road zones where thinning can be undertaken in a manner consistent with the enhancement of visual objectives**

#### Protection of other areas of high environmental value

Known sites within multiple use State Forest containing rare and/or endangered species of plants will be protected through management, and CALM's management proposals are intended to provide for protection of rare and/or endangered animal species. CALM has a statutory responsibility to protect animals and plants and has outlined specific objectives to achieve this. Management in State Forest to meet these objectives will include avoidance of harvesting and altered burning regime, where necessary.

Some portions of the multiple use State Forest contain sites of very high conservation value, such as wetlands, swamps, rock outcrops, and heathland. Many of these sites, which CALM has termed diverse ecotype conservation areas, have little or no timber value. Approximately 203 000ha of the karri and jarrah forest containing these sites are proposed to be protected from disturbance.

### **Recommendation 4**

**The Environmental Protection Authority supports the protection of the Diverse Ecotype Conservation areas and recommends that they:**

- **be implemented and identified on publicly available maps; and**
- **remain protected from timber harvesting and associated impacts in perpetuity.**

There are other portions of the State Forest that are important to people for many different reasons, including recreational spots, historic sites, and vantage points. In addition, other parts of the forest provide for corridors between areas of high conservation value, such as reserves or protected buffers. The Authority recognised these requirements in its WACAP Report and required CALM to address the protection and management of these special areas (EPA 1988).

CALM has proposed that, along with the revised road, river and stream reserve system, an additional 3 200ha of old growth karri forest will be protected as linkage areas or sites of high social or environmental value. However, it is very difficult for the Authority to make any judgement as to whether CALM's proposals for protecting and managing these special areas of high value old growth forest remaining within multiple use State Forest complies with the environmental conditions set on the WACAP proposal. CALM should provide information to and involve the community to demonstrate how its intentions would be applied locally.

## **Recommendation 5**

**The Environmental Protection Authority recommends that the 3,200ha of outstanding old growth karri forest proposed by CALM for protection from logging should be identified on a regional basis and with the benefit of public involvement, and should include areas which are particularly valued by the community. These areas should:**

- **include those trees in Beavis, Carey and Giblett forest blocks protected from clearfelling by environmental conditions related to the Manjimup-Beenup power line proposal (EPA Bulletin 603);**
- **be identified publicly within three years from the adoption of the Management Plans;**
- **be managed to retain their social values and not be subject to harvesting in perpetuity; and**
- **should be subject to reporting by CALM on their implementation and management at the next Forest Management Plan review (see Recommendation 15).**

**CALM should retain sufficient contractual flexibility to ensure that the allocation of these areas is not excessively constrained.**

### New Timber Strategy

The remainder of multiple use State Forest would be available for timber production. However, this is not to say that environmental protection and management should be restricted to protected areas. It is essential that environmental management be applied throughout the State Forest, and CALM has made proposals to comply with this objective.

When asked by the Authority to express the 1987 and proposed 1992 Timber Strategies in comparable terms CALM advised that it is very difficult to compare them because of changes in definition and improved assessment techniques. The Authority acknowledges the desirability of using the best methodology, but considers that some comparisons are essential to understand the implications of the new timber harvesting proposals. CALM needs to address comparability when introducing new resource assessment techniques so it can clearly explain to the broader community the implications of management changes.

Based on the Authority's best estimate, it would appear under CALM's proposals that the volume of jarrah logs classified as sawlogs would be harvested at a higher rate for the term of this Strategy than that proposed in the 1987 Timber Strategy. A consistently greater volume of karri sawlogs is also proposed to be available for harvesting. In addition, a substantial volume of jarrah and marri is identified for the first time as being available as residue material.

## **Recommendation 6**

**The Environmental Protection Authority has noted that CALM's silvicultural prescriptions for the jarrah forest have been developed with incomplete knowledge of their long term consequences; and therefore concludes that the proposals to amend the 1987 Timber Strategy should be implemented cautiously. The Authority recommends that the annual sustainable yield estimates in the Timber Strategy should only be applied for the life of the Strategy (i.e. until 2002).**

### Sustainable yield

The forests of the South-West represent a significant asset of the public. CALM's management plans identify the values the community expects from the forests. One of these is wood. In most of the multiple use forest, timber production is the primary objective.

The proposals represent a major change to management of both the karri and jarrah forest, especially the latter. For the karri forest, there are nominated rotation lengths for defined

portions of the forest. Outside of conservation reserves and other protected areas, there will be no current old growth forest remaining in about 40 years. In the jarrah forest, clearfelling will be the dominant regeneration treatment and this will result in a trend towards a younger forest over the first cutting cycle. As with the karri, old growth will largely disappear in the non-protected majority of the multiple use forest.

Management of the multiple use forests of the South-West must take account of the precautionary principle when specifying silvicultural practices and be applied in a flexible and adaptive manner.

### **Recommendation 7**

**The Environmental Protection Authority recommends that the letting of wood supply contracts from the jarrah forest under the CALM Act;**

- **not commit all of the volumes in any class of log defined in the Timber Strategy for a term exceeding 10 years from 1992; and**
- **not exceed the annual levels of supply in any class of log or wood (residue) nominated in the 1992 Timber Strategy.**
- **recognise the possibility of the necessity to reduce wood supply beyond 2002 as a result of monitoring and adaptive management following the trial implementation of the jarrah silvicultural prescription.**

### **Recommendation 8**

**CALM's inventory has identified classes of forest produce (other logs (jarrah) or forest residue (karri) in Tables 13 and 14 of the Timber Strategy) which had previously not been identified for commercial exploitation. There are uncertainties about the ecological implications of removing all of this biomass, so cautious, flexible management is warranted.**

**The Environmental Protection Authority recommends that no contract for a substantial portion of this newly identified resource should be entered into without prior referral of the proposal to the Environmental Protection Authority.**

### Changes to jarrah silvicultural prescription

This Report presents the first major environmental assessment by the Authority of the management of the jarrah forest. While the karri forest has been considered at least two times previously, only elements of jarrah forest management have been considered and reported on previously by the Authority. The main issue on both occasions was mining within the forest areas.

The jarrah forest proposals involve a significant intensification of forest management, including the potential removal of volumes of wood greater than previously predicted. The proposals are very complex and interrelate closely. There is limited available information on the environmental implications resulting from the application of this jarrah forest management. This has caused the Authority to approach these proposals with some caution, and its recommendations for the jarrah forest reflect this situation.

The jarrah forest is a relatively large area, it has a wide range of site conditions and qualities, and its response to management will vary from site to site. The jarrah forest has already been subject to a variety of management strategies, from extensive clearfelling in the high rainfall zone earlier this century, to a broad harvesting regime based on selectively removing the best timber. Jarrah grows slowly in its relatively harsh natural environment. The forest has the capacity to regenerate provided external influence, including management, are not irreversible.

The Authority considers that there is sufficient information to suggest that the jarrah management proposals could proceed. However, there is a need to monitor and evaluate impacts on the environment and the attainment of silvicultural objectives in the medium to long

term. Consequently the Authority considers that the implementation of a modified jarrah forest silvicultural prescription should only apply for the normal period of the 1992 Forest Management Plans and Timber Strategy, that is 10 years. Furthermore, the impacts of the prescription need to be monitored during that period and the results presented as part of the review of the next Plans in ten years time. Monitoring should include impacts on soil and stream salinity, *Phytophthora cinnamomi* spread and management, stream and terrestrial fauna, the effect upon the litter layer and other forest components resulting from removal of the canopy, and success of habitat trees.

### **Recommendation 9**

**The Environmental Protection Authority recognises that the jarrah silvicultural prescription represents a significant change to former jarrah forest management and needs to be conservative. Therefore, the Environmental Protection Authority recommends that the jarrah silvicultural prescription should**

- **be implemented as a trial, to provide a basis for future adaptability of management. Treated sites should be dispersed throughout the range of sites and localities in the forest (see Recommendation 14);**
- **include long term monitoring which quantifies the impacts of silvicultural practices on environmental elements and values in the forest and provides bases to adjust management; and**
- **provide for the first major report on outcomes and modifications to be part of the next review of Forest Regions Management Plans and Timber Strategy, by 2002.**

### Forest ecology

Two major elements of CALM's environmental management in the jarrah forest relate to the exclusion from harvesting of a portion of most catchments for a period of time. At least 30 per cent of 2nd order catchments in the Intermediate And Low Rainfall Zones (i.e. less than 1100mm per annum) will remain unlogged for at least 15 years. Where clearfelling is the regeneration treatment, Temporary Exclusion Areas (TEAS) will be retained as buffers generally 100m wide around gaps, until they are no longer required.

These areas, which may be coincidental in part, are intended to protect water, visual resource and wildlife (i.e., movement and dispersal corridors and habitat) values.

The Authority has recommended specific management of portions of the multiple use forest, consistent with the precautionary approach, to ensure that ecological objectives are met.

### **Recommendation 10**

**The Environmental Protection Authority recommends that in the intermediate and low rainfall zones at least 30 per cent of second order catchments in the multiple use jarrah forest should be left untreated (i.e. undisturbed from harvesting, thinning, etc.) for a period of at least 15 years after harvesting or treatment of the remainder of the catchment. This untreated proportion should:**

- **include areas of multi-aged forest (including unlogged sites);**
- **be selected to emphasise wildlife, water resource and visual objectives;**
- **comprise sites with a minimum dimension of 100m: and**
- **be in addition to protected river and stream reserves and diverse ecotype conservation areas.**

The status and effectiveness of this measure should be evaluated at the time of the next review of the Forest Regions Management Plans and Timber Strategy, by 2002 (see Recommendation 14).

CALM has outlined management objectives for the forests which include protection of flora and fauna species and their habitat. The forms of protection range from exclusion of activities, through modification of activities to the provision of strategies aimed at allowing recolonisation following major disturbance, including habitat loss.

Within the jarrah forest, several CALM proposals relating to nature conservation were highlighted. There is the recognition of the need to retain particular types of habitat, many old trees with or having the potential for hollows and hollow logs on the ground, within areas that have been clearfelled. However, the Authority does not believe that there is sufficient research information to indicate if three retained trees per hectare are sufficient. The extension of river and stream reserves into the jarrah forest is another significant improvement. There is also the proposal to significantly reduce the presence of *Banksia grandis* (Bull Banksia) because of its link with dieback disease. The environmental implications of this have yet to be defined.

### **Recommendation 11**

**The Environmental Protection Authority recommends that the jarrah silvicultural prescription be modified in the following ways:**

- **in providing for habitat trees CALM should ensure that sufficient selected trees are retained on sites subject to gap treatment which have the potential to provide this function throughout the lifecycle of the forest; and**
- **the reduction of the population of *Banksia grandis* be limited to specific areas with a high risk of *Phytophthora cinnamomi* impact, that a programme to identify and evaluate the environmental implications of the reduction be established as a priority, and that the results of that evaluation be subject to the next review of the Forest Regions Management Plans by 2002 (see Recommendation 14).**

### Fire management

Fire has a major influence on the forest environment. It can be essential to some species at specific times of the year, and deleterious at other times and to other species. The Authority endorses CALM's commitment to the application of diverse fire regimes to meet a range of objectives. Nevertheless, submissions showed that the public continues to be concerned about the impact of fire prescriptions on the forests. This appears to be partly due to a lack of public understanding of CALM's fire management programme and the implicit judgements. Research and monitoring needs to continue on the consequences of fire to the forest, and CALM should ensure that the public is better informed about CALM's fire management.

Prescribed burns by CALM can lead to unacceptable smoke levels within urban areas. CALM's proposals include the application of more sophisticated fire management and prediction techniques. Associated with this should be better forecasting of climatic conditions, with the objective of not adversely affecting urban air quality.

### **Recommendation 12**

**The Environmental Protection Authority recommends that the fire management objectives related to the jarrah silvicultural prescription should be modified to:**

- **include avoidance of air pollution in urban areas; and**
- **CALM should inform the public about its fire management (purposes of burns, areas burnt under different regimes of season and periodicity, escapes etc.) on a regional basis in its annual report each year.**

### Salinity risk

In some catchments with high risk salt sites, harvesting could represent a significant threat to water quality. In these areas, the Water Authority has indicated that a different prescription, based on wider protected stream buffers and phased logging, should be adopted. It is not

expected that this prescription would apply to all of the salt sensitive zones, but the high risk sites need to be identified and managed accordingly.

### **Recommendation 13**

**In Recommendation 10 several constraints on logging in the jarrah forest are outlined for the protection of water resources, wildlife and visual amenity. There are some sites, mostly in the Intermediate and Low Rainfall Zones (i.e. <1100mm per annum), where even with these constraints the risk of salt impacts following logging is still unacceptably high.**

**The Environmental Protection Authority recommends that the jarrah silvicultural prescription should be modified to provide for the identification by CALM, on advice from the Water Authority of Western Australia, of second order catchments with a high salt risk, within which**

- **permanently protected stream buffers, at least 50 metres wide, should be left on both sides of all streams and**
- **that part of the catchment which is to be left untreated as required by Recommendation 10 should be concentrated in the lower part of the catchment.**

### Monitoring and research

For the proposed forest management to be properly evaluated as a trial, it is essential that an effective monitoring system be put in place. The scale and timing of the trial dictates that this effort, at the design, measuring and evaluating stages, be coordinated. This monitoring should be based on sound pre-logging information, to enable the identification of desirable and undesirable responses. Management should then be amended according to these findings. This means that research and monitoring should be related to operational practices.

This monitoring needs to be evaluated in time for the next major review of the forest management plans and Timber Strategy, expected in 2002. It is important that the community has an adequate opportunity to participate in this evaluation.

As with other proponents, CALM will be asked by the Environmental Protection Authority to provide reports from time to time on its compliance with the environmental conditions.

### **Recommendation 14**

**The Environmental Protection Authority recommends that a Forest Monitoring and Research Committee be established. The Committee should;**

- **have objectives which include the identification and approval of monitoring and research programmes and projects on environmental impacts of forestry management, granting of funds towards such research, receipt of progress reports, reporting to the Environmental Protection Authority and publication of results;**
- **be established within 12 months;**
- **be funded principally from the proceeds of native forest product sales; and**
- **give brief annual progress reports to the Authority, with major reports in 1997 and 2002, at the time of the next review of Forest Management Plans and the Timber Strategy. The Authority shall report to the Minister for the Environment following the receipt of each major report.**

### **Recommendation 15**

**The Environmental Protection Authority recommends that CALM provide brief annual progress reports to the Authority, and major public reports in 1997 and 2002, on compliance with the environmental conditions.**

# 1. Introduction

The Department of Conservation and Land Management (CALM) has proposed changes to its Forest Management Plans for the Swan (formerly Northern Forest and Metropolitan), Central Forest and Southern Forest Regions and the associated Timber Strategy. Also CALM is required under the environmental conditions of approval of the 1987 Regional Plans to provide information on a number of matters for assessment by the Environmental Protection Authority. In addition CALM has responsibility for satisfying a number of the Environmental Conditions relating to the approval of the W. A. Chip and Pulp Co Pty Ltd (WACAP) proposal of 1987.

Although the Environmental Conditions currently apply to WACAP, and WACAP is legally responsible for the meeting of those Conditions, approximately half of them can no longer be considered in that light. Following the assessment of the WACAP proposal in 1988, major changes occurred in relation to commercial aspects of harvesting. CALM took over responsibility for the harvesting and transport of all logs to sawmills and the chipmill. In addition, CALM as manager of the State Forest has a direct responsibility for forest planning and land allocation. Therefore, following discussions between officers of the Authority, CALM and WACAP, it was agreed that CALM would be responsible for Environmental Conditions No. 2, 3, 4, 5, 6 and 13 attached to the WACAP project. Several other Environmental Conditions (No. 1, 9, 11 and 12) apply to both CALM and WACAP. Environmental Conditions arising from this assessment should enable clarification of a number of these responsibilities.

CALM has outlined its proposals in a document entitled "Proposals to Amend the 1987 Forest Management Plans and Timber Strategy and Proposals to Meet Ministerial Conditions on the Regional Plans and WACAP ERMP" (the Proposals document).

Some of the details of the proposals and the supporting information is provided in the draft documents entitled "Management Strategies for the South-West Forests of Western Australia" (draft Forests Management Strategies) and "A Nature Conservation Strategy for Western Australia" (NCS) which were released for public review in parallel with the proposals document.

Further background information on some of the proposals was provided in the five volume document "National Estate Values in the Southern Forest Region, South West Western Australia" released for public review (at the same time as the other documents) jointly by CALM and the Australian Heritage Commission.

To assist its consideration of the technical and scientific issues related with the assessment the Authority established a Technical Advisory Panel (TAP) of people with recognised expertise in areas being considered by the Authority. The Panel was convened by Professor Albert Main (an ex-Chairman of the Authority). The other members were Dr Bernie Dell of Murdoch University, Dr Frank Hingston of CSIRO, Dr Rick Howe of the W A Museum, Dr Ian Loh of the W A Water Authority and Dr Joanna Tippet-Young, a former research scientist with CALM.

The TAP's Terms of Reference included a list of questions prepared by the Authority. The TAP met three times with the Authority, as well as holding discussions with CALM and other interested parties. A report prepared by TAP is presented in Appendix 2. The Authority's list of questions was also provided to CALM and CALM's responses to them are in Appendix 3.

In addition, the Authority was aware of the need to place CALM's proposals in a wider context and to submit the documents to peer review. The Authority therefore contracted Dr Ken Shepherd of ANUTECH (the commercial arm of the Australian National University) to provide advice from an international and national perspective of forestry standards. Dr Shepherd's report is presented in Appendix 4.

This report presents the Environmental Protection Authority's assessment of the proposals as outlined in CALM's Proposals document and supporting documents, and recommendations on the environmental conditions which should be applied to their implementation.

## **2. CALM's proposals**

CALM's proposals relate to a large number of forest management issues throughout the South-West forest and are outlined in CALM's proposals document. A brief summary of the proposals is provided here while more detailed descriptions of each proposal are presented in Section 4 of this report.

### **2.1 CALM's new forest management objective**

CALM has proposed a new overall forest management objective:

"To manage the native forests of the south west of Western Australia, in consultation with the community, so that they provide the values required by society while sustaining indefinitely their biological and social diversity." (CALM 1992b, p119)

This is supported by a series of sub-objectives and strategies for their implementation, chiefly through progressive inclusion in the plans, programmes and policies prepared by CALM from time to time.

### **2.2 CALM's revised road, river and stream reserves**

CALM has completed a review of the system of road, river and stream reserves which has been operating in the old Woodchip Licence Area since woodchip exports commenced in 1975.

A new system of travel route zones is proposed throughout the entire forest, based on defining routes with the highest levels of use and viewer sensitivity. Within these zones in the Southern Forest Region there will be no logging (though a small area will be thinned), and in the Central Forest and Swan Regions logging practices will be modified according to visual resource management principles. As a result of these proposals the width of most existing road zones will be reduced from 400 metres either side to 100 - 200 metres either side, and several roads will no longer have road zones.

A new system of river and stream zones is also proposed. Again the proposal will lead to the width of some existing zones being reduced, but the system is to be extended from the old Woodchip Licence Area to the entire forest. These zones will not be logged

### **2.3 CALM's proposals for high value old growth forest**

Under an agreement reached between CALM and the Australian Heritage Commission (AHC) areas of high value old growth forest in the Southern Forest Region have been identified and are proposed for nomination for the Register of the National Estate.

Much of the identified old growth forest is already protected in conservation reserves, and further additions to the reserve system are proposed. Some will also be protected in the proposed river and stream zones and linkage zones.

Modified logging procedures are proposed for those identified areas of old growth forest which are outside existing and proposed reserves, and changes are also proposed to the karri silviculture to help maintain old growth values.

### **2.4 CALM's karri forest management guidelines**

Changes are proposed to the karri silvicultural specification. Maximum coupe (gap) size will be reduced to 80 hectares, with the average about 30 hectares, and there will be constraints on clearfelled gap dispersal and the period between the harvesting of adjacent areas.

CALM also proposes the retention of mature habitat in zones linking the road, river and stream zones and other retained areas.

Increased rotation lengths are proposed so that a proportion of the karri forest will be managed on a 250 year rotation and the rest on a 100 year rotation except for some small areas which will be harvested and regenerated at 60 or 80 years.

## **2.5 CALM's jarrah forest management guidelines**

CALM proposes a new jarrah silvicultural specification involving more intensive timber extraction (see Timber Strategy changes), but with provision for reduced gap size and specified minimum widths of undisturbed forest between gaps.

Phased logging is proposed for salinity control so that, except in the high rainfall zone (HRZ), at least 30 per cent of each second order stream catchment will remain unlogged for at least 15 years after the remainder of the catchment is logged.

It is proposed that the forest be thinned to a tree density equivalent to a basal area of at least 15 square metres per hectare in the high rainfall zone and 15 square metres per hectare in the low (LRZ) and intermediate rainfall zones (IRZ).

Three large habitat trees and at least one ground habitat log will be retained per hectare. The maintenance of the existing multi-aged structure is proposed, with a minimum of three age classes (mature trees, intermediate aged 'crop' trees and regeneration) present in each area of forest cut over.

CALM will maintain diverse fire regimes will be maintained in the forest, and a review of fire management programmes in the forest is proposed, incorporating a Wildfire Threat Analysis. Timber industry personnel will be trained to increase the resources available for fire-fighting.

Community education on dieback will be expanded. The *Banksia grandis* (Bull banksia) population in high impact sites in the jarrah forest will be reduced to reduce inoculum density and prescriptions for the use of phosphorous acid for control of dieback will be developed.

A fox eradication campaign is proposed, with the aim that 20 per cent of the forest will be fox-free in the next ten years.

## **2.6 CALM's marri chiplog harvesting from the 'salt risk' zones**

CALM proposes that the constraint on harvesting marri for woodchips from the 'salt risk zones' of the Southern Forests Region should be lifted on the basis that the available evidence suggests that salinity can be adequately controlled using its proposed jarrah silvicultural specifications. On-going monitoring is also proposed.

## **2.7 CALM's management of State Forest next to reserves**

CALM proposes to apply visual resource management principles to timber extraction from areas adjacent to Dalgarp, Lennard, Mullalyup, Preston, Noggerup, Mowen and Dardanup conservation reserves. In addition, Lennard, Preston and Noggerup reserves are also to be expanded.

## **2.8 CALM's changes to reserves and State Forest**

Significant additions to State forest were foreshadowed in the 1987 Region Management Plans. They will be proceeded with. CALM proposes some major new reserves and several other minor changes of tenure are also proposed.

Areas of heathlands, rock outcrops, wetlands and other important diverse ecotypes within State forest are currently not logged. They will be protected from road making and other physical disturbance.

## 2.9 CALM's new timber strategy

The figures of available timber and sustainable yield given in the 1987 Timber Strategy have been updated by CALM to reflect the additional quantity of timber identified in the recently completed forest inventory, adjustments to the reserve and zone system in the karri forest and to take into account new milling technology and new market opportunities for lower grade products.

## 3. Public review

Under the Conservation and Land Management Act, CALM was required to release the draft documents for public review. Also, because the proposals have the potential for significant environmental impacts and are in part to meet Environmental Conditions previously imposed by the Minister for the Environment, their environmental acceptability has been assessed under the Environmental Protection Act following public review. As public review of the proposals was required under both Acts, the Authority in cooperation with CALM agreed on a single public review of the document outlining the proposals.

Because of the complexity of the subject matter and CALM's requirements under its legislation several documents were released simultaneously for review. In response to the pressure this placed on the responding public, adjustments were made to the review periods to increase the time available for consideration and comment. The documents and their review periods were as follows:

**Table 3-1. Documents subject to this review**

Document Title	Abbreviated title used in this Report	Public Review began	Public Review ended
Proposals to Amend the 1987 Forest Management Plans and Timber Strategy and Proposals to Meet Ministerial Conditions on the Regional Plans and the WACAP ERMP	Proposals document	29 February 1992	5 June 1992
Management Strategies for the South-West Forests of Western Australia - A Review - Draft for Public Comment	draft Forests Management Strategies	5 February 1992	5 June 1992
A Nature Conservation Strategy for Western Australia - A Draft for Public Comment	NCS	4 February 1992	6 July 1992
National Estate Values in the Southern Forest Region, South West Western Australia (5 volumes)	AHC/CALM documents	5 February 1992	5 August 1992

Submissions were received by both CALM and the Authority on the Proposals document. A summary of the issues raised in submissions received by the Authority was made and this was referred to CALM for response. The summary of issues and CALM's responses to them are provided in Appendix 1.

The Authority received more than 1000 submissions from the public and organisations during the public review of the proposals by CALM. While a very large number of specific points and questions were raised in those submissions, the following central concerns emerged.

### Sustainable yield of timber

Submissions questioned whether the proposals for multiple use State Forest management (including a perception that there was an increase in the volume of timber to be removed from the forest) were ecologically sustainable in the medium and long term.

### Road, river and stream reserves

There was a general desire in submissions that the existing system of protected reserves along major roads, rivers and streams in the karri forest should not be changed, and that while there was strong support for the extension of these reserved buffers into the remainder of the Forest Regions, this should be additional to the existing system.

Most submissions expressed concern at the width of the proposed reserves, especially along streams. People referred to scientific papers which pointed to the need to have buffers wider than those proposed by CALM to ensure that habitat and other fauna values were protected.

### Additional conservation reserves

Most submissions were in favour of the additional reserves proposed, especially in the Southern Forest region though some objected to this additional constrain on timber extraction. A number of submissions suggested that other areas of the State Forest, such as Hester Block and Crowea Block, should have also been reserved.

### Areas of old growth forest not included in proposed reserves

The notion that old growth values in the multiple use forest could be retained by logging on a long enough rotation period, as proposed by CALM, was not acceptable to some people. There were views expressed that old growth areas of forest should not be logged, that more areas should be protected but remain outside of the reserve system, and that the area of multiple use forest to have a long (> 250 year) rotation period should be significantly increased.

### Jarrah forest management

There were many aspects of the proposed jarrah forest management which raised concerns in submissions. Issues such as dieback and fire frequency, intensity and timing were raised, as well as concerns about impacts on the forest ecology and salinisation of water resources resulting from harvesting.

This very brief discussion is inadequate to indicate the range and depth of issues raised in submissions. The interested reader is referred to Appendix 1 where the issues raised, and CALM's responses are tabulated in parallel with the text of the Proposals document.

## **4. Environmental implications and their management**

This assessment has provided the opportunity for the Authority to refine its assessment of management proposals for the karri forest and to consider jarrah forest management in detail for the first time.

The present assessment is based on the requirement for the Authority to consider the environmental implications of proposals that CALM has developed to address some of the Environmental Conditions arising from the assessment of aspects of forest management in 1987 and 1988, and partly to assess the environmental acceptability of foreshadowed and additional changes to proposals reviewed by the Authority in 1987 and 1988.

In its 1987 report on WACAP, the Authority encouraged the adoption of flexible management of forests. The Authority remains convinced that such flexibility is essential to ensure that management is responsive to research and operational findings.

The EPA has been approaching forest management and ecological maintenance through a hierarchy of actions, commencing with its first major thrust shortly after its formation: the review of the adequacy of the existing system of conservation reserves. This approach has been based on three main elements:

- establishment of a comprehensive, representative reserve system where effective management for conservation purposes is the principal objective;
- maintenance of natural processes through management of all forest ecosystems and uses; and
- minimisation of environmental impacts through effective management of forest use.

These are major parts of the strategy now being applied in Australia to ensure that forest use is ecologically sustainable.

### **Ecologically sustainable development**

The Draft National Forest Policy requires that forest management in Australia meets the objectives of ecologically sustainable development (Commonwealth of Australia 1992). The Ecologically Sustainable Development Working Group on Forest Use used the following principles to guide the development of its view of ecologically sustainable forest use.

*"The Working Group considers that ecologically sustainable forest use implies optimising the tangible and intangible social and economic benefits which forests can provide to the community, with the goals of maintaining the functional basis of forested land, biodiversity, and the options for future generations" (ESDWG, p35)*

The Working Group then related the principles of ecologically sustainable development to the formulation

*"... of a policy framework and approaches which recognise three requirements:*

- *maintaining ecological processes within the forests;*
- *maintaining biodiversity; and*
- *optimising benefits to the community from all uses within ecological constraints."* (ESDWG, p35)

How these could be achieved within the forest was considered at length by the RAC's Forest and Timber Inquiry. The Inquiry concluded that the ecological requirements of sustainable development of the forests would be met if five key goals were incorporated into forest use policies and plans:

- *to recognise that forest ecosystems have a complex evolutionary history, change naturally over time, and have thresholds beyond which they are not capable of maintaining their natural structure and function;*
- *to manage ecosystem processes in a way that does not compromise the long-term ability of forests to regenerate the natural (capital) stock of ecological resources (soil, water, plants, and animals);*
- *to maintain the biological diversity of Australia's forests through an adequate system of conservation reserves and through appropriate management practices in other public and private forests, in particular those managed principally for timber production;*
- *to adopt a precautionary approach whenever there is a significant chance that a particular forest use option might lead to irreversible consequences;*
- *to redress our incomplete information base and poor understanding of forest ecosystems by consistent measurement and assessment procedures that are agreed to and adopted by all forest management agencies."* (RAC 1992a, p110)

### **Precautionary approach**

The Authority's concept of flexible management is similar to the precautionary approach mentioned by the RAC. This approach was referred to in the RAC's conclusions on the environmental impacts of wood production in native forests.

*"At present there are relatively few published and unpublished Australian papers containing original data on the impacts of forest use. Consequently, there is insufficient information available to support claims about whether impacts resulting from forest uses, including wood production, are benign or deleterious to environmental values in Australia. The information that is available addresses short term effects (a decade or less). However, in the view of the Inquiry, the major concerns are those that are less obvious and gradual and may become serious in the longer term.*

*After taking the precautionary principle and intergenerational equity into account the Inquiry concluded that the cessation of wood production activities in native forests is not justified on the basis of the evidence before it. However, the Inquiry strongly emphasises that there are inherent uncertainties about long term effects and therefore the precautionary principle must form the basis for all future policies and practices relating to the management of forests for wood production and for minimising the impacts of this activity. This is particularly important given the current trends towards increasing intensity of wood production regimes.*

*The Inquiry concludes that the current levels of monitoring impacts are inadequate and recommends that systematic long term monitoring be established and that forest managers hold the maintenance of forest ecosystem processes as their highest priority. The Inquiry considers that there is much scope for improving public confidence in the ability of forest managers to identify problems and modify their management accordingly. To this end, the Inquiry recommends independent audits of the adequacy of forest codes of practices and their enforcement." (RAC 1992b, p68-69)*

This conclusion is entirely consistent with the approach outlined by the Authority in 1987 and provides a fundamental framework within which the Authority has considered these proposals.

### **Adaptive management**

Intimately related to the precautionary approach is adaptive management. This was explained by the RAC in the following way:

*"Adaptive management aims to take account of environmental, economic and social information at the very beginning of the design process for resource developments. The approach requires the following:*

- *identification of the boundaries of the management problem in terms of explicit and hidden objectives, practical constraints on action, and the breadth of factors considered in policy analysis;*
- *development of a management framework that considers all attributes of the management system through time;*
- *involvement of interested parties in identifying and solving problems during the design phase;*
- *representation of existing understanding of the managed system (forest ecosystems) in terms of explicit models of dynamic behaviour that identify assumptions and predictions clearly enough to detect errors and provide a basis for learning;*
- *design of studies to identify the particular management requirements involved in the project;*
- *design of studies as part of the management framework;*
- *representation of uncertainty and risk and its propagation through time in relation to management actions;*
- *development of monitoring and remedial mechanisms as integral parts of the design;*
- *in the design of the monitoring and remedial mechanisms, a careful analysis of the economic trade-offs between mechanisms that aim to eliminate unexpected events*

*through proper planning and design and mechanisms that provide for monitoring and mitigating the effects of unexpected events;*

- *a mechanism for change to incorporate the results of monitoring and experimentation in management procedures;*
- *design of balanced policies that provide for sustainable resource protection while searching for better understanding and untested opportunities."* (RAC 1992a, p455)

### **EPA environmental management principles**

The Authority outlined a number of guiding principles for environmental management of multiple use forests in its 1988 assessment of the woodchipping industry (EPA 1988, p13-14). These have been slightly revised for this assessment:

1. Legitimate forestry practices such as sawlog production, the extraction of other wood products derived from these practices, or justified silvicultural practices (such as thinning) are generally environmentally acceptable in multiple use State Forest.
2. So far as possible, management of State Forest for multiple use should remain amenable to re-appraisal in the future.
3. Forest management practices should be flexible and adaptive.
4. Where knowledge about significant aspects of the proposal is uncertain, caution dictates that critical decisions should be conservative and that these uncertainties should, where possible, be addressed.
5. It is desirable that there should be alternate resource bases such as plantations on private property to relieve pressure on the multiple use forests, especially old growth forests.
6. Community confidence on management of the multiple use State Forest is enhanced where there is scope for consultation and involvement.

The Authority has continued to follow these basic principles in this assessment, taking the key elements of ecologically sustainable development with them.

### **Conclusion**

CALM's proposals have been prepared within the context of ecologically sustainable development and the recent draft Forest Strategy. In many respects, they comply with them better than management plans for forests elsewhere in Australia. (see Appendix 4 of this Report).

There are major advances in environmental protection, such as the changes to the conservation reserve estate in the Southern Forest Region and extension of protected river and stream buffers into the jarrah forest. However, as noted by the Resource Assessment Commission and also Dr Shepherd, there is a lack of certainty of knowledge of the environmental impacts of the proposals. The CALM proposals do not provide the degree of caution within this context that the Authority would expect. The application of the intensive jarrah silvicultural prescription throughout the jarrah forest is a major expansion and yet there remain many uncertainties associated with the management prescription. Whether there will be sufficient suitable habitat retained within the multiple use forest to preserve species in the long term, and adequate protection of water quality on some forest sites, are not clear and there is insufficient research information to allow decisions to be made with certainty.

The Authority has applied the precautionary approach to CALM's proposals and has made recommendations which modify a number of the proposals. Of particular importance is the Authority's recommendation to the Minister for the Environment that he accept the fundamentals of the CALM proposals as a trial and place conservative caveats which allow room to adapt management should subsequent monitoring and experience show the need to adapt.

## **Recommendation 1**

**The Environmental Protection Authority concludes that;**

- i) the proposals for the karri and karri-marri forest are environmentally acceptable; and could be implemented in accordance with the recommendations in this report and the application of a precautionary approach as outlined in this report; and**
- ii) the proposals in the jarrah and jarrah-marri forest are environmentally acceptable as a trial, since there are a number of uncertainties in predicting their long term environmental impacts. The Authority therefore recommends that they are implemented in accordance with the recommendations in this report and the application of the following general principles:**
  - a precautionary approach;**
  - adaptive and flexible management practices based on research and monitoring of operations;**
  - implementation as a trial with a reassessment by the Environmental Protection Authority after ten years (the period of the Management Plans and the Timber Strategy); and**
  - no commitment of all of the wood resource in the long term.**

### **4.1 New objective for native forests**

In Chapter 2 of the proposals document CALM outlines a new overall management objective for native forests:-

*"To manage the native forests of the south west of Western Australia, in consultation with the community, so that they provide the values required by society while sustaining indefinitely their biological and social diversity."*

On pages 119-122 of the draft Forests Management Strategies this is amplified by five subsidiary objectives:

#### ***Conservation objective***

*To maintain biological diversity at the genetic, species and ecosystem level in the forest, with special emphasis on the protection and conservation of threatened, rare and uncommon taxa and communities.*

#### ***Management objective***

*To protect and enhance identified forest values and to employ the best practices in managing forest ecosystems.*

#### ***Production objective***

*To manage the forests to produce the mix of commercial values approved by Government, in a manner which is ecologically sustainable.*

#### ***Recreation objective***

*To facilitate the public enjoyment of the forest in a manner that is consistent with nature conservation and other objectives.*

#### ***Knowledge objective***

*To seek a better understanding of the composition and function of forest ecosystems and to promote awareness and appreciation of their values.*

Under each of these objectives several strategies are listed which aim at achieving the objectives.

In his report on the documents (see Appendix 4 of this Report) Dr K Shepherd examined the consistency of CALM's objectives and proposals with the latest national and international understandings. He advised that the proposals

*"... are entirely consistent with the thrust of the current environmental and conservation debate" (p1)*

In relation to the national approach arising from recent reviews of forest use and ecologically sustainable development, Dr Shepherd advises that CALM's proposals meet the intentions outlined by the Ecologically Sustainable Development Working Groups, the Resource Assessment Commission and the Draft National Forest Policy.

## **Implementation**

CALM explains that implementation of these objectives will be through the development of forest region management plans, issue plans, area management plans, wildlife management programmes and recovery plans, policies and prescriptions and the five year research plan. Implementation hinges on the development of these programmes, policies and plans. As a minimum, therefore, a programme for their preparation is required, cross-tabulated to the strategies to ensure provision is made for the implementation of all strategies.

## **Constraints**

No mention is made in the CALM documents of the constraints under which CALM is operating. Some elements of the objectives appear to be competitive and thus will constrain achievement of the objectives. For example, CALM has referred to constraints due to contractual commitments for the supply of timber which limit its flexibility with regard to the proposal widths for stream zones. These constraints need to be acknowledged in the document so that the context for CALM's proposals can be properly understood.

## **Conclusion**

The Authority considers that the objectives outlined in the CALM documents appear to provide for the range of the community's expectations for their forests.

## **4.2 Proposed changes to the reserve system in south-west forests**

There are many proposed changes to the conservation reserve system in the Forest Regions. Several new national parks and nature reserves and additions to a number of national parks, nature reserves and conservation parks are proposed, some existing areas of conservation reserve will revert to State Forest, and other areas will be removed from control under the Conservation and Land Management Act

### **4.2.1 Amendments to the conservation reserve system and State Forest**

The draft Forests Management Strategies indicates proposals to amend the existing or 1987 proposed classification of land within the three forest regions, or to excise some areas from the land managed by CALM. Table 4-1 below lists these changes.

**Table 4-1. Proposed changes to State Forest and Conservation Reserves**

Area Name	Area (ha)	Classification		Area Name	Area (ha)	Classification	
		Current (1987)	Proposed (1992)			Current (1987)	Proposed (1992)
<b>SWAN REGION</b>				<b>Dwellingup District</b>			
Perth District				Meelon	5	nature res(P)	delete
Yanchep	45	VCL	nat pk	George	3140	State for	cons pk
Mundaring District				Lane Poole Reserve (Icy Creek)	180	cons pk(P)	5g res
John Forrest	1130	freehold	nat pk				
Burkinshaw Road	10	cons pk(P)	delete				
Jarrahdale District							
Araluen-Canning	35	cons pk(P)	delete				
Monadnocks	15370	cons pk(P)	nat pk				
Gibbs	5850	State for	cons pk				
Grobs	10	timber res	cons pk				
<b>CENTRAL FOREST REGION</b>				<b>Kirup District</b>			
Harvey District				Goonac	30	cons pk(P)	nat pk
Lane Poole Reserve	26420	cons pk(P)	nat pk	Preston	305	State for	nat pk
Lane Poole (Stene)	1465	State for	nat pk	Hovea	1055	State for	nat pk
Clarke (Falls Brook)	1165	State for	nature res	Noggerup	1690	State for	nat pk
Kemerton	1405	5g res (P)	delete	Gwindinup	10	cons pk(P)	delete
Kemerton	265	5g res (P)	cons pk	Hester	780	State for	cons pk
Wagerup	10	cons pk(P)	delete	Ryall	260	State for	cons pk
Collie District				Camballan	7155	VCL	cons pk
Lane Poole Res.	9845	cons pk(P)	nat pk	Camballan	1430	State for	cons pk
Lennard	645	State for	cons pk	Camballan	110	other res	cons pk
Gervasse	2015	State for	cons pk	Busselton District			
Roseneath	1360	State for	nat pk	Leeuwin-Naturaliste	325	other res	nat pk
Goonac	5140	cons pk(P)	nat pk	Nannup District			
				Beaton	415	State for	cons pk
<b>SOUTHERN FOREST REGION</b>				<b>Walpole District</b>			
Manjimup District				Mattaband	250	State for	nat pk
Jardee	10	cons pk(P)	State for	Pardalup Road	30	nature res	delete
Jervik Park	10	cons pk(P)	delete	GumLinkRd(Mt Roe)	575	nature res	nat pk
Dingup	210	State for	nature res	Thames (Mt Roe)	880	nature res	nat pk
Keninup	6740	State for	nature res	Thames (Mt Roe)	500	nature res(P)	nat pk
Talling	6410	State for	nature res	Mt Roe	11715	VCL	nat pk
Talling	5	other res	nature res	Mt Roe	37050	State for	nat pk
Chitelup (Mt Roe)	2890	State for	nat. pk	Mt Roe	26770	other res	nat pk
Pemberton District							
D'Entrecasteaux	90	nat pk	State for				
Charley	2385	State for	nat pk				
Hawke	60	State for	nat pk				

(Source: CALM 1992c)

Several of the proposals involve removing land from the estate managed by CALM or changing its conservation management priority. These areas are listed in Table 4-2 below. The Authority sought advice from CALM on the reasons for these changes and this table also outlines that advice and, where land would be deleted from vesting under the Conservation and Land Management Act, the area's future status.

In providing this advice, CALM has forecast several revisions in the final Management Strategies document. These changes involve Kemerton, Wagerup and Jardee.

**Table 4-2. Explanation for some proposed amendments**

Area Name	Area (ha)	Classification		Reason for Change
		Current (1987)	Proposed (1992)	
<b>SWAN REGION</b>				
3. Burkinshaw Road	10	cons pk(P)	delete	Area too small - remain as unvested national park. Area too small - remain as unvested national park. Area unsuitable - remain as unvested nature reserve. To be consistent with classification of surrounding reserve.
4. Araluen-Canning	35	cons pk(P)	delete	
8. Meelon	5	nature res(P)	delete	
10. Lane Poole Reserve (Icy Creek)	180	cons pk(P)	5g res	
<b>CENTRAL FOREST REGION</b>				
14. Kemerton	1405	5g res (P)	delete	Core industrial area to be transferred to LandCorp, and remainder of previously proposed conservation park and new addition now to be 5(g) reserve for industrial buffer & conservation in final plan. Now proposed to be nature reserve in final plan Area too small - remain as unvested national park.
16. Wagerup	10	cons pk(P)	delete	
26. Gwindinup	10	cons pk(P)	delete	
<b>SOUTHERN FOREST REGION</b>				
34. Jardee	10	cons pk(P)	State for	Now to remain as unvested national park, shown in final plan as 'delete' and its future status reviewed. Area unsuitable - remain as unvested national park. Areas isolated from main body of national park Area unsuitable - remain as unvested nature reserve.
35. Jervik Park	10	cons pk(P)	delete	
41. D'Entrecasteaux	90	nat pk	State for	
45. Pardalup Road	30	nature res	delete	

#### 4.2.2 Management of areas adjacent to reserves

The 1987 Northern, Central and Southern Forest Region Management Plans included proposals to replace the pre-existing system of Management Priority Areas (MPAs) with a revised tenure system. In most cases, that meant that areas previously recognised as conservation priority (i.e. Flora, Fauna and Landscape) MPAs would be reserved as conservation park, national park or nature reserve, while a larger number of MPAs with other priorities would remain within State Forest.

In its report on the 1987 Forest Region Management Plans, the Authority accepted these changes. However, it specifically noted that a number of the conservation priority MPAs in the southern portion of the Central Forest Region would only have their core area included within the proposed conservation parks or nature reserves, with the surrounding buffer areas remaining in State Forest. To ensure that the ecological values of these areas were appropriately protected, the following Environmental Condition was applied:

3. *Management plans that will be prepared for those proposed Nature Reserves and Conservation Parks related to the existing Dalgarp, Lennard, Mullalyup, Preston, Noggerup, Mowen and Dardanup Management Priority Areas shall include detailed management proposals for those portions of the Management Priority Areas which have the capacity for direct interaction with the reserved area and will remain within State Forest, to ensure protection of the ecological values within the Nature Reserve and Conservation parks.*

In response to this condition the 1992 review of the Forest Region Management Plans contains the proposals summarised in Table 4-3.

**Table 4-3. Proposed management of forest adjacent to selected reserves**

<ul style="list-style-type: none"> <li>• Increase area of Lennard, Preston &amp; Noggerup reserves and create additional reserves</li> <li>• Apply Visual Resource Management (VRM) prescriptions to forest adjacent to designated reserves</li> <li>• Prepare management plans for reserves</li> <li>• 1991 jarrah silvicultural prescription ensures protection of ecological values in forest</li> </ul>
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(Source: CALM 1992c)

In relation to the three reserves to be expanded, CALM proposes the following amendments:

- Lennard Conservation Park - much of the buffer area of the previous MPA is now to be added to the conservation park;
- Preston Conservation Park - a portion of the previous MPA buffer area is to be reserved, and the conservation park and this addition are to become national park; and
- Noggerup Conservation Park - all of the previous MPA, along with an additional portion of State Forest, is to be reserved as national park.

The application of VRM to adjacent areas of multiple use forest should also enhance the protection of ecological values associated with the reserves.

There have been no proposed changes affecting the areas of Dalgapur, Mullalyup, Mowen and Dardanup Conservation Parks. However, Mowen is now listed as a nature reserve, reflecting the 1987 proposal maps. Likewise, the 1992 draft Forests Management Strategies does not make any mention of the Blackwood Conservation Park, to which Environmental Condition 4 of the Forest Region Management Plans applies.

CALM provided further information in its response to submissions (Appendix 1) on the area within the Central Forest Region that is being set aside as conservation reserves and compared that to the previous Management Priority Area system.

**Table 4-4. Existing and proposed Conservation Areas in the Central Forest Region**

	1982 (ha)	1992 [Proposed] (ha)
National Parks	23 000	83 400
Nature Reserves	3 000	25 200
Flora Fauna & Landscape MPAs	115 000	--
Conservation Parks	--	45 900
Total	141 000	155 370

#### 4.2.3 Conclusions

A soundly based, representative system of secure conservation reserves is essential to meet the requirements of ecologically sustainable development. The Authority has recommended the implementation of the reserve proposals. Preparation of management plans for these reserves is required.

The Authority notes that a major justification for the review of the reserve system in the Southern Forest region related to an evaluation of the protection of national estate values. This has yet to be undertaken in the Swan and Central Forest Regions.

For those reserves nominated in Environmental Condition 3, the Authority considers that the incorporation of Visual Resource Management principles in the management of adjacent multiple use forest is appropriate.

#### Recommendation 2

**The Environmental Protection Authority supports the amendments to the conservation reserve estate and recommends that they be implemented.**

### 4.3 Road, river and stream reserves and other special areas within State Forest

Apart from the allocation of appropriate areas of forest to a protected conservation reserve system, the Authority has always considered that those parts of the forest having high conservation value should be managed to protect those values. In many cases, protection can be best assured by restricting harvesting. This view has been reflected by CALM in its 1992 forest proposals.

The proposals include:

- a new system of protected buffers along important roads and all rivers and streams in the forests;
- protection of wetlands, rock outcrops, heathlands and other different ecotypes; and
- identification and protection of portions of old growth forest with special environmental and social values.

These are considered in this Section and Section 4.4 .

#### 4.3.1 Road, river and stream reserves

One of the commitments arising from the then Forests Department's 1973 woodchip proposal was the establishment of a system of road, river and stream buffer reserves located along major roads, all rivers and major streams. These reserves were intended to provide aesthetic, habitat and water quality protection, and were to be protected from logging.

The forested buffer reserves proposal in the Marri Woodchip Environmental Impact Statement (Forests Department 1973) included the following elements:

**Table 4-5. 1973 Forests Department Proposals for Road River and Stream Reserves**

<b>1973 Forests Department Proposal</b>	
Roads	• not less than 200m either side should be retained in uncut condition along all main tourist roads to provide for adequate floral representation and retention of tourist and recreation values (p 25)
River and stream	• at least 2km of stream reserve comprising 100m either side of the nominated river, stream or gully retained for every 500ha of forest area, and formed into continuous corridors separated by no more than 3 - 5 km of cut over forest (p 24)
General	• Protected reserves along roads, rivers and streams should comprise some 20% of a harvested area and be protected from post cutting regeneration burns (p 24)
	• Individual coupes no larger than 800ha and no cutting of adjacent area for at least 4 - 5 years (p 24)

The EPA recommended in 1976 that the Forest Department's Road Reserves and Stream Reserves should be managed as for Forest Parks, with priority given to the preservation of aesthetic values and preservation of the water resource respectively (EPA, 1976).

The 1987 Southern Forest Region Management Plan forecast that the existing road, river and stream zone system within the region would be reviewed

*"... with the objective of improving their efficiency in providing amenity, wildlife habitat and stream protection."* (CALM 1987c, p11)

A commitment was given in the Plan that no changes to the existing system would be made without evaluation and approval by the Environmental Protection Authority.

In view of the environmental importance of the road, river and stream reserves system, and this commitment by CALM, the Authority made recommendations in both its WACAP assessment report (EPA 1988) and CALM's Forest Region Management Plans report (EPA 1987) on the

existing system. These became environmental conditions applied by the Minister for the Environment to approvals.

Under Environmental Condition 3 of the WACAP approval

3. *No logging shall occur in existing Road, River and Stream Zones until the Department of Conservation and Land Management has developed, in consultation with the public, a detailed proposal for those zones and the Environmental Protection Authority has assessed and accepted the proposal.*

Further, Environmental Condition 5 of the approval of the Forest Region Management Plans required the following:

5. *Noting that:*

(1) *CALM is now preparing a review of road, river and stream zones, including an analysis of results of research on logging in trial areas:*

*the existing area and purpose of the system of road, river and stream zones in the Southern Forest Region shall not be altered (in accordance with the proponent's commitments) and no logging shall occur in these zones, until the proposed review by the proponent has been completed and the EPA has reported on them. This review should include consideration of silvicultural practices within the zones.*

Section 3.1 of the Proposals document is intended by CALM to address these conditions. It describes the existing system, reports on research and proposes a new series of protected reserves and specifications for their definition and management.

CALM explains that the objectives for the system of road, river and stream reserves were:

- *To provide zones of undisturbed vegetation between water courses and logging areas so as to minimise the risks of stream sedimentation or salinity.*
- *To provide vistas of undisturbed forest for tourists travelling on major roads.*
- *To provide corridors of mature vegetation which would provide habitat for wildlife and a reservoir of species which could recolonise maturing regrowth forests in the harvested areas, and which would interconnect major conservation reserves."*  
(CALM 1992c, p6)

CALM's reason for proposing the changes is that the existing system "does not optimise wildlife, water resource and aesthetic values" (CALM 1992c, p7).

The following table summarises the main elements of the current system as implemented and the proposed zone system.

The Woodchip Licence Area referred to in this table comprised most of the Southern Forest Region west of the Frankland River. In 1988, the EPA found that the concept of the Woodchip Licence Area was no longer relevant and this was subsequently reflected in the Environmental Conditions now applying to the woodchip industry.

Because of the different way in which they are treated in CALM's proposals, the road reserves are discussed separately in this report from the river and stream reserves.

**Table 4-6. Main components of the existing and CALM's proposed road, river and stream reserves system**

	Old Reserves System	New Reserves System
Road		Map scenic quality zones (A,B,C)
	Selected major/ tourist roads in Woodchip Licence Area	Classify routes by survey as Level 1, 2,3 or 4.
	400m either side	Southern Forest - Level 1: 200m either side - Level 2: 100m either side - no mature forest logging - thin regrowth forests
		Swan/ Central Forest - Level 1: modify adjacent gap size according to Scenic A,B or C
River	apply to Woodchip Licence Area	apply to all State Forest
	200m either side	100-200m either side
		use ecological boundaries as guide to zone boundary
	no commercial logging	no commercial logging
Stream	apply to Woodchip Licence Area	apply to all State Forest
	100m either side 4th order	50-75m either side 4th order
	100m either side 3rd & some 2nd order	20-30m either side 3rd, 2nd & 1st order
		use ecological boundaries as guide to zone boundary
	no commercial logging	no commercial logging
General		Prescribed burning in all zones

(Source: CALM 1992c, EPA 1987)

#### **New road (travel route) reserves system**

CALM's proposals for travel route reserves involve the integration of visual management principles into both the identification of those routes to which reserves will be applied and the management of the forest within those reserves.

While the primary objective for these reserves relates to aesthetic values, they also perform other secondary functions as identified in CALM's third objective for the zone system (i.e. habitat value and species refuge), and their management needs to take these values into account. The draft Forests Management Strategies outlines how the proposed reserves system incorporates these objectives.

The proposal provides for protected buffer reserves to be defined along nominated roads in the Southern Forest Region. In the Swan and Central Forest Regions, no protected buffers are proposed. In answer to submission enquiries about this, CALM has indicated in its written response (Appendix 1) that

*"It is not considered necessary to have fixed width zones on roads in the Swan and Central Forest Regions because logging has in many cases already occurred and the nature of selection logging means that it is of less visual impact than clearfelling which occurs in the karri forest in the Southern Region." (p22)*

Instead of a system of fixed road reserves, CALM proposes for the jarrah forest that

*"... where group selection cutting and thinning are the harvesting methods employed, new silvicultural prescriptions will be applied adjacent to level one and level two roads to minimise the visual impact of harvesting and regeneration." (CALM 1992b, p156)*

The silvicultural prescription to be applied in the jarrah forest is considered further in Section 4.7 of this Report.

### **Road classification**

CALM has evaluated all travel routes in the Southern Forest Region according to their "viewer sensitivity" based on a set of criteria, including the number of vehicles using the route each day (CALM 1992b, p152-3). The routes have been divided into four classes. CALM proposes fixed road reserves for those routes in the two classes with the highest viewer sensitivity (e.g. > 35 vehicles per day). The width of zone proposed for Level 1 routes (the most sensitive) is 200 metres either side of the road, and for Level 2 routes the proposed width is 100 metres either side of the road.

The travel route zone system does not propose protected buffers along Level 3 and Level 4 routes. One of the consequences of this decision is that a number of roads currently having road reserves would not longer have buffers.

The EPA accepts that, based on the criteria used by CALM in its VRM system, there is no need for Level 3 and 4 routes to have dedicated buffer reserves. However, it also expects that the objectives of VRM in terms of minimising visual impacts would be appropriately applied along all roads, through CALM's forest management.

Clearly utilisation of roads will vary through time. It may well be that some Level 3 or 4 routes should be upgraded if usage levels increase, requiring reserves to be established along them to preserve their visual amenity.

The EPA has noted that there are no proposed travel route (road) reserves within the Swan and Central Forest Regions.

### **Road reserves width**

Since the primary objective of the reserves is preservation of the visual amenity, the reserves need to be wide enough to ensure the viewscape is protected from substantial disturbance. It is likely that the width necessary will vary according to factors like topography and forest type. While this suggests that reserves could be of flexible width, flexible reserves would be more difficult to implement in practice.

The Authority recognises that the review has led to a significant redistribution of the area of State Forest within and outside of protected road reserves, and this redistribution has been achieved within constraints applied through the visual objectives of the VRM system. The Authority considers that the proposed fixed buffer widths are adequate to meet their primary objective whilst also providing some level of habitat protection.

In many instances these reserves are narrower than those presently existing. However, as the primary objectives of the reserves will be adequately met, the Authority considers that the proposed reductions are environmentally acceptable.

### **Road reserves management**

In the Southern Forest Region CALM is proposing that there will be no harvesting of mature forest in these reserves. However, thinning of even-aged regrowth forest within the new road reserves system is proposed.

To clarify the proposal presented in the 1992 Proposals document, the Authority sought advice from CALM on what length of the road reserves would be subject to thinning during the period 1992 - 2002? In addition what would be the area in road reserves in which thinning of regrowth stands would be proposed to occur? CALM responded with the following information:

*"The portion of fixed width road zones proposed which contain thinnable karri, on an area basis, is 835ha out of a total of 18 155ha, which is 4.6%. It is proposed that all of this be subject to thinning at some time.*

*If the average width of road zones is 160m (there are more L1 than L2 roads) then the 18 155ha represents a total distance of about 570kms of which 4.6% is thinnable karri, i.e. 26kms. Some of this has been thinned already, e.g. Vasse Highway, and it would be expected that due to its age most of the rest will be thinned over the next 10 years."*

The Authority is of the view that there is no need for the road reserves to be thinned for visual amenity reasons. Clearly harvesting could significantly affect the values that are intended to be protected within the road reserves. However, the preservation of the visual amenity does not necessarily preclude the removal of some trees, provided that it is done selectively and carefully, to comply with the stated management objectives. Thinning of regrowth in the road reserves should only occur where it can be demonstrated that visual objectives are enhanced.

In the past some roadside areas have been "tidied up" by the removal of undergrowth and dead trees, with consequent loss of faunal values. Management of road reserves should recognise the need to retain their faunal values.

Several submissions claimed that logging had occurred in some existing road river and stream reserves, in contravention of Environmental Condition 3 applied to the 1987 WACAP project. Some submissions also suggested that other requirements of the Condition, relating to "consultation with the public" and "consideration of silvicultural practices within the reserves" have not been met.

### **New river and stream reserves system**

CALM's 1987 Southern Forest Region Management Plan indicated that the system of river and stream reserves was designed to provide:

*"buffer zones between logging areas and major water courses;*

*a network of relatively undisturbed forest at the local level for fauna habitat, especially birds dependent on mature trees for nests, and as a source of fauna for recolonisation of regrowth forest."* (CALM 1987, p11)

These objectives have been confirmed during the recent review.

CALM proposes to classify all streams and rivers in State forest according to a "genealogical" hierarchy. This hierarchy is based on classifying watercourses from first order (smallest watercourse) through to fifth order (river).

The first order streams would be defined in the field by the combination of the characteristics of the stream depression and vegetation. CALM has indicated in Appendix 1 that guidelines will be prepared and be made available to the public.

Although there are five different stream orders, only three different width ranges are proposed. First, second and third order streams are to receive the same minimal reserves to 20 to 30

metres either side (a total width of between 40 and 60 metres) while fourth order streams have width ranges of 50 to 70 metres either side (a total of 100-150 metres) and rivers and streams of fifth order and above have width ranges of 100 to 200 metres either side (a total of 200-400).

Based on these proposed widths, CALM has provided an indication of the proportions of the reserve system in the Southern Forest Region for each of the stream orders. Stream orders have not been mapped in the Central Forest and Swan Regions.

**Table 4-7. Proportion of stream reserve in the Southern Forest Region**

	% by zone area	estimated area (ha)*	% by linear distance
1st	38	23 978	53
2nd	17	10 727	25
3rd	9	5 679	12
4th	9	5 679	5
5th & above	27	17 037	5

\* The total area of river and stream reserves proposed in the Southern Forest Region is 63 100 hectares (Table 19 draft Forests Management Strategies)

CALM proposes that riparian zone width will vary according to soil type, slope, vegetation, type of harvesting (in adjacent areas), rainfall and stream order. While guidelines based on stream order are presented there is no indication of how the other parameters will be used in determining zone width except that 'ecological boundaries will be used to guide the selection.

**The Authority encourages this approach of using ecological boundaries, recognising that this would require a flexible width of reserves.**

The two key components of the objective for river and stream reserves is water protection and habitat protection. These are not mutually exclusive objectives and the width of the dedicated reserves needs to address both of these.

#### Water resource values

River and stream reserves are intended to provide protection to water quality, particularly in relation to salinity and turbidity. This topic has been the subject of a significant amount of research, which culminated in the 1987 Report of the Steering Committee for Research on Land Use and Water Supply (WAWA 1987). This report and its implications are discussed further in Section 4.8 of the Authority's report.

The EPA considered the 1987 Steering Committee report in its 1988 review on WACAP (Bulletin 329) and concluded that some more research was needed. CALM has advised in Appendix 1 that:

*"Although no new research (in the salt-risk zones) has been initiated the DMS (draft Forests Management Strategies) provides an up to date analysis of continued monitoring in the paired catchment studies. This was the major priority for future research stated in the 1987 Steering Committee Report." (p84)*

The Authority asked the TAP to comment on the issues of buffers and water resource implications. While this is discussed in more detail later in Section 4.8, the key points relevant here from the TAP's report (Appendix 2) are:

*"The 1992 Karri Forest management strategy proposes 20 metre stream buffers and a reduction in coupe size (to a maximum of 80 ha) as means of reducing the impact of clear-felling on salinity. In the Jarrah Forest the strategy proposes to maintain a 15m<sup>2</sup>/ha basal area and ensure that 30% of the coupe area remains uncut in second order catchments.*

*These measures will reduce the impact of logging on salinity relative to previous logging prescriptions. However, as the new proposals only retain 20 metres of stream buffer (3%*

*to 5% of likely upslope logged area) the proposals will not eliminate the risk of groundwater discharge in the most susceptible areas." (p4)*

The Authority is satisfied that in most circumstances the proposed river and stream reserves should be adequate to protect water quality for both potability and the aquatic ecosystem in respect of both salinity and sedimentation impacts from adjacent logging. However there are some catchments, particularly in the Intermediate Rainfall Zone but also in the Low Rainfall Zone, where there is a greater likelihood of problems related to salinity arising, and a more complex planning and implementation strategy will be required. This strategy is discussed further in Section 4.8

The Authority also notes that further work is needed to confirm the investigations carried out to date by the Water Authority and to extend it to a wider range of situations.

#### Vegetation, fauna and biological values

Many submissions suggested that the preservation of flora and fauna values was the most important objective for the river and stream reserves. It is also an important environmental objective for the Authority. The Authority therefore sought advice from the Technical Advisory Panel on the bases for the proposal and whether the objective would be met.

The TAP (Appendix 2) pointed to the difficulty in ensuring that the river and stream reserve width was adequate for ecological protection without detailed knowledge of the species involved:

*"The size of faunal conservation corridors can only properly be determined after defining the purpose for which they are to be managed. This is regardless of whether they are located along streams, roads or they join forest blocks. Corridors function differently for different organisms.*

*If zones and corridors are to be managed for faunal values, more needs to be known about the life history strategies of the individual organisms present. Unless we have the knowledge of how these corridors operate and understand what they contain we cannot acknowledge the true benefit. Decisions are also required on the priority given to each species and the frequency with which these areas are likely to be disturbed in the future.*

*The life history data of the "priority" organisms can be used to determine the zone width(s) according to the management objectives for each species within geographic areas. Some knowledge of what is currently within these reserves system and how they might be operating is obviously a prerequisite to making decisions on corridor function and widths." (p6)*

CALM has not yet defined specific conservation objectives for these corridors at a local level. Until these objectives are defined it is difficult to determine appropriate widths to achieve the objectives. This lack of knowledge indicates a need for the application of the precautionary approach and for ongoing research.

One research area which has received little attention relates to the effects of forest operations on vertebrate and invertebrate aquatic fauna. A submission suggested that some research undertaken by Grouns & Davis (1991) indicated that increases in salinity, turbidity, sedimentation & temperature caused by logging could adversely affect aquatic ecosystems, and the recovery of these streams is likely to be slow. CALM's response to this suggestion (Appendix 1) was that:

*"Grouns and Davis (1991) "presented evidence that the invertebrate communities of streams running through clearfelled areas without a buffer zone of riparian vegetation show differences in their composition to that in nearby streams in unlogged areas. However, there is no statistically significant difference in either richness or total invertebrate abundance".*

*The authors also stated:*

*"How long it may take the clearfelled streams in either the Lewin or the Sutton paired catchment to return to conditions that are more similar to those of the undisturbed*

*streams, either in terms of community structure or in terms of water quality, is not known. The invertebrate communities in these streams will probably return to pre-logging status when the physical and chemical conditions return to the pre-logging situation".*

*The DMS (draft Forests Management Strategies) now proposes riparian buffer zones on all streams. Grown and Davis showed that buffer zones (100m wide) were sufficient to reduce impacts of logging disturbance on stream macroinvertebrate fauna." (p84)*

This issue of widths needs to look at defining habitat management objectives (including linkages) on a regional basis then relating those objectives into the widths of stream buffers. For example, invertebrates may need only metres but vertebrates may require hundreds of metres.

The floral ecotypes represented in the riverine environment are likely to differ from those on the uplands so upland vegetation and habitats are likely to be inadequately represented in stream reserves defined on ecological boundaries. This emphasises the need to manage all portions of the forest in such a manner that ecological values are represented throughout and points to the importance of retaining portions of the forest through phased logging practices.

The information presented in the draft Forests Management Strategies and Proposals document is inadequate to determine whether the specific zone widths proposed for the protection of potability are adequate for fauna protection. However, the Authority is prepared to accept that the adoption of flexible widths based on ecological boundaries is more likely to protect and maintain the range of important values of riparian areas than simply applying a fixed width.

**In the development of the specific ecological objectives for these river and stream reserves, establishment of priorities will be necessary. This should involve public participation.**

The Authority considers CALM's proposal not to harvest timber from the river and stream reserves appropriate and essential to the achievement of the stated objectives. These reserves should remain unharvested in perpetuity, and the Authority has recommended accordingly (Recommendation 3).

The burning regimes in the riparian areas must be compatible with the management objectives for those areas (water quality and ecological priorities). Therefore, fire frequencies and intensities may need to differ considerably in riparian areas from those applied to adjacent forest. Concern about the possibility of these areas acting as conduits carrying fire to otherwise protected areas during extreme fire events needs to be addressed, but not in a way which establishes uniform fire management strategies throughout the reserves.

## **Conclusion**

The proposed system of road, river and stream reserves is clearly superior in several ways:

- it will apply to all streams and rivers throughout the forest, whether karri, jarrah, marri or wandoo dominant - the existing system applies only to the woodchip licence area in the Southern Forest Region;
- over 30 roads will have road reserves applied to them;
- there will be no commercial logging in the river and stream reserves; and
- thinning in regrowth portions of the proposed travel route reserves is acceptable provided that it enhances VRM objectives.

The Authority strongly supports the implementation of the revised and protected system of road, river and stream reserves where salinity risk is not identified by the Water Authority of Western Australia as a problem. For high risk areas, the Authority has made a specific recommendation which would require a wider minimum permanent stream buffer of 50 metres either side (see Recommendation 13).

### **Recommendation 3**

**The Environmental Protection Authority recommends that the revised system of travel route (road), river and stream reserves should:**

- **be implemented, consistent with Recommendation 13 in relation to Intermediate and Low Rainfall Zones;**
- **have an effectiveness monitoring programme (see Recommendation 14);**
- **remain unharvested in perpetuity, except for those portions of regrowth forest within road zones where thinning can be undertaken in a manner consistent with the enhancement of visual objectives**

#### **4.3.2 Diverse Ecotype Conservation Areas**

In addition to these changes to the conservation reserve system, CALM has proposed some other areas within State Forest which would be managed to preserve their ecological and scenic value. In general, these diverse ecotype conservation areas have little forest suitable for harvesting, but contain significant ecological values. Table 4-8 outlines CALM's proposal for these areas.

**Table 4-8. CALM's proposals for diverse ecotype conservation areas**

- |   |
|---|
| <ul style="list-style-type: none"><li>• 115,000 ha in the Southern Forest and 88,000 ha in the Central and Swan Forest Regions contain heathlands, rock outcrops, swamps, lakes, and non-forest vegetation</li><li>• No timber harvesting will occur</li><li>• Protection from physical disturbance</li></ul> |
|---|

(Source: CALM 1992c)

The value of these sites could be significantly affected by forest management and CALM's commitment to protect these sites from physical disturbance is supported.

It is essential that the diverse ecotype conservation sites are clearly delineated on publicly available maps, to assist in their identification and management in the field.

### **Recommendation 4**

**The Environmental Protection Authority supports the protection of the Diverse Ecotype Conservation areas and recommends that they:**

- **be implemented and identified on publicly available maps; and**
- **remain protected from timber harvesting and associated impacts in perpetuity.**

#### **4.3.3 Other State Forest areas with special values**

Other parts of the multiple use State Forest also require protection from harvesting. Within the karri forest, the Authority identified the need to apply a different form of forest management to sites which had high social and ecological values. CALM proposes to exclude harvesting from a further 3 200 ha of old growth multiple use forest in the Southern Forest Region.

The proposal for these areas, referred to as linkage areas by CALM, is discussed in more detail in Section 4.4 of this Report.

#### 4.4 High value old growth forest

One of the major issues of debate in forest management over the past decade has related to the expressed desire by members of the public to see stands of very old trees retained in the forest. Some people have suggested that all areas of so called old growth forest should be set apart from multiple use State Forest. Others have suggested that the very best or strategically located portions of the forest should have a different silvicultural regime applied to them, to preserve a proportion of the old growth forest. The issue of old growth forest was a fundamental part of the terms of reference of the recent Resource Assessment Commission Forest and Timber Inquiry.

Appropriate protection and management of the old growth forest was also an important part of the Authority's consideration during its assessment of the WACAP woodchip proposal in 1987-88. In the context of the need to manage the forest by the application of flexible management principles, the Authority discussed in Bulletin 329 two specific aspects of old growth forest management. The first related to the proposal to change the existing system of road, river and stream zones. This has already been addressed in this report in Section 4.3. The second related to the Authority's belief that portions of the multiple use forest containing old growth forest possessing high value should be subject to different silvicultural prescriptions which protected those values. This formed the basis for Environmental Condition 4 applied to the WACAP project.

At approximately the same time, both the State and Commonwealth Governments acknowledged the need to address the issue of national estate values within the State Forest, especially in the Southern Forest Region.

As a consequence of its need to manage the forest estate for a range of values, and considerable work undertaken in identifying specific values in the Southern Forest Region, CALM has proposed the following elements to provide for the protection, management and maintenance of the values of old growth forest.

**Table 4-9. CALM's proposals for high value old growth forests in WA**

<ul style="list-style-type: none"> <li>• National estate criteria will be used to identify areas of high value old growth forest</li> <li>• These areas will be nominated for the Register of the National Estate</li> <li>• A secure and representative conservation reserve system, with no harvesting, will be enhanced</li> <li>• Old growth forest within river and stream and Level 1/2 road zones will not be logged</li> <li>• An additional 3200 ha of old growth forest will be retained, unharvested, as linkage areas or areas having special value.</li> <li>• Logging and regeneration prescriptions which protect national estate values on a regional basis will apply to areas of State Forest on the Register of the National Estate outside of protected zones</li> <li>• These new management prescriptions are detailed under jarrah and karri silviculture</li> <li>• Multi-aged structure of jarrah forest will be maintained, with mature trees being retained on all harvested areas</li> <li>• In regrowth karri, the following areas will be grown until they develop old growth characteristics (&gt; 250 years):</li> </ul>		
When last cut	Proportion retained to >250 yrs	Area
pre-1940	25%	1 400ha
1940-75	all coupes < 200 ha	2 000ha
1975-90	10%	2 650ha
post-1990	50%	
<ul style="list-style-type: none"> <li>• Approx 40% of the karri forest will always contain old growth characteristics</li> </ul>		

(Source: CALM 1992c)

CALM's proposals would lead to virtually all of the old growth forest within the Southern Forest Region which is within multiple use State Forest and not part of the protected road, river and stream reserves or linkage zones being clearfelled.

The Authority has considered the question of old growth values from the position that:

- sufficient representative portions of the forest within old growth values should be permanently set aside in a system of conservation reserves;
- there are other portions of the forest which have special environmental and social values, such as road, river and stream buffers, linkage areas, special environments and recreational sites, which also warrant protection from harvesting but do not need to be included with a conservation reserve system; and
- the remainder of the multiple use State Forest should be available for harvesting, according to environmental sensitive and acceptable prescriptions.

#### **4.4.1 Definition of old growth forest**

One of the significant problems in dealing with this issue has been to define what old growth means. There is no single, generally agreed definition. Over recent years the following definitions have been adopted.

##### **Resource Assessment Commission (1992)**

*"Public perceptions of old-growth forest appear to have confused two concepts. The first is the absence of human disturbance since European settlement and the associated aesthetic and intangible values. The second is the habitat quality of the forest, in particular the presence of old trees (sometimes described as 'over-mature' or 'senescent') or high structural diversity (that is, many different growth forms), or some combination of the two." (RAC 1992b, p29)*

In its final report, the RAC recommended that the term be applied to

*"... forests that are both negligibly disturbed and ecologically mature and have high conservation and intangible values." (RAC 1992b, p67)*

##### **Draft National Forest Policy Statement (1992)**

This recently prepared draft policy provides a good summary of the current position regarding a definition. Its glossary contains the following comment on old-growth values:

*"there is no generally agreed definition of old-growth forests. The Ecologically Sustainable Development Working Group on Forest Use and the Resource Assessment Commissions Forest and Timber Inquiry noted that two concepts are generally used by the public in discussion of forests containing old-growth values: forests containing a high proportion of ecologically mature trees and high structural diversity (that is, many different growth forms); and forests that have been relatively undisturbed since European settlement of Australia. These criteria are often not met simultaneously. In referring to forests with old-growth values, this Statement adopts the view that, in order to define an area containing old-growth values, a relatively easy to measure attribute is required, such as the ecological maturity of trees and structural diversity. Thus, greater importance is attributed to ecological maturity and structural diversity than to the feature of little disturbance." (p26)*

##### **Australian Heritage Commission/ Department of Conservation and Land Management (1992)**

The approach suggested in the Draft National Forest Policy Statement has been adopted by the Australian Heritage Commission (AHC) and Department of Conservation and Land Management during the recent review of the national estate values in the Southern Forest Region. A key element of CALM's proposals to manage old growth forest relates to the outcome of this review and the terms of the agreement reached between the two agencies.

The following table outlines in summary the criteria used by the AHC and CALM to identify areas of old growth forest in the Southern Forest Region that contained places of national estate significance, and the threshold values used to determine whether specific places were selected to be set apart as a reserve (AHC/CALM Vol 2).

**Table 4-10. AHC/CALM National Estate Threshold of Significance Criteria**

Criteria for the Register of the National Estate	Threshold Value																		
A.2 Importance in maintaining existing processes or natural systems at the regional or national scale	<ul style="list-style-type: none"> <li>• comparative position of area in a catchment</li> <li>• size &amp; configuration of area (&gt;2000ha with low boundary:area ratio)</li> <li>• degree of disturbance (least disturbance preferred)</li> <li>• coincidence of areas for abiotic and biotic processes</li> </ul>																		
A.3 Importance in exhibiting unusual richness or diversity of flora, fauna, landscapes or cultural values	<ul style="list-style-type: none"> <li>• above size threshold for ecological viability</li> <li>• landform/soil diversity (highest diversity preferred)</li> <li>• vegetation diversity (least disturbance &amp; highest diversity preferred)</li> <li>• faunal diversity (based on known occurrence)</li> </ul>																		
B.1 Importance for rare, endangered or uncommon flora, fauna, communities, ecosystems, natural landscapes or phenomena, or as wilderness	<ul style="list-style-type: none"> <li>• all occurrences of rare or uncommon attributes, provided in good condition</li> <li>• wilderness value based on size &amp; configuration of area (&gt;700ha with low boundary:area ratio)</li> <li>• undisturbed forest/woodland based on size (&gt;2000ha at regional level, &gt;200ha at a sub-regional level)</li> </ul>																		
C.1 Importance for information contributing to a wider understanding of Australian natural history, by virtue of its use as a research site, teaching site, type locality, reference or benchmark site	<ul style="list-style-type: none"> <li>• based on published or unpublished expert opinion</li> </ul>																		
D.1 Importance in demonstrating the physical characteristics of the range of landscapes, environments or ecosystems, the attributes of which identify them as being characteristic of their class	<ul style="list-style-type: none"> <li>• based on published or unpublished expert opinion</li> <li>• above size threshold for ecological viability</li> <li>• monadnocks based on area, character and disturbance</li> <li>• lakes based on published or unpublished expert opinion</li> <li>• vegetation communities based on least disturbance and preferred minimum size: <table border="0" style="margin-left: 20px;"> <thead> <tr> <th style="text-align: left;">Vegetation types</th> <th style="text-align: left;">Preferred min.</th> <th style="text-align: left;">(Fallback min)</th> </tr> </thead> <tbody> <tr> <td>Karri, Jarrah, Peppermint</td> <td>&gt;2000ha</td> <td>(&gt;200ha min)</td> </tr> <tr> <td>Melaleuca</td> <td>&gt;500ha</td> <td>(&gt;200ha min)</td> </tr> <tr> <td>Marri (pure)</td> <td>no minimum</td> <td>-</td> </tr> <tr> <td>Tingles</td> <td>&gt;200ha</td> <td>-</td> </tr> <tr> <td>Wandoo</td> <td>&gt;500ha</td> <td>(&gt;200ha min)</td> </tr> </tbody> </table> </li> <li>• vegetation assemblage based on preferred minimum size (&gt;2000ha) and least disturbance</li> </ul>	Vegetation types	Preferred min.	(Fallback min)	Karri, Jarrah, Peppermint	>2000ha	(>200ha min)	Melaleuca	>500ha	(>200ha min)	Marri (pure)	no minimum	-	Tingles	>200ha	-	Wandoo	>500ha	(>200ha min)
Vegetation types	Preferred min.	(Fallback min)																	
Karri, Jarrah, Peppermint	>2000ha	(>200ha min)																	
Melaleuca	>500ha	(>200ha min)																	
Marri (pure)	no minimum	-																	
Tingles	>200ha	-																	
Wandoo	>500ha	(>200ha min)																	

(Source: AHC/CALM 1992)

## Department of Conservation and Land Management

In the Glossary at the rear of CALM's Proposals document the following definition of old growth forest is offered:

*"a patch of forest in which the overstorey contains mature and over mature trees, the break up of whose crowns is resulting in seedling establishment and development."*

CALM acknowledges this to be a simplification.

**The Authority considers that the approach used in the Draft National Policy Statement provides a suitable basis for identifying old growth forest.** It still retains elements of judgement, but it does not appear that this can be avoided.

### 4.4.2 Protection of old growth values

Table 28 of the draft Forests Management Strategies indicates that 46 per cent of the expression of undisturbed forest (old growth forest) is within existing reserves. Following the review undertaken by AHC/CALM, CALM has proposed additions to the reserve system which will increase this representation to 56 per cent.

A number of submissions suggested that this proportion of the old growth forest retained in a protected reserve system was inadequate. The Authority considers the criterion of percentage protected in reserves is not of itself sufficient to determine the adequacy of representation. A value can be considered to be adequately represented in the reserve system if that representation makes it (the value) secure in perpetuity and available for appreciation by this and future generations. While this does not necessarily imply that the "best" examples of a particular value are reserved, that is obviously desirable.

Another aspect of the adequacy of representation is whether the "right" areas have been chosen for reservation given that some areas of old growth forest have special (social) values to some people. Several submissions made reference to areas of State forest which they considered should be reserved for their old growth values. Clearly the AHC/CALM review process involved a choice between areas of similar ecological worth or possessing similar value. Indeed, CALM's response to one of questions of the Technical Advisory Panel about high value old growth forest (Appendix 3, p3) acknowledges this:

*"It is not the intention of the CALM/AHC agreement to "protect" old growth values outside of reserves. The agreement with the AHC provides for management of old growth on a regional basis through:*

- *preservation in reserves and protected zones (>50 per cent of all expressions);*
- *minimising impact outside of reserves;*
- *ensuring the creation of old growth through rotation lengths which allow its development 120-240 years."*

Related to this is the question of how much old growth forest would remain outside of the reserve and protected zones system after the first complete round of logging in the karri forest. CALM has indicated in Appendix 3 (p10) that:

*"... assuming the "first rotation" end is the time when the last of the mature karri in the current yield strategy is harvested (which is sometime toward the middle of the next century), is about 29 000 hectares. This is made up of about 20 000 hectares in zones on roads and streams, 3 000 hectares retained in in-coupe patches and 6 000 hectares of regrowth which will have reached the mature stage."*

It is apparent from this advice that the sustainable yield for karri (discussed in Section 4.5 of this Report) is based on the harvesting of virtually all of the currently mature forest not in protected reserves or zones. Over the next decade, the period of the 1992 Timber Strategy and Forests Management Plans, CALM estimates that 20 000ha of the Southern Forest Region would be clearfelled or cut to seed trees.

The proposal for karri silviculture (see Section 4.6 in this Report) outlines the strategy for retention of national estate values, of which old growth is one, in the multiple use forest. The proposal involves a combination of ensuring that a number of age classes of karri, from new regrowth through to mature (older than 250 years), and a certain proportion of the forest at nominated ages, are retained.

#### 4.4.3 Linkage Areas and other special sites

In its 1988 WACAP report, the Authority pointed to the need to identify

*"The most outstanding or special attributes of high value old growth forest ... (with) the following attributes:*

- *ecological systems which are not represented or poorly represented in reserves;*
- *especially valuable components of fauna habitat (for example, an area with trees containing a high proportion of nesting hollows for birds);*
- *areas containing rare or endangered species;*
- *areas having special significance such as:*
  - *readily accessible and used by people for recreation, and*
  - *landscape amenity, that is viewed from areas frequently visited by people;*
- *areas which completed linkages between reserves (for example, bridges gaps between the end of a road, river or stream zone and a conservation reserve);*
- *areas which require special management to protect adjacent conservation areas; and*
- *areas which have high recreational or amenity value such as picnic spots, tourist trees and exceptional scenic areas."* (p20-21)

Environmental Condition 4 relating to WACAP specifically required the identification and protection of these areas by CALM.

CALM intends to meet this condition by a combination of the additional reserves proposed in the Southern Forest region, the new system of road, river and stream zones, the 3 200ha of protected linkage areas and through the new karri multiple use management procedures. (CALM 1992c, p12)

The draft Forests Management Strategies proposes that:

1. *All areas of special cultural, biological, aesthetic or physical significance be identified and recorded in the geographic information system.*
2. *The process of identification of areas of special significance be continually upgraded.*
3. *Management strategies be applied to maintain the values of areas of special significance."* (CALM 1992b, p158)

It is very difficult from the CALM documents for the Authority to make any judgement as to whether this approach meets the Authority's 1988 intention. If the example given in the draft Forests Management Strategies for Jane block is applied throughout the Southern Forest Region, then it may well do so.

CALM should provide more information on the areas to be identified under this proposal to the community.

#### 4.4.4 Management of specific areas with old growth values in State forest

Over the past decade the Authority has made specific reference to several portions of the Southern Forest Region containing areas of old growth forest. Three areas, Beavis-Giblett, Jane and Hawke forest blocks, were mentioned by the Authority in Bulletins 303 and 329. The

implications of the proposals in the draft Forests Management Strategies to these areas are considered below.

In addition to these three areas, a number of submissions to the Authority expressed concern about CALM's management intentions in other portions of the karri forest, particularly Crowea forest block.

### **Beavis-Giblett**

As a consequence of the Authority's assessment of the Forest Region Management Plans in 1987, the Minister for the Environment applied an Environmental Condition relating to the Beavis-Giblett forest block. This Condition states that:

2. *Noting that:*

- (1) *Beavis-Giblett Block is proposed to remain as State Forest;*
- (2) *the Block will be managed as a strategic fire buffer;*
- (3) *the purpose and tenure of the Block will be reviewed at the expiry of the term of the Southern Forest Region Management Plan, within 10 years;*
- (4) *the Executive Director has undertaken that the Block will not be logged for 15 years, thereby preserving the option for its reservation as intact forest at some time in the future;*

*the Beavis-Giblett Block shall be managed accordingly, subject to the undertaking referred to above.*

The AHC/CALM Review has resulted in most of Beavis and Giblett forest blocks being proposed for listing on the Register of the National Estate (draft Forests Management Strategies, Map 7). In its response to submissions, CALM has reiterated the requirement, under the Environmental Condition, to review the status of these areas in the future.

Beavis-Giblett was also the subject of EPA consideration in 1991. In Bulletin 603, dealing with the proposed Beenup - Manjimup power line by the State Energy Commission of WA, the Authority recommended that nominated portions of State Forest along the route should be protected from clearing. The relevant portions of the route were within Beavis, Carey and Giblett forest blocks. On the basis of the proposals in the draft Forests Management Strategies, the Authority sought comment from CALM on whether any of these protected portions would now be subject to harvesting in the future? CALM responded with the following advice:

*"The 1992 Draft Strategy proposes that all State Forest be available for harvesting except;*

- *stream zones*
- *designated road zones*
- *retained patches and linkage areas.*

*As such all of the areas identified along Waistcoat Road in Bulletin 603 as being recommended to be not cleared in the power line construction are available for harvesting. At present, however, the most easterly 2.7kms fall inside that section of Beavis block subject to Ministerial condition 303/2 hence is not available for logging until at least 2002. A small portion occurs in the road zone where Waistcoat Road crosses Seven Day Road.*

*The remainder is potentially available for logging but no areas occur in the current (1991-1994) four year logging plan."*

The Authority sought further advice on this from CALM. The Executive Director has subsequently indicated that;

*"... CALM will protect the areas along Waistcoat Road identified as 'Impacts on Quality Karri' in the table on page 59 of Bulletin 603.*

*The mechanism to achieve this will be through recommendation 3 in the section on Silviculture in the Karri Forest (page 167 of the draft Review), which provides for 3200 hectares of mature karri to be used to retain patches of mature habitat amongst clearfelled and regenerated karri stands"*

## **Jane**

The Authority specifically mentioned Hawke and Jane forest blocks when it identified in Bulletin 329 the need to protect the values of special areas of high value old growth forest (EPA, 1988, p21).

There is no proposal in the draft Forests Management Strategies for any of Jane forest block to be set aside within a conservation reserve. However, the draft Forests Management Strategies provides details on Figure 18 of the application of the proposed system of road, river and stream reserves and also linkage areas within Jane block. The linkage areas shown on that plan comprise an estimated 169ha.

In addition, Jane forest block is identified on Map 7 of the draft Forests Management Strategies as a place proposed for listing on the Register of the National Estate.

## **Hawke**

The draft Forests Management Strategies provides no similar indication of road, river and stream zones or linkage zones for Hawke forest block. Map 7 indicates that all of Hawke block will be proposed for listing on the Register of the National Estate. In addition, a portion of Hawke block (60ha) is proposed in the draft Forests Management Strategies to be set aside as National Park.

Reservation of Hawke block for national park was raised in public submissions. CALM indicated (Appendix 1) that the karri vegetation type in Hawke block was adequately represented elsewhere and reservation as suggested would not occur.

## **Crowea**

The draft Forests Management Strategies indicates that the southern portion of Crowea forest block, closest to Northcliffe, and some of the adjoining Dombakup forest block, are to be proposed for listing on the Register of the National Estate. No conservation reserves are proposed for Crowea forest block.

In response to submissions questioning to omission of east Crowea Block from old growth forest areas to be listed on the Register, CALM indicated in Appendix 1 that

*"Only areas which reached threshold levels based on the nominated criteria were proposed for listing." (p38)*

and that east Crowea area did not meet the threshold value.

### **4.4.5 Conclusion**

The protection of high value old growth forest has been an important part of this assessment, based as it is on environmental conditions flowing from the 1987 WACAP assessment. The Authority has concluded that:

- the reserve proposals that have evolved from the Australian Heritage Commission and Department of Conservation and Land Management review should be supported and implemented;
- implementation of the linkage areas should be undertaken with public involvement. When the EPA recommended that areas of high value old growth forest should be protected or managed differently to the majority of production forest, it had in mind that flexible management should also apply on a site and value specific basis. CALM's documentation does not present any site specific information nor does CALM say if the proposals have adequately acknowledged the 'social' values of high value sites. It would appear that this has not occurred because CALM has tended to focus on regional values. Therefore the Authority is unable to indicate if CALM's proposals comply with Environmental Condition 4; and

- CALM should be subject to the same environmental conditions which applied to parts of the multiple use forest impacted by the previous proponent (WACAP), and CALM's management should be consistent with those conditions.

### Recommendation 5

The Environmental Protection Authority recommends that the 3,200ha of outstanding old growth karri forest proposed by CALM for protection from logging should be identified on a regional basis and with the benefit of public involvement, and should include areas which are particularly valued by the community. These areas should:

- include those trees in Beavis, Carey and Giblett forest blocks protected from clearfelling by environmental conditions related to the Manjimup-Beenup power line proposal (FPA Bulletin 603);
- be identified publicly within three years from the adoption of the Management Plans;
- be managed to retain their social values and not be subject to harvesting in perpetuity; and
- should be subject to reporting by CALM on their implementation and management at the next Forest Management Plan review (see Recommendation 15).

CALM should retain sufficient contractual flexibility to ensure that the allocation of these areas is not excessively constrained.

## 4.5 Proposed amendments to the Timber Strategy

A fundamental aspect of CALM's multiple use forest management proposals is the expected timber availability resulting from forest harvesting.

The 1987 Timber Strategy outlined in Tables 14 to 17 the anticipated supply of jarrah, marri and karri of certain standards for the period 1987 to 1997, and beyond at indicative levels, based on total wood resource availability presented in Table 8.

As part of the 1992 proposals, the Proposals document indicates changes intended to the 1987 Timber Strategy. These changes to Table 8 of the 1987 Timber Strategy arise from a number of factors, including the information derived from the recent jarrah forest inventory and alterations to the multiple use forest due to additional reserves, protected areas and other exclusion areas. In broad terms, these changes are outlined in Table 4-11, which is derived from information in the 1987 Timber Strategy and the 1992 draft Forests Management Strategies.

**Table 4-11. Inventory of Forest Wood availability**

Standing Timber Volume (gross bole volume)	Jarrah (10 <sup>6</sup> m <sup>3</sup> )		Karri (10 <sup>6</sup> m <sup>3</sup> )		Marri (10 <sup>6</sup> m <sup>3</sup> )	
	1987	1992	1987	1992	1987	1992
Sawlogs	18.2	52.81	9.39	10.2	--	5.0
Other logs			8.72	8.8		
Standing residue	49.5#	52.04*				
Other wood					55.9	40.5
Total	67.7	104.85	18.11	19.0	55.9	45.5

# including standing dead trees

\* not including standing dead trees

The implications of this change to Tables 14 to 17 of the 1987 Timber Strategy, which outlined the projected supply of jarrah, marri and karri for the period of the Forest Region Management Plans (1987-1997) are presented in Table 4-12 below. It should be noted that, in relation to the proposed jarrah cut, the 1987 tables indicated that the jarrah inventory would be used to amend supply figures for the period beyond 1992.

**Table 4-12. CALM Proposed Sustainable Yield 1992 - 2001**

Sustainable Yield 1992-2001	Jarrah Forest (m <sup>3</sup> /yr)	Karri Forest (m <sup>3</sup> /yr)
• Jarrah		
- 1st grade sawlogs	459,000	
- other sawlogs	216,000	
- other logs	685,000	
Total sustainable yield	1,360,000	
• Marri		
- sawlogs	57,000	13,000
- other logs	412,000	77,000
Total sustainable yield	469,000	90,000
- residue (not included)	300,000	75,000
• Karri		214,000
- 1st grade sawlogs		103,000
- other sawlogs		100,000
- thinnings		417,000
Total sustainable yield		

The Authority sought advice from CALM as to the meaning of these amendments to the 1987 Timber Strategy. Specifically, the Authority indicated that it is very difficult from the Proposals document to clearly understand the changes that are proposed to the 1987 Timber Strategy. The Authority sought clarification of what is being proposed in 1992 and how that is different from the 1987 Strategy figures.

In its reply, CALM indicated that

*" ... the figures are not directly comparable because of the very different approach in calculating them. The 1987 figures were based on the Allocation of an estimated amount of sawlogs whereas the 1992 Strategy calculations are based on the volume increment possible from a particular forest structure."*

CALM also pointed to a further difficulty in comparing the tables:

*" The value of comparing the grades of logs is also limited because there are factors which are governed by commercial rather than biological factors and have changed significantly since 1987 and will change similarly in the future. For example, first grade logs are now down to 200mm diameter and hence include a lot of what was termed small logs in the 1987 Timber Strategy."*

In attempting to further understand the proposed changes to the 1987 Timber Strategy, the Authority enquired as to whether there was an equivalent term to 'Gross Bole Volume' in the 1987 Timber Strategy. The reply from CALM was that

*"There was no comparable term used in the 1987 Timber Strategy. The closest approximation for jarrah is the figure derived from multiplying the area of jarrah/marri by the increment figure for jarrah. (Table 8). By doing this the range of figures would be 1 456 000 m<sup>3</sup>/annum (current increment) to 2 250 800 m<sup>3</sup>/Annum (potential increment). It should be noted that increment does not always equal yield, see page 167-174 of the Strategy."*

In relation to the karri forest, CALM advised that

*"... an approximation for the karri forest would be to add all sawlog grades in Table 14 of the Timber Strategy to the karri component of chiplogs in Table 16. By assuming 15% of mature k/m (karri/marri) logs are karri and 90% of regrowth k/m logs are karri the GBV projected supply was 330 500m<sup>3</sup> to 437 500m<sup>3</sup> during the period 1992 - 2001."*

#### 4.5.1 Sustainable Cut

Many submissions to the Authority expressed concern about the apparent increase in the allowable cut proposed in the 1992 Timber Strategy. CALM has indicated that the intention of the Timber Strategy is to maintain the present level of harvest.

Both the jarrah and karri allowable cut, as well as that proposed for marri, were endorsed by the State Government in 1987. Market conditions have had a significant influence on the harvest of jarrah and karri sawlogs since 1987. CALM has advised that market conditions have been such that both first grade karri and jarrah customers have not taken their contracted amounts. However, the volume of second grade and other grade sawlogs supplied to the market has exceeded the 1987 Timber Strategy predictions. CALM has been actively encouraging utilisation of the second and lower grade logs.

While CALM has advised that the 1987 Timber Strategy supply predictions and the 1992 Timber Strategy sustainable yield predictions cannot be directly compared, the Authority has prepared Table 4-13, which is based on further discussions with CALM. It indicates the levels

**Table 4-13. 1992 Comparison with 1987 Timber Strategy Sawlog Availability**

Jarrah (m <sup>3</sup> /yr)						
Period	1987 Timber Strategy 1st grade sawlog	1987 Timber Strategy other grade sawlog	1987 Timber Strategy residue	1992 Timber Strategy 1st grade sawlog	1992 Timber Strategy other grade sawlog	1992 Timber Strategy residue
1992	459 000	123 000	--	459 000	216 000	685 000
1993-95	400 000	122 000	--	459 000	216 000	685 000
1996-2000	300 000	99 000	--	459 000	216 000	685 000
2001-05	280 000	94 000	--			
Karri (m <sup>3</sup> /yr)						
Period	1987 Timber Strategy sawlog	1987 Timber Strategy other log		1992 Timber Strategy sawlog	1992 Timber Strategy other log	
1992-95	221 000	104 250		214 000	203 000*	
1996	221 000	172 500		214 000	203 000*	
1997-2000	224 500	172 500		214 000	203 000*	
2001-05	224 000	192 000				
Marri (m <sup>3</sup> /yr)						
Period	1987 Timber Strategy sawlog	1987 Timber Strategy other log	1987 Timber Strategy residue	1992 Timber Strategy sawlog	1992 Timber Strategy other log	1992 Timber Strategy residue
1992-95	30 000	539 000	--	70 000	489 000#	375 000
1996-2000	30 000	439 000	--	70 000	489 000#	375 000
2001-05	30 000	450 000	--			

\* includes some sawlogs

# includes some jarrah regrowth and estimate of proportion of marri in mature & regrowth karri forest

of potential forest harvest that could be sustained indefinitely. That is not to say that all of this timber would be removed from the forest, but it would be available to the market. The effect of the 1992 proposal in comparison to the 1987 Timber Strategy is also illustrated in Figure 1.

In view of the difficulty in making comparisons which CALM indicated, the Authority sought confirmation from CALM that the above tables were not misleading, and CALM advised that they were in general agreement with the proposals.

CALM's proposal in the 1992 Timber Strategy is to maintain the extraction of jarrah at the current (1992) level, the extraction of karri at a similar level and to increase the extraction of marri. A major difference between the two timber strategies is that the 1987 Strategy forecast reductions in the jarrah extraction over the period of the Strategy whereas the new Strategy maintains the level. In addition, the 1992 Strategy incorporates the extraction of volumes of jarrah and marri timber (identified as residue) not previously included for potential supply.

This sustainable yield is only achieved under a particular suite of forest management prescriptions. CALM's draft Forests Management Strategies presents a discussion of this in Chapters 6 and 7 (CALM 1992b). Factors such as the area of forest available, the structure of the existing forest and desired future forest, market requirements, and other management requirements related to issues like disease and fire all play a part in determining this yield.

The remainder of the Authority's Report discusses in detail the proposed management prescriptions for the jarrah forests. Research information relating to operational aspects of the new forest harvesting are somewhat incomplete and there is uncertainty relating to a range of issues which include;

- the salinity response of the catchments to the management and silvicultural prescription;
- the effect of the salinity response on water resources and aquatic species;
- the localised faunal impacts of the management and silvicultural prescription;
- dieback interaction with intensive harvesting; and
- the long term community acceptability of a significantly restructured forest.

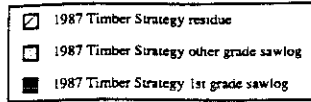
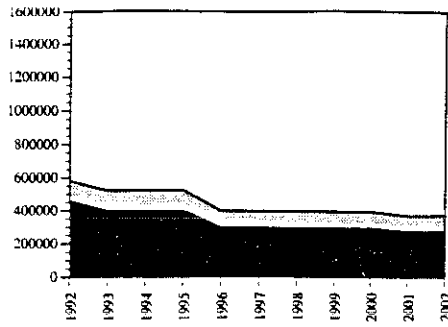
These are significant issues about which more specific information is required. This can only be acquired through the application of the management prescription, but within a properly designed and monitored trial. The results of this trial should be used to determine the environmental acceptability of the prescription. During the trial, which should be at least for the period of the new Forest Management Plans, that is 1992 - 2002, the Authority considers that a precautionary approach to forest operations should apply. This would include the adaptation of management to incorporate monitoring results and other experience.

Consistent with this precautionary approach, the State should not enter into long term commercial commitments for the whole of the sustainable yield. The Authority recognises the desire of the forest industry to have a level of certainty in terms of wood supply volume and quality, and to operate within a level of certainty for forward planning.

However, a degree of uncertainty is inherent in the management of the forest. It is appropriate, therefore for the State to be prudent when making commitments when conditions may change. The operational trial recommended by the Authority may lead to the need to adjust the sustainable yield to reflect management of environmental impacts better defined during monitoring.

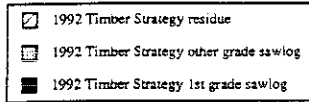
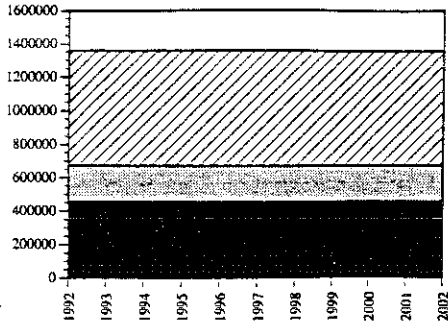
## **Recommendation 6**

**The Environmental Protection Authority has noted that CALM's silvicultural prescriptions for the jarrah forest have been developed with incomplete knowledge of their long term consequences; and therefore concludes that the proposals to amend the 1987 Timber Strategy should be implemented cautiously. The Authority recommends that the annual sustainable yield estimates in the Timber Strategy should only be applied for the life of the Strategy (i.e. until 2002).**



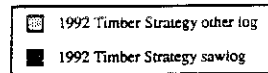
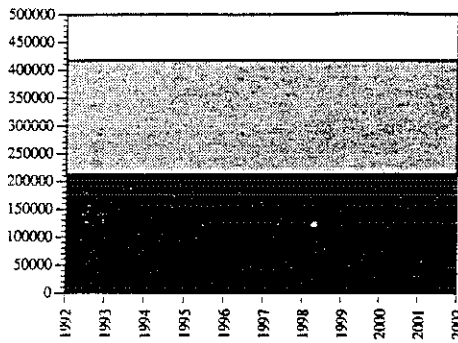
### Jarrah

1987 Timber Strategy



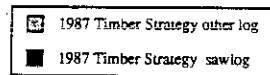
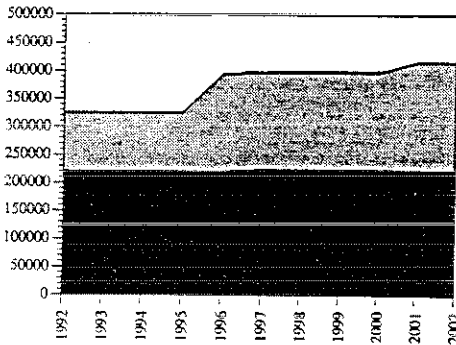
### Jarrah

1992 Timber Strategy



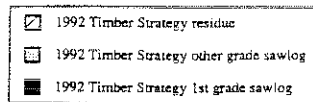
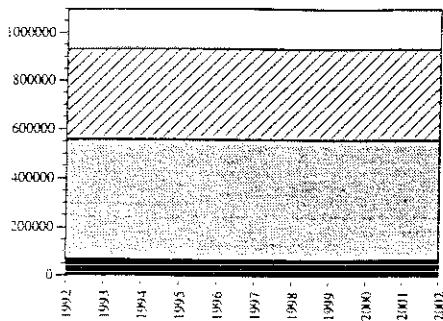
### Karri

1992 Timber Strategy



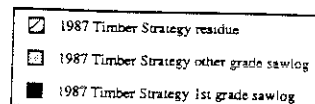
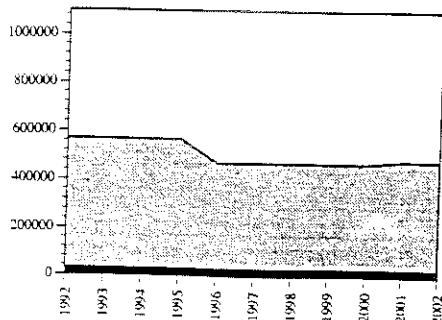
### Karri

1987 Timber Strategy



### Marri

1992 Timber Strategy



### Marri

1987 Timber Strategy

## Recommendation 7

The Environmental Protection Authority recommends that the letting of wood supply contracts from the jarrah forest under the CALM Act;

- not commit all of the volumes in any class of log defined in the Timber Strategy for a term exceeding 10 years from 1992; and
- not exceed the annual levels of supply in any class of log or wood (residue) nominated in the 1992 Timber Strategy.
- recognise the possibility of the necessity to reduce wood supply beyond 2002 as a result of monitoring and adaptive management following the trial implementation of the jarrah silvicultural prescription.

## Recommendation 8

CALM's inventory has identified classes of forest produce (other logs (jarrah) or forest residue (marri) in Tables 13 and 14 of the Timber Strategy) which had previously not been identified for commercial exploitation. There are uncertainties about the ecological implications of removing all of this biomass, so cautious, flexible management is warranted.

The Environmental Protection Authority recommends that no contract for a substantial portion of this newly identified resource should be entered into without prior referral of the proposal to the Environmental Protection Authority.

### 4.5.2 Private property

One of the main thrusts of the debate on forests and timber supply in recent years has been the increasing emphasis on the development of private plantation resource. Both the Resource Assessment Commission and the Ecologically Sustainable Development Working Groups have pointed to the need to promote forest development on private property to complement and even substitute for State Forest resource (RAC 1992, ESDWG 1991)

While it is acknowledged that CALM's statutory responsibilities relate to land vested under the Conservation and Land Management Act, it has been involved in encouraging private plantation schemes, and has identified a broader role under its Production objective for forest management, whereby CALM will:

- *Seek to develop new forests in conjunction with other land owners.*
- *Assist private forest owners to maximise the productivity of and the economic returns from their forests.*" (CALM 1992b, p121-122)

This encouragement and participation is supported. As is clearly reflected in the 1987 and 1992 Forests Management Plans and Timber Strategies, there is a limited natural forest resource which is facing increasing and competing pressures for multiple usage. There appears to have been an emphasis placed on a single species of tree for hardwood plantations (*Eucalyptus globulus*), aimed principally at the chipwood market. In terms of ecologically sustainable development, CALM should also be encouraging the establishment of private plantations for sawlog purposes. These sawlogs could be used to both supplement the variety and substitute some portion of the native forest resource.

Where plantations are developed, they should only be established on cleared land (EPA 1988). It is the Authority's clear preference that land should not be cleared of native vegetation for the establishment of timber plantations.

## 4.6 Proposed changes to karri silviculture

Closely related to the issue of protection of old growth karri forest considered in Section 4.4 is the management of the multiple use forest containing karri and karri/ marri stands.

The Proposals document indicates that the final Forests Management Strategies document will contain the karri silvicultural prescription. This prescription would contain the elements of the proposal outlined in Table 4-14.

**Table 4-14. Karri silviculture proposals**

<ul style="list-style-type: none"> <li>• Maximum gap size less than 80 ha and an average size of 30 ha.</li> <li>• An additional 3200 ha of old growth forest will be retained as linkage areas or having special value, without harvesting and protected from regeneration burns.</li> <li>• All river and stream zones will be excluded from timber harvesting.</li> <li>• In regrowth karri, the following areas will be grown until they develop old growth characteristics (greater than 250 years):</li> </ul>		
When last cut	Proportion retained to >250 yrs	Area
pre 1940	25%	1 400ha
1940-75	all coupes less than 200 ha	2 000ha
1975-90	10%	2 650ha
post 1990	50%	
<ul style="list-style-type: none"> <li>• A minimum of 3 years will elapse between harvesting of adjacent coupes, and the distance between areas of retained mature forest will not exceed 400m where possible.</li> </ul>		

(Source: CALM 1992b)

CALM has advised the Authority that the last of these points, as presented on page 20 of the Proposals document, is incorrect. Table 4-14 has been amended to reflect this change.

### 4.6.1 Silvicultural prescription

The draft Forests Management Strategies proposes to alter the name of the areas within the karri forest that are clearfelled. Previously these areas have been termed coupes, but the draft Forests Management Strategies now calls them gaps, a similar term to that used in the jarrah silvicultural prescription (see Section 4.7 of this Report).

The dispersal of clearfelled gaps in the karri forest is an important component of the environmental protection objective. The issue of dispersal also has to be related to the relative ages of adjacent portions of the forest. Some submissions suggested that the proposed minimum period of three years between the harvesting and regeneration of adjacent gaps is far too short in forest with a physiological age of >250 years, and that the 1973 woodchip EIS had recommended 4 or 5 years. CALM's response (Appendix 1) was that

*"The relationship between coupe dispersal and age of adjoining stands is a complex issue. For instance the guidelines for protection of National Estate values illustrates that in some cases it is desirable to aggregate coupes in order to maximise undisturbed areas elsewhere, in other cases it is desirable to disperse cutting.*

*The relevant points are these:*

1. *The most important criterion for wildlife is the separation of patches of mature forest from younger stages of development. The DFS (draft Forests Management Strategies) proposes that there be a maximum of 400m between retained patches of mature forest.*

2. *There is no advantage in dispersing coupes to enhance wildlife values if adjoining stands finish up at the same early stage of development (establishment stage). In this context it would be undesirable to cut and regenerate a stand before an adjoining stand reaches approximately 7 years of age.*

*The question of coupe dispersal will be reviewed in the final document." (p97)*

#### **4.6.2 Phasing out of old growth forest chiplogging**

Since the EPA reported on the WACAP project, the State Government has stated its intention to phase out chipwood log harvesting from old growth native forests. This led submissions to question how woodchip demands would be met under this policy. CALM has responded (in Appendix 1) with the following comment:

*"The future demand for paper products will be met from a combination of plantations and other sources. Government Policy on the phasing out of woodchipping does not preclude native forest woodchips from the following sources: (i) sawmill waste; (ii) silvicultural thinnings; (iii) residue material from the forest floor. The following statement was made by the Premier Carmen Lawrence.*

*"I confirm that it is government policy to commence to phase out woodchipping from old growth forest after the year 2000, but I am hopeful that advances in technology may permit this to happen a little sooner.*

*At the same time, the government fully supports the continuation of the sawmilling industry on a sustainable basis. Where sawlog harvesting occurs in old growth forest the genuine residue material will, of course, continue to be utilised for woodchip production unless higher value products can be found. In addition, woodchips will continue to be produced from thinnings, plantations and small residues." (p80)*

This commitment by the State Government came after the 1988 review of the continuation of the woodchip industry. It is clear from the information provided by CALM that the area of old growth forest in multiple use State Forest will continue to diminish rapidly, apart from those portions given special protection. The above statement by CALM suggests that all logs removed from the forest will have sound portions removed for sawn timber, and the remainder of each log treated as sawmill residue (CALM 1992b,p.175). In the case of many of the old growth karri and marri logs, most of each log will be residue.

#### **4.6.3 Conclusion**

Virtually all of the remaining old growth karri in the multiple use forest will be harvested over the next forty years or so. Some portions previously regenerated will be allowed to grow to maturity, under a rotation of 250 years. The majority of the multiple use forest will have a much shorter rotation length.

CALM has yet to finalise the karri silvicultural prescription. However, the Authority considers that, in conjunction with road, river and stream reserves, linkage areas and conservation reserves, the karri forest management proposals are environmentally acceptable.

### **4.7 Proposed jarrah silviculture**

The jarrah forest has traditionally been the largest source of timber in Western Australia. However, apart from the concerns about the developing bauxite mining industry during the 1970's, the harvesting has not generated the same level of public interest as the karri forest. At around the time of the WACAP proposal, the Authority was advised by CALM that a major change in the silvicultural management of the jarrah forest was in the process of being implemented. The Authority was shown examples of the treatments proposed, which included the felling of virtually all of the overstorey in areas, now called gap creation.

In its report on the WACAP proposal, the Authority expressed its concern about the apparent intensification of the silvicultural prescription in the jarrah forest (EPA 1988). CALM has often stated that it is not intensifying its operations in the Jarrah forest (Appendix 1).

The Proposals document outlines a number of proposals related to the sustainable management of the jarrah forest. These are summarised in the following two tables. Table 4-15 outlines the silvicultural practices that CALM proposes to use in the multiple use jarrah forest.

**Table 4-15. Proposed Jarrah Forest silvicultural prescription**

- Existing multi-aged structure of the jarrah forest will be maintained, with no nominated rotation length
- Gap size less than 10 ha, with scenic quality determining size
- Generally 100m wide strips of undisturbed forest (Temporary Exclusion Areas) will separate gaps
- In the Intermediate & Low Rainfall Zone at least 30% of 2nd order stream catchments will remain unlogged for at least 15 years after harvesting of remainder of the catchment
- 3 habitat trees and at least 1 habitat log will be retained on every hectare
- In thinning, a minimum of 10 m<sup>2</sup>/ha basal area in High Rainfall Zone and 15 m<sup>2</sup>/ha basal area in Intermediate & Low Rainfall Zone will be retained
- A minimum of 3 age classes (mature, intermediate crop & seedling regeneration) will be present on every area of cutover forest
- No harvesting in river and stream zones

(Source: CALM 1992c)

CALM has advised in Appendix 1 of this Report that the 10 year period for retention of 30 per cent of the catchment of 2nd order streams will be extended to 15 years. Table 4-15 has been amended to reflect this change to the proposal.

In addition to these proposals, other amended management practices in the jarrah forest are intended by CALM. These are listed in Table 4-16 below.

**Table 4-16. Additional Jarrah Forest management proposals**

- Review of fire management programmes, incorporating Wildfire Threat Analysis, will be undertaken
  - Diverse fire regimes (intensities, frequencies & season) will be maintained
  - Habitat regeneration burning will occur where special needs for rare/ endangered species are identified
  - New fire fighting resources will be developed
  - Community education on dieback disease will be expanded
  - *Banksia grandis* populations will be reduced:
    - in jarrah forest subject to timber harvesting
    - in other forest areas, to a maximum of four mature cone-producing trees per hectare
    - fire regimes will be implemented to minimise the development of seed-producing trees
- Operational prescriptions for the use of phosphorous acid will be developed for dieback control
- Research on life cycle of dieback causative agent will be used for operational decisions
- Priorities for weed treatment and feral animal control will be developed
- Aim for 20% of forest to be fox free by 2002, using baiting programmes and researching development of biological control agents

(Source: CALM 1992c)

A key part of CALM's approach to the maintenance of ecological values within the jarrah forest is the retention of portions of the forest in areas not subject to harvesting. These areas, comprising conservation reserves, river and stream zones and high priority visual resource management sites, represents 32.8% of the jarrah forest (Appendix 1)

#### 4.7.1 Application of jarrah silvicultural prescription

One of the means of assisting with the determination of environmental impact relates to both the intensity of change proposed and the area affected by the change. To find out more about these aspects, advice was sought from CALM on the area of jarrah forest that is projected to be subject to the three components of the 1991 jarrah silvicultural prescription (thinning, shelterwood and gap treatment) each year during the period of the new management plan. CALM's response was:

*"It is not possible to answer this question because detailed mapping of jarrah forest structure and lignotuber stocking density, the factors which determine the treatment to be applied, is not available.*

*The forest officer in charge of the logging must determine which treatment is applied virtually on a hectare by hectare basis .*

*Areas cut over (hectares) in the past 3 years have been;*

	Northern	Central	Southern	Total
1989/90	2 950	7 470	4 100	14 520
1990/91	2 570	6 710	3 190	12 470
1991/92	1 970	7 140	1 800	10 910

*Areas cut over in the future are expected to be of a similar order and mapping done during 1991 has shown (1991/92 Annual Report) the following approximate percentages*

<i>Thinning</i>	<i>25%</i>
<i>Gap creation</i>	<i>55%</i>
<i>Shelterwood</i>	<i>5%</i>
<i>Single tree selection</i>	<i>13% (marginal forest where it is not possible to create a gap commercially)</i>
<i>Other (clearing etc.)</i>	<i>2%</i>

*At this stage we can only assume the proportions will be similar for the next decade."*

The 1991 Jarrah Silvicultural specification indicates that, while no precise rotation length is defined for the various portions of the jarrah forest, it sets a minimum rotation of 100 years, except for high visibility, high priority sites where a minimum rotation of 200 years is indicated.

#### Multi-aged structure

CALM has made a commitment to retain three age classes in harvested areas. In response to questions about the rationale for this, CALM provided the following information in Appendix 1.

*"In a cutover area of forest there will be at least 3 age classes (at least 2 ages of regrowth plus mature/senescent forest as habitat trees and retained groups and exclusion zones), but as you take a wider view of the forest there will be groups of the entire range of age classes from juvenile to senescent, with the mature/senescent stage being represented in every stand. The choice of at least three age classes represents a compromise between the desire for efficiency in timber production and wood growing against the benefits of structural diversity for wildlife and aesthetics. The production of more age classes in an area has not been shown as of greater benefit to those values. With a greater number of age classes there is likely to be greater detriment due to dieback hygiene, fire protection and regrowth quality. The large tree studies (Burrows, 1992) show that few jarrah trees live beyond 250 years hence it would seem to be excessive to have a rotation of forest stands much beyond 250 years. The retention of some of the stand (e.g. Habitat Trees)*

*can cater for the "ancient" relics. The available cut from the old growth forest is determined by the goal of sustaining a nominated forest structure not from the rotation length."*

Related to this proposal is the stated intention by CALM of not nominating a jarrah rotation period. However, Appendix A of the Proposals document indicates that there will be two minimum rotation lengths in the jarrah forest. For all of the multiple use jarrah forest not considered to be high visibility, high sensitivity sites, harvesting would occur on a minimum 100 year rotation. In the sensitive sites, the minimum harvest period would be 200 years.

### Jarrah Forest Structural Goal

On the future structure of the jarrah forest the draft Forests Management Strategies recommends that:

*"The structural goal for the jarrah forest be the maintenance of existing distribution of size classes. This will ensure that all of the values associated with different stages of tree development will be represented in perpetuity and that the proportion of each will be similar to that exhibited in virgin stands."(p 134)*

There are five defined stages in the development of the jarrah forest presented in the draft Forests Management Strategies. These are listed in Table 4-17.

**Table 4-17. Development stages of Jarrah Forest**

Stage	Name	Appearance	Age at which this stage usually ends
Stage 1	Establishment	includes seedling, lignotuberous seedling, coppice	5 years
Stage 2	Juvenile	crown development through to development of bole < 15cm (d.o.b.)	15 - 30 years
Stage 3	Immature	15cm - 45cm (d.o.b.)	40 - 70 years
Stage 4	Mature	45cm - 100cm (d.o.b.)	120 - 250 years
Stage 5	Senescent	> 100cm (d.o.b.)	generally < 360 years

(Source: CALM 1992b)

The following distribution of different size classes in a number of virgin jarrah forest stands and the multiple use jarrah forest is taken from Figure 16 of the draft Forests Management Strategies.

**Table 4-18. Distribution of diameter classes in the Jarrah Forest**

	Frequency of Diameter Classes (stems/ha)			
	20-30cm	30-50cm	50-100cm	>100cm
High productivity (Virgin Site A)	34	37	25	2
High productivity (Virgin Site C)	55	51	28	2
High productivity (Virgin Site D)	26	34	28	3
Low productivity (Virgin Site B)	25	22	16	1
Existing State Forest	33	28	14	1

(Source: CALM 1992b)

The data in Table 4-18 show that there is no single frequency distribution of size classes in the jarrah forest. This raises the question of which "existing distribution of size classes" will CALM adopt for the achievement of the management objective? The following table, taking the

data from Figure 16 of the draft Forests Management Strategies, attempts to show the range for each size class that was found on four virgin sites and the State Forest site.

The way in which the figures in Tables 21 and 22 of the draft Forests Management Strategies are totalled suggests an implicit assumption that all diameter classes are equally represented, but this is clearly unrealistic. In the final Forests Management Strategies CALM needs to make more explicit, at a sub-regional level, its structural goal for the jarrah forest in terms of frequency of diameter and/or age classes.

**Table 4-19. Proportion of diameter classes in the Jarrah Forest**

	Proportion of Diameter Classes (%)			
	20-30cm	30-50cm	50-100cm	>100cm
Virgin jarrah forest	28 - 40	26 - 37	20 - 30	2 - 3
Existing State Forest	44	36	18	2

(Source: CALM 1992b)

In the silvicultural specification for the jarrah forest (CALM 1992c, Appendix A, p3) it is explained that for the purpose of ensuring that at least three age classes are present within each, adjacent protected areas such as stream zones should be considered as part of coupe.

#### 4.7.2 Wildlife values

CALM's jarrah silvicultural prescription includes at least five elements that are intended to provide for the retention of wildlife values in the multiple use jarrah forest. These are:

- exclusion of harvesting within the expanded river and stream reserve system;
- management to ensure that a minimum of 3 age classes (mature, intermediate crop & seedling regeneration) will be present on every area of forest that has been treated, including harvesting;
- generally 100m wide strips of undisturbed forest ( called Temporary Exclusion Areas) separating areas subject to gap treatment;
- in the Intermediate & Low Rainfall Zones at least 30% of 2nd order stream catchments remaining unlogged for at least 15 years after harvesting of remainder of the catchment; and
- retention of 3 habitat trees and at least 1 habitat log on every hectare subject to silvicultural treatment.

#### River and stream reserves

The Proposals document indicates that the river and stream zone system will be extended from the Southern Forest Region into the Swan and Central Forest Regions, but the travel route zones will not.

The Authority has already discussed these proposals in Section 4.3 of this Report. The introduction of protected river and stream reserves throughout the jarrah forest is a significant environmental improvement.

#### Undisturbed multiple use forest

While the untreated retention of at least 30 per cent of second order catchments for 15 years has been proposed by CALM to address salinity concerns, clearly these same areas would have a major role in protecting wildlife values as well. If they are sufficiently large and distributed throughout the forest they will be more effective in protecting wildlife values.

Appendix A of the Proposals document indicates that Temporary Exclusion Areas (TEAS) will be established to protect nominated values while silviculturally treated areas regenerate. They will eventually be treated and would have a minimum dimension of 100m in most instances.

The values for which TEAS would be retained would be for wildlife protection, visual resource and water values.

In terms of wildlife protection, the TEAS are intended to

*"... act as corridors for movement and dispersal into adjacent regenerating forests and contain habitat elements absent from the regenerating area." (CALM 1992c Appendix A, p7)*

These areas would link permanent exclusion areas, such as river and stream reserves, conservation reserves, and diverse ecotype conservation areas, much as the linkage areas in the karri forest would do.

Under a precautionary management approach, these proposals can make a significant contribution to the protection of wildlife values. This contribution is reflected in Recommendation 10 of this Report.

### **Habitat trees**

Three large trees are proposed to be retained on every hectare to provide habitat for hollow-nesting species. In addition suitable ground habitat (e.g. hollow logs) will be retained and protected as far as possible, at a rate of at least one per hectare.

Several submissions questioned the adequacy of the provision of three habitat trees per hectare. CALM responded in Appendix 1 by indicating that the selection of three habitat trees per hectare is based on local and eastern states research data. For instance, Inions (1985) showed that about three trees/ha were used by possums for diurnal refuge in eastern jarrah forest. The number of trees to be retained is greater than in eastern Australia where there are more arboreal marsupial species. The jarrah silviculture prescription also requires habitat trees to be clumped (CALM 1992c, Appendix A).

To ensure that the three habitat trees/ha have hollows, are used and are adequate, CALM intends to monitor the effectiveness of habitat trees. This would be part of ongoing programs which monitor the impact of disturbance causing activities on particular species and proposed monitoring of ecosystem change through periodic measurement of permanent plots.

Another relevant issue is the development of hollows in jarrah/marri forest. CALM has advised (Appendix 1) that work by Inions (1985) and Inions et al (1989) has shown that hollows suitable for habitation by possums first develop in jarrah trees about 300 years old and about 200 years in marri trees. This work also showed that high intensity fire reduced the the average age of trees bearing hollows by about 100 years.

The TAP provided the following comment on the adequacy of the proposed habitat tree retention:

*"There is little knowledge of the density and role of habitat trees within the mature forests of Western Australia. The CALM proposal for habitat trees is based on research into the requirements of a single possum species which is just one of approximately 20 mammals which may use hollows within the Southern Forests. In addition there are many other vertebrates including birds which require tree hollows for breeding and shelter, some of which cannot exist without this habitat.*

*The TAP is not convinced that the tree retention proposal is adequate and CALM's own data supports this view. Inions (1985 ) reports that possums required three habitat trees per hectare. Other species such as birds require additional hollows with different characteristics.*

*The spatial distribution of habitat trees should also be considered. It is difficult to determine the "optimum" distribution of trees without defining the conservation management objective for an area. Animal behaviour needs to be considered when making such decisions.*

*There are also concerns about the selection and long term viability of these trees. It is difficult to decide what are the best habitat trees unless considerable time is spent on the*

*ground observing. Just because a tree has hollows and is 200yrs old does not necessarily mean that it is being utilised by fauna.*

*Many trees are also likely to die in the short to medium term as a result of the normal mortality factors operating on the population. This would be a problem if the remaining forest was managed at the "juvenile" end of the age spectrum which is consistent with timber production." (p7)*

The Authority is not convinced that the proposed retention of three habitat trees will achieve the desired objective. There is insufficient local research to provide a clear indication of how many habitat trees are required. Moreover, there needs to be recognition in forest management of the period of time taken for habitats (hollows, etc.) to develop in trees. Many of these trees are near the end of their life, and there is a need to ensure that sufficient trees are available throughout the lifecycle of the forest.

The Authority has addressed these concerns in Recommendation 11 of this Report.

#### **4.7.3 Dieback**

One of the concerns expressed about the jarrah silviculture prescription is that it could lead to the spread of dieback. Dieback already infects approximately 15 per cent of the jarrah forest.

##### **Thinning treatment**

One issue raised with CALM was the possibility that the proposed thinning of the jarrah forest to 10-15 square metres per hectare could enhance the propagation and spread of *Phytophthora cinnamomi*. For instance, thinning of the canopy could extend the period when soil temperatures are sufficiently high and the soil moisture levels sufficiently wet for the fungus. CALM's response to this suggestion is that this has not been shown to be a factor in dieback spread (Appendix 1).

This issue was also considered by the Technical Advisory Panel. Its report (Appendix 2) provides the following information:

*"Dieback policy over the past two decades has been based on trying to minimise spread of the fungus from diseased to uninfected areas. This has required extensive mapping and restrictions on movements within the forest. This policy, based only on minimising spread, is severely and unnecessarily limited. In the development of silvicultural prescriptions, the effects of different practices on disease development and the long term fate of jarrah and understorey species must be considered. Disease spread will probably be exacerbated by logging, thinning, disturbance and perhaps burning on some sites if the canopy is lost." (p2)*

and

*"The fungus does not sporulate prolifically below 15°C and its maximum growth is at around 30°C. The microclimate near and below ground greatly affects the rate of pathogen development and fate of individual trees after infection. The water status and temperature of soil and plant tissues greatly influences the activity of the fungus. Well watered trees are more vulnerable than drought stressed trees. Appreciating that this fungus "takes off" in temperatures greater than 15°C the effects of canopy removal on soil temperatures should be considered." (p2)*

The Authority considers that the relationship between canopy density, silvicultural treatment and dieback risk should be investigated (see Section 4.9 of this Report).

Concern was also expressed in submissions about the consequence to dieback risk and spread resulting from harvesting during summer under wet conditions. Management of the forest should explicitly build in contingencies for logging and other dieback threatening activities during wet summers.

## **Banksia grandis**

The proposal to reduce the population of *Banksia grandis* (Bull banksia) within the multiple use forest raised several concerns, mainly related to the justification for such a proposal and its environmental implications. CALM has responded to these issues in Appendix 1 with the following comments:

*"Proposed Banksia grandis reduction programs are an example of scientific research leading to management actions. It may seem a drastic measure but the alternative "no action" option would be even worse, threatening ecosystem processes and maintenance of biological diversity. If mature Banksia grandis plants are reduced the inoculum potential of P. cinnamomi to affect overstorey jarrah trees and other ground plants is reduced. The potential for lateral spread of disease through roots of B. grandis is also reduced.*

*A comprehensive summary of research into the host-pathogen interaction of B. grandis and P. cinnamomi is given in Shearer and Tippett (1989). Strategies to disfavour the pathogen including manipulation of understorey composition offer one of the few practical means of reducing dieback impact on a large scale. These strategies are also discussed in detail in Shearer and Tippett (1989)."*

CALM goes on to point to two further bases that support this proposal:

*"Reduction of mature B. grandis plants will actually alter the presence of this species in the jarrah forest to somewhere near the abundance found in undisturbed jarrah forest. Populations of B. grandis are thought to have proliferated following the opening up of forest canopies during timber harvest."*

and

*"There is justification of favouring one species, if the survival of that species is threatened. Conversely there is justification in disfavouring one species if its presence in high abundance threatens the abundance and survival of many other species."*

The Technical Advisory Panel explored this issue, including discussing it specifically with CALM officers. The advice given in the TAP's report was:

*"In its discussions with CALM on this issue, the TAP expressed concern about the possible ecological consequences of the removal program and the emphasis that was being placed on this species.*

*Concern was expressed by members about the role of the species in providing food for insects and animals at critical times in the year and during drought. Secondly the TAP was surprised at the emphasis being placed on this species when it is known that there are many other plant vectors in the forest understorey.*

*It was the TAP's view that the importance of the B.grandis reduction program is over rated and further work is required to determine the significance of other trees and shrubs for fostering the penetration of P cinnamomi in deep soil profiles." (p3)*

While CALM may consider that the removal of *Banksia grandis* is justified for dieback control, the Authority does not consider that the environmental implications, and particularly the ecological, implications of such an objective have been adequately considered and substantiated by research. The Authority has reflected this concern in Recommendation 11 of this Report.

### **4.7.4 Fire**

Many submissions expressed concern about the environmental impacts of CALM's prescribed fire regime employed. CALM has indicated in Appendix 1 that the frequency of prescribed burns is determined by a number of field factors, including fuel accumulation.

CALM's conservation objective for the forest is proposed to be met in relation to fire by continuing to maintain fire regimes with a range of intensities, frequencies & seasonality. In order to get a better appreciation of what this means on the ground, CALM was asked to provide more detail on this diversity. The following information was provided:

*"The prescribed burning programmes vary from year to year, and different burn regimes may be applied over time on the same area. The burn objectives also vary, and in nearly all cases there are multiple objectives to each burn. For example, whilst the primary objective of a particular burn may be to enhance habitat, it may also provide for a fuel reduction objective. Conversely, fuel reduction burns often meet a secondary objective such as vegetation management."*

Diversity is also encouraged by the behaviour of prescribed burns. CALM's response to submissions (Appendix 1) indicates that a mosaic of different aged vegetation is encouraged in the forest because only 60 - 80 per cent of an area is burnt during a prescribed fire.

In relation to the proportion of different fire regimes applied in the forests CALM advised that, using the Mundaring District as being representative of the northern jarrah/wandoo burn programme, the number of burns within five year rotation classes irrespective of burn objectives were as follows:

**Table 4-20. Frequency of prescribed burns in the CALM Mundaring District.**

Rotation	No. of Jobs
05-09 years	62 (41%)
10-14 years	35 (23%)
15-19 years	9 (6%)
> 20 years (including 'no planned burns')	44 (30%)

With regard to seasonality, an issue often raised by the public, CALM indicated that:

*"The proportion of burns carried out in spring/early summer versus autumn varies greatly from year to year, depending on the availability of suitable safe burning conditions in autumn, and on the programme itself. On average the ratio is approximately 4:1 in favour of spring."*

*In addition to the prescribed burning programme must be added the high intensity wildfires which range from a few hundred hectares in a mild season to thousands of hectares in a hot summer."*

The fire management regime has a significant impact on environmental components. Where the prescription is tuned to the specific management objectives of sites (e.g. flora or fauna species), fire may be a beneficial influence but where the prescription is less discriminating of site requirements, its effect may be detrimental. CALM's intention of maintaining fire diversity may be appropriate to meet environmental as well as the other fire management objectives, but this should be clearly demonstrated through continuing research and monitoring, and the results made publicly available.

An issue of increasing public comment, as well as being of concern to the Authority, is the effect of prescribed burns on air quality, particularly in urban centres. While the Authority accepts that prescribed burns may be necessary to meet environmental and public safety objectives, the pall of smoke that often hangs over Perth and other centres during spring and autumn periods is environmentally unacceptable. There has been considerable discussion between the Authority and CALM in recent years about the need for CALM to better manage burns to reduce this problem.

The Authority has included these concerns in Recommendation 12 of this Report.

#### 4.7.5 Nutrients

An issue that was raised in submissions is the effect on nutrient levels in the forest as a consequence of harvesting and other management practices, including the loss of nutrients resulting from the burning of organic material. CALM believes that this is not a problem. In its response to submissions, CALM has made the following points:

*"Relevant points in this issue are:*

- 1. Nitrogen is lost by volatilisation during combustion.*
- 2. Nitrogen is returned to the system by non-symbiotic and symbiotic nitrogen fixation and small accretions directly from the atmosphere.*
- 3. There are large stores of nitrogen in the ecosystem.*
- 4. Any long term loss of nitrogen depends on the balance of points 1 and 2 above.*
- 5. Even if long term net losses of nutrients occur they may not be a problem unless the nutrient pool is depleted below a critical level.*
- 6. The balance of nitrogen suggests that there is quite a degree of resilience in the jarrah and karri ecosystems, to quote O'Connell and Grove (1991)"*

This position was confirmed by the TAP. Their advice was that nutrient loss resulting from forest management in the jarrah forest was not likely to present any problem in the short term, and that only nitrogen levels in the soil may require explicit attention in the long term (Appendix 2, p8).

The effect of forest management on the nutrient status of the forest should continue to be monitored over the long term.

#### 4.7.6 Areas in State Forest of particular public interest

Submissions to the Authority expressed concern about CALM's management intentions in a number of parts of the jarrah forest. On a numerical basis, the main area identified was Hester forest block, located near Bridgetown.

##### **Hester Block**

A number of submissions expressed concern about CALM's proposals for management of the Hester forest block, near Bridgetown.

Comments included:

- Hester Block should not be logged because there is no nearby forest to provide alternative habitats.
- Hester is high value old-growth forest and has many values to the community.

CALM has responded in Appendix 1 by indicating that it will develop management plans, particularly for logging, for the area in consultation with the Bridgetown community. The closeness of Hester to Bridgetown and its value to the local community, including recreational, water supply, visual amenity, will be considered in its management. In relation to concerns about logging, CALM has indicated that the long term logging plan for the Bridgetown area has not yet been determined.

#### 4.7.7 Conclusion

There are a number of important initiatives included within these proposals. For instance, the expansion of the designated river and stream zones into the State Forest outside of the Woodchip Licence area is a significant environmental benefit. In addition, the adoption of a more flexible logging regime which takes account of the potential for increasing the salinity in

watercourses in the forest is highly desirable. CALM has been intimately involved in the research that lead to suggestions related to silvicultural practices within the salt risk portions of the forest. At the same time, the proposals outline significant changes to the current nature and condition of the jarrah forest.

The Technical Advisory Panel has advised the Authority that, while the proposals may well be environmentally acceptable, there is no basis in the documentation prepared by CALM or in discussions that the Panel had with CALM, to be able to make such a statement with certainty.

For the jarrah forest management proposals, the Authority is emphasising the need for the application of the precautionary approach and its recommendations reflect this. The Authority cautions against committing resources or applying prescriptions in such a way that management cannot respond to changing circumstances or new monitoring results.

The Resource Assessment Commission emphasised the necessity for forest managers to apply an adaptive management approach, which would include the need to

*"review and revise codes of practice in light of improved knowledge, preferably with community consultation."* (RAC 1992b, p76)

The main elements of the jarrah forest prescription have been applied to areas of the Central forest over the past five years or so. It is unfortunate that virtually no environmental impact monitoring has been carried during this time, particularly when the Authority's concern about intensification was made clear, publicly, in 1988.

While each element of the jarrah silvicultural prescription has been applied historically, including clearfelling on large areas of the forest during the 1920s and 1930s, the Authority considers that the proposals involve more intensive forest operations because:

- there will be an ongoing requirement for thinning;
- there will be clearfelling of approximately 55% of treated areas; and
- the treatment will generate more wood per hectare.

The Authority believes CALM should implement the proposed jarrah silvicultural prescription as a trial. Consistent with the precautionary approach, the State should make no long term contractual commitments of forest produce, that is, beyond the period of this management plan (1992-2002) such that, if the Timber Strategy needs revision downward, this is economically and socially possible. The precautionary approach also dictates that to the extent consistent with other constraints (fire, dieback, etc.), the implementation of the trial should be in areas of forest which are spatially and temporally dispersed across the range of forest and ecosystem types.

Related to this approach is the essential need to check and confirm the predicted outcomes and to adapt and modify forest management according to the results.

While the CALM proposals focus appropriately on the threat associated with dieback disease, there are other diseases and pests such as the leaf miner and leaf skeletoniser which are present through much of the jarrah forest. CALM's commitment to expand discussion on other forest diseases and pests in the final Forests Management Strategies is noted.

Salinity is a key environmental issue in the jarrah forest. This is discussed in detail in Section 4.8 of this Report.

## **Recommendation 9**

**The Environmental Protection Authority recognises that the jarrah silvicultural prescription represents a significant change to former jarrah forest management and needs to be conservative. Therefore, the Environmental Protection Authority recommends that the jarrah silvicultural prescription should:**

- **be implemented as a trial, to provide a basis for future adaptability of management. Treated sites should be dispersed throughout the range of sites and localities in the forest (see Recommendation 14);**

- include long term monitoring which quantifies the impacts of silvicultural practices on environmental elements and values in the forest and provides bases to adjust management; and
- provide for the first major report on outcomes and modifications to be part of the next review of Forest Regions Management Plans and Timber Strategy, by 2002.

#### Recommendation 10

The Environmental Protection Authority recommends that in the intermediate and low rainfall zones at least 30 per cent of second order catchments in the multiple use jarrah forest should be left untreated (i.e. undisturbed from harvesting, thinning, etc.) for a period of at least 15 years after harvesting or treatment of the remainder of the catchment. This untreated proportion should:

- include areas of multi-aged forest (including unlogged sites);
- be selected to emphasise wildlife, water resource and visual objectives;
- comprise sites with a minimum dimension of 100m: and
- be in addition to protected river and stream reserves and diverse ecotype conservation areas.

The status and effectiveness of this measure should be evaluated at the time of the next review of the Forest Regions Management Plans and Timber Strategy, by 2002 (see Recommendation 14).

#### Recommendation 11

The Environmental Protection Authority recommends that the jarrah silvicultural prescription be modified in the following ways:

- in providing for habitat trees CALM should ensure that sufficient selected trees are retained on sites subject to gap treatment which have the potential to provide this function throughout the lifecycle of the forest; and
- the reduction of the population of *Banksia grandis* be limited to specific areas with a high risk of *Phytophthora cinnamomi* impact, that a programme to identify and evaluate the environmental implications of the reduction be established as a priority, and that the results of that evaluation be subject to the next review of the Forest Regions Management Plans by 2002 (see Recommendation 14).

#### Recommendation 12

The Environmental Protection Authority recommends that the fire management objectives related to the jarrah silvicultural prescription should be modified to:

- include avoidance of air pollution in urban areas; and
- CALM should inform the public about its fire management (purposes of burns, areas burnt under different regimes of season and periodicity, escapes etc.) on a regional basis in its annual report each year.

### 4.8 Harvesting marri from the salt-risk zones

When the then Forests Department proposed the establishment of a woodchip industry in 1973, there was significant public and scientific concern that intensive harvesting within the

Woodchip Licence Area, particularly in the lower rainfall north east portion, could lead to reduced quality of water resources resulting from the release of salt stored in the soil. In view of this concern, the Forests Department made a commitment to restrict cutting in the north east sector of the Woodchip Licence Area (bounded by South West Highway, Perup Road, and the Licence boundary) to experimental stages (Forests Department, p21).

The issue of logging in the low rainfall zone to obtain chiplogs was raised by WACAP in its 1987 Environmental Review and Management Programme. In its report on the WACAP proposal to continue harvesting for woodchips, the Authority took account of the findings of the Steering Committee and noted that harvesting for woodchips was progressively moving beyond the Woodchip Licence Area, into the Intermediate and Low Rainfall Zones of the Central Forest Region. As a consequence, the Authority considered that there could be

*"... increased intensity of harvesting (for chiplogs) in salt-risk zones of Jarrah-Marri in the Southern Forest region, but only after preparation of an Environmental Management Programme (EMP) to the satisfaction of the Authority. This EMP would need to detail the nature and location of harvesting proposals, the safeguards which would be taken, the monitoring which would occur, and the mechanisms for response should monitoring show any impact" (EPA 1988\*, p23)*

This is the basis for Environmental Condition 6 attached to the WACAP proposal.

CALM has prepared Section 3.4 of the Proposals document to address this condition, so that the restrictions on harvesting marri in the low rainfall zone could be removed. CALM proposes the following procedures to fulfil the requirements of Environmental Condition 6, which calls for an Environmental Management Programme as indicated above.

**Table 4-21. CALM proposals for harvesting in salt sensitive areas**

<ul style="list-style-type: none"> <li>• River &amp; stream zones will be implemented in salt risk areas</li> <li>• The 1991 jarrah silviculture prescription will apply to the jarrah and jarrah/marri forests, the major elements of which are:             <ul style="list-style-type: none"> <li>- retain multi-aged forest structure in all areas;</li> <li>- gap size will not exceed 10 ha;</li> <li>- 3 habitat trees per hectare will be retained within gaps; and</li> <li>- cutover areas will be regenerated</li> </ul> </li> <li>• In the Intermediate &amp; Low Rainfall Zone at least 30 per cent of the forest on every 2nd order stream catchment will remain unlogged for at least 15 years after harvesting of the forest elsewhere on the catchment ('phased' logging)</li> <li>• Where stands are thinned in Intermediate &amp; Low Rainfall Zone, a minimum of 15 square metres of basal area per hectare will be retained on all areas</li> <li>• Establish a stream monitoring programme throughout Intermediate &amp; Low Rainfall Zone:             <ul style="list-style-type: none"> <li>- 2nd order stream catchments sampled for 5 years after logging</li> <li>- Total soluble salts will be determined at peak and base flow periods</li> <li>- ten unlogged 2nd order catchments will be sampled to establish 'control' total soluble salt levels</li> </ul> </li> <li>• Monitoring existing bores &amp; research catchments will continue</li> <li>• Stream monitoring programme results will be reported annually to Water Authority of WA</li> </ul>
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(Source: CALM 1992b)

In its reply to submissions, CALM has indicated that the period for which almost one third of the 2nd order catchments would remain unlogged would be extended from 10 years to 15

years. This change, which would be included in the final Forest Management Strategies document, has been incorporated into Table 4-21.

#### 4.8.1 Salinity and logging trials

Much of the research into the effects of logging on the environment has related to the early perceived risk associated with salinisation of water resources. In particular, the concern related to changes on potable standards of water quality, as well as sediment contribution from logging and also changes in water yield.

In 1987, the Steering Committee for Research on Land Use and Water Supply completed its 15 year review programme into the impacts of logging on water resources within the Woodchip Licence Area. The emphasis of these investigations was on salts released from the soil and turbidity caused by timber harvesting, within the Low and Intermediate rainfall Zones, that is less than 1100mm per annum.

The management conclusions and recommendations of the Steering Committee were:

##### *"Conclusions*

- 1. In the high and intermediate rainfall zones, logging operations have caused small and temporary increases in stream salinity and/or sediment concentration in many local streams but this presents no significant threat to regional water resources.*
- 2. Further refinement of logging practice is possible to moderate local transient effects on stream salinity and sediment concentration.*
- 3. With appropriate management, there is no significant stream salinity risk from heavy selection cutting in the low rainfall north-east sector of the Woodchip Licence Area.*

##### *Recommendations*

- 1: Woodchipping operations can proceed in the north-east sector of the Licence Area subject to the implementation of recommendations 2 and 3.*
- 2: practical techniques for the identification of local salt-sensitive areas in the intermediate and low rainfall zones should be developed and implemented.*
- 3: Methods to control deep groundwater contribution to streamflow should be refined and incorporated into practice in the salt-sensitive areas of the intermediate and low rainfall zones. Methods include the greater use of stream buffers and phased logging operations.*
- 4: Methods to further reduce any temporary increase of stream sediment concentration should be developed and incorporated into operations. Methods include improved road location and design, more extensive use of stream buffers, phased logging operations and limiting winter operations in the most sediment sensitive areas.*
- 5: The current level of monitoring of research catchments should continue with a further major review in 1990. Monitoring and evaluation should be carefully conducted to guide operational development, especially with respect to phased logging and permanent groundwater management.*
- 6: Management prescriptions to protect water quality and quantity should be regularly modified in response to improved understanding gained through research and operational experience." (WAWA, 1987)*

Submissions questioned several aspects of the CALM proposal for logging of marri in the salt sensitive zone on the Southern Forest Region because it appeared to differ from the recommendations of the Steering Committee. In particular, comment was made about the width of buffers along streams in logged catchments and the increase in sediment and salinity arising from trial logging of forest.

In relation to these two issues, CALM provided the following comment:

*"WAWA (Research Steering Committee) recommended that the layout of stream buffers should be matched to the risk of saline discharge from permanent groundwaters in the low rainfall zone. In the intermediate rainfall zone the minimum width was suggested to be 10% of the upslope logged area or 50m either side of the watercourse. The report also permitted subsequent extraction of timber from stream zones under a system of "phased logging". CALM proposes a flexible system of buffer widths ranging from 30m to 200m either side of streams, but it does not propose any logging in these riparian zones.*

*In addition there is proposed to be a limit of 70% overstorey removal upslope from stream buffers in catchments in the low and intermediate rainfall zones. In effect CALM proposes both permanent buffers and phased logging.*

*The Steering Committee 1987 report said the sediment increases were minor, declining to pre-logging levels within 4-5 years. No sediment increases were detected on catchments where a stream buffer was kept. CALM's DMS (draft Forests Management Strategies) now proposes stream buffers on all streams." (p86)*

#### **4.8.2 TAP comments**

The Technical Advisory Panel considered the available research information and CALM proposals, and provided the following comments in Appendix 2 of this Report:

*"These measures (for the Intermediate and Low Rainfall Zones) will reduce the impact of logging on salinity relative to previous logging prescriptions. However, as the new proposals only retain 20 metres of stream buffer (3% to 5% of likely upslope logged area) the proposals will not eliminate the risk of groundwater discharge in the most susceptible areas.*

*Alternative measures to further reduce the risk of saline groundwater discharge following logging are worthy of consideration. The phased logging approach is based on a permanent 50 metre buffer and a two phased logging operation that is separated by about 15 years (the time to re-establish the hydrologic balance). In each logging phase a downslope area remains unlogged that represents between 15% to 30% of the upslope cut-over area.*

*These proposals could pose additional cost and cause logistic difficulty to forest operations. Therefore their application should only be considered where the environmental effects of high, low flow salinity are considered particularly important, or in sensitive water supply catchments where logging in IRZ zones of water supply catchments are not diluted by streamflow from higher rainfall zones within the catchment." (p4, 5)*

#### **4.8.3 Conclusion**

The two page discussion in Section 3.4 of the Proposals document in itself cannot be considered by the Authority as meeting the requirements for an Environmental Management Programme prepared to address the issues nominated by the EPA in 1988 and Environmental Condition 6. Mention is made above of the Authority's expectations of the EMP.

However, the Authority accepts that there is considerable published information of the implications to water resources of a range of potential harvesting prescriptions, as well as knowledge about the options available to manage known adverse conditions. Much of this has been conducted by the Water Authority and CALM. The Authority also took advice from the Technical Advisory Panel, which provided specific advice on this topic.

EPA recommends a more flexible approach based on pre-logging planning, expanded stream buffers, phased logging, and the identification of high salt risk catchments. Monitoring of turbidity and salinity, and the use bio-indicator(s), especially for the beginning and end of season salt flushes to determine effects on aquatic fauna are important parts of the approach.

## Recommendation 14

The Environmental Protection Authority recommends that a Forest Monitoring and Research Committee be established. The Committee should;

- have objectives which include the identification and approval of monitoring and research programmes and projects on environmental impacts of forestry management, granting of funds towards such research, receipt of progress reports, reporting to the Environmental Protection Authority and publication of results;
- be established within 12 months;
- be funded principally from the proceeds of native forest product sales; and
- give brief annual progress reports to the Authority, with major reports in 1997 and 2002, at the time of the next review of Forest Management Plans and the Timber Strategy. The Authority shall report to the Minister for the Environment following the receipt of each major report.

## 4.9 Research and monitoring

The major emphasis in this report has been the Authority's interest in applying the precautionary approach to forest management, and implementation of adaptive management.

This approach relies on a soundly designed, adequately resourced and independently monitored research programme tailored to specific identified areas and implemented within an operational framework.

Research and monitoring need to be integrated and, in the case of forest management, relate closely to operational practices.

In its Forest and Timber Inquiry, the RAC drew the following conclusion relating to monitoring of the environmental impacts of wood production in native forests:

*"The inquiry concludes that the current levels of monitoring impacts are inadequate and recommends that systematic long term monitoring be established and that forest managers hold the maintenance of forest ecosystem processes as their highest priority. The Inquiry considers that there is much scope for improving public confidence in the ability of forest managers to identify problems and modify their management accordingly. To this end the Inquiry recommends independent audits of the adequacy of forest codes of practices and their enforcement."* (RAC, pxxxvii)

### 4.9.1 Research and monitoring

The Authority made some comments on research topics, organisation and resourcing in its 1988 WACAP report. The Authority supported the changing emphasis of CALM's research in the forests towards a better understanding of the ecological relationships in the karri and jarrah forest, and how forest management practices might affect them (EPA 1988, p32)

A list of specific research areas was included in the Authority's report, and much is still relevant today:

- *improved understanding of aquatic fauna of the karri forest;*
- *complete an inventory of flora of the karri forest;*
- *forestry management practice impacts on long term flora and fauna composition in the karri and jarrah forest;*
- *the effect of continued logging on nutrient status and cycling in the forest;*

- *the effect of fertiliser application in the forest on vegetation and fauna and water quality;*
- *the ecological implications of the forest as affected by disease and pests, and*
- *the effects of climatic change."* (EPA 1988\*, p32)

There are other areas of research and monitoring that should receive a focus as a result of this major review by the Authority. Many of these have been mentioned in this Report and others are referred to in the TAP report. In addition, CALM itself has identified areas of monitoring as an integral part of its forest proposals (CALM 1992b).

The following is a compilation of areas for research and monitoring identified by the Authority in this assessment. Most arise from the proposed jarrah forest management.

- soil and stream salinity response to timber harvesting;
- the effect of the salinity response on water quality and ecosystems;
- the use of bio-indicators to assess the effects of harvesting and buffers on streams and aquatic fauna;
- the identification of high salt risk sites and methods for managing harvesting impacts;
- the interaction of dieback with intensive harvesting;
- *Phytophthora cinnamomi* spread and management,
- the role and significance of *Banksia grandis* in the spread of *P cinnamomi*;
- the ecological impacts of removal of *Banksia grandis*;
- the effects of the removal of the canopy on the litter layer and other forest components;
- the relationship between forest management and the spread/survival/outbreak of insect pests, in particular leaf skeletoniser and jarrah leaf miner;
- impacts of forest management practices on sensitive vertebrate and invertebrate, terrestrial and aquatic fauna;
- impacts of forest management practices on understorey components of the flora;
- very long term monitoring, especially via role/ loss/ management of litter layer and soil organic material
- what is a sufficient number of habitat trees, and how do they perform over the lifecycle of the forest
- the effectiveness in terms of ecological and water quality objectives of 30% of 2nd order catchments on which harvesting is deferred;
- fire regimes (frequency and intensity) to achieve environmental objectives; and
- the long term community acceptability of a significantly restructured forest.

It is clear that the community is expecting CALM to provide answers to a wide range of complex questions. Even though its research effort is significant and its research staff have considerable expertise, there is a need for greater effort to be applied to these issues. The Government needs to recognise the concerns of the community and enable CALM, as forest manager with prime responsibility for research in the forest, to carry out the necessary monitoring and research. Much of it is long term and therefore requires suitable commitment and funding and needs to be independently programmed and reviewed and available to the public.

An integral part of the process of accountability and review relates to the need to monitor outcomes, to make conclusions based on those outcomes and for resultant decisions to be subject to scrutiny.

It will be important to monitor the impact of a number of management practices and report on the results in five years time and at the time of the next review. Throughout this Report the

Authority has specified management practices the impacts of which should be monitored. These include the new system of river and stream reserves, the timber cutting and silvicultural systems in the jarrah forest and the *Banksia grandis* removal programme.

In these monitoring programmes, the Authority does not propose that CALM make widespread measurements of a comprehensive range of parameters over the forest; this would be prohibitively expensive and ineffective in achieving the objective.

The Authority recognises that the most effective way of monitoring any impacts will be to consider the system in the light of existing knowledge, form hypotheses and then test these hypotheses in a formal research and monitoring programme.

Certainly some of the monitoring projects are self-evident. Testing the relationship between catchment logging and water quality and turbidity has already been carried out; but further work in the jarrah forest seems warranted. This should include the study of certain aquatic organisms as bio-indicators.

Often the critical task will be to select the most appropriate organisms as potentially sensitive to particular changes in forest management. These may be understorey plants if fire frequency is an issue, or nectar feeders if *B. grandis* removal is studied.

The results of this research and monitoring should be published in refereed journals, as far as possible. In this form they are publicly available, their scientific validity is independently attested, and their preparation is a proper part of the responsibilities of the research staff. Naturally, where necessary, pre-publication drafts could be used to inform any review of the management plans.

#### 4.9.2 Organisation

Much of the existing research information in the forests has arisen through the efforts of the forest manager (recently CALM) and, in relation to specific issues such as the water resource impacts of logging and mining in the forests, the Steering Committee for Research on Land Use and Water Supply.

In 1988, the Authority expressed the view that this Steering Committee should be reconstituted and determine the objectives and priorities for research into the environmental impacts of the woodchip proposal by WACAP (EPA 1988). This was reflected in Environmental Condition 10 applying to WACAP.

The Authority remains convinced that research and monitoring into forest management should be undertaken under the auspices of an independent co-ordinating committee. This Forest Monitoring and Research Committee should have the following terms of reference:

- to identify and approve monitoring and research projects into the environmental impacts of the proposed forest management;
- to co-ordinate the granting of funds towards such monitoring and research;
- to co-ordinate the evaluation of the monitoring and research data and projects;
- to advise the Environmental Protection Authority and the Department of Conservation and Land Management on the implications of research and monitoring data for forest management;
- to ensure the publication of the results of the monitoring and research projects; and
- to report publicly to the Environmental Protection Authority on outcomes, conclusions and recommendations arising from this monitoring and research, when required by the Authority or the Minister for the Environment, but at least after five years (1997), and again immediately before the expiry of the Forest region Management Plans, in 2002.

The membership of the Forests Monitoring Research Committee should be drawn from those government agencies with direct involvement and/or expertise relevant to forest management and the projects. It should comprise one representative from the following:

Environmental Protection Authority

Department of Conservation and Land Management  
Water Authority of Western Australia  
WA Museum  
and preferably CSIRO

While the Committee should be comprise this membership, the Committee should actively promote the participation of and draw expertise from other government agencies, tertiary institutions, public organisations and individuals. This involvement is important in terms of the accountability and independence.

Clearly, the funding of the necessary monitoring and research is essential. The better inventory information and more intensive management proposed for the jarrah forest in the 1992 management plans will mean an increased timber extraction over the next 10 years of nearly 2 million cubic metres of sawlogs, compared to the 1987 Timber Strategy. About half of this will be first grade sawlogs.

Because of the more intensive management which generates these additional logs, there is created an increased need to monitor the consequences. It is logical to debit the monitoring cost to the extra timber production income.

It is important that the Forest Monitoring and Research Committee commence as soon as possible. The Authority considers that the Committee should be established by the end of 1992, and that it should identify monitoring and research projects and complete the design of priority projects by July 1993.

#### **4.9.3 Proposal compliance**

As with all projects subject to formal environmental assessment, it is essential that the Authority has clear knowledge of the implementation of each element of the proposals.

In this Report, the Authority has used tables to list the proposals outlined by CALM in the Proposals document. These lists should form the basis of the compliance reports, which should be prepared annually and made publicly available.

#### **4.9.4 Conclusion**

The Authority has recommended that a Forest Monitoring and Research Committee be established to identify and approve monitoring and research projects, to grant funds towards such research, to receive progress reports and to ensure publication of results. The general areas of such monitoring have been identified elsewhere in this Report. The funding, at a level agreed as adequate by the Authority in consultation with CALM, should be provided by the Government from the proceeds of timber sales, and disbursed by the Committee to its research contractors in CALM, other agencies or private consultants.

#### **Recommendation 14**

**The Environmental Protection Authority recommends that a Forest Monitoring and Research Committee be established. The Committee should:**

- **have objectives which include the identification and approval of monitoring and research programmes and projects on environmental impacts of forestry management, granting of funds towards such research, receipt of progress reports, reporting to the Environmental Protection Authority and publication of results;**
- **be established within 12 months;**
- **be funded principally from the proceeds of native forest product sales;**  
**and**

- **give brief annual progress reports to the Authority, with major reports in 1997 and 2002, at the time of the next review of Forest Management Plans and the Timber Strategy. The Authority shall report to the Minister for the Environment following the receipt of each major report.**

### **Recommendation 15**

**The Environmental Protection Authority recommends that CALM provide brief annual progress reports to the Authority, and major public reports in 1997 and 2002, on compliance with the environmental conditions.**

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## **Appendix 1**

**Issues raised in submissions and CALM's response**



REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p><b>2. NEW MANAGEMENT OBJECTIVE FOR NATIVE FORESTS</b></p> <p>Objective</p> <p>Forest management objectives for Western Australia must incorporate the legislative requirements of the CALM Act (1984) and the wildlife Conservation Act (1950), the principles of ecologically sustainable development and the Government's specific goals and policies.</p>	<p>Does CALM consider the present legislative requirements appropriate, or does it recommend some amendments?</p>	<p>Legislation is being constantly reviewed and when necessary updated to accommodate changing community values.</p>
	<p>Define principles of ecologically sustainable development.</p>	<p>The principles of ecological sustainable development are defined in the Draft Review of Forest Management Strategies, page 113.</p>
	<p>Terms such as sustainability not supported by relevant facts.</p>	<p>The available data to support sustainability and their interpretation into forest management practices was the basis of the introductory chapters.</p>
	<p>CALM not harvesting for a profit, this debt is going up!</p>	<p>Forest operations earn 5% real. Government decides where revenue is directed and how operations are funded.</p>
	<p>RAC report suggests the use of the precautionary principle when considering the principle of ecologically sustainable development.</p>	<p>CALM agrees with RAC.</p>
	<p>Existing practice is ecologically sustainable.</p>	<p>CALM agrees but believes introduction of proposed practices is in accord with the precautionary principle.</p>
	<p>Inclusion of ecologically sustained development in forest management is a hurried approach to a new idea.</p>	<p>The basic principles of ESD have been employed in forestry for decades. The application of ESD is now being spelt out in detail for first time.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p>Arising from amended legislation, the new Nature Conservation Strategy and the Review of Management Strategies for South West Forests carried out during 1991, a new overall objective for the management of public native forests in Western Australia has been developed. This is:</p>	<p>CALM to give reasons why 1987 objectives inadequate.</p>	<p>The 1992 objective for forest management takes account of changing community perception of the values to be managed for, and need to spell out goals of ESD.</p>
	<p>Strategy to define additional landscape types in SFR eg: southern slopes.</p>	<p>It was not the intention of the Strategy to define all landscape character types but to outline the methodology.</p>
	<p>Strategy should have provided research programme list to show work done in SFR by all organisations.</p>	<p>Agree. This may have been useful but the list was meant to show the broad areas of work rather than all projects.</p>
	<p>Table 25 of the review strategy to consider small structures &amp; Hardware Portfolio.</p>	<p>Only guidelines relating to land management were included.</p>
	<p>Wetland studies by Jim Lane to be mentioned in the SFR.</p>	<p>This will be done in the final document.</p>
	<p>Plan too prescriptive (e.g. water quality not buffer widths).</p>	<p>CALM acknowledges the validity of managing to direct quantitative objectives (e.g. water quality) but needed to outline in the strategies how this was to be achieved.</p>
	<p>CALM proposal gives impression of a hurried approach.</p>	<p>The proposals were developed over many years and written over 12 months.</p>
	<p>Don't list land areas for heritage listing, CALM already covers this.</p>	<p>CALM management did account for many of the criteria which make places significant for national estate values but in some cases did not (e.g. Wilderness). The joint AHC/CALM study was necessary to ensure all were included.</p>
	<p>Concise pamphlet of proposal issues distributed free.</p>	<p>The proposals document was free and considered as concise as reasonable.</p>
	<p>WACAP proposal would be covered by EMP if appropriate.</p>	<p>The EMP arose out of the WACAP proposal and would cover it.</p>
	<p>Policy stating areas available for defense activities.</p>	<p>Such areas are integrated into other management activities and will vary in time.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Recommendations don't reflect planning process involved.	The planning process is the means by which the recommendation will be implemented.
	Concern that recommendations may not be implemented.	An implementation schedule will be included in the final strategy.
	Will sanctions be applied if not implemented.	There should be no need for sanctions however this is an EPA responsibility.
	Specify date of implementation.	See the final strategy document.
	Concern that CALM document not an accurate description of forest state.	The state of the forest could be described at a range of levels. The Strategy document purposefully took a broad strategic view of the forests.
	CALM library document gave no facts to assess & no submission date.	The submission date was included in the inside cover.
	Information in documents hard to comprehend; would require a long time to respond effectively.	The Strategy was available for four months and was accompanied by numerous briefings.
	Much background information not given - should have had a separate document for this.	It was considered necessary to have the back ground material with the strategies to enable readers to see the context.
	Major reference material expensive & hard to obtain.	All in Library which are free.
	References and data within proposals is selective and data often vague.	Specific instances are required to comment on this.
	Operational detail found only in Jarrah silvicultural specifications.	The karri silvicultural specification will be written to reflect the strategy proposals if they are accepted.
	CALM to develop silvicultural specifications that truly reflect aims stated.	CALM believes they do.
	Why must CALM propose amendments over & above ministers?	Amendments are proposed to deal with the Environmental Conditions and new information available. They will require ministerial approval.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Do ministers condition No's 3,4,5,6,13 apply only to WACAP ERMP?	No they apply generally, except where they are written to apply to a specific area, as per condition No. 13.
	How was the major CALM/AHC study funded & what benefit?	CALM and the AHC jointly funded to ensure the inclusion of national estate as a value in forest management.
	Compile a list of proposed forest management practices & 1987 ones including benefits, defects & costs.	The individual strategies as discussed in the draft document discussed the benefits of amending existing strategies.
	Inclusion of new objectives in management plans without survey of future changes.	CALM intends to conduct public attitude surveys.
	Developed conditions 1,3,4,5,6 in '87 so why is new approval needed from the EPA?	Approval is required in respect of specific requirements in existing conditions and because of variations to approved practices.
	EPA didn't review the timber strategy or approve implementation of the document.	The Timber Strategy was reviewed by the EPA as part of the 1987 Regional Management Plans.
	Environmental Condition 12 of WACAP project has only just begun to be implemented.	Some conditions (4, 6) could not be implemented until the jarrah inventory was compared and the AHC methodology worked out.
	Many terms in glossary of terms are biased towards wood growing.	Specific examples are required before a comment can be made.
	Poor supervision & enforcement of CALM's codes of logging practice.	This is not an issue which relates to the draft strategy but is a day to day management issue.
	CALM doesn't have resources or ability to implement prescriptions proposed.	Resources are available. Priorities will dictate to where they are directed.
	Should make use of agroforestry practices.	CALM is acknowledged as a world leader in promoting and practicing agroforestry.
	Statements of management objectives conflicting & confused.	Specific examples required for comment.
	Need more precise & comparable figures between 87 and 92 documents.	An attempt will be made to clarify this in the Final Strategy.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	CALM not interested in the findings of the Commercial Forest and Timber inquiry.	CALM liaised with the RAC constantly and was aware of the thrust of their conclusions before publication of the draft strategy.
	Will new objective spread the responsibility to include public & private lands.	CALM is not proposing legislative controls on forest practices on private land.
	CALM used assumption that what is good for economy is good for the environment.	ESD acknowledges the interaction of the economy and the environment but maintains the overriding objectives of ecological sustainability in commercial use.
	Logging industry secure with legally binding contracts.	Legally binding contracts are one means of providing security to the forest based industries.
	No more ignorance towards cumulative effects of land degradation.	The need to integrate activities means cumulative effects are considered in management.
	Would like to see the expansion of CALM's Rural Advisory services.	Priorities for the allocation of resources do not allow this to happen in the short term.
	No proposal tackling intensity of logging & bauxite mining in Northern Jarrah forest.	The final strategy will outline proposals to better integrate bauxite mining and other forest uses in the jarrah forest.
	Production of fine furniture within our S-W forest area.	The end use of timber will be part of a Timber Industry Statement, which will follow the final strategy.
To manage the native forests of the south west of Western Australia, in consultation with the community, so that they provide the values required by society while sustaining indefinitely their biological and social diversity.	Scientifically survey the public's priorities for management.	CALM will undertake public attitude surveys but it is the Government's responsibility to dictate priorities for management. This process is called the Westminster System of democracy.
	Community input should have been sought prior to review drafting.	A series of public seminars and workshops were held to obtain input at a broad level and on specific issues such as stream zones and reserve selection principles. Also we called for input, and got it.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	What is meant by the 'social diversity' of native forests?	"Social diversity" in this context is the forests ability to provide for the diverse demands placed on it by society.
	There should be community input into the value system used for protection.	The priorities CALM puts on fire protection life, property, forest values were detailed in the policy summaries in the Draft Review of Forest Strategy hence available for comment.
	How will CALM provide for public input into proposed travel routes in Northern forest?	CALM will advise local Government and tourism bodies of the classification of travel routes and advertise the existence of the classification to enable interested people to inspect it at Regional offices.
	There has been scant research to find out public perceptions of forest management.	CALM intends to continue research into the public perception of forest management issues. Also, CALM staff represent a wide range of professional disciplines hence are partly a reflection of public perception.
	Rely on professional foresters and not public for policy implementation.	All plans are approved by the Minister and endorsed by controlling bodies. Policy implementation is the responsibility of the Department however public comment will be sought where the technical aspects allow a range of solutions.
	Explain to the public how forest management is funded.	This is set out in Departmental Annual reports.
	Create public awareness of LFC, NPNCA & FPC's role.	The individual controlling bodies have programmes to achieve this.
	Specialists required to link management to society values.	Society's values are determined by Government and it is the role of CALM officers to implement the management plan which reflects those values. Increasingly, specialists are being employed to achieve that in fields such as aesthetics and communications.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Forest management should aim to enrich individual experience and not necessarily educate.	The recreation program has this as one of its goals.
	Develop a communication strategy, use all involved in forest management.	CALM regularly develops communication strategies for programs in forest management.
	Further classification of social diversity required.	The public submission period has been a useful means in which to determine social requirements and relative demands.
	Communications which are only public relations exercises create suspicion not understanding.	CALM publications are recognised as being of a high standard and informative.
	Perception that taxpayer subsidises operations, nothing to state otherwise.	See Annual reports.
	Public perception of being unwelcome in forests.	CALM does not believe this is wide spread. Figures show the number of visitors to the forest is growing each year.
	A small percentage of timber royalties should go to community education.	Currently no timber royalties are retained by CALM but all go directly to Consolidated Revenue.
	CALM shows insufficient understanding of the difference between interpretation & other community education methods.	CALM has a number of programs to inform and educate the public. Interpretation is one of these.
	Interpretive tours play greater role than other community education methods.	CALM believes these tours are valuable but other approaches are also required.
	Public consultation should not end when the management plan is published.	CALM agrees.
	Should be regular publication of intended operations on CALM lands.	This is now standard practice and is done through some regional newspapers.
	Plan for detailed, accessible, public information.	Within budget constraints this is already done.
	How will the differences between strategies be resolved without public review.	Strategies are integrated at field level through prescriptions such as the silvicultural prescription.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Lack of coherence in public documents defeats public review process.	No comment - is a statement which we disagree with.
	The overload of public documents on review suggests CALM has no real interest in public comment.	The 3 documents were available for 4, 5 and 6 months respectively. This is considered reasonable.
	Public has not seen the jarrah forest inventory.	A more detailed output from the jarrah inventory will be published.
	Public doesn't like what CALM are doing to state forests.	An assertion - we accept some sections of the public do not like Govt. policy regarding use of State forests.
	CALM wastes scarce public money on propaganda material.	Many people are seeking information on forest management issues.
	Details of river & stream zones for Swan & Central region should be released for public comment.	Details were included in the Forest Strategy page 59.
	Wildfire threat analysis should be published for public comment.	Wildfire threat analysis is available for anyone interested. It is considered too detailed and specialised to be of general public interest, and values change nearly every year.
	Public to access firewood in forests.	The public does have access to firewood however, it must be managed according to the demand and impact on other forest values.
	Concern over forest industries targeting of school kids.	The responsibility of the Ministry of Education, outside CALM's control.
	Full explanation of costs and benefits should be made available to public.	It is very difficult to quantify costs and benefits. The draft strategy attempted to do so qualitatively.
	Community consultation required in respect to local amenity values & tourism.	Local developments in amenity and tourism is done in consultation with local community.
	CALM unapproachable.	CALM is approached by a vast number of people on a range of issues every day.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	CALM may talk to and sometimes listen to community groups, but has shown total inflexibility on plans for timber extraction.	CALM has created significant new areas of reserves from 1987 which has resulted in a lowering of available timber. In addition structural goals for karri and jarrah limit availability of wood.
	CALM ignores public submissions in subsequent management plans.	The criteria for evaluating public comments is detailed in the summary of public submissions.
	Final plans formed only after a more considered public comment.	CALM is considering all comments made to it.
	Bridgetown friends of forest wish to assist CALM in management.	CALM is liaising with this group at the local level.
	Liaisons with all interested parties to discuss forest management.	This occurs with those parties who wish to comment on practices in specific areas.
	Want better control of Calm's operations.	CALM's operations are controlled by the Minister through relevant Acts, Policies and prescriptions.
	All government departments to come together to organise a management plan.	There has been considerable interactions with other Government Departments in finalising the strategy.
	The time taken for native trees to mature should be taken into account when setting royalties.	Royalties are determined on the cost of growing which includes time taken for trees to mature.
	CALM trying to blind reader with geeewiz technology & shiny paper.	CALM is actually trying to communicate the technical requirements of modern forest management with the public.
	Too much dependence on the poorly defined 'whole of forest' concept.	'Whole of forest' concept implies treating all of the forest in an integrated way rather than compartmentalising and managing compartments in isolation.
	Charge royalties to cover all forest management costs	Royalty calculations include a component for all forest management costs.
	Remove taxpayer subsidies to timber & woodchip industries.	There are no subsidies from the taxpayer to the timber industries.
	Principles, objectives of draft do not recognise economics.	The principle of ESD acknowledges economics of production.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	What are estimated ongoing costs to manage national parks & heritage areas?	This question is too complex to answer in this format.
	Costs & timetable to be given for implementing new proposals.	The timetable for implementation is detailed in the final strategy. Costs cannot be as they will depend on implementation techniques.
	Cost to WA community of proposed changes.	CALM believes the WA community will gain from the proposal through a better managed forest.
	Profitable to operate small scale timber. industry & manage it effectively?	Aspects of the Timber industry will be dealt with in the follow up Timber Industry Statement.
	No cost predictions & no analysis of where \$ come from or goes to.	Cost of implementation will depend on how strategies can be integrated.
	Supports the Strategy concept of demonstration forests but does not want too many.	Acknowledged.
	Term "demonstration forests" not defined but if that proposed by Jepsen then 5 is absurd.	It is not envisaged that all demonstration forests will need to be as well developed as the Vancouver example managed by Jepsen.
	No evidence that "demonstration forest" effective at changing management attitudes.	Demonstration forests are to help the public to understand the implementation of forest management.
	Special areas showing current management practices to be set aside	Current management practices can be viewed in many places throughout the forest. It is not necessary to set aside any.
	"Natural Forest" is not the result of intensive management.	It is not possible to have "natural forest" and use the products from it. However, it is important to preserve some natural forest and this is done in the reserve system.
	Against wood going to Kemerton for ash.	The silicon plant at Kemerton provides an excellent use for residue which would otherwise be wasted.
	Paper products not to come from forest destruction.	Agree, this is why it is preferable to source raw material for paper production from managed Australian forests.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Concern over relationship between CALM and Timber industry.	The Williams inquiry found the relationship was perfectly legal.
	Against the destructive practices of the Timber industry.	Some specific instance is required to enable comment.
	Concern over jarrah & other long-maturing indigenous species.	The structural goal allows for a proportion of the forest to grow until natural death.
	Should double the prices for high quality timbers.	CALM has doubled the price of logs over the last 5 years, but current prices are at market value.
	Spot mills to be located in areas cleared for mining.	Areas cleared for mining are rehabilitated as soon as possible after mining ceases.
	Royalties to include cost of regeneration.	Royalty calculations include the cost of regeneration operation.
	Timber left standing unless all cost.	Royalties cover all the costs of growing a forest stand.
	Against forest being ripped down first & sold off later.	Unable to comment. However, logging only occurs according to approved plans.
	Opposed to exclusion of other industries in S-W forest.	Multiple purpose management provides for all industries, but not at maximum levels.
	Forest clearing results in world hunger.	No direct relationship seen between forest harvest in WA and world hunger.
	Concern about bulldozing activities by farmers.	Outside the scope of the Strategy.
	Extraction cost increases on ecological not aesthetic grounds.	Managing for aesthetics is a legitimate objective of management.
	User of ecological benefit should pay increased management costs.	This is agreed with in principle and CALM is developing the accounting procedures to identify.
	Forest ecosystem research paid by major Company's. eg: Bunnings.	The royalty calculation have a component which funds research.
	Forest not to go to pulp mills, more recycling required.	Deciding the social value of the end use of timber is a Government role. CALM encourages value adding of wood but is especially concerned to see its extraction is ecologically sustainable.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Possibility of undiscovered medicines in native forests.	Possible. Since all species regenerate after logging, no potential is going missing.
	South-west forest an industrial wasteland.	Disagree with this statement.
	Should let things be for the sake of nature.	This does not recognise societies wish to materially benefit from forest use.
	Recreation issues not addressed in great detail.	The document was intended to be basically strategic hence did not provide much detail.
	Must develop management of European heritage sites.	This is being done now but will be expanded when the CALM/AHC study examines European heritage.
	Role of the forest as a resource base for recreation.	This is recognised.
	Maintenance and management of recreation areas.	Too specific to be addressed in a strategic document.
	Secure resource base & finance for recreation areas.	The resource base must be integrated with other forest areas so a range and level of opportunities are available.
	Recreation more closely integrated with other forest uses.	Agree with this.
	Monitoring and reviewing of recreation uses required.	Agreed.
	Cyclic nature of timber harvest reflected in recreation site design.	It is possible to integrate many values in time to reflect the dynamic changes in a regenerating ecosystem.
	Preparation of Recreation Framework plans to be a priority of the strategy.	The preparation of these documents is already a priority to CALM.
	Increase visitor input & ownership in Recreation areas -to stop vandalism.	This is recognised by CALM and is being aided on through programs such as "Camp Ground Host".
	Staff training & appropriate career structure for recreation management.	Not pertinent to this document.
	Preserve the natural history of the remaining forests.	Natural history (Heritage) is one value CALM manages for but it must be balanced with other values.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Bushwalking not considered separate from day use activities.	CALM considers the strategies provide ample scope for bush walking.
	Development of recreation areas that balance between user need & environmental preservation.	Agreed.
	Extensive areas required to facilitate undisturbed outdoor recreation.	Agreed.
	Tourism development is destroying the features it is supported by.	It has the potential to hence must be managed to avoid it.
	Must note impact of tourism development on private land.	This is outside the scope of the strategy.
	Town businesses feel livelihood depends on forest attractions.	CALM recognises this.
	Liaison with tourism organisations to promote areas & pool resources.	Agreed.
	Importance of forest resource as a tourist attraction.	This is recognised in the amenity strategies and National and Conservation Park proposals.
	A review of the royalty system is necessary.	This has been done in the Timber Strategy.
	Waste wood used for fuel in non-bleach pulp mills.	No pulp mill in WA proposals call for environmentally safe projects.
	Designated firewood areas to be more widely advertised.	Designated firewood areas are advertised in the press each year.
	Mining company reforestation programmes not adequate.	Reforestation in mined areas is adequately researched and monitored by Company and Government committees.
	Major environmental problems in Australia associated with loss of tree cover.	Agreed in most areas.
	Breaking of the Bunnings monopoly on the WA timber industry.	Not a forest management question.
	Need to use alternative methods for producing paper.	Outside the scope of the Strategy.
	Strive to maintain environment for future generations.	Agreed this is a function of ESD and an objective of the Strategy.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Sawmillers seen as a pest attacking public lands.	If people did not want timber there would not be a need for sawmillers.
	Pristine forest and wilderness values are not renewable resources.	Wilderness can be restored (see AHC documents). Pristine, if its definition includes non disturbance, by definition can not be restored, however, all other attributes of it can be.
	Need a table of CALM's budget, total timber extraction & government subsidies.	See Annual Reports.
	At what level would timber extraction cease to be profitable?	This is too complex a question to answer without defining the specific area harvesting and processing options.
	What subsidisations are given to the timber industry?(BC)	None.
	What income from royalties for timber?(BD)	See Annual Reports.
	What are the costs of roads, replanting, forest management and research?	See Annual Reports.
	Need comparison of value added and raw timber.	This is outside the scope of the strategy but will be addressed in the forest industry statement.
Implementation		
The above objective will be put into effect through the following devices.		
Firstly, through the development of issue plans attached to and approved with the Regional Management Plans (eg, the Timber Strategy) which are put into effect using regulations under the CALM Act.	Are these issue plans available to the public?	Yes.
Secondly, through incorporation in the management plans for the forest regions. This will provide the land tenure base for the conservation reserve system and multiple use forest areas.	Management decisions to be made by local professional officers, not public.	Management decisions are the responsibility of CALM; any input by the public is advisory only. Overall land use decisions are made by the Govt. not CALM.
	Presentation of plans is poor(593)	A matter of opinion.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
Thirdly, by development of area management plans for individual parks and reserves.		
Fourthly, by development of wildlife management programs and recovery plans for selected flora and fauna taxa.		
Fifthly, through the development of departmental policies and prescriptions (eg, for disease control or silviculture) which apply on all forests managed by CALM and are implemented by CALM staff in regions and districts.	Is this meant to imply that these policies and prescriptions apply equally to forest where wood extraction occurs and forest in conservation reserves?	Yes, although some policies are specific to certain land tenures.
Sixthly, through the development of an annually updated five-year research plan which directs the priorities for research by CALM.	Final management proposal to state when plans to be renewed	Management plans run for 10 years unless changes dictate a revocation at an earlier date.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p><b>3.1 Road, River and Stream zones</b></p> <p>A system of road, river and stream zones was developed for southern forests during the early 1970s. The objective was to provide corridors and strips of undisturbed forest adjacent to areas being harvested for sawlogs and woodchips. The system comprised a network of varying widths along selected major roads, rivers and some streams. Along selected streams 100 metres of forest either side of the stream was protected; this width increased to 200 metres either side of rivers. Along selected roads 200 metres either side of the road was designated. In practice up to 400 metres either side was actually retained.</p>		
<p>The objectives of this system were:</p> <ul style="list-style-type: none"> <li>To provide zones of undisturbed vegetation between water courses and logging areas so as to minimise the risks of stream sedimentation or salinity.</li> <li>To provide vistas of undisturbed forest for tourists travelling on major roads.</li> </ul> <p>To provide corridors of mature vegetation which would provide habitat for wildlife and a reservoir of species which could recolonise maturing regrowth forests in the harvested areas,</p>	<p>Support the objective of retaining stream zones to ensure maintenance of ecological and riparian values in all State forests.</p>	<p>Good.</p>
	<p>Why are linkage zones not applied to all forest types, not only Karri?</p>	<p>Linkage zones occur naturally through jarrah silviculture because of the nature of selection cutting.</p>
	<p>What security is there that areas in the new zone system will not be logged in future?</p>	<p>Any proposal to log these zones (other than thinning of road zones) would require EPA approval which is subject to public review.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	If they are secure from future logging they should not be included in the Inventory of Timber Resource as multiple use forest.	The inventory of timber resource covered all State forest and the standing volumes reflected that. For calculations of sustainable yield however, the timber in the zones were excluded.
	If Forests in the proposed road river zones may have already been logged.	Some have already been logged. The figures are provided on table 5 under regrowth karri .
	Linkage zones/movement corridors to be excluded from logging.	In karri forest this will be the case until regrowth has taken on mature forest characteristics.
	Corridors/linkage zones to be a min of 100m wide-and full of old growth forest or /structurally mature forest.	It is intended these areas contain mature forest. The width will vary but will generally be comparable to the stream zone width it is connecting.
and which would interconnect major conservation reserves.	Support the use of corridors to interlock buffers with high conservation areas.	Ok.
When this system was developed in the early 1970s the best information available at the time on forest hydrology and nature conservation was used.	This is misleading. It was known at time of the woodchipping EIS that buffers were needed along 1st, 2nd & 3rd order streams as well as larger streams to protect water quality, but they were not introduced.	This is not so, the Kelsal committee trials were instigated to determine these requirements.
However, it was recognised that more information was required, and several research programs were initiated. Specifically, it was necessary to determine objective methods of optimising water resource protection, conserving fauna at the local level and managing the visual resource.		
It was also recognised that the original system was distorted by the unnecessarily excessive width of some road protection zones, where 400 metres was set down, although 200 metres was specified.	Reserve system should not be duplicated unnecessarily.	Historical reservation patterns have resulted in uneven representation of vegetation complexes. The proposals in this document are aimed at including under represented complexes.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p>The extensive research and public consultation programs undertaken since the 1970s indicated that the objectives of the original road, river and stream zone system remained valid, but the allocation of forests to these zones could be made more effective.</p>	<p>All existing road river &amp; stream buffer zones should be retained.</p>	<p>The development of a new road, river and stream zone system had to be accomplished within the context of the 1987 Timber Strategy (Environmental Condition No. 4(2)). This necessitated a redistribution of existing zones.</p>
	<p>Removal of buffers threatens landscape, recreation and tourist values.</p>	<p>All important road zones to be protected. Landscape and recreation values will not be threatened.</p>
	<p>Support the objective of improving road, river &amp; stream zones.</p>	<p>Ok.</p>
	<p>Increasing forest areas in road, river and stream reserves enhances high conservation areas.</p>	<p>Increasing area in stream zone enhances high conservation areas but road zones generally have no especially significant conservation value compared with other forests.</p>
<p>In addition, CALM has developed a Geographic Information System which can analyse a variety of options for meeting the specific objectives of the road, river and stream zone system. The GIS was used to determine the most effective river, stream, and road zone system.</p>	<p>What is meant by 'the most effective river, stream, and road zone system'?</p>	<p>The system that optimises hydrological, biological and aesthetic values with the area available.</p>
	<p>CALM's 1986 1:50 000 maps are inadequate to discern 1st order low gradient streamlines so logging should be delayed until GIS data becomes available.</p>	<p>Implementation will be based on field evaluation not map information.</p>
<p>The proposed system is based on the results of research into forest hydrology and nature conservation, and on a quantitative assessment of forest visual resource values.</p>	<p>What will be the ecological impacts of the redistribution of river &amp; road zones?</p>	<p>CALM believes the redistribution will improve ecological values at the local level by improved protection of water and wildlife values.</p>
	<p>If the proposed zone system is based on research why have the zone widths recommended by CALM's researchers been reduced?</p>	<p>Research shows that 30m is adequate.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Forest management should be based on ecology not visual resource values.	Aesthetics, or the visual resource, is a value which society requires forests to be managed for hence CALM must include it.
	What, if any, legislative protection will road, river & stream zones have?	Road, river, stream zones do not have tenure protection. They are protected by CALM management plan and an Environmental Condition stemming from EPA review.
	VRM & aesthetic conservation dubious & contrary to professional standards.	Aesthetics is a legitimate value required by society to be managed for by CALM. VRM is the best method to quantitatively achieve that.
The results of hydrological and ecological research on this issue are discussed in the Review of Management Strategies for South West Forests. The principal findings from this research were:		
(i) Small, local and transient reductions in water quality associated with timber harvest and regeneration in some areas can be avoided by retaining a zone of undisturbed vegetation adjacent to streams and rivers (see Water Authority, 1987).	Gronns & Davis (1991) say buffer zones of at least 100m on ephemeral streams 'appear to be sufficient to reduce' (not prevent) the impact of logging, and 'the recovery of these streams will be slow'. How can these effects be described as avoidable (with 20-30 metre zones) or transitory?	Research has shown that any physical impacts (salinity and turbidity) are small and transitory.
(ii) The retention of undisturbed streamside zones also helps to protect nature conservation values in forests from which timber is being harvested, through the provision of mature habitat and of linkages to other undisturbed areas; these undisturbed streamside zones are also themselves areas of high ecological diversity (Wardell-Johnson et al., 1991).	As the streamside buffer zone is likely to be ecologically different from the adjacent forest, how will it serve as a recolonisation area for that forest?	The stream zone will have habitat (eg. mature trees) which will enable species to remain in the area and recolonise the surrounding forest as its regeneration stage provides appropriate habitat. Additional recolonisation resource in reserves and linkage zones.
	Buffer zones should be planted and protected.	Stream zones will not be disturbed hence planting will not be necessary.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Protect trees on roads, rivers, streams buffer zones.	Trees in zones will be protected except for the thinning of regrowth in road zones and the removal of trees which pose safety hazards.
	Little research on the value of buffers as biological corridors.	Agree. However ecological principles give strong support to the concept, especially in streams.
(iii) Roadside forests can be managed to avoid or minimise disturbance to the highest scenic values by the application of visual resource management procedures (Revell, 1991).	How in detail will the application of Visual Resource principles operate to 'sustain the beauty of the natural environment'?	VRM principles are applied at 3 levels : Broad scale planning, specific project planning and design and in monitoring and evaluation.
	What research evidence is there for the principles of VRM?	An extensive bibliography can be supplied on request.
	Under the silvicultural specification these zones will be logged (albeit more slowly) so after 20 years in what way will they differ visually from the adjacent multiple use forest?	There will be substantially less area logged and gap sizes will be reduced hence the visual impact will be less.
	Don't like the way that clearfelling is hidden.	Road zones are mainly in place because tourists on travel routes would rather see largely undisturbed forest. CALM can provide guides for people seeking to view C/F areas.
In addition to these scientific studies, the Lands and Forest Commission conducted a public workshop on the designation and management of road, river and stream zones in southern forests at Manjimup in 1991. Proceedings of the workshop were published (Lands and Forest Commission, 1991).	Management of these zones should be determined by professional forest managers, based on scientific research and clear objectives.	This is the intention of CALM.
The existing system of road, river and stream zones does not optimise wildlife, water resource and aesthetic values.	Management not too prescriptive, flexibility gives better decisions in the field.	CALM endorses this however must find a balance between flexibility and accountability.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p>The review of research findings and of public input concludes that the priority must be protection of riparian zones in the forest.</p>		<p>Riparian zones are the key to protecting aquatic ecosystems but in some cases whole of catchment work may be required to rehabilitate degraded streams e.g. Denmark and Blackwood.</p>
<p>while aesthetic values along roadsides can be maintained by the application of visual resource management strategies.</p>	<p>VRM can only reduce disturbance to highest scenic values, not avoid it.</p> <p>Proposed VRM system places fixed restrictions &amp; ignores economics.</p>	<p>This is acknowledged. VRM is a means to include visual values in the balance of values being managed for.</p> <p>VRM is a flexible system. In the southern forest region fixed width zones have been placed on well used roads but this is in addition to VRM management. The economics of management are always a consideration but VRM is not seen as an economic impost but a value that must be managed for.</p>
	<p>What was the 'review of research findings and public input' which concluded that VRM can maintain aesthetic roadside values?</p>	<p>The trials conducted in the southern forest region where road zones were halved indicated aesthetic roadside values can be maintained. VRM manages high value aesthetic values by prescribing minimal alteration.</p>
	<p>Cutting trees promotes weeds, and does not enhance scenic values.</p>	<p>Weeds, particularly pioneering species, can become established following logging, however, experience has shown native vegetation regrowth competition eliminates them as it develops. Cutting trees will generally not enhance scenic values except, in some peoples view, when regrowth forests are thinned allowing greater viewing depth.</p>
<p>A new system for road, river and stream zones is proposed. The proposals are shown for roads (or "Travel Routes" because a tramway and a walking path are included) in Table 1, and for rivers and streams in Table 2.</p>		

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p><b>Table 1 A proposed new travel route zone system for West Australian forests</b></p> <ul style="list-style-type: none"> <li>The entire forest will be mapped into three scenic quality zones (A, B or C).</li> </ul>	<p>What are the criteria for these scenic quality zones, and how were they derived?</p> <p>Level 1 sensitivity should be accorded to private property boundaries. A 'VRM A' zone should apply in forest 200m from private property, subject to negotiation with the owner.</p>	<p>This is explained in the Draft Forest Strategy pages 149-154.</p> <p>One of the criteria for Level 1 sensitivity is the number of people viewing the scene. Private property boundaries, in most cases, have very few viewers. CALM does however as a matter of course negotiate with private property owners concerning activities on their boundaries.</p>
<ul style="list-style-type: none"> <li>Travel routes throughout the forest will be surveyed and classified as Level 1, 2, 3 or 4 according to patterns of use and viewer sensitivity. Level 1 routes are those which meet the highest criteria for visual resource values.</li> </ul>	<p>What opportunity will there be for community consultation in this classification process?</p>	<p>Viewer sensitivity classification is based on objective criteria published in the Draft Forest Strategy. The public have had an opportunity to comment on levels for the southern forest region. Classification is completed for the Swan and Central Regions and they may be obtained from the respective Regional offices.</p>
<ul style="list-style-type: none"> <li>In southern forests where clearfelling is the method of timber harvest and regeneration, 200 metres of undisturbed forest will be retained on either side of all travel routes classified as Level 1, and 100 metres will be retained on either side of all travel routes classified as Level 2 (See below for a list of roads in the Southern Forest Region classified as Level 1 or Level 2.) Level 3 and Level 4 travel routes do not require buffers.</li> </ul>	<p>Level 3 &amp; 4 travel routes should also be managed as visual resources.</p>	<p>They are but to a lesser degree.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Level 1 & 2 travel routes in all forest areas should have 200m & 100m buffers respectively.	It is not considered necessary to have fixed width zones on roads in the Swan and Central forest regions because logging has in many cases already occurred and the nature of selection logging means it is of less visual impact than clearfelling which occurs in the karri forest in the Southern region.
	The existing 400m designated road zones should be retained until their ecological and old-growth forest values have been publicly assessed.	The old growth forest values have been assessed for all of the southern forest region including road zones in the CALM/AHC study. Ecological research, whilst not targeted at individual road zones, has shown that riparian areas are more important hence CALM's decision to reduce road zones to build up stream zones.
	Reject the proposed new road zones (except in old-growth areas) because the public should see how the forest is logged.	There are many opportunities for the public to see logging in the forest away from the main roads whereas the tourism industry representing the travelling public believe minimal disturbance on major roads is desirable.
	Road reserves should not be 'screens' only to maximise flora/fauna values & provide wildlife corridors.	Road zones are retained to fulfil both aesthetic and wildlife protection values.
	Against flexible road, river and stream zone widths.	Flexibility is required to enable variation in width to ensure maximum ecological advantage is obtained from the available width. A set minimum is specified as a safeguard.
	A min of 150m each side of the road centreline to be left in clearfelled areas.	On Level 1 road this will be 200m and Level 2, 100m.
<ul style="list-style-type: none"> <li>No logging of mature forests will take place in these zones.</li> </ul>	Protect trees on roads, rivers, streams buffer zones.	Trees in zones will be protected except for the thinning of regrowth in road zones and the removal of trees which pose safety hazards.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
Even-aged regrowth forests will be thinned;	If they are to be thinned how are they 'undisturbed' as stated above?	All stream zones and mature forest in road zones will not be disturbed by logging. Forest in road zones will be thinned. Disturbance will be slight and temporary.
	There should be no logging at all in the existing road river & stream zones or proposed river & stream zones without a prior assessment of values.	CALM does not consider biological surveys at that level to be effective as there are no species vulnerable to local disturbance. All effort should go into regional biogeographical surveys to determine the more useful regional patterning of flora and fauna.
	Buffer zones to be a min 30m each side of road centreline & be exempt from thinning.	Regrowth forest only will be thinned. Thinning is a natural process, and does not detract from long term visual attractiveness.
dangerous trees may be felled and utilised if these pose a hazard to human life.	How can CALM satisfy the public that this provision will not be abused to permit normal commercial logging?	New Forest Management Regulations will be gazetted to ensure that each tree is inspected and marked for removal.
<ul style="list-style-type: none"> <li>In central and northern forests and in jarrah stands adjacent to Level 1 roads in southern forests, harvest gap size will be modified depending upon whether the area is classified as Scenic Quality A, B or C. Allowable gap sizes will be spelt out in silvicultural specifications (see Table 7).</li> </ul>	Can CALM provide information about travel zones in the Swan and Central forests?	Viewer sensitivity has been defined for travel routes in the Swan Region. They can be obtained through the Regional office at Kelmscott.
Prescribed burning for fuel reduction or habitat regeneration will take place from time to time in these zones.		
New roads may be constructed which cross these zones but they will be designed to minimise impacts on the values which are being protected. Forest produce generated during legitimate road construction will be utilised.	CALM should review the practice of low-profile roading.	CALM is reviewing its whole dieback management at present.
<b>Level 1 travel routes in the southern forest are:</b>		

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p>Big Tree Rd*            Beardmore Rd            Boat Landing Rd            Boorara Rd*            Burma Rd            Centre Rd*            Channybearup Rd            Chesapeake Rd            Chindalup Trail*            Collins Rd            Coronation Rd            Cosy Creek            Diamond Tree Rd*            Davidson/Graphite Rd            Deeside Coast Rd            Dog Rd*            Donnelly Mill Rd            Donnelly Drive*            Eastbourne Rd*            Eastbrook Rd*            Glauders Rd*            Kin Kin Rd*            Kurandra Rd*            Middleton Rd            Middlesex Rd*            Mockedillup Rd*            *Roads which were not included in the previous road zone system.</p>	<p>What are the criteria for selection of travel routes?</p>	<p>Criteria for the designation of viewer sensitivity levels are published in the Draft Review of Forest Management Strategies on page 152, 153.</p> <p>Travel routes will be reviewed internally on a regular basis and formally with the renewal of each Regional Management Plan.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Add Windy Harbour Road.	The Windy Harbour road only coincides with CALM tenure in the D'Entrecasteaux National Park hence will not need L1 status to ensure the aesthetic values are retained.
<p>Level 2 travel routes in the southern forest are:</p> <p>Boronia Rd*            Boyup Brk/Cranbrk Rd            Corballup Rd            North Walpole Rd            Pozzi Rd*            Seaton Ross Rd*            *Roads which were not included in the previous road zone system.</p>	<p>Add Calcup Road, Springdale Road.</p>	<p>The VRM system provides an objective criteria on which to base sensitivity and there are no reasonable grounds seen to vary them to accommodate Calcup and Springdale Road.</p>
	Boronia Road lies totally within existing and proposed national parks so its 'road zone' is double counted.	Incorrect. In the calculation of areas in road zones the GIS overlaid conservation reserve tenures and removed those that overlapped hence only multiple use State forest is included in the road zone area statements.
<p>The previous road zone system in the Southern Forest Region included Bevan Rd, Bunnings Log Rd, Dean/KTC Rd, Distributor Rd, Kingston Rd, Nelson Rd, North Rd, Springdale Rd and Westbourne Rd. When evaluated using visual resource criteria, these roads did not rate as Level 1 or Level 2 travel routes.</p>	Retain Dean/KTC Road.	The VRM system provides an objective criteria on which to base sensitivity and there are no reasonable grounds seen to vary them to accommodate Dean/KTC Roads.
<p><b>Table 2 A proposed new river and stream zone system for Western Australian Forests</b></p> <ul style="list-style-type: none"> <li>This proposal will apply to all state forests.</li> </ul>		

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<ul style="list-style-type: none"> <li>All rivers and streams within the publicly-owned forest of the south west will be classified as first, second, third, fourth or fifth order and a protective zone of undisturbed vegetation will be designated. (Note: Stream order numbers are based on a genealogical approach.</li> <li>A first order stream is the smallest at the top of the catchment. Where two first order streams meet a second order is formed and where two second orders meet a third order is formed. Fifth order streams are usually rivers.</li> </ul>	<p>It is misleading to say all these zones will be 'undisturbed' because the forest to be included in the zones may well have been disturbed by logging, or even clearfelling.</p> <p>Can CALM clarify how first order streams will be defined in the field?</p>	<p>The reference to undisturbed refers to future management not past.</p> <p>First order streams will be defined by the combination of the characteristics of the stream depression and the vegetation. Guidelines will be drawn up and made public.</p>
<p>On all first, second and third order streams a zone of between 20 metres and 30 metres of undisturbed vegetation will be retained on either side of the stream.</p>	<p>Mapping of 1st order ephemeral streams only accurate through ground survey.</p> <p>According to Grown &amp; Davis (1991) buffer zones of at least 100m on ephemeral streams 'appear to be sufficient to reduce' (not prevent) the impact of logging on macroinvertebrate fauna, so how is 20-30 metres adequate?</p>	<p>Agreed. These will be designated on the basis of ground survey.</p> <p>Grown &amp; Davis (1991) also state the "100m buffer left along the stream edges was effective in ameliorating any disturbance due to logging" and further "Borg et al (1988) found that, in Western Australia, reducing the width of buffer zones from 200 to 100 and 100 to 50m had no effect on the water course or water quality". Evidence (Clinnick 1985) suggests 30m will be adequate to maintain water quality.</p> <p>A monitoring program to assess stream quality will be devised in consultation with the Water Authority.</p>
	<p>What plans are there to monitor the effectiveness of these buffer areas (especially their biological impact) in both jarrah and karri forests?</p> <p>1st &amp; 2nd order streams should be given same protection as 3rd order streams.</p>	<p>1st, 2nd and 3rd order streams all have the same level of protection under the draft proposals.</p> <p>See reference to Grown &amp; Davis above.</p>
	<p>Unlogged streams and streams with 100m buffers have similar faunal populations.</p>	

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	River, stream (riparian) zones should all be a minimum of 100m.	CALM must produce a management strategy which balances the output of all values. It is not possible to have 100m wide riparian zones and balance other forest values, particularly timber production, in keeping with Environmental Condition No. 4(2).
	Reduction in habitat corridors threatens biological diversity.	CALM believes research suggests maintaining the same area of habitat corridors but placing them on streams will be better for the maintenance of biological diversity.
	River buffers need to be a min of 75m either side.	River zones (5th order and above) will be 200m either side.
The width applied will depend on the location of the riparian zone, as determined by ecological and topographical characteristics.	The zone width should not be fixed but 'should be increased according to the steepness of the stream valley or creek gully, as well as the gradient of the stream' (Hillard, Penn & Potter (1987)). Since the width depends on the riparian zone, will the system protect the riparian zone or will it provide a buffer of sufficient width to protect aquatic ecosystems and water quality? The enforcement of flexible stream buffers would be nigh on impossible, with industry and public alike unsure of actual requirements in a given area. Ecological boundaries should define stream zone boundaries.	There is some flexibility built into zone width to take account of soil type, steepness of valley and vegetation type. It is anticipated that it will do both. CALM will monitor and commission research to check that it does. Minimum widths are prescribed to ensure requirements are quantifiable but the objective is to protect the zone and the water and this should be identifiable by monitoring. It is CALM's intention that this be so.
	Stream zones should include 'a narrow band of mature trees' and 'ensure that roads are above steep slopes and seasonally moist sites' (Hillard, Penn & Potter (1987)). All seepage sites & valley head waters should be protected & not harvested.	Where trees are in preservation zones this will occur. Road location guidelines attempt to ensure this occurs whenever possible for ecological and engineering reasons. Protection of these ecologically sensitive areas is the purpose of the Strategy on identifying and managing special areas.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	CALM should increase riparian zone widths, thus max area of representative vegetation and reducing the overall area subsequently available for logging.	CALM must produce a management strategy which balances the output of all values. It is not possible to have 100m wide riparian zones and balance forest values, particularly timber production.
<ul style="list-style-type: none"> <li>On all fourth order streams a zone of between 50 metres and 75 metres of undisturbed vegetation will be retained on either side of the stream. The width applied will depend on the location of the riparian zone, as determined by ecological and topological characteristics</li> </ul>	River buffers need to be a min of 75m either side.	See previous answer.
<ul style="list-style-type: none"> <li>On all fifth order streams and above (i.e., rivers) a zone of between 100 metres and 200 metres of undisturbed vegetation will be retained on either side of the river, the width depending on the adjoining ecological and topographic situation.</li> </ul>		
<ul style="list-style-type: none"> <li>Prescribed burning for fuel reduction or habitat regeneration will take place from time to time in these zones</li> </ul>	Stream/river zones are an important part of the nature conservation network and should be managed as are conservation areas, especially re- road construction and burning.	This is intended, however, the narrowness and spatial distribution of stream zones will make it impossible to manage them the same as an aggregated area.
<ul style="list-style-type: none"> <li>New roads may be constructed which cross these zones but these will be designed to minimise impact on the values that are being protected.</li> </ul>		
<ul style="list-style-type: none"> <li>Forest produce generated during legitimate road construction and trees removed because they present a danger to human life will be the only utilisation in these zones. No logging for the sole purpose of generating forest produce will be permitted.</li> </ul>		

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p><b>Comparison of 1975 road, river and stream zone system and proposed new system</b></p>		
<p>The following tables compare the original road, river and stream zone system which applied only to the woodchip licence area and the proposed road, river and stream system which will apply to all south west forests.</p>		
<p><b>Roads/Travel Routes</b></p>		
<p><b>Table 3: Area of forest (ha) in existing and proposed road zones in the Southern Forest Region</b></p>	<p>The table is misleading. Existing zones are undisturbed, proposed zones will be logged, so they are not comparable.</p>	<p>Proposed road zones will only be logged to the extent that existing zones are, that is removal of dangerous trees and thinning of regrowth.</p>
<p><b>ROAD ZONES</b></p>	<p>Are some roads (e.g. Boronia Rd) double counted in the table in that they pass through existing or proposed national parks or conservation reserves in which the concept of a road zone does not apply?</p>	<p>No. The portions of road zones passing through tenures in which logging is not permitted were removed from the area statement.</p>
<p>Forest Type Existing Proposed Proposed Total</p>		
<p>System (in WLA) (not WLA) (prop.)</p>		
<p>Jarrah 27100 10385 530 10915</p>	<p>What area of mature jarrah in proposed zones?</p>	<p>The nature of past selection cutting makes it difficult to define the area of mature jarrah hence it was not done for these figures.</p>
<p>Karri Even aged regeneration 2000 830 5 835 Mature Karri 8900 4430 5 4435 Other forest - 70 0 70 Other 3400 1360 540 1900 Total 41400 17075 1080 18155</p>	<p>Has location &amp; value of mature karri in zones been assessed.</p>	<p>Yes, partly, through the CALM/AHC assessment of National Estate values.</p>
<p>WLA = "Woodchip Licence Area"</p>	<p>There are 38 000ha of forest in the current road zones within the WLA, the proposed system has only 16 255ha for the whole Southern Forest Region.</p>	<p>It was a deliberate strategy to reduce the area of road zones to enable increased coverage of streams. This is seen as a superior distribution for optimising the mix of wildlife, water and aesthetic values.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
Rivers and Streams		
<b>Table 4: Areas of forest (ha) within existing and proposed river and stream zones in the Southern Forest Region.</b>		
RIVER AND STREAM ZONES		
Existing Proposed Proposed Total System (in WLA) (not WLA) link zones proposed & corridors		
Jarrah 14200 22700 2540 25240 Karri	What area of mature jarrah in proposed zones?	See previous answer
Even-aged regeneration 1 000 3600 3600		
Mature karri 12300 15560 200 3200 18960 Other forest 200 250 250 Other 3 100 9 920 8270 18 190	Has location & value of mature karri in zones been assessed?	See previous answer
TOTAL 30800 52090 11010 3200 66300		
Note woodchip licence area no longer has any legal status.		
The river and stream zoning system will also be extended to the native forest in the Central Forest Region and the Swan Region. This will result in the allocation of a further 91 400 hectares to protected riparian zones.		
There has been some controversy surrounding the road, river and stream system in the southern forest. It has been suggested that the existing system will be reduced to compensate for new forest reserves to be created elsewhere. In fact, if the above proposals are implemented:		

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<ul style="list-style-type: none"> <li>the area in the road, river and stream zone system in the southern forests will be increased from 72 200 hectares to 84 455 hectares (see Table 5 for details);</li> </ul>	<p>These figures are not comparative, as the first relates only to the WLA and the second to the Southern Forest Region.</p>	<p>The formal system of Road River and Stream zones stemming from the 1973 Woodchip EIS only applied to the (then) existing woodchip licence area. The 1992 Strategy proposes the extension of the formal system to the remainder of the southern region and to the Central and Swan Region.</p>
<ul style="list-style-type: none"> <li>the area of mature karri forest in this system will be increased from 21 200 hectares to 23 395 hectares;</li> </ul>		
<ul style="list-style-type: none"> <li>the area of road, river and stream zone system in all native forests will have been more than doubled (see Draft Forest Strategy Review, page 159); and</li> </ul>	<p>This claim is misleading since half of all native forest was not previously part of the system.</p>	<p>It is true that only the southern forest was covered by a formal system; thus the extension to cover the whole forest was seen as a significant achievement.</p>
<ul style="list-style-type: none"> <li>visual resource management principles will be applied to the management of roadside forests adjoining all major travel routes through the forest.</li> </ul>		
<p><b>Table 5: Comparison of areas (ha) of forest (by forest type) within existing and proposed systems of road zones, river and stream zones and linkage zones Southern Forest Region</b></p>		
<p><b>FOREST TYPE</b></p>		
<p>Jarrah Regrowth Karri Karri Forest</p>		
<p>Other Karri Forest</p>		
<p>Existing System (Woodchip Licence Area only)</p>		
<p>14200 1000</p>		
<p>Road Zones</p>		
<p>27100 2000 8900</p>		
<p>- 3400 41400</p>		
<p>Total</p>		
<p>41300 3000 21200 200 6500 72200</p>		

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
Proposed System (Woodchip Licence Area only)		
River&stream zones 2700 3 660 15560 250 9920 52090		
Road zones 0385 830 4430 70 1360 17075		
Linkage zones - 3200 - - 3200		
Total 33085 4490 23190 320 11280 72365		
Proposed System (Entire Region)		
River and stream zones 5240 3660 15760 250 18190 63100		
Road zones 10915 835 4435 70 1900 18155		
Linkage zones - 3200 - - 3200		
Total 36155 4495 23195 320 20090 84455	There is less forest (i.e. excluding the 'Other' category) in the new system, down from 65 700ha in the old woodchip licence area to 64 305ha in the much larger Southern Forest Region.	This appears to have occurred because the increase in stream zones at the expense of road zones has resulted in a large increase of heath and sedge type vegetation often associated with the riparian areas, but in fact part of the forest.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p><b>3.2 High Value Old Growth Forest</b>            The need to preserve representative and viable areas of high value, old growth forest is widely recognised, and is a feature of the conservation reserve system which has been established in WA forests and which it is proposed to further expand (see part 4 of this document).</p>	<p>Proposals do not indicate which is high value old growth forest.</p>	<p>It is necessary to look at Vol. 3 of the AHC/CALM documents to see which of the national estate indicative areas contains criteria relevant to old growth forest. In time CALM will prepare maps of expression of individual criteria.</p>
	<p>Private areas of high conservation value outside CALM establishment to be acquired by CALM or CALM to assist in managing these areas.            Hester is high value old-growth forest.</p>	<p>CALM has a list of areas it would like to acquire and a budget to implement a proportion of it each year.</p>
	<p>Against clearing of Hester block in the Bridgetown area.</p>	<p>CALM acknowledges the value of Hester and will consult with Bridgetown community about its management, particularly logging.            There are no plans to clear Hester block.</p>
	<p>Salinity &amp; herbicide concerns if Hester logged.            Hypocritical to log as agricultural clearing bans enforced in the Bridgetown area.</p>	<p>When logging occurs these will be considered.            There is a vast difference in the ecological impact of clearing for agriculture versus logging and regeneration.</p>
	<p>Would quantity of timber that could be obtained warrant costs involved in harvesting Hester?</p>	<p>It would.</p>
	<p>Hester susceptible to introduced species invasion if logged.</p>	<p>These can be managed.</p>
	<p>Hester is ecologically mature and important environmentally, aesthetically and economically for industries other than timber extraction.</p>	<p>This is acknowledged and will be incorporated into plans for the area which will be developed in consultation with the Bridgetown community.</p>
	<p>Want ecologically sustainable use of Hester.</p>	<p>CALM agrees with this.</p>
	<p>If VRM cosmetically based then Hester to get an A class rating throughout.</p>	<p>The closeness of Hester to Bridgetown will be considered in its management.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	VRM inadequate on its own as it doesn't consider economic or recreational requirements.	VRM is not meant to include requirements other than aesthetics. It is the means by which aesthetics are included, along with recreation and other requirements into decision making.
	More than 50% of Bridgetown Shire is being forested.	The long term harvesting plan for the forests in the Shire are not set.
	Hester blocks highly visible and this is why people live close by.	This will be considered in its management.
	All forest in Bridgetown Shire has been or will be harvested within the decade.	The long term logging plan for the Bridgetown area has not been determined.
	In 30 yrs there'll be no multi-purpose forest in the Bridgetown are 50yrs old and over.	Jarrah forest is selectively logged to retain a series of age classes some more than 100 years.
	Hester of huge recreational value.	This will be considered in its management.
	Hester Brook drains Hester blocks, this water already experiencing rising salinity.	This is due to clearing for agriculture.
	Hester already under pressure, logging to be reconsidered.	CALM will liaise with the local community in developing plans for the logging of Hester.
	Hester blocks islands of wildlife refuge in surrounding farmland areas.	See previous response.
	Hester an amenity for country dwellers & resource for tourism.	See previous response.
	There will be a drop in property values if Hester logged.	See previous response.
	Tourism important economically in the area, with an emphasis being on environmentally intact destinations.	See previous response.
	CALM did not set up a project team to assist in the public consultation process re Hester.	See previous response.
	CALM has formed a quality improvement team to reduce public opposition, but not to discuss!	See previous response.
	No areas for 200 yrs while Hester recovers from logging.	See previous response.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Gap creation to be limited to 0.33% of Hester/year with thinning of pole stands & removal of shelter wood in addition to this.	See previous response.
	55ha should be logged in one year followed by 4 years with no logging.	See previous response.
	There are various categories of portable mill that would result in less damage.	See previous response.
	Suggest setting up a formal workshop to establish management plans accommodating all goals of all interested parties.	See previous response.
	Hard to believe that gov't. would undermine landowner by logging Hester.	See previous response.
	Bridgetown shire was not consulted about the proposed logging of Hester.	See previous response.
	Will herbicides be used within the Hester catchment area.	See previous response.
	DMS proposes reclassifying some areas around Bridgetown.	See previous response.
	Maps & text in DMS conflict with proposed reclassifications of Hester area.	Cannot identify this conflict.
	Maps 5 & 7 obscure in respect to the rifle range reserve at Bridgetown.	No proposal for this reserve.
<p>The requirement to look beyond the reserve system to identify and appropriately manage additional areas of high value old growth forest was hampered for some time by disagreement about what constituted "high value" and "old growth" forest.</p> <p>CALM has adopted the system developed by the Australian Heritage Commission in it's definition of National Estate forests as the basis for identifying high value old growth forests on a regional basis in W.A.</p>	<p>Can CALM give a clear statement of the criteria used by CALM/AHC for identifying old growth forest?</p>	<p>A study of the CALM/AHC reports needs to be made for detail. In brief it included aspects of the following AHC criterion: A2 (existing processes/natural systems), A3 (richness and diversity), B1 (rare, endangered or uncommon natural), D1 (representativeness natural).</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Is the evaluation based on a regional representation of values?	No, the evaluation considered every occurrence on its own merits.
	Assessing old growth forest on visual criteria ignores their role in providing ecologically mature systems for nature conservation. Will this role be protected outside the reserves and buffer zones?	Yes, the structural goal for the jarrah forest will ensure the maintenance of the old growth component through the forest. In the karri forest the extension of rotation length for part of the regrowth forest will, in time, provide old growth throughout the karri forest available for logging.
	DMS & proposals give inaccurate & biased definition of old-growth forest.	There is no universally accepted definition of old growth forest.
	Reject Christensen's definition of old growth forest.	Ok.
	"RAC definition of old growth forest supported, CALM to adopt this.	The RAC definition of old growth forest, requiring negligible disturbance, is seen as too restrictive as it would exclude nearly all WA hardwood forest from the definition.
	Environmental Condition 4 requires CALM to use AHC developed criteria for old growth forest.	No it does not.
	CALM to provide 1:50 000 maps of old growth forest by species.	CALM has not mapped "old growth" as an attribute.
A major joint study between CALM and AHC staff has examined the southern forests, and agreement has been reached on the designation of National Estate areas for this region, and their management (CALM/AHC, 1992). This study will be continued in central and northern forests in 1992.	Would like all national parks, conservation parks & nature reserves on the register national estate.	Where these areas attain threshold value in the CALM/AHC study they will be proposed for listing on the register of the national estate.
	Above should be explicit in CALM and Wildlife Conservation Acts.	There can not be a legislative requirement to list areas on the register of the national estate. It must be based on an assessment of values present.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p>Under this system high value old growth forests will be protected in the conservation reserve system; in the road, river and stream zones; in additional areas of forest which will link stream and road zones and conservation reserves; and in other areas where management prescriptions will apply to ensure the maintenance of National Estate values on a regional basis.</p>	<p>All remaining old growth areas should be protected from wood extraction.</p>	<p>It is not possible to do this whilst the Government also endorses a timber industry based on native forests.</p>
	<p>Does CALM disagree with the RAC view that logging of old growth forest potentially violates the precautionary principle of sustainable development? If not, how does CALM plan to manage logged old growth forest for all values, and not simply replace it with old growth trees?</p>	<p>Yes, if it is not done within a holistic management strategy which provides for ecological values at the strategic level with a representative reserve system and at the local level with the protection of special areas and the retention of mature habitat. CALM does not agree with the RAC definition of OGF.</p>
	<p>How can CALM ensure that sufficiently large areas of old growth forest are protected to ensure that hollow nesting species requiring large hollows are adequately protected from extinction? (Wardell-Johnson 1992).</p>	<p>CALM has reserved from logging 33% of the jarrah forest and 45% of the karri forest. Management is aimed at distributing that area effectively in the landscape.</p>
	<p>As CALM/AHC are proposing that old growth forest outside conservation areas be logged (albeit more slowly) is it correct to assume that they disagree with the RAC definition of old growth forests as 'Forests that are both little disturbed and ecologically mature'?</p>	<p>CALM agrees with the intent of the definition in terms of little disturbance and dominated by mature trees. CALM does not accept the concept of "ecological maturity". Individual trees grow and mature and in doing so provide an important ecological niche however it is fallacious to equate this niche with a state of ecological maturity. The ecological niches provided in forests are not the result of a neat succession which is a function of age but a result of disturbance cycles operating in the understorey and overstorey.</p>

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	Old growth forest may qualify for inclusion on the register of the national estate.	AHC/CALM assessment of forest for national estate significance included old growth as one of the criteria.
	Mature forest left standing & plantations to be established on degraded farmland.	Plantation is seen as complementary to harvesting in native forests.
	Against continued logging & burning of areas on the National Estate.	The CALM/AHC agreement manages national estate values to ensure they are sustained on a regional basis. Individual national estate areas may be logged.
Proposals are set out in table 6		
<b>Table 6 Proposals for identification and management of high value old growth forests in WA</b>		
<ul style="list-style-type: none"> <li>The criteria developed by CALM and the AHC to identify forests with National Estate value will be used to identify areas of high value old growth forest. These areas will be nominated for the Register of the National Estate.</li> </ul>	How will CALM provide for the on-going updating of its register of old growth forest to reflect the dynamics of the ongoing processes?	CALM records the impact of disturbance on the forest (logging, fire, storm, etc.) and will use this to update records on a periodic basis.
	Will the designation of heritage priorities involve the general public?	Identification of national estate values has not involved the public except to seek out knowledge held by the conservation movement on attributes used in the assessment. The process and results are however now available for public comment.
	Important areas of high value old growth forest have not been included. Why, for example has East Crowea Block not been listed?	Only areas which reached threshold levels based on the nominated criteria were proposed for listing.
	Support AHC's findings on significance of old growth forest to national estate.	Agree.
	East Crowea state forest for national estate listing.	This area did not meet threshold value for national estate significance.
	Clearfelling maximises losses to National Estate values.	If the value is related to mature forest this is so, however, the effectiveness of the regeneration enables values to return in time.

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<ul style="list-style-type: none"> <li>A secure and representative conservation reserve system has been identified and established and is proposed to be further enhanced. In these areas there will be no timber harvesting, thereby allowing old growth values to be retained or to develop over time.</li> </ul>	<p>There would be minimal development of old growth forest values in forest younger than 200yrs.</p> <p>Dispersal of old growth forest should reflect faunal dispersion.</p>	<p>Old growth forest values begin to develop after 100 years and by 200 years would be well developed. Rayner (1992) found few stands of virgin karri trees in excess of 350 years and that a multi-aged structure occurred on each sampled site with the majority of the regeneration events under 200 years ago.</p> <p>The spatial distribution of retained old growth values has been selected to ensure their distance apart is not greater than 400m. This is based on an understanding of faunal movement.</p> <p>This is agreed.</p>
	<p>RAC inquiry states, "logging old growth forest destroys pristine nature."</p> <p>Regrowth forest will never attain ecological &amp; cultural values of old growth forest.</p>	<p>RAC believes, correctly in CALM's opinion, "ecological characteristics of old growth may be regenerated in the long term".</p> <p>The only aspect of old growth not renewable in time is the pristine nature i.e. not having been disturbed by man. This is not of ecological significance.</p> <p>Virgin forest in reserves in WA is 36% for jarrah and 76% for karri.</p> <p>This will depend on the area in question. For the coupe it will be 100% but in the local area might only equate to 5%.</p>
	<p>ESD working group considers old growth forest as non-renewable.</p>	
	<p>Clear that unlogged forest poorly represented in the reserve system.</p> <p>CALM says existing old growth logging values reduced, but by how much?</p>	
<ul style="list-style-type: none"> <li>Old growth forests within designated river and stream zones will not be harvested for timber. In zones adjacent to travel routes classified as Level 1 and Level 2 in the southern forests, old growth forests will not be harvested for timber.</li> </ul>		

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<ul style="list-style-type: none"> <li>Within State Forests an additional 3200 hectares of mature Karri forest will be designated to link reserves and roadside and streamside zones or to encompass patches of mature forest, or areas of special ecological, cultural or recreational value. These areas will not be harvested.</li> </ul>	<p>Karri Forest Silviculture principle 3 (Strategy p167) makes no mention of the linking role. What is the significance of this omission?</p>	<p>There is no significance to this omission. Retained patches will be used in any of the ways mentioned to achieve the optimum ecological benefit.</p>
	<p>Does mature forest differ from old growth forest?</p>	<p>Mature forest will have the biological characteristics of old growth forest but may fall down on disturbance criteria.</p>
	<p>Old growth forest still occurs in extended areas, not just patches.</p>	<p>Agree.</p>
	<p>Is the additional 3200ha of mature karri for patches or linkage zones?</p>	<p>Both.</p>
	<p>Where are the additional 3200ha to be found?</p>	<p>It is part of State forest currently available for harvesting.</p>
	<p>CALM/AHC documents use "undisturbed" not old growth or mature.</p>	<p>"Undisturbed" is an attribute which was mapped and was used as one indicator of old growth values.</p>
<ul style="list-style-type: none"> <li>In areas listed on the register of the National Estate which are outside the conservation reserve system, outside the road, river and stream zone system or outside the additional areas designated to link reserves, logging and regeneration prescriptions will be applied which ensure that National Estate values are maintained on a regional basis.</li> </ul>	<p>All areas on the National estate should be added to conservation areas.</p>	<p>The register of the national estate is not meant to be a surrogate for a nature conservation reserve system. The philosophy of the CALM/AHC agreement was that national estate values were as important as any other forest value and needed to be identified and provided for in management which considers the mix of all values, not the maximisation of a single value (national estate) at the expense of all others.</p>
	<p>What logging and regeneration prescriptions will CALM apply to ensure that National Estate values are maintained on a regional basis?</p>	<p>The major strategy to maintain national estate values on a regional basis is their representation in the reserve system. The guidelines for minimising the loss of national estate values is detailed in volumes 4 and 5 of the CALM/AHC report.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	CALM to identify & protect old growth areas outside conservation reserve system.	CALM has assessed them through the CALM/AHC study. It will not protect them individually but will manage them on a regional basis.
	Other uses important in old growth forests, many not destructive.	Agreed.
	CALM has not identified all areas of forest worthy of heritage listing.	Areas that have not been identified are all areas in the Central and Swan regions not yet assessed.
<ul style="list-style-type: none"> <li>Where temporary losses of National Estate values are unavoidable, these losses will be minimised.</li> </ul>	What are the temporary losses of National Estate values referred to here, and why might they be unavoidable?	Many national estate values are sensitive to disturbance such as that resulting from logging. They are unavoidable because timber production is a value to be managed for from the forests and they are temporary because ecosystems regenerate and with time national estate values return.
	How will losses of National Estate values be minimised?	Losses will be minimised through use of guidelines and procedures outlined in volumes 4 and 5 of the CALM/AHC report.
<ul style="list-style-type: none"> <li>Management procedures are detailed in the new silvicultural specifications for the jarrah and karri forests (see Appendix A), and in guidelines within the CALM/AHC report.</li> </ul>	What are the new silvicultural specifications for karri forests? (Appendix A covers only jarrah forests)	A summary is provided on page 167 of the Draft Forest Strategy and page 19 of the document provided to the EPA. If the thrust of proposed changes is accepted a new karri prescription will be developed.
	What operational guidelines are there to ensure heritage protection at a site-specific level? How do they differ from normal silvicultural practices?	Guidelines for site specific management of national estate values are listed in volume 4 of the CALM/AHC agreement. "Normal" practice will no longer exist in the implementation of the new strategy. Gap size, frequency of return logging, rotation length of regeneration and aggregation or dispersal of coupes will depend on the national estate value as well as the biological, visual and resource values of the site.

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	<p>The CALM/AHC report suggests designated areas will be logged last. Does CALM/AHC also propose more sensitive logging practices (e.g. smaller gaps or selective logging) for designated areas?</p>	<p>Yes. Refer to previous answer.</p>
	<p>Believe logging of 'old growth' forest can be sustained at levels that do not preclude habitat &amp; other ecological values.</p>	<p>Agree. This is the basis of the forest management strategies.</p>
<ul style="list-style-type: none"> <li>The multi-aged structure of the jarrah forest will be maintained. Mature trees will be retained on all areas harvested for timber. This will provide old growth values throughout the jarrah forest. (see Table 7 and Appendix A)</li> </ul>	<p>Why is it the existing multi-aged structure which is to be maintained, why not the pre-logging age structure? (314)</p>	<p>The existing age (size class) structure is known through the jarrah inventory and represents something to aim at. The pre-logging age structure is not known and would necessitate an arbitrary decision. In addition, any structural goal which necessitated development of more mature and senescent trees than currently exist would require a severe curtailment of timber cutting rates in defiance of Environmental Condition 4(2).</p>
	<p>Does this refer to the 3 senescent trees per hectare, or will there be a balanced structure including mature trees as well?</p>	<p>The 3 habitat trees/hectare are included in this as are retained crop trees (mature) and the range of age classes contained in stream zones.</p>
<ul style="list-style-type: none"> <li>Areas of regrowth karri forest have been identified which will be grown on until they develop old growth characteristics. These include 25 percent of all pre-1940 regrowth stands and all regrowth stands regenerated between 1940 and 1975 occurring in patches of less than 200 hectares in size.</li> </ul>	<p>Presently large areas of immature regrowth in remnants of old growth forest.</p>	<p>Particularly in the karri forest cut using a small group selection system from 1940-1965</p>
<p>A further 50 per cent of all stands regenerated after 1990 will be grown on until they develop old growth characteristics.</p>	<p>The percentage of forest retained to develop old growth values may include forest in conservation reserves.</p>	<p>Regrowth exists in many conservation reserves and this is expected to grow on and obtain old growth values.</p>

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<p>Approximately 40 per cent of the Karri forest will always contain old growth characteristics.</p>	<p>How much of this is in production forest and how much in buffer zones, linkage zones and conservation reserves?</p>	<p>When the minimum of 40% is reached it will be almost entirely within reserves, stream zones, road zones and linkage zones. Thereon it will begin to increase as forest harvested in the initial stages of cutting (eg, Big Brook, Treen Brook) move into the mature stage and begin developing old growth characteristics.</p>
	<p>Old growth estimates probably overestimate amount left.</p>	<p>This will depend on the definition of old growth. CALM definition would include selection cut karri forest whereas RAC would exclude it.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p><b>3.3 Management of Jarrah Forest Types</b></p> <p>Jarrah forests managed by CALM fall into two broad categories: those within nature reserves, national parks and conservation parks (which are managed primarily for nature conservation and recreation);</p>	<p>Require greater protection of the jarrah forest.</p>	<p>The Draft Forest Strategy outlined an objective criteria for conservation reserves in the jarrah forest and proposed new areas to achieve them.</p>
	<p>Jarrah to be used for the production of furniture.</p>	<p>Jarrah is used for furniture.</p>
<p>and those within State forests (which are managed for multiple uses, including nature conservation, recreation, and timber and water production).</p>		
<p>In State forests the management objective is to sustain, in a whole of forest context, all forest values indefinitely. This will be achieved by the use of silvicultural techniques which develop or maintain a forest structure that delivers fundamental requirements for nature conservation, timber production, water resource conservation, heritage and landscape values; and by the application of protection programs which minimise damage to the forest from fire, disease and pests.</p>	<p>All State forest should be kept ecologically mature (250-350yr rotation)</p>	<p>It is not possible to do this and maintain the Government required level of timber supply. Further more this is not the natural life cycle of trees in the forest. See the age class distribution of j and k on page 12 and 13 of the Strategy.</p>
	<p>Remove substantially less wood from State forest.</p>	<p>This is against current Government policy and would result in further unemployment in the south west, and increase costs of wood.</p>
	<p>The proposed silviculture/integrated logging management system is very complex. What specific training are field staff given? What supervision is there to minimise inconsistency of application between regions?</p>	<p>It is recognised ongoing training is required. This will be addressed in the implementation phase.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Wardell-Johnson & Christensen (1992) suggest that there is inadequate research to support the assumption that the silvicultural techniques will indefinitely sustain forest values other than timber production. What research is proposed to rectify this lack	The publication cited detailed research requirements. Research is continuing in many aspects of silviculture and ecology in the forest.
	No more clearfelling of native forests	Clearfelling is demonstrably the best method to regenerate karri forests.
	Management should involve replanting more trees, especially in areas affected by salt or erosion.	This is outside the scope of the Strategy which dwelt on native forest management. CALM supports this comment and is already involved in intensive planting on cleared agricultural land. The issue will be in the Forest Industry Statement currently being prepared.
	The level of forest use should be determined by the natural processes of the forests, not by the demand for a particular use or group of uses.	CALM agrees with this as it is the outcome of employing ecologically sustainable development and integrated management.
	What will be the effect of the proposed native forest removal on rainfall?	It is not intended to remove any native forest. Research has shown the leaf area and transpiration rates of native forest are restored to 90%+ within 10 years (Stoneman et. al. 1988). There is no evidence that rainfall will be reduced.
	Does CALM agree that the principle of sustainability requires that environmental concerns should be considered first, with timber extraction at a level to fit the ecological capacity of the forest to sustain that extraction?	Yes, this is ecologically sustainable development.
	Scientific research findings should be applied to the Jarrah ecosystem	Agree, and do so.
	Silvicultural techniques let every commercial product be simultaneously removed as forest coupes are logged.	Agree.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Forest should not be logged unless resources are available for regeneration.	If regeneration (in jarrah forest) is not present, logging is not done for regeneration but to a shelterwood to establish regeneration. CALM rejects this assertion.
	CALM lacks a genuine commitment to ecosystem protection.	Evidence suggests management is well within the uncertainty zone.
	How, in the absence of adequate past or planned research, has CALM determined that it is not operating in Schapper's (1992), 'uncertainty zone'?	Forest ecosystems are adapted to disturbance hence will recover following logging. Techniques aim to minimise damage to soil to ensure regeneration is effective.
	In view of the complex symbiotic relations disrupted by logging how do the silvicultural techniques deal with these fundamental requirements for nature conservation?	The thrust of CALM's management is to integrate activities and this requires looking at combined effects.
	CALM looks at each factor separately, what about combined effects?	CALM tries to promote independent research to ease the burden on its own resources.
	Research into forest ecosystems and the impacts of logging on them should be undertaken independently of CALM.	Some trees will, but not all trees do in the natural environment. See the age distribution in uncut forests of j and k on pages 12 and 13 of the Strategy.
	Trees to be allowed to grow to ecological maturity (300 - 400yrs).	The comment appears to be directed at a lower level of timber yield. The current level is sustainable and to the best available knowledge is not impairing ecological processes hence should be able to be continued.
	Silvicultural specifications generally accepted but apply less intensively.	Management strategy attempts to provide for all users.
	Current management satisfies a small minority, at expense of other forest users.	The Draft Strategy actually proposed to remove 120,000 ha from areas available for wood production.
	Maximised land under the silviculturalists control.	Agree, but is small in the global carbon balance.
	Forest management practices do effect the amount of carbon stored.	

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	Arrogant to assume that we can manage the forests.	Management must be attempted whilst humans live in forests, around them and use their products
	Forests only need managing if used for purposes not intended.	The presence of european man in and around the forest, the introduction of feral animals, weeds and unnatural fire sources requires that all forests be managed.
	Forest not to be a resource for the human species.	Forests are a resource for the human species and a huge number of other vertebrate and invertebrate species.
	No information on timing & location of intended logging operations.	These are detailed in logging plans available in regions.
	Doubt that silviculturally logged forest regenerates the former ecosystem.	Evidence available indicates they will.
	New silvicultural practices if implemented will be an improvement.	Ok.
	Use Wardell-Johnston to suggest how much disturbance the forest can take.	It is not up to one person to dictate forest management.
	CALM protests too much re forest ecology.	CALM is merely making sure the logical inferences are set down.
	Ecological processes in forest largely time and area dependent.	Agree.
	State Gov't, CALM & timber industry should face up to debacle that remaining forest in tatters.	Do not agree.
	Should manage the forest based on the basic philosophy of the principle of stewardship - that is with a commitment to maintain in perpetuity ecological processes.	Agree, this is ESD
	CALM to develop differing silvicultural prescriptions in infected/uninfected forest.	Silviculture will vary according to disease presence and predicted impact.
	Endorse the concept to replace bush picking wildflowers by cultivation.	CALM is not advocating this.

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	Native seeds should also be cultivated not bush picked.	It is not possible to cultivate all requirements.
	Oppose export of native seeds picked from bush.	There is no reason why seed can not be harvested in a sustainable manner. Against Government policy.
	Moratorium on all logging for at least 100 years.	CALM's management ensures forests are regenerated so that resource values are restored.
	Allow for recovery of forest/resources in order to establish correct use and to manage adequately.	CALM employs ecologists and many other scientific disciplines applicable to level management.
	CALM employ interpretive ecologists research into management.	
The fundamental requirements are considered to be:		
<ul style="list-style-type: none"> <li>To maintain biodiversity at the genetic, species and ecosystem level throughout the jarrah forest.</li> </ul>	<p>In what ways does CALM consider such practices as clearfelling, burning regimes, removing species to prevent disease, thinning to promote particular tree form or species etc consistent with maintaining biological diversity?</p> <p>As mature and senescent trees will be mainly confined to reserves, buffer zones and habitat trees, the multiple use forest, composed of immature trees and seedling regeneration will be incapable of maintaining biodiversity at the genetic, species and ecosystem level throughout the jarrah forest.</p>	<p>None of the practises listed have been shown to reduce biological diversity in south west forests.</p> <p>The multiple-use forest will be composed of trees in all stages of development from establishment to senescent. Apart from the availability of hollows for hollow dwelling species the age of the overstorey has less impact on maintaining diversity than factors such as fire, introduced predators and plant diseases.</p>
<ul style="list-style-type: none"> <li>To maintain or restore populations of all taxa so that use of the forest does not lead to loss of biodiversity at the local level.</li> </ul>	<p>Hester Block should not be logged because there is no nearby forest to provide alternative habitats.</p>	<p>Proposed logging in Hester Block will not significantly affect habitat and wildlife values. Nearby forest blocks are Nelson, Glenlyn, Winneyup, Walcott, Greenbushes, Catterick and Jolly.</p>
	Protection of native fauna should be approached as a whole issue.	The Draft Forest Strategies and the Nature Conservation Strategy do this.

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	The destruction of habitats because of clearfelling is contrary to this requirement.	Whilst habitat is severely modified by clearfelling habitat is managed at a wider level than the coupe. Habitat values are quickly restored in regrowth forests, and provided hollow bearing trees are kept throughout the jarrah regrowth forests to complement the reserve system no fauna species will be permanently disadvantaged. The DFS proposes this. See pp 157-165.
<ul style="list-style-type: none"> <li>To protect and conserve taxa or communities which are threatened, rare or uncommon in the forest.</li> </ul>	<p>Require a comprehensive system of wildlife corridors &amp; refuges.</p> <p>Little data is presently available concerning water quality &amp; ecology of native fish. What research does CALM propose?</p>	<p>There are several research projects in progress or planned to commence which will continue to improve the understanding of water quality and aquatic biota. The proposal to install undisturbed riparian zones on all forest streams will protect streams from erosion, sedimentation, salinity and changes in temperature thus reducing the potential impacts on aquatic fauna.</p> <p>See DFS Chapter 3 pp.59-62; Chapter 7 pp.158-159.</p>
<ul style="list-style-type: none"> <li>To manage the forest so as to sustain an efficient timber industry.</li> </ul>	<p>CALM has overlooked the impacts of timber extraction on the indigenous fish population.</p> <p>CALM should ensure stable resource supply at nominated levels.</p> <p>Since the amount of timber that can be sustainably extracted from the forest depends on the ecology of the forest, which is dynamic, does CALM agree that the concept of an allowable cut which is guaranteed in the long term is inappropriate?</p>	<p>This has been done. See DFS Chapter 7 p.175.</p> <p>An allowable cut, guaranteed in the long term is appropriate if the maintenance of forest structure can be achieved and if forest processes are maintained. CALM only advocates firm supply contracts for 10-15 years.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	How does CALM define "an efficient timber industry"?	An "efficient timber industry" is one which maximises utilisation of each tree cut from the forest, maximises recovery and utilisation in processing those logs and maximises value adding and downstream processing of timber. An efficient timber industry is also cost effective and innovative in harvesting, processing and marketing timber to ensure that it is competitive in the market place. Through ecosystem monitoring.
	How is forest management schemes sustainability measured?	
<ul style="list-style-type: none"> <li>To maintain the quality of water from forest catchments and to enhance the yield of water within harnessed catchments.</li> </ul>		
<ul style="list-style-type: none"> <li>To maintain, enhance and improve the scenic quality of the forest.</li> </ul>		
<ul style="list-style-type: none"> <li>To minimise the occurrence and damage caused by wildfires in the forest.</li> </ul>	In view of large areas burnt through escapes from controlled burns each year, delete the word 'wild'.	"Wildfire" is a traditional term for an unplanned fire event, regardless of cause. DFS Table 7 (page 50) shows that 13% of fires were caused by accidental escapes from CALM's prescribed burning, between 1981 and 1987.
<ul style="list-style-type: none"> <li>To prevent the spread and to minimise to intensification of forest diseases and to minimise the damage caused by insect pests.</li> </ul>	Insufficient reference is made in the documents to other diseases eg: canker fungi	Agreed. This will be covered by an addendum in the final document.
	There is no reference in the documents to the effects of leaf miner & gum leaf skeletoniser.	Agreed. This section could have been more detailed but insect pests were covered on p.128 (Chapter 7) in the DFS.
The principal device used to translate these objectives into operational practice in areas where timber harvesting takes place is the silvicultural specification. This is a document which provides detailed rules and guidelines for field staff responsible for planning and supervising timber harvest and regeneration.	Current silvicultural practices do allow proposed management object to be achieved.	The silvicultural specifications show how gap size, rotation length, retained areas are used to ensure the achievement of the wide range of management objectives.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p>Silvicultural specifications are updated from time to time as policy is amended or new research findings are incorporated.</p>	<p>Forest management changes should be based on scientific research. There has been little scientific research into the proposed silviculture techniques, and some of the information which is available does not support them. Extensive field trials are needed before implementing the new proposals.</p>	<p>Proposed changes to silvicultural practices are aimed at increasing the maintenance of all forest values, at the "local level" and to ensure forest values are sustained through time and space throughout the forest. Extensive field trials will be implemented and evaluated.</p>
<p>Because silvicultural specifications deal with parameters such as gap size, stand density, retention of habitat trees or patches, cutting cycles and rotation lengths, they are the primary mechanism by which forest structure is managed. In turn, forest structure determines the provision of forest values.</p>		
<p>During 1991 the silvicultural specification for the jarrah forest was reviewed and substantially modified. The new approach provides a practical mechanism for meeting nature conservation, timber production, water resource conservation and heritage and landscape objectives for jarrah forests in the Swan, Central and Southern Forest Regions.</p>	<p>Oppose intensified logging in the jarrah forests.</p>	<p>CALM is not proposing intensified logging in the jarrah forest.</p>
	<p>Wood extraction still dominates in new Jarrah silvicultural specifications.</p>	<p>The jarrah silvicultural prescription is about providing wood while sustaining a range of other values.</p>
	<p>Changes to forest management are almost all aimed at increased logging intensities.</p>	<p>Timber values are "traded off" to increase other forest values in the new jarrah silviculture. Potential timber supply is reduced by increased stream zones and ecotype zones, reduced gap size, reduced thinning intensity in salt risk zones, retention of habitat trees, longer rotation length etc.</p>
	<p>Forest management plans should be prepared for individual forest blocks.</p>	<p>In the future with improved GIS capability managements may be prepared to cover smaller areas of forest.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	No evidence of further research on forest hydrology, or silvicultural techniques.	Forest hydrology knowledge is still being advanced by monitoring long term catchment studies. Silvicultural research was described in the Strategy.
	Against current forest management practices.	Opinion. No Comment required.
	Selective logging protects the forest whilst mining destroys everything.	Opinion. No comment required.
	Forests are presently being managed properly.	Opinion. No comment required.
	More care needs to be taken with management practices.	Opinion. No comment required.
The new proposals for silvicultural practice in jarrah forest are detailed in Appendix A. Principal changes are summarised in Table 7. (Note: New silvicultural proposals for karri forest have also been developed and are discussed in Section 3.5 of this document and page 167 of the Draft Forest Strategy).	Present silvicultural techniques are probably the best so far evolved for wood production, but the rate and intensity with which they are being applied over the whole forest is excessive for the maintenance of values other than wood production.	Other values are being maintained but the comment is directed at the relative outputs of the mix of values. Government must ultimately decide what levels are appropriate. Only approximately 1% of forests are harvested each year.
Table 7 New proposals for silvicultural practice in multiple purpose jarrah forests	Forest not manipulated to make jarrah grow at other values expense.	One of the values is wood and it is appropriate in some areas for forest structure to be manipulated to increase that value.
<ul style="list-style-type: none"> <li>The existing multi-aged structure of the jarrah forest will be maintained.</li> </ul>	How will the existing multi-aged structure be retained?	See above. Wood production levels are set by Government in consideration of social, economic and global environmental factors as well as the need to sustain other values in south west native forests.

REVIEW DOCUMENT	ISSUES RAISED	CALA'S RESPONSE
<ul style="list-style-type: none"> <li>Gap size (see glossary at Appendix B for definition) will not exceed 10 hectares and will be varied downward depending on the scenic quality zone in which timber harvest is taking place.</li> </ul>	<p>Gaps, zones and corridors don't constitute wilderness.</p> <p>10 ha gaps too big, especially for fauna; suggest 2-3ha.</p>	<p>Agreed. Wilderness values are protected in the reserve system. New reserve proposals in the southern forest are specifically aimed at protecting forest areas with highest wilderness quality.</p> <p>Disagree. No evidence to support this opinion.</p>
<ul style="list-style-type: none"> <li>Strips of undisturbed forest will be retained between gaps until a later cutting cycle. These strips will be 100 metres in width except where gaps are below one hectare in size, where the minimum strip width will be 50 metres.</li> </ul>		
<ul style="list-style-type: none"> <li>Throughout the intermediate and low rainfall zones at least 30 per cent of the forest of any second order stream catchment will be retained uncut for at least 10 years after the cutting and regeneration of the forest on the remainder of the catchment.</li> </ul>	<p>The 30% of forest retained in second order stream catchment salt risk zones should be left uncut for 20yrs, not 10yrs.</p>	<p>10 year (minimum) time period is based on recommendation from WA Water Authority. (See WAWA 1987.) Research has shown that the crown cover of jarrah regrowth stands after harvesting was restored to 90+% of the original forest cover within 8 years of harvesting. Latest WAWA advice suggests 15 is a more appropriate period for phased logging. Final document will reflect this.</p>
<ul style="list-style-type: none"> <li>Three large trees will be retained on every hectare to provide habitat for hollow-nesting species; suitable ground habitat (eg., hollow logs) will be retained and protected as far as possible, at a rate of at least one per hectare.</li> </ul>	<p>What is the research on which the decision to provide 3 habitat trees and one ground habitat/ha is based? Evidence suggests that isolated trees are inadequate.</p>	<p>The selection of 3 habitat trees per hectare is based on local and eastern states research data. Inions (1985) showed that about 3 trees/ha were used by possums for diurnal refuge in eastern jarrah forest. This number retained is greater than in eastern Australia where there are more arboreal marsupial species. Eg in Victoria 1.5 habitat trees are retained per ha (Lindenmayer et. al, 1991). The jarrah silviculture prescription requires habitat trees to be clumped. See proposals document Appendix A (p.18).</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	<p>What monitoring and reporting is proposed to ensure that the 3 habitat trees/ha have hollows, are used and are adequate?</p>	<p>Monitoring and reporting is covered on pp 182-85 of DFS. The effectiveness of habitat trees will be monitored through ongoing and increasing programs which monitor the impact of disturbance causing activities on particular species and proposed monitoring of ecosystem change through periodic measurement of permanent plots.</p>
	<p>Chuditch alone needs preferably five den logs per hectare (Serena, Soderquist &amp; Morris 1991 p9).</p>	<p>Serena et al (1991) states "den logs should be distributed at a density of at least 1/ha, and preferably 5/ha to provide adequate choice." Soderquist (1988) states "In one year each female <i>Dasyurus geoffroi</i> is estimated to occupy, on the average, 65 logs and 110 burrows distributed over an area of about 1km<sup>2</sup>". This equates to 0.65 logs per ha. The jarrah silviculture prescription requires den logs to be kept at a rate of "at least 1/ha". See Proposals document Appendix A (p.18). Serena et al. (1991) also say that in the jarrah forest Chuditch prefer the denser vegetation along river systems. The DFS proposals for increased formal riparian zones supports this research finding. In regard to den logs, the data presented by Serena et. al does not indicate whether or not dens are a limiting factor to Chuditch populations in the jarrah forest. Much of the present logging provides more den sites than would have been available in pre-European times.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	<p>What is the time taken to form hollows in jarrah/marri forest?</p>	<p>Work by Inions (1985) and Inions et. al. (1989) showed that hollows suitable for habitation by possums first develop in about 300 years in Jarrah and about 200 years in marri. This was for forest at the eastern edge of State forest. Inions' work also showed high intensity fire decreased the average age of trees bearing hollows by about 100 years.</p>
	<p>The best habitat trees should be selected regardless of any impact on crop trees.</p>	<p>The jarrah silviculture prescription does not preclude the selection of exceptional habitat trees, regardless of impact on crop trees. See Proposals document Appendix A (p.18).</p>
	<p>All old trees containing hollows to be left standing but not alone.</p>	<p>See above.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<ul style="list-style-type: none"> <li>No rotation length is nominated for the jarrah forest. This concept is no longer relevant. The objective will be to ensure a multi-aged structure of the forest in all areas.</li> </ul>	<p>If so, why does the Jarrah Silvicultural Specification specify rotation lengths and not forest structures?</p>	<p>The Jarrah Silviculture Specification 2/91 predates the 1992 Draft Forest Strategy. Nevertheless the Silviculture specification does not set a precise rotation length for various zones, it sets <i>minimum</i> rotation lengths (greater than 100 years, greater than 200 years).</p> <p>Rotation length is not abandoned in the jarrah forest. The specification shows that rotations will vary according to the needs of the stand. A proportion of the forest will be on a natural rotation (Reserves, Retained Stream Zones, Preservation VRM zones, etc) amounting to 32.8% of the jarrah forest. A proportion will be on rotations of at least 200 years, with the remainder being of a least 100 years.</p> <p>The large tree studies (Burrows, 1992) show that few jarrah trees live beyond 250 years hence it would seem to be excessive to have a rotation of forest stands much beyond 250 years. The retention of some of the stand (e.g. Habitat Trees) can cater for the "ancient" relics.</p> <p>The available cut from the old growth forest is determined by the goal of sustaining a nominated forest structure not from the rotation length. The rotation length is thus a consequence of that structure and the growth rates of the trees in the forest.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	<p>The concept of rotation length may not be relevant to timber production, but it is relevant &amp; essential to other values. The shorter rotations proposed produce ecologically immature trees which cannot sustain forest ecology or values other than timber production.</p>	<p>The DFS does not propose short rotations for jarrah. The strategy for jarrah forest structure is to maintain the full range of diameter classes, which falls within the range of diameter distributions of virgin stands. This strategy is aimed directly at sustaining all forest values.</p> <p>Note also that immature trees have an important ecological role in the forest, and they grow into mature trees.</p>
<ul style="list-style-type: none"> <li>In the thinning of regrowth stands in the high rainfall zone a minimum of 10 square metres of basal area will be retained per hectare. In the intermediate and low rainfall zones a minimum of 15 square metres of basal area per hectare will be retained.</li> </ul>	<p>There is no justification for thinning stands in the intermediate &amp; low rainfall zones.</p>	<p>The justification for thinning stands in the intermediate and low rainfall zones is to enhance several forest values including timber production. Timber is one of the primary values of management of State forest specified in the CALM Act.</p>
	<p>There should be no intensified logging in jarrah forest in the salt risk zones</p>	<p>CALM is not intensifying logging in the jarrah forest.</p>
	<p>Why choose 15m<sup>2</sup>/ha thinning in low &amp; intermediate salt areas?</p>	<p>The selection of basal area limits in thinning operations in intermediate and low rainfall zones is based on several research projects which have developed relationships between forest density, canopy cover, stream flow and stream salinity. These limits were endorsed by WA Water Authority. The research is summarised in Steering Committee Report WAWA (1987) and Stoneman et. al. (1990).</p>
	<p>What is the research basis for the selection of these basal area minima? What are typical basal area characteristics for undisturbed jarrah forest? Could CALM show graphically (similar to Fig 16 on p134 of the Strategy) how the proposed silviculture compares with undisturbed forest in terms of basal area?</p>	<p>See comment above. CALM has a very large amount of data on basal area distribution in virgin forests which can be compared to cutover stands. The best references for this are Stoate and Helms (1938) and Abbott and Loneragan (1986).</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Concern over water resources and poisoning of trees	Poisoning trees by stem injection results in negligible egress into ground water.
	Disgusted at the acts of poisoning	Opinion. Use of herbicide to cull trees is the preferred method for one major reason - it is the cheapest and most effective method, and therefore can result in a substantial saving of public money.
	Thinning too sparse at 10m <sup>2</sup> /ha.	See previous comments.
	Selection of retained trees in Jarrah regeneration to favour resistant Jarrah.	Agreed. This line of research is being actively pursued by CALM and ALCOA.
<ul style="list-style-type: none"> <li>Following timber harvest and regeneration a minimum of three age classes will be present in every area of cutover forest; mature trees, intermediate aged trees retained as crop trees and seedling regeneration.</li> </ul>	<p>What is the basis for the minimum of 3 age classes? How many age classes in unlogged jarrah forest? What are they? How old are mature &amp; intermediate-aged jarrah trees? Are 3 age classes enough to maintain forest ecosystems and their processes in perpetuity?</p>	<p>Patches of unlogged forest can be single aged, two-tiered or multi-aged depending on the source of regeneration. When the forest has not been significantly disturbed for a long period it will appear as if even-aged, even though the trees may well be of different ages. When the forest has been disturbed relatively recently and regeneration occurs, different age structures will be readily apparent. The diameter, height and density of younger trees will be different to older forest. Where this disturbance occurs due to minor events, eg wind throw, individual tree decline, the regeneration in the small gap will be a small component of the stand; but where it follows a major disturbance the regrowth is likely to be significant if not dominant in the stand. If there are a series of disturbances over time a multi-aged stand will result. Stands appear multi-aged purely based on stem size. This may in fact be an even-aged stand with the smaller stems being those suppressed by the larger dominant trees in the stand.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
		<p>In a cutover area of forest there will be at least 3 age classes (at least 2 ages of regrowth plus mature/senescent forest as habitat trees and retain groups and exclusion zones), but as you take a wider view of the forest there will be groups of the entire range of age classes from juvenile to senescent, with the mature/senescent stage being represented in every stand. The choice of at least three age classes represents a compromise between the desire for efficiency in timber production and wood growing against the benefits of structural diversity for wildlife and aesthetics. The production of more age classes in an area has not been shown as of greater benefit to those values. With a greater number of age classes there is likely to be greater detriment due to dieback hygiene, fire protection and regrowth quality. The large tree studies (Burrows, 1992) show that few jarrah trees live beyond 250 years hence it would seem to be excessive to have a rotation of forest stands much beyond 250 years. The retention of some of the stand (eg Habitat Trees) can cater for the "ancient" relics. The available cut from the old growth forest is determined by the goal of sustaining a nominated forest structure not from the rotation length.</p>
	<p>Ecological maturity should be no less than 300 years.</p>	<p>CALM's goal is to maintain representative mature trees in all jarrah forest stands.</p>
	<p>Trees to be allowed to grow to ecological maturity, 300 - 400yrs.</p>	<p>See above.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<ul style="list-style-type: none"> <li>No harvesting will occur in river and stream zones, except that associated with road construction or the removal of dangerous trees which may threaten human life (see Table 2).</li> </ul>		
<p>A number of other new measures are also proposed to enhance jarrah forest management in the Swan, Central and Southern Forest Regions. These are shown in Table 8.</p>	<p>Supports demonstration forests but does not want too many</p>	<p>Opinion. No comment required.</p>
<p>Table 8 Other proposals for jarrah forest management</p>		
<ul style="list-style-type: none"> <li>A review of fire management programs in the forests will be undertaken. This will incorporate the Wildfire Threat Analysis which integrates the risks of fires starting and the factors which influence fire behaviour and suppression, and the results of fire ecology research.</li> </ul>	<p>Wildfire Threat Analysis should be published for public comment.</p>	<p>A description of the Wildfire Threat Analysis will be published before the end of 1992. An early draft of the WTA was published in a discussion paper to the NPNCA in 1988 "Fire Management and Prescribed Burning on CALM lands". The WTA was developed within the framework of CALM Policy No. 19 "Fire Management". This policy is summarised in the DFS on pages A1-6 to A1-7 and the policy is available for public comment.</p>
	<p>Welcome CALM's commitment to review fire programmes</p>	<p>Opinion. No comment required.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	<p>CALM's prescribed burning should be reviewed by independent experts</p>	<p>CALM's prescribed burning practise has been reviewed by many independent experts over the years.</p> <p>The comprehensive summary paper by Christensen and Abbott (1989) "Impact of fire in the eucalypt forest ecosystem of southern Western Australia: A critical review" was reviewed by independent experts and referees before being published in the Journal of Australian Forestry.</p> <p>Another review by Gill (1986) "Research for the fire management of Western Australia's State Forests and Conservation Reserves" provided an independent view of this issue.</p> <p>In addition there have been numerous visits by international fire management and fire research authorities to Western Australia. These people have commented favourably on the professionalism and scientific validity of CALM's fire management operations.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Why do so many "controlled burns" escape?	<p>CALM conducts approximately 200 prescribed burns each year, requiring up to 450 separate ignitions. These burns are conducted in a wide range of weather conditions, including hot dry conditions required for slash removal and forest regeneration burns.</p> <p>The average number of escapes from CALM's prescribed burns is 25 per year, which is 1 per 18 ignitions.</p> <p>The average area of wildfires which escape from CALM prescribed burns in State forest is about 15ha. More than 90% of escapes are contained to less than 5ha because they occur during the burning operation when conditions are usually moderate and suppression forces are in attendance.</p>
	Stop burning of forests, introduce fauna to reduce leaf matter.	<p>The primary reason for escapes from prescribed burning is inaccurate weather forecasting.</p> <p>Herbivorous fauna has a significant impact on shrub vegetation, at least in the jarrah, and some fauna will consume fallen leaves, however, they cannot keep them below proven dangerous levels.</p> <p>CALM maintains fire regimes within currently understood ecological parameters.</p>
	Fire and it's effect on ecosystem not properly understood by CALM.	<p>Fire protection level must be balanced with other management requirements.</p> <p>No known evidence to support this statement.</p>
	Level of fire protection in Southern Forest be maintained-enough resources provided.	
	Few areas of forest with no recent fire-these areas were healthier above & below ground.	

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	CALM prescribed burns burnt back from roadside buffer zones every 2nd rotation.	CALM does in some circumstances burn back from buffers to maintain roadside amenity however there are problems which would preclude creation of parallel buffers on all roads CALM will liaise with MRWA on all roadside burning.
	MRWA advised of impending burns, and input a plan for roadside zones.	CALM's prescribed burning regimes now involve far greater diversity of fire intensity, seasonality and periodicity in forest areas.
<ul style="list-style-type: none"> <li>Diverse fire regimes (incorporating a range of fire intensities, frequencies and season of burning) will be maintained in the forest.</li> </ul>	Present fire regimes are not compatible with maintaining forest ecosystems. Fire regimes need to be more conservative, with less forest burnt, much longer rotations and much less spring burning. Concerned that 90% of National Parks were exposed to burning last year.	Fire is a natural part of the ecosystem in all forest areas including National Parks. Protection of park visitors and conservation values is implicit in National Park burning regimes.
	Substantially reduce prescribed fuel reduction burn area.	There is no ecological evidence that reduced burning is justified and plenty of evidence that it is necessary.
	Reduce frequency of fuel reduction burns, especially spring.	Opinion. Note however that Serena et. al (1991) prefer cool spring burning in jarrah forest to favour the Chuditch. This is an example of how particular burning regimes may favour one or a group of fauna species.
	Complete overhaul of prescribed burn system.	Prescribed burning is reviewed constantly in CALM for operational, ecological and financial reasons.
	Investigate cost to the taxpayer of "controlled burns"	The cost of prescribed burning is known and available if required. What is more difficult is to quantify the benefits of prescribed burning. (Protection of human life, private property values, forest regeneration, protection of wildlife and forest values, forest recreation, water production etc.). Many of these benefits cannot be quantified in dollar terms.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Does fuel reduction burning work in severe weather conditions?	Fuel reduction burning is not carried out in severe weather conditions.
	"the soil and biomass nutrient reserve are unprotected for a much longer time in the aggregate under our frequent and widespread controlled burning regime ...we should be reviewing our current wide scale fuel reduction practices in favour of more restricted perimeter burns and strip burning of fixed areas." (Costin 1991)	The method of burning proposed by Costin (1991) is exactly the method employed unsuccessfully in south west forests before 1961. A Royal Commission followed the Dwellingup bushfires recommended a broadacre prescribed burning be implemented.
	Burning affects tourism, destruction of wild flowers	CALM's prescribed burning practise specifically aims to minimise impacts on wildflowers alongside tourist roads by favouring autumn road edge burning and only burning one side of a tourist road in any one year. Some of the best wildflower displays follow recent prescribed burns.
	Little diversity of fire frequency and intensity.	CALM fire regimes have built into them diversity in season and frequency.
	Burning is essential.	Agree.
	Support selective burning.	Agree.
	Require more prescribed burning in Manjimup area.	Prescribed burning achievements have fallen behind target in most forest areas in recent years, due to diminishing resources. This is not only the case in the Manjimup area.
	How does fire maintain diversity of ecosystem when natural forces can not?	Fire is the main natural force which drives ecosystem change.
	In what circumstances will nature fail to adjust to the removal of man made fire?	Fire is a natural part of the ecosystem dynamics and to remove it, if it was possible, would result in a marked change in species composition and density.
	Short span between burns in high rain zone doesn't establish differing aged vegetation.	Prescribed fire burns only 60-80% of an area hence a mosaic of different aged vegetation is established.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Nothing to deter roadside burns annually & little care taken.	CALM is not aware of any forest area which is burnt annually. This is unnecessary and very difficult to do.
	Must change local council attitudes to preservation not destruction.	Not relevant to CALM.
	A minimum of 8 years not a maximum of 5 years needed between burns.	The periodicity between burn is not determined in years. It is related to many factors including fuel accumulation. In most cases the period between burns in the jarrah forests five to ten years.
	Josephine Spriggett's work on soil microflora ignored, recommended a longer time between burns.	Other studies have found rapid recovery (Abbott 1984) (3 years) of invertebrates following fire.
	Banksia seminuda -not less than a 15 year burning cycle.	Where it is known that particular plant species require specific fire regimes this can be satisfied in prescribed burning objectives. See Management Plan for Walpole National Park.
	Cease fuel reduction burning of remote forests.	There are no remote forests in the south-west.
	Gap sizes/dispersals may affect fire programmes and silvicultural techniques in Karri forest.	Agreed. Coupe dispersal in particular will influence the effectiveness of broad burning buffers in the karri forest.
	Assess interactions between gap size/and time space dispersals to maintain fire protection.	See above.
<ul style="list-style-type: none"> <li>Habitat regeneration burning will be undertaken in forests where special requirements for threatened or endangered species are identified.</li> </ul>		
<ul style="list-style-type: none"> <li>New fire-fighting resources will be developed by training personnel employed in the timber industry.</li> </ul>	Mobile rangers should be employed to patrol high risk areas.	Ground patrol is a very ineffective method of fire detection. Aerial detection or fire towers are significantly more efficient.

<b>REVIEW DOCUMENT</b>	<b>ISSUES RAISED</b>	<b>CALM'S RESPONSE</b>
<ul style="list-style-type: none"> <li>Newly developed fire system analysis and computerised techniques in fire management will be implemented in forest districts.</li> </ul>	<p>There has been no technological advance in fire management over the last 25 yrs.</p>	<p>Disagree. Technological advances in fire management include:</p> <ul style="list-style-type: none"> <li>Highly reliable fire behaviour and fuel moisture models - "Forest fire behaviour tables" which have now been computerised to provide accurate predictive capability.</li> <li>Fuel moisture measurement equipment</li> <li>Incendiary machines for reliable aerial ignition (developed by CALM in WA).</li> <li>Computer based fire management systems including Wildfire threat Analysis, Fire Suppression Decision Support Systems and Fire Weather and Fire Behaviour predictive models.</li> <li>Aerial detection and reconnaissance systems based on light aircraft, acknowledged as the best in Australia.</li> <li>Use of chemical retardants and foam for fire suppression and mopping-up.</li> </ul>
<ul style="list-style-type: none"> <li>Community education programs on the problem of dieback disease will be expanded.</li> </ul>	<p>Education recommendation for disease supported.</p>	<p>Ok.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	<p>Dieback research findings should be made more accessible to public.</p>	<p>Dieback research findings are published in various forms, from scientific papers to simple brochures. CALM scientists contributed to the publication of 20 scientific papers in the past 3 years. In 1990/91 alone CALM produced 7 publications specifically on dieback disease.</p> <ul style="list-style-type: none"> <li>. Research Bulletin No. 3 Jarrah Dieback</li> <li>. Dieback on the Central West Coast</li> <li>. Fight Dieback, Give Our Plants a Chance</li> <li>. Dieback Kills Wildflowers</li> <li>. Fight Dieback Speakers Kit</li> <li>. Tree Killer - Dieback</li> <li>. Stop the Rot - Winter Firewood</li> </ul> <p>There was also dieback research information published in "Landscape" and various CALM management plans. CALM is working with Rotary International to increase public awareness of the dieback problem.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p>Populations of <i>Banksia grandis</i> (Bull banksia), whose extensive root systems are highly susceptible to dieback fungus, will be reduced in jarrah forests at risk from jarrah dieback disease to lessen inoculum density of dieback fungus, hence the risk to jarrah trees.</p>	<p>Reducing <i>Banksia grandis</i> population is a drastic measure.</p>	<p>Proposed <i>Banksia grandis</i> reduction programs are an example of scientific research leading to management actions. It may seem a drastic measure but the alternative "no action" option would be even worse, threatening ecosystem processes and maintenance of biological diversity. If mature <i>Banksia grandis</i> plants are reduced the inoculum potential of <i>P. cinnamomi</i> to affect overstorey jarrah trees and other ground plants is reduced. The potential for lateral spread of disease through roots of <i>B. grandis</i> is also reduced.</p> <p>A comprehensive summary of research into the host-pathogen interaction of <i>B. grandis</i> and <i>P. cinnamomi</i> is given in Shearer and Tippett (1989). Strategies to disfavour the pathogen including manipulation of understorey composition offer one of the few practical means of reducing dieback impact on a large scale. These strategies are also discussed in detail in Shearer and Tippett (1989).</p> <p>Reduction of mature <i>B. grandis</i> plants will actually alter the presence of this species in the jarrah forest to somewhere near the abundance found in undisturbed jarrah forest. Populations of <i>B. grandis</i> are thought to have proliferated following the opening up of forest canopies during timber harvest.</p> <p>Disagree. There is justification of favouring one species, if the survival of that species is threatened. Conversely there is justification in disfavouring one species if its presence in high abundance threatens the abundance and survival of many other species.</p>
	<p>What research is there on the impact of this measure on the forest ecosystem to enable CALM to conclude that there will be no unacceptable side-effects?</p>	
	<p>No scientific or ethical basis for protecting one species at the expense of another. Should restrict logging and vehicle movements, not remove <i>Banksia grandis</i>.</p>	

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<ul style="list-style-type: none"> <li>Research into and use of the fungicide phosphorous acid for control of dieback disease in vulnerable species of trees and shrubs will be developed into operational prescriptions.</li> </ul>	<p>Use of phosphorous acid unlikely to be applicable across whole forest.</p>	<p>Agreed. It is likely that this method of control would only be employed in the field in exceptional circumstances. Nevertheless, it is important that operational prescriptions are developed in cas these circumstances arise.</p>
<ul style="list-style-type: none"> <li>The results of research in the life cycle of the causative agent of dieback disease will be used to determine when and where operations will be carried out in the forest.</li> </ul>	<p>Increase research into dieback immediately.</p>	<p>The dieback research program by CALM and other agencies is listed in CALM's Annual Research Plan. There are 54 current research projects in the Plant Diseases Program listed in CALM's 1990/91 Research Plan.</p>
	<p>CALM presently logs quarantine dieback areas all year round.</p>	<p>Logging in "quarantine" (Disease Risk Areas) is carried out because this is where the best information exists (accurate disease maps), to prevent introduction and spread of dieback. This is why forest areas were quarantined - to obtain accurate disease location maps. The season of logging (moist or dry soil) is determined by a rigorous evaluation (the Seven Way Test) of potential disease spread, disease impact, land use impact and appropriate hygiene measures.</p>
	<p>Develop prescriptions to manage and rehabilitate disease areas.</p>	<p>CALM has such a prescription - Silviculture Specification 4/89 "Regeneration in Forest Affected by <i>Phytophthora cinnamomi</i>".</p>
	<p>Monitor the effects silvicultural strategies have on disease, especially in intermediate/low rainfall zones.</p>	<p>Agreed. This aspect needs to be monitored.</p>
	<p>Fungus can be spread by workers carried under nails, on hand.</p>	<p>The risk of introduction or spread of disease by this vector is insignificant.</p>
	<p>Is dieback one of the greatest threats to biodiversity? Fortress management.</p>	<p>Yes, particularly outside the forest areas.</p>
	<p>The removal of all marri from areas of jarrah forest being regenerated to be reviewed.</p>	<p>Marri is not being removed from jarrah forest areas being regenerated. See Proposals document Appendix A page 9.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	CALM to re-appraise management DRA - what level of access should public have?	The DFS recommends this. See page 126.
	Assess effects of vegetation & species loss caused by <i>P. cinnamomi</i> on fauna.	This is likely to be more significant in the heathlands.
	Identify & protect species at risk of extinction from <i>P. cinnamomi</i> .	CALM has begun this work.
	Determine whether any vulnerable vegetation sites in Jarrah forest	This has already been determined. Upland stream zones are vulnerable.
	Which jarrah forest vegetation is most affected? The understory?	Riparian vegetation on high impact sites.
	If regeneration fails, few jarrah forest objectives will be met.	Agreed.
	Assess the effect <i>P. cinnamomi</i> has on regeneration with/without fungus monitor.	This will be part of the monitoring program.
	After canopy removal, soil temp increases, sites become wetter, and this increases fungal populations.	This is hypothesised but has not been shown to be a factor.
	Site disturbances/loss of canopy cover may exacerbate disease.	See above.
	CALM should limit jarrah forest thinning to disease free sites.	Potential impact is of greater consequence than fungal presence/absence.
	CALM logging guidelines to take particular care after summer rains.	Acknowledged.
	Proposals to control dieback are commendable.	Ok.
	CALM to acknowledge the extent of the dieback problem & control it.	CALM has run many public awareness campaigns on dieback problems.
	Provide boot cleaning facilities on park walkways.	This strategy is being considered for particularly susceptible sites.
	Acknowledge the effect of recreation activities on spread of dieback.	It is acknowledged that any activity which has the potential to more infected material can play a part in dieback distribution.
	Has CALM written off 64% of state forest to dieback?	No.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Must maintain quarantine area boundaries.	Quarantine boundaries and management are being reviewed.
	More of CALM's lands should have been quarantined years ago.	Consideration is being given to extending quarantine boundaries. However, the original intention was to have quarantine for 3 years .
	Believe that more than 15% of forest is infected with dieback.	This is a very difficult figure to measure at any one time. The figure of 15% is believed to be close to the actual.
	Close off forests to tourism, this will help prevent spread of dieback.	It is not necessary to close off forest but to manage the access.
	CALM should develop different silvicultural prescriptions for infected and uninfected forest. These prescriptions should also consider forest of different hazard ratings in different zones of the forest.	CALM does this. Refer to Silvicultural Prescription 4/8C and 7 Way Test Guidelines.
	Vital that dieback quarantine methods are well understood, accepted & enforced	Agreed.
	Against logging into wet winter period because of the threat of dieback and instances of inadequate enforcement of hygiene.	Responded to above.
	Make isolation dieback affected areas more acceptable.	CALM is reviewing quarantine procedures as part of the dieback review and may be able to better target quarantined areas.
	Doubts about dieback quarantine.	Opinion. No comment required.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	<p>American expert Dr T Lawson considers hygiene practices inadequate to prevent introduction of dieback.</p>	<p>CALM staff including the General Manager and Manager of Environmental Protection Branch have communicated with Dr Lawson in America by telephone and mail following a request by him for information about CALM's forest hygiene practises. It was understood that he wanted this information to design hygiene management practises in Port Oxford Cedar forests in Oregon. To CALM's knowledge Dr Lawson has never been to Western Australia. CALM understands that Dr Lawson was also sent information by the Conservation Council and that the Conservation Council has a "report" from him. The Council refused a request by CALM for a copy of the report. In CALM's opinion Dr Lawson's lack of knowledge about P. cinnamomi disease in Western Australia and his lack of knowledge about forest hygiene practises hardly constitute the mantle of "expert".</p>
	<p>Reference should be made to other diseases, eg: canker fungi.</p>	<p>Agreed. The final document will include more information on other fungal diseases including canker fungi.</p>
	<p>Shires should be involved and resources provided for weed control.</p>	<p>CALM participates in local APB advisory committees on which Shire Councils are represented. Resources for weed control are limited and priorities are determined to criteria listed on page 126 of the DFS.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	No planting of exotic species in forest or nearby.	Generally agreed. There is currently very little exotic tree planting in native forest areas compared to past decades. Exotic plantings are generally restricted to highly disturbed sites or recreation facility areas where extensive exotic trees have been planted previously and where existing cultural themes will be enhanced by further exotic planting.
	CALM should eradicate noxious weeds & vermin from the forest, and APB should enforce this as it does for private landholders.	See above.
<ul style="list-style-type: none"> <li>• Priorities will be developed for the treatment of weeds in the forest and for the control of feral animals.</li> </ul>	Hester susceptible to introduced species invasion if logged.	Logging is much less likely to cause invasion of introduced species in Hester than other agents, eg: weeds introduced from surrounding farms, horse riding and birds.
	Acknowledge all exotic species (including cats & pigs) & their impact on forests.	Agreed. The final document will acknowledge other feral animals.
	Fox and cat baiting programme necessary.	Agree.
	CALM needs more resource assessments to show impacts of logging, fire, pests etc.	CALM would welcome more resources in all aspects of management.
	Commend decision to phase out grazing leases - this should be done quickly.	No comment required.
	Weeds, e.g. Watsonia, Acacia sp a threat to integrity of forest.	Agreed. These weeds will be treated as resources permit and priorities determine.
<ul style="list-style-type: none"> <li>• A coordinated program for the eradication of foxes from areas of State forest will be developed and implemented. The aim is to achieve at least 20 per cent of the forest fox-free in the next 10 years.</li> </ul>	Grazing leases in State forest phased out in life of this plan.	Some pastoral leases do not expire until 2015. Unless lessees are willing to sell leases to CALM, little can be done before 2015.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Why does CALM concentrate on the threat posed by foxes only?	CALM has concentrated on control of foxes in this forest strategy because of the overwhelming weight of research pointing to the fox as the most serious predator of native fauna and because of the scientific fact that many species benefit from fox control methods. See DFS pages 126-128.
	Plan to eradicate foxes is welcomed, but burning & logging permit easy access for foxes (Wardell-Johnson 1992).	Wardell-Johnson is not aware of a 1992 reference. Wardell-Johnson and Nichols (1992) said "the demise of many ground-dwelling vertebrates in native vegetation has largely been attributed to the european fox, which also has a considerable effect on the recovery of native fauna following disturbance". The link between logging, fire and fox predation has not been established. In areas where foxes are eradicated, this link will be circumvented.
	Control & eradication costs can be provided by a lift in royalties.	Fox control is unlikely to be directly funded by an increase in timber royalties although revenue from royalties may be indirectly returned to CALM for wildlife conservation programmes such as fox control.
The impacts of forest management practices on forest ecological processes and the flora and fauna are discussed in detail in Chapters 2 and 3 of the draft Review of Management Strategies for the South-West Forests	All is not well in the Jarrah forest & unless it has been badly damaged it is not improved by logging.  Employ less destructive & capital intensive logging & transport equipment. Lighter on-ground transport equipment sought for in-forest use.	Logging is not done to improve the forest but to supply a resource. This can be done whilst sustaining other values.  Many modern logging machines have very low ground pressure. See above.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p>In summary, research has shown water quality and quantity can be maintained or increased with appropriate practices,</p>	<p>"B double road trains not to be permitted in forest. Reductions in water quality do occur as a result of logging Felling practices result in salinity increases.</p>	<p>Civil engineers recommendations are that B doubles actually cause less damage than a semi-trailer carrying the same total quantity of timber. "Changes to water quality are small and temporary and present no significant threat to regional water resource "Research Steering Committee (1987). Small increases between 50 and 150mg/L TSS have been recorded in research experiments in some areas. However all stream salinity recordings have remained below flow weighted 500 mg/L TSS, the limit for high quality drinking water. Effects are transitory even in "worst case" treatments. Retention of additional stream buffers and limits on overstorey removal will further minimize potential impacts.</p>
	<p>From 1970-1986 salinity rose in every river and stream in the WLA including totally forested catchments where logging was the only activity (Barlee Bk, Deep &amp; Weld Rivers) (Forests Dept 1973, WAWA 1988)</p>	<p>Incorrect. Specifically, the trend for Barlee Brook, Carey Brook and April Road North (all fully forested) is declining salinity. Reference Schofield et al, 1988 Table 9 page 34. An explanation of the trend for 17 fully forested catchments is provided. In summary stream salinity within fully forested catchments has declined over the last 20 years This decline is attributed to lower rainfall conditions causing the lowering of groundwater tables and decreased groundwater discharge (Schofield et al, 1988)</p>
	<p>Increases in salinity, turbidity, sedimentation &amp; temperature caused by logging adversely affect aquatic ecosystems.</p>	<p>See response later re Grouns and Davis (1991) research findings.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Status of aquatic fauna concentrations to accurately assess water quality.	Water quality for human use can be readily measured. More research is required to determine suitable biological indicators, however, the invertebrate group/groups may be one.
	Problems of thistle, salinity & erosion from clearfelling.	Spear Thistle ( <i>Cirsium vulgare</i> ) often incorrectly called Scotch Thistle is a very short lived weed which often appears following soil disturbance and opening of the forest canopy. The species does not persist in the forest environment and disappears following canopy closure and development of a litter layer.
	Must address bad farming practices in all areas to control pollution into streams.	Outside the scope of the Strategy.
	LCDC to make farmers contribute to reducing salinity.	Not relevant to CALM.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p>there is no evidence for any long-term loss in forest nutrient status</p>	<p>Fire does affect soil fertility, removes leaf litter &amp; encourages erosion. (Hingston et. al. 1989, Keith &amp; Raison 1992).</p>	<p>In relation to the loss of nutrient capital with the combustion of litter.</p> <p>Relevant points in this issue are:</p> <ol style="list-style-type: none"> <li>1. Nitrogen is lost by volatilisation during combustion.</li> <li>2. Nitrogen is returned to the system by non-symbiotic and symbiotic nitrogen fixation and small accretions directly from the atmosphere.</li> <li>3. There are large stores of nitrogen in the ecosystem.</li> <li>4. Any long term loss of nitrogen depends on the balance of points 1 and 2 above.</li> <li>5. Even if long term net losses of nutrients occur they may not be a problem unless the nutrient pool is depleted below a critical level.</li> <li>6. The balance of nitrogen suggests that there is quite a degree of resilience in the jarrah and karri ecosystems, to quote O'Connell and Grove (1991).</li> </ol>
	<p>Silvicultural practices wont let the forest nutrient cycle maintain itself.</p>	<p>Disagree. This comment is not based on fact. The most important axiom about any ecosystem is that they are dynamic systems, and thus are continually changing. Changes caused by silvicultural management obviously cause changes in the ecosystems however unless the ecosystem is completely destroyed then the nutrient cycles will continue. It may take time for the system to return to the state it was prior to disturbance, but disturbance per se will not 'destroy the nutrient cycles'.</p>
	<p>"Fires of moderate intensity can result in ... the loss of a high proportion of the nitrogen in the system" (Ward et al 1991) so how is there 'no evidence of long-term nutrient loss'?</p>	<p>See above.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Clearfelling practices destroying fertility (433)	See above
	Nutrient cycle of affected streams may take 200yrs to return to normal.	No evidence for this assertion. Given small and ephemeral changes in the nutrient loads in streams following burning, logging and regeneration it is difficult to accept that changes could last 200 years.
	Current logging destructive to remaining vegetation & soil.	Studies have shown vegetation regenerates after logging.
	Stated that fire increases certain plants growth & replaces lost N.	Agree.
	No knowledge of other nutrients not replaced.	It is acknowledged that information on budgets is incomplete, however what there is suggests depletion is unlikely to be a major problem.
	Not true that roots remove nutrients from heartwood in time.	Physiology studies have shown trees are able to extract nutrients from leaves before they die and living tissue before it is set to heartwood.
	Effect of UV-b rays on soil structure as remaining trees will increase rays in.	Rapid regeneration ensures soil exposure time is very limited.
	Phosphorous may be depleted & this nutrient likely to limit timber production.	Not proven, however, it can easily be artificially added if it becomes depleted.
	Strategy table 6 deficient in many aspects of phosphorus input/output.	P is so readily and cheaply replaceable it is not considered a problem if deficiencies show. The table also did not show the pinpoint at the time of planting in the karri forest which is significant in the budget.
	Any decrease in Potassium or Nitrogen would immediately reduce plant growth.	No such declines have become evident.
	Nutrient deficiencies overcome by changing rotation lengths.	This is one option available to management if nutrient deficiencies occur.
	Above means productivity & profit will decline, so system not sustainable.	This has not occurred.
	If nutrient deficiencies corrected, how will this affect profit ?	Nutrient input is a small cost in the total cost of the rotation. In many cases it could actually increase profit.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Strategy table 6 contains error on reference for Potassium input from weathering.	Acknowledge the footnote error.
	Strategy nutrient budget misleading with respect to N lost in drainage.	WA forests lose little N from drainage because they are hydrologically well buffered allowing the vegetation ample opportunity to remove it.
	Soil acidification not discussed, but will become a limit factor.	Acidity needs to be monitored, however, it is a long term (centuries) problem which can be readily adjusted by fertilisation or liming.
	Josephine Spriggett's work ignored, relating to time needed between burns for soil microflora.	Other studies have shown recovery within 3 years.
	More research into invertebrate & litter/soil biota.	Agree.
	There are few areas forest with no recent fires - and these areas healthier above & below ground.	Opinion.
	Don't believe that sustainability of long term timber harvest is in perpetuity.	Opinion.
	Soil decline, nitrate to streams & increased soil acidity with proposed timber extraction.	These effects are very small, if at all, and operate over very long time scales.
	Timber production wont be competitive if soils depleted & degraded.	Agree. Management strategies are designed to avoid this.
	Addition of fertiliser increases costs & increases environmental pollution & acts as fire hazard.	Fertilizer increases costs but would only be done if costs could be recovered and environmental impact acceptable.
	Absence of evidence of damage to the ecosystem not same as no damage!	Agreed, but considering the time over which disturbance has been occurring and the work done the balance of probabilities is that no damage is occurring.
There has been no loss of any plant or animal species as a result of forest harvesting and regeneration	Acknowledge that past practices haven't resulted in extinctions.	Opinion. No Comment required.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	<p>Because no comprehensive flora &amp; fauna survey of WA forests was conducted before logging began, it is not possible to say that there has been 'no loss of any plant or animal species' because of harvesting. In fact we do not know.</p> <p>Concern over the eradication of species.</p>	<p>On the basis of current knowledge and extensive research CALM's statement is correct. It could be rephrased "on the basis of current knowledge there ..."</p>
	<p>Not that there's no evidence of extinctions, there's no evidence at all! CALM haven't looked.</p>	<p>It is not planned to eradicate any native species, only introduced species.</p> <p>The south-west forest ecosystem has been studied at greater detail than most other ecosystems.</p>
<p>and fire management regimes are within the known life cycle strategies of plants and animals</p>	<p>Not enough knowledge of effect of fire on vegetation.</p>	<p>What is "enough knowledge"? There have been literally hundreds of papers written on research conducted into the effects of fire on vegetation in the forests of Western Australia. Research is continuing and there are currently 29 research projects being conducted by CALM alone on aspects of fire and vegetation (1990/91 Research Plan).</p>
	<p>Burning often alters floristic richness &amp; loses sensitive species.</p>	<p>No evidence for statement that burning "loses sensitive species". In regard to species richness see paragraph 6 on page 55 of DFS.</p>
	<p>For most species the life cycle 'strategies' are not known. (Wardell-Johnson et al 1992)</p>	<p>Although life cycles are not completely known for all species, it is possible to make reliable predictions when knowledge of vegetation is coupled with a good knowledge of the life history strategies of the component organisms (Wardell-Johnson, et. al. 1989).</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	<p>Muir (1987) shows that rotations of less than 6 years will eliminate some species yet some jarrah forest is burnt at five-year intervals.</p>	<p>The Muir (1987) paper did show that about 10% of the 198 obligate seed regenerations examined in the study required 6 years or more before flowering. Although there are implications from this study for fire periodicity, time before flowering should not be the only consideration. Most areas burnt under prescribed conditions aim to develop a mosaic of burnt and unburnt areas. Not all mature plants are killed in a fire event and many of these species are represented by seed storage in the soil. Muir's work does however, confirm the need to incorporate diversity of fire intervals, fire, intensity and season of burning into forest fire regimes. CALM is doing this.</p>
<p>Research in all these areas is continuing The impact of disease, introduced predators and weeds has the potential for serious adverse effects and management must take account of this.</p>	<p>Require application of correct fire regimes for specific ecosystems.</p>	<p>Agreed. CALM does this in accordance with management plans.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p><b>3.4 Harvesting Marri from the Salt-Risk zones of the Southern Forests: An Environmental Management Program</b></p>		
<p>Marri sawlogs are harvested throughout the Southern Forest Region, including the "salt-risk zones".</p>		
<p>Marri chipwood logs are harvested from the intermediate rainfall zone, but not from the low rainfall zone of the Southern Forest Region. This is because there was concern at the time the original Environmental Impact Statement was prepared in 1975 that this may have led to increased stream salinity</p>	<p>No marri should be taken for woodchips from Southern Forest salt risk zones</p>	<p>Research reported in Research Steering Committee (1987) shows there is no salinity risk as a result of logging in the Low Rainfall Zone and salinity can be controlled in the intermediate zone by controlling water table through stream buffers and/or phased logging.</p>
	<p>Removal of marri for woodchips from the intermediate rainfall zone is a breach of Condition 6 of the WACAP environmental approval. The intermediate zone is at greater risk from salinisation than the low rainfall zone (EPA 1988, p23; WAWA 1987, p25)</p>	<p>The Chairman of the EPA approved CALM's continued harvest of marri from the IRZ in November 1988, whilst an Environmental Management Plan for this activity was being prepared.</p>
	<p>CALM taken Marri for woodchips from salt-risk zones without monitoring.</p>	<p>Long term monitoring has been done on the paired catchment studies located in the 3 rainfall zones.</p>
	<p>Marri resistant to <i>P. cinnamomi</i> to maintain forest structure &amp; prevent increasing salinity.</p>	<p>Marri regeneration can fulfil the same purpose.</p>
	<p>Woodchipping and clearfelling are supported.</p>	<p>OK.</p>
	<p>Woodchipping a good conservation practice, if it gets rid of unwanted growth.</p>	<p>The end use of the product is not important in an ecological sense, only that the silviculture ensures maintenance of the ecological process.</p>
	<p>Woodchipping supported if marri waste used.</p>	<p>As above.</p>
	<p>Woodchipping of waste wood only.</p>	<p>As above.</p>
	<p>Not enough care taken in current woodchipping practices.</p>	<p>As above.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p>Since that time the Government has stated its intention to phase out chipwood log harvesting from old growth native forests</p>	<p>Will woodchipping of old-growth forest be phased out by wiping out old growth forests?</p> <p>If woodchipping of old-growth forest is phased out, how will demands be met?</p>	<p>70% of karri and 30% of jarrah in reserves is old growth. It is in no danger of being wiped out.</p>
		<p>The future demand for paper products will be met from a combination of plantations and other sources. Government Policy on the phasing out of woodchipping does not preclude native forest woodchips from the following sources: (i) sawmill waste; (ii) silvicultural thinnings; (iii) residue material from the forest floor. The following statement was made by the Premier Carmen Lawrence.</p> <p>"I confirm that it is government policy to commence to phase out woodchipping from old growth forest after the year 2000, but I am hopeful that advances in technology may permit this to happen a little sooner.</p> <p>At the same time, the government fully supports the continuation of the sawmilling industry on a sustainable basis. Where sawlog harvesting occurs in old growth forest the genuine residue material will, of course, continue to be utilised for woodchip production unless higher value products can be found. In addition, woodchips will continue to be produced from thinnings, plantations and small residues."</p> <p>Opinion. No Comment required.</p>
	<p>Phasing out woodchipping from all old-growth areas would be detrimental to the timber industry.</p>	
	<p>RAC figures regarding % of logs from old growth forest wrong.</p>	<p>Not relevant to Draft Strategy.</p>
	<p>Up to 87% of WA's eucalypt woodchips from old growth forests.</p>	<p>Confirmed in Annual Reports.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Not known if chip logs from private property from old growth forests.	This was not relevant to the Draft Strategy.
	Research on plantation establishment - nutrients loss from fertiliser, soil microfauna, disease and insect attacks on monoculture.	Research on plantations is being undertaken.
	Research on plantations - species for saw logs rather than pulp.	The driving force behind hardwood plantation establishment and research is economics. At present investors see pulpwood rotations as providing a greater economic return than sawlogs.
	Research on plantations - varied species - wildlife habitats/multiple products.	Agree this is desirable but a lower priority to existing plantation problems.
	Products from privately owned forest must be sustainable, to protect old-growth values.	Agree.
	CALM no mandate to convert public forest into tree plantations.	CALM regenerates harvested areas with natural tree species.
	Increase royalties to induce woodchip industry to restructure.	Royalties must reflect market value and be related to other log products. Royalties have increased by about 500% since 1986.
	Woodchippers to produce and harvest their own wood - to gain own resource security and remove pressure on forests. Then there'll be no need to import tropical timbers.	The only woodchip company in WA is investing in plantations.
	Not concerned over woodchipping as forest appears to be going up all the time.	Opinion.
	Establishment of more tree farms instead of clearfelling.	Plantation estate is a necessary component of future timber supply but does not mean cessation of all native forest harvesting is desirable.
	Environmental Condition No 4 should be addressed by WACAP EMP so why CALM involved?	CALM is responsible for forest management hence must be the body putting it forward.
	Grow trees for woodchips etc. on land already cleared	This is occurring now.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Govt, industry support for tree plantations on cleared land.	The Government does support tree plantation on cleared land.
	Contracts to log only given if Company replants on cleared areas.	This is part of the companies export licence.
	Concern over cutting down & burning forests for plantations.	CALM promotes replanting of cleared land in its plantation scheme.
	Logging in plantations only.	It is not Government policy to do this.
	Against clearing of natural bush for plantations	It is not Government policy to clear native forest for plantations
	Need a separate review of plantations as they have an impact upon native forests.	The plantation strategy will be reviewed in the Forest Industry Statement to be published following finalisation of the Draft Forest Strategy.
	How far have we progressed in terms of plantations?	The plantation estate is increasing steadily each year. About 100 000 hectares of hardwood and softwood plantations are planted on private and public land.
Integrated logging operations will continue in these zones during the phase out period so that the Government's timber strategy commitments can be met and proper forest regeneration completed.	What is the meaning of 'proper forest regeneration'? Is it JSI & is this good practice in salt zones?	"Proper forest regeneration" in this context means the removal of cull trees to allow a full stocking of regrowth free from competition to be established in forest gaps. Essentially this is what the jarrah forest silvicultural specification and follow-up JSI treatment aims to achieve. JSI is not expected to be a problem in "salt risk zones" if stream zone buffers and limits on overstorey, removal are implemented.
Extensive research has been carried out to determine the effects of timber harvesting on water quality in western Australian forests.	No commitment by CALM to cease logging if monitoring results indicate problems.	Research has shown the problem can be managed by maintenance of an appropriate level of canopy cover and does not necessitate cessation of logging.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p>This research has been summarised in a report by the Steering Committee for Research on Land Use and Water Supply (Water Authority of Western Australia, 1987). The committee concluded its assessment of the implications to forest management with these words:</p>	<p>WAWA report looks at effects of logging on the water resource only, not aquatic ecosystems. Steering Committee says records are needed over more than 20yrs to identify salinity trends. Only 10yr records are available so far for paired catchments and do not include biological data.</p>	<p>Logging in Project 4 experimental catchments was completed in 1977. These catchments have now been monitored for 15 years and the Project 2 experiment catchments monitored for 10 years following logging. Trends have been established which enabled the Steering Committee to draw sound conclusions.</p> <p>Data on water quality is collected primarily to assess impacts on water for human consumption, nevertheless this data on stream turbidity, sedimentation and salinity will be useful if subsequent biological research establishes a relationship between aquatic fauna habitat and these water quality parameters.</p>
<p>"Analysis of research results currently available indicates that logging methods involving clearfelling of karri and heavy selection cutting of jarrah have minor effects on stream salinity and sediment concentrations.</p>	<p>The figures actually show that salinity has risen in every stream &amp; river in the old WLA.</p> <p>A salinity increase of just 50% may adversely impact on aquatic biota &amp; make the water unsuitable for human consumption.</p>	<p>Incorrect. See response to 235. Reference Schofield et. al. (1988).</p> <p>The magnitude of any change in stream salinity needs also to be considered in terms of firstly the duration of change and secondly the geographic scale of change.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	<p>Increases in salinity, turbidity, sedimentation &amp; temperature caused by logging adversely affect aquatic ecosystems, and the recovery of these streams is likely to be slow (Growth &amp; Davis 1991, p704).</p>	<p>Growth and Davis (1991) "presented evidence that the invertebrate communities of streams running through clearfelled areas without a buffer zone of riparian vegetation show differences in their composition to that in nearby streams in unlogged areas. However, there is no statistically significant difference in either richness or total invertebrate abundance".</p> <p>The authors also stated:</p> <p>"How long it may take the clearfelled streams in either the Lewin or the Sutton paired catchment to return to conditions that are more similar to those of the undisturbed streams, either in terms of community structure or in terms of water quality, is not known. The invertebrate communities in these streams will probably return to prelogging status when the physical and chemical conditions return to the prelogging situation".</p> <p>The DFS now proposes riparian buffer zones on all streams. Growth and Davis showed that buffer zones (100m wide) were sufficient to reduce impacts of logging disturbance on stream macroinvertebrate fauna.</p>
	<p>EPA considered the WAWA 1987 report in its 1988 review and concluded more research was needed. CALM has provided no evidence of further research in the salt-risk zones.</p>	<p>Although no new research has been initiated the DFS provides an up to date analysis of continued monitoring in the paired catchment studies. This was the major priority for future research stated in the 1987 Steering Committee Report.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Results used for managing water quality not applicable to all areas.	Research covered the high, intermediate and low rainfall zones hence should be applicable to all areas subject to logging.
	Status of aquatic fauna conditions to accurately assess water quality	Answered previously.
No major changes to management practice are necessary.	Must rectify ignorance towards salinity.	The cause and control of stream salinity is well understood.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p>However, transient effects on stream salinity and sediment concentrations could be locally significant and could be moderated by refinements to management practice. Such refinements should be progressively developed and implemented." (Water Authority of Western Australia, May 1987.)</p>	<p>Proposed CALM buffers are much less than those recommended by WAWA in public water supply areas.</p> <p>The results indicate a substantial increase in forest erosion and sediment input into streams.</p> <p>Status of any river area reliant on up &amp; downstream conditions.</p>	<p>WAWA (Research Steering Committee) recommended that the layout of stream buffers should be matched to the risk of saline discharge from permanent groundwaters in the low rainfall zone. In the intermediate rainfall zone the minimum width was suggested to be 10% of the upslope logged area or 50m either side of the watercourse. The report also permitted subsequent extraction of timber from stream zones under a system of "phased logging". CALM proposes a flexible system of buffer widths ranging from 30m to 200m either side of streams, <u>but it does not propose any logging</u> in these riparian zones.</p> <p>In addition there is proposed to be a limit of 70% overstorey removal upslope from stream buffers in catchments in the low and intermediate rainfall zones. In effect CALM proposes <u>both</u> permanent buffers and phased logging.</p> <p>Disagree. The Steering Committee 1987 report said the sediment increases were minor, declining to pre-logging levels within 4-5 years. No sediment increases were detected on catchments where a stream buffer was kept. CALM's DFS now proposes stream buffers on all streams.</p> <p>Self evident statement. No comment required.</p>
<p>The Steering Committee concluded:</p>		

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p>"1. In the high and intermediate rainfall zones, logging operations have caused small and temporary increases in stream salinity and/or sediment concentration in many local streams but this presents no significant threat to regional water resources.</p>		
<p>2. Further refinement of logging practice is possible to moderate local transient effects on stream salinity and sediment concentration.</p>		
<p>"3. With appropriate management, there is no significant stream salinity risk from heavy selection cutting in the low rainfall north-east sector of the Woodchip Licence Area."</p>		
<p>The results of the hydrological research initiated by the Steering Committee were reviewed in consultation with the WA Water Authority as part of the Review of Native Forest Management (CALM 1992).</p>		
<p>This review confirmed the conclusions of the Research Steering Committee and in particular highlighted the benefit of undisturbed zones of vegetation along streams.</p>		
<p>In experimental catchments where zones of undisturbed vegetation were retained along streams there has been no reduction in water quality.</p>	<p>To claim that 'there has been no reduction in water quality' in experimental catchments is false.</p>	<p>The statement which is challenged referred to "catchments where zones of undisturbed vegetation were retained along streams - there has been no reduction in water quality". This statement is clearly supported by the data. See previous response for sediment and Table 4 in the Steering Committee Report (1987) for salinity. April Road North and Yerraminup South catchments (with buffers kept) showed no significant increase in flow weighted salinity following logging.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p>The Steering Committee recommended either retention of stream zone vegetation or phased logging as the principal methods to be used to moderate local, transient effects of logging on stream salinity and sediment concentration.</p>	<p>The preferred option in the high rainfall zone in WAWA (1987) was permanent buffers. Phased logging is proposed by CALM because the resource is needed to meet commitments. How is this consistent with the principle of sustainability?</p>	<p>This comment is incorrect and also misquotes the WAWA (1987) document. The WAWA document says on page 25 that in the high rainfall zone permanent stream buffers on all streamlines is <u>one means</u> of minimizing sediment concentration. Phased logging is another means. In any case CALM proposes in the DFS to have permanent stream buffers in the high rainfall zone.</p>
<p>They also recommended that a monitoring system be implemented to identify salt-sensitive areas.</p>	<p>Water quality in the presently logged, low rain zones is not being protected or monitored.</p>	<p>Disagree. Water quality is being protected in the low rainfall zone through measures previously described. The following quotation from the Steering Committee (1987) report is relevant. "At the outset of the research programme, there was particular interest in the effect that the new logging strategies could have on water quality in the north-eastern low rainfall (&lt;900mm per year) sector of the Woodchip Licence Area where the soil salt storage is high. However, experimental results have shown that there was no stream salinity increase in this area because recharge was small and the depth to groundwater was sufficiently large such that groundwater (the major source of salt) did not contribute to streamflow following logging".</p>
<p>Once identified it was proposed that stream buffer areas in the intermediate rainfall zone which were not salinity prone would be available for timber harvesting.</p>		

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p>The Steering Committee proposed that water quality would best be preserved in the high rainfall zone by "the introduction of permanent stream buffers" but noted that this would result "in a loss of valuable timber resources". As an alternative they proposed that phased logging operations be introduced.</p> <p>It is proposed that restrictions on the harvesting of marri, imposed in the low rainfall zone for salinity control reasons, be removed.</p>	<p>Support removal of Marri restrictions in low rain zone.</p> <p>No intensification of logging in low &amp; intermediate salt risk zones in Central &amp; Swan Forest Regions.</p>	<p>Opinion. No Comment required.</p> <p>It appears that some submitters equate removal of marri with "intensification of logging".</p> <p>The Steering Committee (1987) report concluded (page viii):</p> <p>"With appropriate management, there is no significant stream salinity risk from heavy selection cutting in the low rainfall sector of the Woodchip License Area"</p> <p>and recommended that:</p> <p>Woodchipping operations proceed in this sector subject to modified forest management practise.</p>
<p>The small, local and transient effects of logging on salinity will be avoided by the imposition of stream and river zones of undisturbed vegetation throughout the forest, and phased logging throughout the intermediate and low rainfall zones.</p> <p>It is also proposed that a monitoring system be introduced.</p>	<p>There should be monitoring of dieback, water &amp; soil salinity in areas being logged.</p>	<p>Monitoring of water quality following logging is recommended in the Proposals document. See pages 17 and 18.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p>The specific procedures which will be introduced to fulfil the requirements of Environmental Condition 6 are as follows:</p>		
<p>1. The river and stream zone system outlined above in Table 2 will be implemented in the salt risk areas. This means that zones of undisturbed vegetation will be retained beside all streams.</p>		
<p>No logging, including thinning (other than the removal of dangerous trees where they pose a threat to human life or salvage of forest produce generated by legitimate road construction) will occur in these zones.</p>		
<p>2. The 1991 jarrah Silviculture Specification will be applied to jarrah and jarrah/mairri forests in these areas. This specification is at Appendix A. Major features are summarised in Table 7.</p>		
<p>In essence, the multi-aged structure of the jarrah forest will be retained in all areas;</p>		
<p>gap sizes will not exceed 10 hectares, within gaps three mature habitat trees per hectare will be retained;</p>		
<p>all cutover areas will be regenerated.</p>		
<p>The proposed Silvicultural Specification for Karri and for Karri Forests is outlined in Chapter 4. These changes will be formalised into a CALM silvicultural specification and applied to the appropriate areas on release of the final Strategy document.</p>		

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p>3. In the intermediate and low rainfall zones at least 30 per cent of the forest on every second order stream catchment will be retained uncut for at least 10 years after the cutting and regeneration of the forest elsewhere on that catchment.</p>		
<p>This ensures that logging will be "phased" throughout the intermediate and low rainfall areas.</p>		
<p>4. Where stands are thinned in the intermediate and low rainfall zones a minimum of 15 square metres of basal area per hectare will be retained on all areas.</p>	<p>15m<sup>2</sup>/ha too low in salt-risk zones.</p>	<p>To protect water quality at a Regional level the 15m<sup>2</sup> is considered adequate. The impact of this level of thinning on small localised high salt areas will be monitored.</p>
<p>5. A stream monitoring program will be established throughout the intermediate and low rainfall zones.</p>		
<ul style="list-style-type: none"> <li>• All second order catchments will be sampled for a period of five years after they have been logged.</li> </ul>		
<ul style="list-style-type: none"> <li>• Total soluble salts will be determined at peak flow and base flow periods.</li> </ul>		
<ul style="list-style-type: none"> <li>• Ten unlogged second order catchments will be sampled for the purpose of establishing "control" total soluble salt levels.</li> </ul>		
<p>6. Monitoring of existing bores and research catchments will continue.</p>		
<p>7. The results of the stream monitoring program will be reported annually to the WA Water Authority.</p>		

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p><b>3.5 Management of Areas Adjacent to Existing or Proposed Conservation Reserves in the Jarrah Forest</b></p> <p>Environmental Condition 3 resulting from the EPA's review of the 1987 Forest Regional Management Plans required that management plans for specified conservation reserves in the jarrah forest be prepared.</p>		
<p>The condition also required that these plans should detail management proposals for areas adjacent to the reserves which would ensure the protection of "the ecological values within the nature reserves and conservation parks".</p>		
<p>The following addresses the Environmental Condition:</p>		
<p>The Review of Forest Management has shown there is no evidence that any existing management practice in areas adjacent to the conservation reserves has any detrimental effect on the ecological values of the reserves</p>	<p>What research/investigation was undertaken as part of the Review to reach this conclusion?</p>	<p>The research conducted into impacts of disturbance activities in jarrah and karri forests. See DFS Chapters 2 and 3.</p>
	<p>Why has CALM dropped the idea of core and buffer areas?</p>	<p>If State forest surrounding conservation reserves is managed in sympathy with the nature conservation values within the reserve then State forest acts as a buffer. The principles for developing a conservation reserve system are detailed on page 135 of the DFS (Note: A public workshop held on this topic did not raise the core/buffer concept as an important methodology for a reserve system).</p>
	<p>No research or evidence that forest management affects conservation reserves, not no effects.</p>	<p>The effect of forest management outside reserves on those reserves is minimal because forest management is low impact.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE																					
<ul style="list-style-type: none"> <li>• Nevertheless, a new jarrah forest silvicultural specification has been developed which further ensures the protection of ecological values in the forest.</li> </ul>	<p>How will the treatment given to areas adjacent to conservation reserves differ from that applying in the main timber production areas?</p>	<p>Managing the impact of distribution to Visual Resource Management objectives relate to maintenance of <i>inevitable</i> alteration to the visual landscape. This is usually achieved through more sensitive timber harvesting and prescribed burning operations.</p>																					
<ul style="list-style-type: none"> <li>• It is proposed to increase the area of the Lennard, Preston and Noggerup reserves (see Section 5) and create additional reserves.</li> </ul>	<p>The former conservation MPAs Dalgarnup, Lennard, Mullalyup, Preston, Noggerup, Mowen and Dardanup &amp; Blackwood River recreation MPA have been progressively removed from the conservation estate since 1982. They should become conservation reserves.</p>	<p>Many former M.P.A. core areas have increased in size since 1982 and many more areas with more significant conservation values have been added to the reserve system in 1987. More are now proposed in the 1992 review. In the Central Forest Region the following data is relevant:</p> <table border="0"> <tr> <td></td> <td style="text-align: right;">1982</td> <td style="text-align: right;">1992</td> </tr> <tr> <td>National Parks</td> <td style="text-align: right;">23,000</td> <td style="text-align: right;">(Proposed) 83,400</td> </tr> <tr> <td>Nature Reserves</td> <td style="text-align: right;">3,000</td> <td style="text-align: right;">25,200</td> </tr> <tr> <td>Flora Fauna &amp; Landscape M.P.A's</td> <td style="text-align: right;">115,000</td> <td style="text-align: right;">-</td> </tr> <tr> <td>Conservation Parks</td> <td style="text-align: right;">-</td> <td style="text-align: right;">45,900</td> </tr> <tr> <td>5g Reserves</td> <td style="text-align: right;">-</td> <td style="text-align: right;">-</td> </tr> <tr> <td>Total:</td> <td style="text-align: right;"><u>141,000</u></td> <td style="text-align: right;"><u>155,370</u></td> </tr> </table>		1982	1992	National Parks	23,000	(Proposed) 83,400	Nature Reserves	3,000	25,200	Flora Fauna & Landscape M.P.A's	115,000	-	Conservation Parks	-	45,900	5g Reserves	-	-	Total:	<u>141,000</u>	<u>155,370</u>
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<ul style="list-style-type: none"> <li>• It is proposed to apply visual resource management prescriptions (detailed in A Review of Forest Management) to the areas adjacent to the conservation reserves designated in the Environmental Condition.</li> </ul>	<p>VRM is not based on ecology, which should be the guiding principle of all forest management.</p>	<p>Correct. Visual Resource Management is based on the premise that the visual landscape must be appreciated as a value in its own right.</p>																					
<ul style="list-style-type: none"> <li>• Management plans for the designated reserves will be prepared according to the availability of resources and priorities of the Government and the NPNCA. It is anticipated, however, that these plans will be prepared before the expiration of the Regional Management Plans.</li> </ul>	<p>The condition will not be satisfied until the plans are prepared.</p>	<p>Agreed. The Environmental Condition will not be satisfied until the management plans are prepared. The condition did not specify a time for the management plans to be completed.</p>																					

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
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REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p><b>4. PROPOSED CHANGES TO KARRI SILVICULTURE</b></p> <p>When timber is being harvested from mature multiple purpose karri and karri/marri forests the following changes to the silvicultural approach spelt out in the 1987 Regional Management Plans and Timber Strategy and the WACAP ERMP are proposed</p>	<p>The lack of data on the impact of the proposed silvicultural changes makes it difficult to comment. CALM should extensively evaluate the proposals.</p>	<p>Agreed. CALM proposes to extensively evaluate the proposals. Details will be provided in the final strategy document.</p>
	<p>Can't properly assess these changes without far more information (detailed maps, scientific basis for figures).</p>	<p>"Whole of forest" planning using GIS technology will enable this type of visual map presentation to be available before 1997.</p>
	<p>Inappropriate to assign over 2/3 of worlds karri to woodchips &amp; unsold timber(666)</p>	<p>Incorrect.</p>
	<p>Crowea karri resource already committed in allowable cut figs so no room to manoeuvre by CALM.</p>	<p>This is so and the reason why the Minister offered to keep the Crowea area free of harvesting if the group could find an equivalent area of karri currently reserved from logging to swap for it.</p>
<ul style="list-style-type: none"> <li>Gap size (or coupe size) will not exceed 80 hectares.</li> </ul>	<p>Accept the reduced coupe sizes.</p>	<p>Opinion. No comment required.</p>
	<p>80ha is better than 200ha. What evidence is there that 80ha is not still too large?</p>	<p>The limits on coupe size are primarily related to visual impacts. However, in the final analysis it will ..... coupe <u>shape</u>, rather than coupe <u>size</u>, which will have greatest influence on aesthetic values and wildlife values. The proposed limits on coupe size provide some expectation as to those impacts.</p>
	<p>Since selective logging is more acceptable than clearfelling from most environmental viewpoints'(Attiwell 1982, p29), why is selective logging not practised in any of the karri forest?</p>	<p>Selective logging has been proven to be unworkable in the karri forest if timber is to be one of values for which the karri forest is managed. (See Bradshaw and Lush 1981, pp. 17-20; Rotheram 1982, Christensen 1992, p.79; DFS, pp. 71-74.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Worried that karri to be clearfelled for the next 10 years.	See previous answer.
	Timber extraction & initial regeneration to take place in one season in each coupe.	Agreed that this is a desirable objective.
	Logs removed & soil restored within 12 months of operations start.	Agreed.
	Post-harvest silvicultural treatments & regeneration burns done at first available opportunity.	Agreed.
	Accept small coupe clearfelling but not the rate at which removals are occurring.	Opinion
	Smaller annual area of logging required and the dispersal of smaller coupes.	This would not supply the level of timber required.
	If clearfelling karri to continue, then smallest possible coupes wanted.	Coupe size must be determined by ecological, visual and operational efficiency.
	Does coupe size influence salinity & groundwater fluctuations?	Not coupe size, but the proportion of the catchment logged at any one time.
<ul style="list-style-type: none"> <li>Gap size and shape will be designed to meet the landscape, wildlife, recreation and heritage values of the site.</li> <li>Gaps may be as small as one hectare.</li> <li>Average gap size is expected to be 30 hectares.</li> </ul>		
<ul style="list-style-type: none"> <li>Retained mature habitat in addition to the road, river and stream zone system an additional 3200 hectares of mature forests will be excluded from harvesting and regeneration and from yield calculations. This area will be distributed to cover "habitat patches" and to provide linking corridors within larger gaps and the river, stream and road zone system, and to encompass special high value ecological or</li> </ul>	All high value old-growth forest must be retained.	Opinion. The highest value old growth forests have been identified through the assessment of National Estate values in the southern forest region. Guidelines for the protection of these values have also been developed (CALM/AHC, 1992) and subject to endorsement in the final plans, these guidelines will be implemented
	Require a comprehensive system of wildlife corridors & refuges.	CALM believes the proposed system is comprehensive.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<ul style="list-style-type: none"> <li>recreational sites. In these areas understorey vegetation and ground components will be kept undisturbed during harvesting and regeneration.</li> </ul>		
<ul style="list-style-type: none"> <li>Rotation lengths will vary</li> </ul>		
<ul style="list-style-type: none"> <li>No rotation length is nominated for areas being managed primarily for nature conservation and recreation (ie, road, river and stream zones and habitat retention areas).</li> </ul>		
<ul style="list-style-type: none"> <li>These areas are expected to reach their natural physiological rotation, ie &gt;250 years.</li> </ul>		
<ul style="list-style-type: none"> <li>In regrowth forests regenerated before 1940, 25 per cent will be managed on a 250 year rotation and the remainder on a 100 year rotation</li> </ul>	<p>What is the basis for allocating these percentages to these rotation lengths?</p>	<p>The Strategy for sustained wood yield from the karri forest has been derived from a structural goal for the forest. The structural goal provides for minimum proportions of each stage of development to be represented in the forest. This structure enables the important mature and senescent stages to be sustained.</p>
	<p>Capacity for jarrah/marri to regrow to maturity can't be demonstrated for 200yrs.</p>	<p>Evidence of 100 years of regeneration growth gives no reason to doubt trees will not continue for another 100 years plus.</p>
	<p>So clearfelling must be considered a risky procedure.</p>	<p>As above.</p>
	<p>Will future environmental conditions permit easy forest regrowth?</p>	<p>The uncertainty as to what the greenhouse effect will actually do precludes predicting its impact on forest processes.</p>
	<p>Must address greenhouse issues.</p>	<p>See above.</p>
	<p>Karri forest re-growth will lead to shortage of karri sawlogs.</p>	<p>The Draft Strategy shows a constant level of sawlog production indefinitely.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<ul style="list-style-type: none"> <li>In regrowth forests regenerated between 1940 and 1975 where patch size is less than 200 hectares the rotation age will be 250 years. Where the patch size is more than 200 hectares the rotation age will be 100 years.</li> </ul>	<p>How much of the forest is in this age category?</p>	<p>2000 Hectares. See DFS page 167.</p>
<ul style="list-style-type: none"> <li>In regrowth forests regenerated between 1975 and 1990 approximately 10 per cent will have a rotation age of 250 years. In the remainder the rotation age will be 100 years, except for some small, understocked or fire-damaged areas which will be harvested and regenerated at age 60 or age 80.</li> </ul>	<p>Logging of under-stocked or fire damaged areas 60-80yrs old is aimed at producing wood not maintaining forest ecosystems.</p>	<p>The logging of these areas at this age is primarily designed to ensure that the forest is fully stocked and properly regenerated as a karri forest. A secondary aim is to develop structural (age class) diversity within these areas which currently have very large single aged regrowth distribution.</p>
<p>For 50 per cent of regrowth forests established after 1990 rotation length will exceed 150 years and may exceed 200 years.</p>		

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<ul style="list-style-type: none"> <li>Gap dispersal. A minimum of three years will elapse between the harvesting and regeneration of adjacent gaps.</li> </ul>	<p>Three years is far too short in forest with a physiological age of &gt;250 years. Even the old EIS recommended 4 or 5 years.</p>	<p>The relationship between coupe dispersal and age of adjoining stands is a complex issue. For instance the guidelines for protection of National Estate values illustrates that in some cases it is desirable to aggregate coupes in order to maximize undisturbed areas elsewhere, in other cases it is desirable to disperse cutting.</p> <p>The relevant points are these:</p> <ol style="list-style-type: none"> <li>The most important criterion for wildlife is the separation of patches of mature forest from younger stages of development. The DEFS proposes that there be a maximum of 400m between retained patches of mature forest.</li> <li>There is no advantage in dispersing coupes to enhance wildlife values if adjoining stands finish up at the same early stage of development (establishment stage). In this context it would be undesirable to cut and regenerate a stand before an adjoining stand reaches approximately 7 years of age.</li> </ol> <p>The question of coupe dispersal will be reviewed in the final document.</p>
<p>Where possible, the distance between areas of retained mature forest will not fall below 400 metres.</p> <p>These changes will be formalised in a CALM silvicultural prescription when the final Strategy document is released.</p>	<p>How will CALM ensure the distance between areas of mature forest is not less 400m?</p>	<p>This will be part of the coupe planning.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p><b>5. PROPOSED CHANGES TO THE RESERVE SYSTEM IN SOUTH-WEST FORESTS</b></p>		
<p>The 1987 Forest Regional Management Plans designated the bulk of the forest areas managed by CALM as either national park, nature reserve, conservation park, State forest or timber reserve. The land use designation set out in these plans have been steadily implemented over the last five years.</p>	<p>State forest/conservation reserves complementary role</p>	<p>The Strategy has as its philosophy a "whole of forest" approach in which different land uses are integrated.</p>
<p>Since the 1987 plans were approved, more information has become available on the heritage value of southern forests, on the criteria for wilderness and on the presence within the forest of specific plant communities. A new set of principles has been developed which help to define an ideal nature conservation reserve system. These principles (which are dealt with in some detail in the Review of Forest Management Strategies) require that the reserve system incorporates areas which are special, representative, viable, properly managed and have involved the community in their selection.</p>	<p>Area set aside for conservation is still too small.</p>	<p>CALM have set objective criteria and tried to meet them.</p>
	<p>National parks still threatened by mining. Forest parks/reserves are available for selective logging. That logging permitted in conservation areas diminishes their importance. Don't agree that a representative reserve system has been identified &amp; established. All undisturbed forest to be reserved. Undisturbed woodland areas are not adequately reserved.</p>	<p>Government Policy. This category of reserve was not preceded within the 1987 management plans. Agreed but is not occurring. Would need to see criteria used to base statement on. Not possible and maintain a timber industry. The Mt Roe proposal was meant to redress this.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	All areas with wilderness characteristics to be reserved. Conservation estate has no security.	Not possible, while meeting other values being managed. It has the best security the Westminster system can supply.
	Strong conservation. Act for native forests from State Govt.	The CALM Act is a good Act.
	No area management plans for several national parks. WA does not have a representative reserve system.	The task is very large and will take a long time. Would need to see criteria on which statement is based to comment.
5.1 Additions to State Forest The 1987 Forest Region Management Plans identified an area of 283,000 hectares of forest which could be dedicated as State forest. This forest is currently vacant Crown land, or within various miscellaneous reserves in the south west.	"283,000ha not for state forest alone, also for national parks and conservation reserves.	Agreed. This was a error in the proposals document.
All these areas were re-examined during 1990-91. This review confirmed the value of these areas for multiple-purpose management, so it is proposed to proceed with their dedication as State forests. This will represent the most significant increase to the State forest estate for many decades.	283,000 also includes non-forest areas. Reserve remaining virgin State forest - no logging.	Overall, it is all forest. Not possible and maintain the Government approved timber strategy.
5.2 New Conservation Reserves		

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
A review of the current conservation reserve system in south west forests has revealed that all major forest types are represented in the reserve system. The review indicated that the system could be enhanced by expansion to include some specific vegetation types within forest types, and to incorporate wilderness values.	Protection of all virgin forest in conservation reserves.	See Above.
	Use integrated approach in reserves too for consistency.	It is to a certain extent however reserves are predominantly for nature conservation and management must reflect that.
A substantial increase to the conservation reserve system is recommended. In particular, a major new national park of 78,820 hectares is proposed in the Southern Forest Region, and new national parks are proposed within the jarrah forest in the Central and Swan Regions	CALM have not ensured protection of conservation values in conservation areas. Immediately implement parks & reserves in 1987 plans.	Assertion. CALM management objectives for these areas is to do this It is not possible to implement all proposals immediately as it takes some time to complete the Parliamentary process.
	Proposed extensions to parks and reserves supported.	Ok.
	1987 buffer area concept out so nature reserves reduced to 1/3 original area.	Individual reserves were reduced to core areas but the actual area of reserved forest has increased due to additional areas.
	Require more information on forest area in the conservation estate & the proposed excisions.	Specific information should be sought by going directly to CALM.
	CALM removed over 24,000ha from 8 reserves over last 10 yrs.	See 1 above
	All former conservation management priority areas to become conservation reserves.	See above.
	Why duplicate National Parks as National Heritage areas ?	The two are different concepts and not managed the same.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Why National Park instead of state reserve for multi-use?	National Park is a state reserve classification.
	Why is a substantial increase in conservation reserve system recommended?	The criteria on which the new reserves were recommended was published in the draft strategy essentially it is to ensure adequate representation of vegetation complexes.
	Adopted reserves maximise ecological & riparian values & minimise reserve losses.	Agree.
	Representative areas of forest ecosystem preserved in a dynamic reserve system.	Agree.
	Land surrounding Warren & Crowea for 2km to be conservation reserve.	This area did not meet the criteria published for inclusion in the reserve systems.
	Denbarker conservation area, wonder over sudden generosity in proposing this.	The size was based on representing the value "wilderness" in the reserve system.
	CALM not implemented 1987 proposed plans-public be told why not.	See previous answer.
Table 9 and Table 10 summarise all the recommended additions to the conservation reserve system. The location and extent of the proposed reserves is shown on maps included in the Review of Forest Management in the South west of western Australia.	State forest of lower Mitchell River added to Mt Lindsay N.P.	No additional vegetation complexes would be reserved by doing this.
	Sharpe state forest added to Mt Frankland N.P.	No additional vegetation complexes would be reserved by doing this.
	Proposals should have contained details of vegetation types in new conservation areas.	Vegetation types were described for the Swan and Central Region reserves, however, were not mapped at the level required to do so for the south.
	How much conservation estate has been returned to state forest since 1982?	None.
	CALM to restore removed conservation areas to conservation estate immediately.	CALM has increased the area of total conservation estate and ensured buffer representation of different vegetation types by adopting the approach it has.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
Table 9 Recommended additions to the nature conservation reserve system - Swan Region and Central Forest Region		
Table 10 Recommended additions to the nature conservation reserve system - Southern Forest Region		
5.3 Changes to Existing Tenure		
In addition to the nature conservation reserve system outlined in Table 9, the process of implementation of the 1987 Regional Plans has highlighted a number of		
inconsistencies requiring minor changes to land tenure and classification.		
These mainly relate to the appropriateness of the 1987 proposed classification in relation to the designated area's size or condition, or boundary changes requiring amendment to the plan.	Some so-called new national parks already proposed as conservation parks.	Yes. This represents an upgrading of their status.
Table 11 summarises all proposed changes to tenure and vesting the location and extent of which are shown on maps 3, 4 and 5 of the Draft Forest Management Strategy Review.		
Table 11 Proposed changes in tenure, vesting and purpose for the Swan, Central Forest and Southern Forest Regions	No 84 Bridgetown forest block to be state forest.	
	No 75 Greenbushes MPA to be State park.	Greenbushes is proposed to become Nature Reserve. There is no category State Park.
	No 76 Greenbushes MPA not logged & become state park.	Greenbushes is proposed to become Nature Reserve. There is no category State Park.
	No 83 Bridgetown state park classification appropriate.	There is no land classification State Park.
	No 74 Nollajup MPA as state park; forest park/reserves only if no logging.	Forest Park was abandoned in the final 1987 RMP. Nollajup is proposed to be a nature reserve.



REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	Monadhocks sufficiently protected being in DRA.	DRA status does not imply any form of management for ecology.
Field visits/surveys required to establish areas suited to National Park status.		In many cases this is done however broad scale landform mapping has also been successfully used to identify areas suitable for NP status.
Dwellingup District		
Meelon 5 nature res.(P)delete		
George 3140 State for cons pk		
Lane Poole Reserve 180 cons pk(P) 5g res.	Would like to see C73 (Murray V) included in Lane Poole National Park.	
(Icy Creek)		
CENTRAL FOREST REGION		
Harvey District		
Lane Poole Reserve 26420 cons pk(P) nat. pk		
Lane Poole (Stiene) 1465 State for nat. pk		
Clarke (Falls Brook) 1165 State for nature res.		
Kemerton 1405 5g res.(P) delete		
Kemerton 265 5g res.(P) cons pk		
Wagerup 10 cons pk(P) delete		
Collie District		
Lane Poole Res. *9845 cons pk(P) nat. pk		
Lennard 645 State for cons pk		
Gervasse 2015 State for cons pk		
Roseneath 1360 State for nat. pk		
Goonac 5140 cons pk(P) nat. pk		
Kirup District		
Goonac 30 cons pk(P) nat. pk		
Preston 305 State for nat. pk		
Hovea 1055 State for nat. pk		
Noggerup 1690 State for nat. pk		
Gwindinup 10 cons pk(P) delete		
Hester 780 State for cons pk		
Ryall 260 State for cons pk		
Camballan 7155 VCL cons pk		
Camballan 1430 State for cons pk		
Camballan 110 other res. cons pk		
Busselton District		

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
Leeuwin-Naturaliste nat. pk 325 other res.		
Nannup District		
Beaton 4.15 State for cons pk		
SOUTHERN FOREST REGION		
Manjimup District		
Jardee 1.0 cons pk(P) State for		
Jervik Park 1.0 cons pk(P) delete		
Dingup 2.10 State for nature res.		
Keninup 6.740 State for nature res.		
Talling 6.410 State for nature res.		
Talling 5 other res. 2890		
Chitelup (Mt Roe) 2890 State for		
nat. pk		
Pemberton District		
D'Entrecasteaux 9.0 nat. pk State for	Hawke Karri state forest added to Warren National Park.	There are no plans to do this as the vegetation type is adequately represented elsewhere.
Charley 2385 State for nat. pk		
Hawke 6.0 State for nat. pk		
	Against sand mining in D'Entrecasteaux National Park	Government Policy.
	Gazetting of reserves (incl D'Entrecasteaux) a highest priority.	Gazetting is progressing steadily however in the mean time they are being managed as if they were already gazetted.
Walpole District		
Mattaband 2.50 State for nat. pk		
Pardalup Road 3.0 nature res. delete		
Gum LinkRd(Mt Roe) 5.75 nature res.		
nat. pk		
Thames(Mt Roe) 8.80 nature res. nat. pk		
Thames(Mt Roe) 5.00 nature res.(P)nat. pk		
Mt Roe 11.715 VCL nat. pk		
Mt Roe 3.7050 State for nat. pk		
Mt Roe 2.6770 other res. nat. pk		
Note: ID numbers 40, 46-51 represent the proposed Mt Roe National Park (80 380 hectares).	New Mt Roe National Park supported.	Ok.
	No wildflower picking in Mt Roe area or where dieback introduction is possible.	Dieback can be managed through controls rather than exclusion.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	No case for the proposed Mt Roe National Park.	The case, as perceived by CALM, was clearly set out in the draft strategy document.
	Mt Roe recommendation not explained.	See above.
	Are Mt Roe reserve area practices currently unsatisfactory.	Current practices are appropriate to the land use purpose.
	Reference to more information becoming available doesn't relate to Mt Roe.	Criteria for proposing Mt Roe be reserved is based on existing information.
	WAWA moves to excise potential damsites from Mt Roe rejected.	Water storage is something that must be catered for in forest planning.
	Suggest renaming Mt Roe National Park to reflect Aboriginal heritage.	Cannot comment on a proposed name until Government decides to reserve it.
<p>*In the Draft Forest Strategy Review these figures (Table 16) were lower as parts of the identified areas were not included in the area statement. The supporting map (Map 4) showed the boundaries correctly.</p>		
<p>5.4 Diverse Ecotype Conservation</p>	Welcome proposed addition of diverse e-types to conservation estate but must manage.	Agree.
<p>A mosaic of heathlands, sedge and herb vegetation, rock outcrops, swamps, lakes, wetlands and low shrubby woodlands occurs throughout State forest, particularly in southern forests.</p>		
<p>These are very important areas for wildlife conservation and in some cases passive recreation. They are also a distinctive and integral facet of the forest landscape, and they frequently provide linkage between conservation reserves and other undisturbed forests.</p>		

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p>1. An area of 115,000 hectares of these diverse ecotypes occurs within the southern State forests and a further 88,000 hectares occurs within central and northern State forests.</p>		
<ul style="list-style-type: none"> <li>No timber harvesting occurs in these areas and it is proposed that they be accorded special protection from road making and other physical disturbance.</li> </ul>		
<p>Effectively this will add a further 203,000 hectares to the area primarily managed for nature conservation within south west forests.</p>	<p>Link Franklin &amp; Shannon National Parks with corridor.</p>	<p>They are linked through the corridor down the South-West Highway.</p>
	<p>Linkage of buffer zones to larger areas of conserved forest.</p>	<p>Ultimately they are connected to the reserve system.</p>
	<p>Reject concept, "forest managed primarily for nature conservation" - dishonest.</p>	<p>Disagree - Nature conservation reserves and forest to be left undisturbed in State forest is largely for nature conservation values.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p><b>6. PROPOSED AMENDMENTS TO THE TIMBER STRATEGY</b></p> <p>As well as proposing changes to the Forest Region Management plans, it is proposed that changes are made to the State's Timber Strategy (which was produced in association with the regional plans in 1987).</p> <p>Changes to the Timber Strategy are required in the light of:</p> <ul style="list-style-type: none"> <li>changes to forest management strategies proposed in the Review of Forest Management;</li> <li>new information about timber resources obtained from the forest inventory;</li> </ul>		
	<p>CALM have overcommitted Hester -cut set too high.</p> <p>CALM accuracy calculations are 'ponderable' with respect to Jarrah inventory.</p> <p>No details given for Jarrah inventory, &amp; it doesn't ease logging rate.</p> <p>Reject new inventory as it is unsubstantiated &amp; biased.</p> <p>Moratorium on cutting down jarrah &amp; tingle trees.</p> <p>Will timber industry still demand resource. security when forest ruined?</p> <p>Oppose proposal to increase the amount of timber available for harvest.</p> <p>Recommend a precaution to exclude 15% of multiple purpose forest (after other exclusions) in terms of the allowable cut.</p> <p>RAC report states- past cutting practices have limited future options.</p>	<p>CALM have no plans to cut all of Hester block in any period.</p> <p>Need to study Spencer (1992).</p> <p>Jarrah inventory showed logging rate did not need to be eased. More details will be published on the jarrah inventory.</p> <p>Need to study Spencer (1992).</p> <p>Not possible unless Government wishes to close down jarrah timber industry.</p> <p>The forest is not being ruined by current management.</p> <p>The level of present harvest forest is to be maintained.</p> <p>See page 175 of the DFS. 30% of the potential yield has been excluded to ensure the maintenance of other values.</p> <p>This is true and would apply in any situation but does not mean that option is available are not desirable.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	What is the relationship between growth/logging rates - and sustainability.	Sustainability in an ecological sense is relevant on an adequate forest structure and an important factor in that will be the growth rate of trees.
	Sustainability seems only to relate to timber.	Not so. The whole thrust of the Strategy is to sustain ecological process.
	Past, present, proposed levels of cut too high.	Present levels of cut are sustainable.
	Karri allowable cut figs arrived at by doubling present logging values and adding 10%.	Nonsensical. No comment required.
	Recommend 5 separate inventories of logging patterns and allowable cut.	One done properly is adequate.
	Reduce allowable cut to a more realistic sustainable yield.	Current cut is sustainable.
	Should not need to log reserves to maintain allowable cut.	Agree. They will not be.
	Strongly oppose any increase in allowable cut.	The allowable cut is sustainable.
	CALM's figs for increasing allowable cut to be verified by independent experts	This could be done if the Government considered it necessary or desirable.
	Narrow of zones, continued clearfelling & logging of salt risk zones to increase allowable cut.	The redistribution of zones has actually decreased the karri available for harvesting.
	Figures for allowable cut must be gained from 1987 timber strategy	The Strategy proposes a new sustainable cut based on the structural objectives and reserves proposals.
	1987 proposed reductions in allowable cut should be adhered to.	See above. The new proposal is seen as superior for timber and wildlife values.
	Largest timber firms least efficient in use of timber resources & foreign currency.	Large firms conduct drying and value adding for export and this meets to be considered in assessing relative efficiencies.
	Largest firms produce timber at higher prices than smaller competitors.	Market forces will resolve this.
	Utilisation of mill wastes for charcoal, don't use live trees.	Mill waste is used for charcoal. In addition live trees are only used to the extent that they are unsuitable for sawlogs.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
<p>If approved, both the amended Regional Management Plans and the amended Timber Strategy will be current for the period 1992-2002.</p> <p>Two amendments to the Timber Strategy are proposed.</p>	<p>Next review of forest management in 1997, not 2002.</p> <p>Timber strategy does not define efficiency</p> <p>Present royalty structure not achieving stated timber strategy aims.</p> <p>Timber strategy - evidence of royalties vs costs needed.</p> <p>Strategy doesn't state specific operational constraints to deal with erosion.</p> <p>Principle 4 of timber strategy to be backed up with data on royalties.</p> <p>Principle 5 means that timber extraction will be maintained even if a decrease in productivity occurs.</p> <p>If production ceases to be competitive, will it stop or be subsidised ?</p>	<p>The review will be in 10 years from approval unless the Minister decides it should be revoked sooner.</p> <p>Is a relative term which is always improving.</p> <p>Royalty structure is only part of the Strategy to achieving aims.</p> <p>See Timber Industry Statement to be published later</p> <p>These are in codes of practice, available to the public.</p> <p>This will be in the Timber Industry Statement.</p> <p>Should any decrease in productivity due to nutrient depletion will be on a time scale well beyond current commitments (5-15 years) hence adjustment will be easy.</p> <p>The timber industry operates because people purchase timber at prices sufficient to maintain the industry. No subsidies.</p>

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
The first is a restatement of standing volumes of timber in State forests, shown in Table 8 (page 17) of the 1987 Timber Strategy. The updated estimates of timber volumes are shown below in Table 12.	CALM should be required to fully explain figures in relation to sustained forest management.	More detail will be publicly available.
Table 12 Inventory of timber resource on native forests designated for multiple use in regional management plans	Table 12 to include other zones as timber resource eg: river.	The table includes the standing volume on all State forests, including road, river and stream zones. It is not however all available for use.
	"Table 12 Karri area does not include road, river and stream reserves.	See above.
	Table 12 to include the effects of river & stream widths.	Table 12 is an inventory. The effects of different retention zones is reflected in the yield strategy.
	Table 12 sawlog volume does not state where in range value lies.	Figures are midway in ranges.
	Table 12 stand increment rates not backed up by any data.	Data comes from CALM increment plots.
	Tables 13 & 14 to be changed after changes made to table 12.	These tables already include the effect of retained areas.
	Table 12 should offer figures for marri alone.	More information on the inventory will be published.
	Gross bole volume used as a unit of assessment rather than product volume.	Agree. Product changes with economics, technology, etc.
	Has problem with calculated yields of forest types rather than regions.	This is a broad presentation, a whole of forest basis. Regions are used for specific contracts.
	Recover significantly more sawn timber from sawlogs.	CALM is seeking highest possible recovery rates through pricing. It is not possible to stipulate achievable recovery rates because logs are natural products with difficult to minimise faults.
	Concern over low wood recovery rates by company mills.	As above.
	CALM sawlog supply contracts conditional on increased recovery rates.	Recovery rates depend on quality of logs. It is preferable to convert even poor logs with low recovery than waste them.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
Forest type Karri & Jarrah/ karri/marri		
Area (ha) 121700	1239000	
Standing Timber Vol. (10 <sup>6</sup> m <sup>3</sup> )		
Gross Bole Vol <sup>(1)</sup> 25.4	144.0	
Sawlogs 10.2	57.2 <sup>(5)</sup>	
Other logs 15.2 <sup>(2)</sup>	86.8 <sup>(6)</sup>	
Forest Residue <sup>(7)</sup> 4.0	78.7	
Stand increments (m <sup>3</sup> /ha/an)		
1.5 <sup>(3)</sup> to 1.65		
10.0 <sup>(4)</sup>		
(1) GBV of all major species		
(2) Includes 6 400 000m <sup>3</sup> of marri logs		
(3) The increment of the selection cut of old growth forest		
(4) The increment of high prod. regrowth (ave regrowth increment=7.3m <sup>3</sup> /ha/an)		
(5) Includes 4 400 000m <sup>3</sup> of marri sawlogs		
(6) Includes 34 800 000m <sup>3</sup> of marri logs		
(7) Wood additional to gross bole volume (branchwood & wood from dead trees)		
The second amendment concerns recommended sustainable yields for the jarrah, marri and karri forests. Tables 13 and 14 below are proposed to replace Tables 14-17 of the 1987 Timber Strategy	The level of sustained yield past & future is more than ecology, soil and water can take.	Available evidence does not support this.
	Bridgetown/Greenbushes friends of forest have proposed changes to rotation lengths which will disrupt timber industry by a mere 217ha of Karri and 2 814ha of Jarrah.	CALM has discussed this with BTGFOF.

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
	If sustainable yields not reduced then more disruption to industry by turn of century including species extinction. State and Timber industry living on forest capital.	Current yields are sustainable - no disruption will occur and available evidence indicates no plant or animal species faces extinction. Not so. DFS yield levels are sustainable.
Table 13 Calculated annual sustainable yield from jarrah forest available for timber harvesting		
JARRAH MARRI		
SUSTAINABLE YIELD		
Gross Bole Volume(m <sup>3</sup> /an)		
1992-2001 1 360 000	469 000	
2002-2036 1 360 000	469 000	
LOG PRODUCT YIELDS		
(current specifications)(m <sup>3</sup> /an)		
First grade sawlogs	459 000	
Other saw logs(1)	216 000	
Other logs(2)	685 000	
Sawlogs	57 000	
Other logs(2)	412 000	
Forest Residue(3)	300 000	
(1)	Includes 2nd grade sawlogs, short sawlogs & small diameter sawlogs	
(2)	Includes inferior log grades which are available but not all of which are marketed currently	
(3)	Wood additional to gross bole volume (branchwood & wood from dead trees)	

REVIEW DOCUMENT	ISSUES RAISED	CALM'S RESPONSE
Table 14 Calculated annual sustainable yield from karri forest available for timber harvesting		
KARRI MARRI		
SUSTAINABLE YIELD		
Gross Bole Volume(m <sup>3</sup> /an)	Concerned over the allocation of Gross bole volumes into log grades.	This is not an allocation but an indication. It will change as a result of economics and technology advances.
1992-2001	417 000	90 000
2002-2036	417 000	90 000
LOG PRODUCT YIELDS 1992-2001		
(current specifications)(m <sup>3</sup> /an)		
First grade sawlogs	214 000	
Other saw logs	103 000	
Thinning residue(1)	100 000	
Sawlogs	13 000	
Other logs	77 000	
Forest Residue(2)	75 000	
(1) Logs below sawlog specifications, derived from thinnings in regrowth forest.		
(2) Wood additional to gross bole volume (branchwood)		

## **Appendix 2**

### **Advice from the Technical Advisory Panel**



**Advice on Issues related to Impacts of Forest  
Management on the Environment and the  
Functioning of the Forest Ecosystem**

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**Technical Advisory Panel on Forest Review**

**Advice to the Environmental Protection Authority**

**Perth W.A.  
September 1992**

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## **Appendices**

- A. Terms of reference
- B. TAP responses to selected EPA questions
- C. Example of table describing trade-offs

## Summary of Advice

This document is a summary of the advice, both oral and written, provided to the Environmental Protection Authority by the Technical Advisory Panel (TAP) appointed to advise on technical matters associated with the review of CALM's "Draft Management Strategies for the Forests of South-West Forests of Western Australia" February 1992. The main issues of concern to the TAP include ; .

### Dieback

Dieback, *Phytophthora cinnamomi* (Pc) is still spreading and affects over 14 percent of the Jarrah Forest. CALM appears to be moving away from the sophisticated hazard rating and hygiene practices that have been developed to manage the disease. In addition CALM appears to be placing a greater emphasis on limiting the overall number of movements in the forest as a trade off for liberalising other control measures.

There is concern about the consequences of a succession of wet years on the spread of the disease and the implications to the timber industry. A responsible strategy to protect industry from not being able to log during wet summers needs to be developed. In the absence of a strategy to address this problem CALM has relaxed hygiene procedures.

There is also concern about the potential impact of Pc on lignotuberous regeneration in the Jarrah forest. More information is needed on the effect of Pc on the persistence of the stock of lignotuberous plants. It is from this source that the next stand generation will develop. CALM needs to monitor the effects of operations and silvicultural practices on dieback in the intermediate and low rainfall zones of the forest. Disease expression should be evaluated before and after thinning and the forest improvement and rehabilitation trials over a range of sites. The focus on *Banksia grandis* appears misplaced. CALM should identify the role of understorey species other than *B. grandis* as hosts for Pc and determine the ecological effects of the proposed changes in the Jarrah forest understorey composition.

### Salinity and Road, River and Stream Zones

Overall, the impact of forest operations on salinity are low. However, parts of the 900-1100 mm zone of the forest (the IRZ) are susceptible to salinity increases following heavy logging operations. The proposed road, river and stream reserves and associated silvicultural management provide improved water quality protection relative to the original EIS reserve system. However the 1992 proposals apply to the entire south-western forest. More flexibility is desirable in defining stream buffer sizes relative to local risks and specifying management goals. The current proposal will not eliminate the risk of groundwater discharge in the most susceptible areas of the forest.

A phased logging approach is proposed in those areas where the environmental impact of increased salinity is considered particularly important. Monitoring of research catchments should continue to determine appropriate thinning regimes for the maintenance of water yield and quality. The phased logging approach is based on a permanent 50 metre buffer and a two-phased logging operation separated by about 15 years. In each logging phase a downslope area remains unlogged that represents between 15 and 30 percent of the upslope cut-over area. As this approach is costly and logistically difficult it should only be implemented in regions where the environmental impacts are high.

Through joint planning and water resource and conservation values, the Water Authority of Western Australia (WAWA) and CALM could identify regions where phased logging may be justified over the next 2 to 3 years.

A standard corridor width (equivalent to stream buffer zone) is not meaningful for terrestrial vertebrates. CALM needs to define the principle management objectives at a regional level in order to determine the appropriate corridor widths (buffer zone) for terrestrial vertebrates. The life history strategies of a selected number of aquatic insects and the effects of forest management on them should be determined to resolve uncertainties about the effect of salinity and turbidity. The faunal conservation objectives for the reserve system, stream zones and linkage corridors should be determined at a regional level. Management priorities should be defined and life history information on key vertebrate species used to determine the appropriate corridors widths. Further investigations are needed of the ecological functions of road reserves to determine the ecological cost (if any) of the proposed intensification in timber harvesting in some road reserves.

### **Habitat Trees**

The TAP is not convinced that the proposal to retain the equivalent of three habitat trees per hectare is adequate. There is a need to re-examine the requirements of fauna in multiple use forest to determine habitat tree requirements of priority species taking into consideration animal behaviour and tree mortality.

### **Forest Nutrients**

The TAP recognises that natural nutrient levels within the soils of the Jarrah forest are extremely low. The vegetation is consequently highly adapted to low nutrient levels. There is little indication that nutrient depletion is a serious problem now. However, the amount that is removed by harvesting, fire and other management practices, though virtually undetectable in the short term could be significant over decades. If a problem did develop many of the elements could be replaced through the addition of artificial fertilisers. However there may be difficulties with maintaining nitrogen levels due to the degradation of the soil litter substrate. Nitrogen replacement depends on biological fixation and Pc is known to attack some nitrogen fixing species.

### **Old Growth Forest**

There is no clear indication in the CALM documentation of the harvesting strategies for old growth forest outside the reserve system. Nor is it clear on what basis CALM and the Australian Heritage Commission(AHC) have allocated the forest which satisfies their agreed old growth criteria between the reserve system and multiple use forest.

The TAP considers the CALM/AHC agreement on old growth forest acceptable provided that linkage/reserve zones are satisfactorily outlined during detailed planning at the regional level.

### **Fire Management.**

The document conveys an impression of the absence of effects of the current fire prescriptions on many components of the fauna and flora when the factual basis for this is very small. For example very little is known of the effects of low intensity fires on invertebrates. These organisms underpin other components of the ecosystem and further investigations are required.

Whilst the TAP recognises CALM's legal obligations to reduce the threat to life and property from bushfire, ongoing research into the ecological impacts of fuel reduction burning is required. Public disclosure of such factors as the fire risk in different areas and the area of forest subjected to different fire prescriptions is supported.

CALM should quantify the risks associated with its fuel reduction burning at a regional level including the probability of prescription burns "escaping" and of "no burn" areas surviving the impacts of bushfire. This information should be made available to the public.

## **Forest management - a cautious approach**

The TAP found that the documentation did not specify the assumptions within CALM's yield projection modellings, the trade-offs involved in allocating the forest resource between conservation and timber production and the extent to which CALM is constrained in making decisions about forest management. Of particular concern is the absence of discussion on the trade-offs between production, environmental protection, social values and resources in arriving at the proposed land-use strategies. With-out this information it is not possible to determine how CALM arrived at its proposed forest management strategies or what other options may have been considered. The trade-offs, assumptions and any contractual constraints upon CALM should have been stated in the documentation.

The TAP feels that under the precautionary principle CALM should develop and implement adaptive management strategies to resolve uncertainties associated with certain aspects of the proposal. These include; salinity control and aquatic ecosystem protection, stream and linkage zone widths for faunal conservation, disease management under wet summer conditions, provision of habitat trees and the impacts of prescriptive burning on components of the biota.

The TAP therefore advises that the proposed changes in management practices be limited in area and phased in over time as individual aspects of the strategy are developed. On-going management of the forest should be based on research which is directly linked with operations. This is essential if the effects of operations on environmental values are to be gauged.

# 1. Introduction

## 1.1 Terms of Reference

In April 1992, the Environmental Protection Authority (EPA), as part of its assessment of the Department of Conservation and Land Management's (CALM) proposed amendments to its Forest Management and Timber Strategies, appointed a Technical Advisory Panel (TAP) to provide scientific and technical advice on various issues associated with forest management. The advice from the panel was to be used in conjunction with information obtained from various other sources in assessment.

The Environmental Protection Authority identified broad issues on which advice was sought. These issues were identified from the 1992 CALM proposals and public comment on these proposals and the 1987 Environmental Conditions on WA Chip & Pulp Co Pty Ltd and CALM Management Plans.

A list of questions on specific technical issues were also incorporated within the Terms of Reference (see Appendix A). Whilst the TAP chose to answer a selected number of these questions (Appendix B), its main emphasis was on the broad strategic issues considered to be of greatest importance.

The members of the TAP included;

Professor Albert Main (Convenor), former Chairman of the Environmental Protection Authority

Dr Joanna Young, former research scientist with CALM

Mr Ian Loh, Water Authority of Western Australia

Dr Frank Hingston, CSIRO

Dr Rick Howe, Western Australian Museum

Dr Bernie Dell, Murdoch University

## 1.2 Meetings, Supporting study and Form of reporting.

The TAP held a total of seven meetings in July and August 1992 including three with the EPA and one with the Executive Director of CALM. The TAP was asked to provide an oral briefing of its findings at the EPA meeting on August 6th, 1992 and prepare this written report. The Department of CALM also provided an unsolicited response to the TAP questions which is presented as an appendix of the main EPA assessment report.

In addition to the TAP, the EPA contracted Dr Ken Shepherd of ANUTECH Pty Ltd to place the CALM proposal within an international and national perspective. Dr Shepherd, who has a professional and academic background in forestry attended two of the TAP meetings and undertook a field trip to the Southern Forests to examine current silvicultural practices. Apart from attending the two TAP meetings Dr Shepherd worked independently of the TAP.

## 1.3 Limitations on Advice

After detailed consideration of the issues, the TAP concluded that some of questions within its brief went beyond the membership's area of expertise. Where this occurred the TAP sought professional advice elsewhere.

Limitations on time and resources resulted in a decision to focus on a limited number of key issues. These were the issues considered by the TAP to be of highest environmental significance within the context of the current proposal and included dieback; salinity; old growth; road, river and stream zone; nutrient loss; fire management and conservation and production trade-offs.

## 2. Technical Response

### 2.1 Dieback

#### 2.1.1 Background

In CALM's 'Draft Management Strategies for the Forests of South-West Forests of Western Australia' (FMS), no long-term objectives have been stated in relation to dieback caused by *Phytophthora cinnamomi* (Pc). The reality is that the jarrah forest is an extensively infected forest and the disease is causing irreversible damage to the ecosystem over a large area. The species composition of the understorey is being dramatically changed with loss of species of the *Epacridaceae*, *Proteaceae* and some other understorey species.

Dieback policy over the past two decades has been based on trying to minimise the spread of the fungus from diseased to uninfected areas. This has required extensive mapping and restrictions on movements within the forest. This policy, based only on minimising spread, is severely and unnecessarily limited. In the development of silvicultural prescriptions, the effects of different practices on disease development and the long term fate of jarrah and understorey species must be considered. Disease spread will probably be exacerbated by logging, thinning, disturbance and perhaps burning on some sites if the canopy is lost.

Concern is now being expressed within and outside CALM on the relaxation of policy. Thirty percent of dieback free forest may now be logged in winter (in other words wet soil conditions) and the fungus will be spread under such conditions going on past evidence.

Thus effects of disease should be considered both in terms of future jarrah timber supply and the effects on understorey and associated fauna.

The fungus does not sporulate prolifically below 15°C and its maximum growth is at around 30°C. The microclimate near and below ground greatly affects the rate of pathogen development and fate of individual trees after infection. The water status and temperature of soil and plant tissues greatly influences the activity of the fungus. Well watered trees are more vulnerable than drought stressed trees. Appreciating that this fungus "takes off" in temperatures greater than 15°C the effects of canopy removal on soil temperatures should be considered.

The Pc issue may have been considered by CALM during the formulation of their strategies but this is not apparent within the document.

#### 2.1.2 Reason for Concern

- The disease is expressed in the Intermediate Rainfall Zone (IRZ) of the forest e.g along the Perth Muja powerline. The infections resulted from field operation in the days before the implementation of forest hygiene.
- the disease is worst in wet years. It is really 20 years since the last years of well above average rainfall for the northern jarrah forest. CALM does not have a strategy to help the timber industry cope with further restrictions on operations during wet summers. Above average summer rain recently resulted in CALM relaxing hygiene prescriptions, which seems inappropriate.
- CALM has not assessed dieback expression before and after thinning. A report on effects of thinning on the vulnerability of jarrah, to Pc does not seem to be available.
- Often disease expression and symptom development is slow and subtle but long term consequences of the disease in this context, within the Intermediate Rainfall Zone of the

forest cannot be ignored. Pc can affect growth of jarrah without necessarily causing mortality.

- Effects of the disease on different vegetation types, understorey species and flora seem to have been ignored by CALM in the timber strategies document.
- There is a great lack of information about disease expression in the southern forests. Many understorey species are being killed and their conservation status is unknown. The focus on *B. grandis* with little regard for other understorey host plants appears misplaced (see below).

### 2.1.3 Hygiene

Dry summer soil conditions are the only really safe time to harvest jarrah. If mapping is accurate, logging may continue under wet soil conditions but there is a much greater risk of spreading the fungus on the machinery. CALM responded that the risk would be reduced because the strategy reduced the number of incursions into the forest and there is more comprehensive removal at one time.

### 2.1.4 Regeneration

A critical appraisal of regeneration as a result of silvicultural practices in the Jarrah forest is required as this issue has not been examined in detail in the past.

The effects of the fungus on regeneration are also unknown. Uncertainties such as whether seedling regeneration occurs on old dieback sites and the impact of different fire regimes on the health of lignotubers requires examination. For example fuel reduction burning may result in a reduction in canopy cover through time increasing soil temperatures and fungal activity.

The possible effects of the fungus on jarrah regrowth within gaps if they become infected is unknown. The TAP expressed concern about lignotuber regeneration in the jarrah forest affected by Pc. In extremely wet years it is unknown what the repercussions are for disease and regeneration. We are concerned about consequences of a succession of wet years on Pc spread throughout cut-over areas.

Discussion about possible uses of jarrah selected for resistance to Pc is absent from the CALM document.

### 2.1.5 Banksia Removal

A case either for or against *B. grandis* removal could be developed. CALM appears to be arguing that as this species is a major vector of Pc its removal will reduce the risk of disease spread. They claim the population level is higher now than in pre-european times and as such there is justification for selective removal in multiple purpose forest. Furthermore *B. grandis* will always be present because of its vigorous reproduction strategy.

In its discussions with CALM on this issue, the TAP expressed concern about the possible ecological consequences of the removal program and the emphasis that was being placed on this species.

Concern was expressed by members about the role of the species in providing food for insects and animals at critical times in the year and during drought. Secondly the TAP was surprised at the emphasis being placed on this species when it is known that there are many other plant vectors in the forest understorey.

It was the TAP's view that the importance of the *B. grandis* reduction program is over-rated and further work is required to determine the significance of other trees and shrubs for fostering the penetration of Pc in deep soil profiles.

## 2.2 Stream Reserves and Salinity

### 2.2.1 Stream Sediment

CALM proposes that a riparian buffer of at least 20 metres is left un-logged on all first, second and third order streams. This will significantly reduce the effect of logging operations on stream turbidity levels relative to the original Environmental Impact Statement (EIS) prescriptions established for the southern forest region in the early 1970s. While minor turbidity events are still likely to occur from time to time they are not likely to be a significant environmental concern.

### 2.2.2 Stream Salinity

Research results have shown that:-

- (1) a wide range of salinity responses are possible following logging, with the IRZ being the most susceptible to salinity increases from forest operations;
- (2) the salinity response is a function of the local soil salinity levels in valley areas and the chance that this salt will be mobilised by rising groundwaters following the logging;
- (3) the salinity risk in the LRZ is low where the depth to groundwater is large (greater than 6 metres), and;
- (4) the salinity risk in the High Rainfall Zone (HRZ) is low as salt storage is low

The risk of local salinity increases following logging in the IRZ is highly variable locally. Areas exist where either the depth to groundwater or the local soil salinity is such that only small amounts of salts are mobilised following logging. In these cases only minor increases in salinity occur. Annual mean flow-weighted salinities commonly remain below 250 mg TSS/L and base flow salinities would rarely exceed 1000 mg TSS/L.

In areas where average shallow soil solute concentrations above the water table exceed about 2000 mg TSS/L and depths to water are less than 6 metres salts can be mobilised following logging and increases in salinity can result. Base flow salinities in excess of 1000 mg TSS/L at the start and end of the flow period can develop locally and annual mean flow-weighted concentrations in excess of 500 mg TSS/L can occur in dry years.

The effects of logging local high salinity risk sites are diluted at the medium scale (50 sq. km) by the effects of logging other lower salinity risk areas in the IRZ. However the high salinities at the start and end of the flow period are less likely to be diluted than those in the main winter periods. This is because the salt sensitive areas commence flowing earlier and cease flowing later than the less salt sensitive areas.

High rainfall zone tributaries provide additional dilution of these IRZ disturbances to the extent that the overall impact of logging operations at the large water resources scale is minor.

The 1992 Karri Forest management strategy proposes at least 20 metre stream buffers and a reduction in coupe size (to a maximum of 80 ha) as means of reducing the impact of clear-felling on salinity. In the Jarrah Forest the strategy proposes to maintain a 15m<sup>2</sup>/ha basal area and ensure that 30% of the coupe area remains uncut in second order catchments.

These measures will reduce the impact of logging on salinity relative to previous logging prescriptions. However, as the new proposals only retain 20 to 30 metres of stream buffer (3% to 5% of likely upslope logged area) the proposals will not eliminate the risk of groundwater discharge in the most susceptible areas.

### 2.2.3 Phased logging

Alternative measures to further reduce the risk of saline groundwater discharge following logging are worthy of consideration. The phased logging approach is based on a permanent 50 metre buffer and a two-phased logging operation that is separated by about 15 years (the time to re-establish the hydrologic balance). In each logging phase a downslope area remains unlogged that represents between 15% and 30% of the upslope cut-over area.

These proposals could pose additional cost and cause logistic difficulty to forest operations. Therefore their application should only be considered where the environmental effects of high, low flow salinity are considered particularly important, or in sensitive water supply catchments where logging in IRZ zones of water supply catchments are not diluted by streamflow from higher rainfall zones within the catchment.

The Water Authority and CALM, through joint planning of water resource and conservation values, could identify regions where phased logging may be justified. Cheaper methods to identify the local risk areas within these regions also need to be developed. Research involving both hydrologic modelling and experimental studies should aim to evaluate the 1992 proposed management with and without phased logging. Much of this work could be developed over the next 2 to 3 years.

### 2.2.4 Water Yield

Hydrologic research has clearly demonstrated that forest logging increases water yield in the early years following the logging. As the forest regenerates water yields decline and can reduce below prelogging levels if dense regrowth stands are allowed to develop. On-going management of regenerating stands is required in water supply catchments to avoid significant reduction in water yields.

As the draft 1992 Forest Management Strategy seeks to maintain the current age structure of the Karri Forest there should be no major reduction in water yield in the middle of the next century by which time the major water resources of the southern forests are likely to be developed. However on-going monitoring of research catchments should continue to determine appropriate thinning regimes to ensure that possible declines do not occur.

### 2.2.5 Impacts on Aquatic Ecosystems

Removal of vegetation (especially overstorey) in the vicinity of streams and wetlands is known to increase water temperature. This is known to impact on the composition and density of invertebrate species.

Monitoring in southern forest catchments has shown in some circumstances there are two peaks of salinity events (one each at the beginning and the end of the stream flow period) following logging in the 900-1100 mm rainfall zone of the forest areas. This possibility is based on initial monitoring of macro-invertebrate communities downstream of three research catchments near Manjimup and macro-invertebrate salinity tolerance studies in Victoria. Whilst only limited study of these effects have been undertaken in Western Australia the overall regional impact is likely to be minor for the following reasons. It is only the macro-invertebrate species composition, not the richness or total abundance of taxa that was found to be significantly different downstream of the clearfelled area. Species present in the south-west of Western Australia have evolved in conditions where streams naturally dry up each season and should be tolerant to desiccation. They may therefore be tolerant of seasonal salinity changes. The areas where peak salinities are increased significantly are limited to part of the 900-1100 mm rainfall zone. Gradual re-colonization from unlogged and unaffected areas could be expected.

Nevertheless if regional water resource and forest conservation planning studies identify important wetland communities or river reaches worthy of special protection, modified forest management practices to further minimise the risk of salt discharge following logging could be warranted

A proposed phased logging approach is detailed in section 2.2.3 above. While designed to minimise salinity impacts the phased logging it would also minimise the possible effect of logging on water temperature.

Research into the life history strategies of a selected number of insects is desirable to improve our knowledge of forest disturbance and aquatic ecosystems.

### **2.2.6 Stream width implications to Fauna.**

The proposed buffer zones around first and second order streams is commendable, however the proposed minimum 20 metre buffer may substantially limit the conservation value and function of these zones for fauna. There has been no quantitative work to determine the required width of riparian zones for terrestrial biota in Western Australian forests. Studies summarised by Wardell-Johnson and Nichols (1991) indicate that riparian associations generally have a more diverse assemblage of vertebrate species. Wardell-Johnson et. al (1991) recommended that a corridor of 50 metres be retained each side of first, second and third order drainage lines. This recommendation has not been adopted in the CALM proposal for riparian areas.

## **2.3 Zone and Corridor Widths for Conservation**

### **2.3.1 Size and Function**

The size of faunal conservation corridors can only properly be determined after defining the purpose for which they are to be managed. This is regardless of whether they are located along streams, roads or they join forest blocks. Corridors function differently for different organisms.

If zones and corridors are to be managed for faunal values, more needs to be known about the life history strategies of the individual organisms present. Unless we have the knowledge of how these corridors operate and understand what they contain we cannot assess the true benefit. Decisions are also required on the priority given to each species and the frequency in which these areas are likely to be disturbed in the future.

The life history data of the "priority" organisms can be used to determine the zone width(s) according to the management objectives for each species within geographic areas. Some knowledge of what is currently within these reserves system and how they might be operating is obviously a prerequisite to making decisions on corridor function and widths.

Invertebrates are much more substrate specific and distributions are much more patchy. As such corridors will act more as refuges. For the more mobile species obviously it will be crucial to maintain gene flows and these corridors will act as linkage between reserves.

### **2.3.2 Width of road zones**

Logging in and the reduction of width of road reserves will alter their value as faunal refuges and corridors. However, there is no research data from south west Western Australia to identify the nature or significance of this change. Conservation reserves linked by corridors will be more effective than those that are isolated while larger corridors are more effective for movement and refuges of their composite fauna. Harris and Scheck (1991) suggest the following principles should be adopted :

- a. *when the movement of individual animals is being considered, when much is known about their behaviour and when the corridor is expected to function in terms of weeks or months then the appropriate corridor width can be measured in metres (c. 1-10m)*
- b. *When the movement of species is being considered when much is known about its biology, and when the corridor is expected to function in terms of years then the corridor width should be measured in hundreds of metres (c. 100-1000m)*
- c. *When the movement of entire assemblages of species is being considered and/or when little is known of the biology of the species involved, and/or if the faunal dispersal corridor is expected to function over decades then the appropriate width must be measured in kilometres*

Further investigation of the ecological function(s) of road reserves system is warranted to determine the ecological cost of an intensification of harvesting and whether visual resource management can act as a surrogate for ecological needs.

In terms of visual resource management, the retention of 400m on one side only of the road reserve would be beneficially in an ecological context. However, in the event of a fire the entire zone would be lost whereas if 200m were retained either side only one side would be damaged. Obviously these situations represent a trade-off.

### **2.3.3 Implementation and Monitoring.**

It may be difficult for field staff to adhere to the zone distance criteria when applying buffers. To apply exact distances either side of the stream would not take into account ecological boundaries.

Technology such as geographical information systems would help to identify ecological boundary areas and CALM should be given greater flexibility in deciding on boundaries than prescribing finite minimum distance criteria.

Monitoring and operation should go hand in hand and although there has been opportunity to do this in the past, it has not occurred. There is some knowledge of what widths may be required to protect composite elements of the fauna but this information has not been documented.

### **2.3.4 Impacts of Fire**

In terms of protecting invertebrate fauna it would be more beneficial to maintain 200m either side of the road in the event of a fire as these organisms are relatively immobile in comparison to vertebrate fauna.

Many fire studies look at post-fire events to make assessments and comparisons on the effects of burning. It would be beneficial to have information on a burnt area's pre-burnt status to make general statements on the impact of fire on biota.

## **2.4 Habitat Trees**

There is little knowledge of the density and role of habitat trees within the mature forests of Western Australia. The CALM proposal for habitat trees is based on research into the requirements of a single possum species which is just one of approximately 20 mammals which may use hollows within the Southern Forests. In addition there are many other vertebrates including birds which require tree hollows for breeding and shelter, some of which cannot exist without this habitat.

The TAP is not convinced that the tree retention proposal is adequate and CALM's own data supports this view. Inions (1985) reports that possums required three habitat trees per hectare. Other species such as birds require additional hollows with different characteristics.

The spatial distribution of habitat trees should also be considered. It is difficult to determine the "optimum" distribution of trees without defining the conservation management objective for an area. Animal behaviour needs to be considered when making such decisions.

There are also concerns about the selection and long term viability of these trees. It is difficult to decide what are the best habitat trees unless considerable time is spent on the ground observing. Just because a tree has hollows and is 200yrs old does not necessarily mean that it is being utilised by fauna.

Many trees are also likely to die in the short to medium term as a result of the normal mortality factors operating on the population. This would be a problem if the remaining forest was managed at the "juvenile" end of the age spectrum which is consistent with timber production. Even if there is recruitment from regeneration, it would take many decades for the habitat function to be replaced and hence there would be major changes in fauna composition and population levels over time.

Whilst the TAP commends CALM for taking this initiative, consideration should be given to retaining more trees and to defining their habitat function if forests are to be managed for multiple use.

## 2.5 Forest Nutrition

The statement that there has been no recorded evidence that there is a decline in the growth of the forest is not a very firm basis to decide whether the forest is being depleted. There are three reasons for this (1) variability within the forest itself, (2) changes are extremely small in comparison with the stores of nutrients in the forest and its response, and (3) the whole system is adjusted with a lot of feedbacks in it.

However, the TAP considers that the only nutrient of concern in the long term (100-200yrs) is the loss of nitrogen from the jarrah forest system. The document offers a balance for this and other elements, but TAP believes this to be a brave step by CALM as some of the numbers are extremely difficult to extrapolate from the experimental areas that have been looked at.

The system in the karri forest is reasonably uniform partly due to CALM's burning practices which encourage the growth of nitrogen fixing plants and a fairly uniform understorey. It is reasonable to assume input of Nitrogen into the system is uniform and values estimated (given in the literature) are reliable.

In the jarrah system this is not the case because the distribution of nitrogen fixing understorey plants is patchy and there is little knowledge of the efficiency of the composite species. Therefore a greater degree of caution may be warranted in accepting literature estimates as applying to the jarrah forest.

The amount of organic matter in some areas of the jarrah forest may also decreased over the long term due to the sandy nature of soil and management practices such as fire and removal of biomass. It is important that the organic matter is maintained from the soil conservation and nutrient viewpoints.

The TAP does not believe that there is likely to be a problem with phosphorous and other macro-elements in the short to medium term for either the jarrah or karri forest. If major deficiencies do eventuate over time the problem could be resolved through the addition of fertilisers. There is evidence from other native forest areas however that use of fertilisers can result in weed invasion.

In conclusion whilst the TAP does not consider nutrient loss is a major issue in current forest management practices it would be wise to establish a long term monitoring program as a precautionary measure. Further discussion on forest nutrition is included in the TAP's response to the specific EPA questions (see Appendix 2).

## **2.6 Old Growth Forest**

The Forest Management strategies document does not present data on the areal extent of forest types in conservation reserves or parks. CALM should prepare a table which clearly indicates the trade-offs in order to maintain the multiple use forest structure. This table should clearly indicate (among other things) the area and distribution of old growth forest within the reserves, corridors and multiple use forest at the regional level.

The management objectives for the old growth forest within the reserve system should also be defined as they will vary on a local or regional basis. These objectives will also determine the appropriate fire prescription and corridor linkage configuration.

## **2.7 Fire Management**

Fire management, especially prescriptive burning for fuel reduction purposes is a contentious issue in this state and elsewhere in Australia. There is division within the scientific and forest management community on the impacts of fire on forest structure, composition and biota. The principle issue is not so much whether fire should be used as a management tool, but rather how it is used. It is widely recognised that fire is an inherent component of Australian forest ecosystems and wild fires will occur irrespective of human activities.

In the past fifteen years CALM has implemented an aggressive fuel reduction program, designed principally at reducing the probability of crown fire development during adverse fire weather conditions. From a fire suppression perspective there is evidence of the success of this program. However success comes at a price including the possibility of some burns escaping and there may be adverse impacts on biota under some circumstances.

It is the TAP's view that CALM should attempt to quantify the risks associated with the fuel reduction burning including the probability of burns "escaping" and "no burn" areas surviving the impacts of bushfire. This should be done at a regional level and made available to the public.

This process may reduce public concern on the fuel reduction issue by explaining the assumptions and judgements made by CALM when implementing particular prescriptions.

The CALM documentation should also recognise that despite past research, there is still much to be learnt about the impacts of fire on the forest ecosystem. Meantime CALM must meet it's legal obligations on fire safety and continue it's research into the ecological impacts of fuel reduction burning.

## **3. Conservation and Production Trade-offs**

There is concern about the lack of discussion of the assumptions within CALM's yield projection modelling, the trade-offs involved in allocating the forest resource between conservation and timber production, and the extent to which CALM is constrained in making decisions about forest management.

Trade-offs are made in every field of resource management and are based on a range of factors including technical/scientific data, political and economic considerations and value judgements.

Whilst it is accepted that CALM has the responsibility for making professional judgements on such issues, there is an increasing need (and public expectation) for CALM to explain policy positions on the major issues. Such explanations would go a long way to allaying the wide spread public distrust of CALM's activities that becomes apparent when reading the public response to the current proposal.

It is ironic that such distrust exists in the community given that CALM is proposing a scheme of management that incorporates conservation objectives which are arguably the most progressive in Australia at this point in time.

A possible format for describing the trade-offs involved in arriving at a policy decision is presented in Appendix C.

#### **4. Adaptive Management**

The concept of adaptive management and its application in renewable resource management is described in detail in Walters (1986). The application of the concept in Australian forestry was also discussed in the Resource Assessment Commissions Forest and Timber Industry Report (1992).

Essentially the concept recognises that limited resource exploitation may be acceptable in circumstances where there are doubts about sustainability etc if the proposal is treated as an experiment. In such circumstances, the resource manager defines the objective of the proposal and predicts outcomes from particular management technique. After defining the criteria used to determine success, the proposal is implemented on a limited scale and the results monitored. If the predicted outcomes eventuate and are considered acceptable in the context of current objectives, the manager continues with the approach. If the original prediction does not eventuate, and the original outcome is desired, changes can be made to the management strategies.

The TAP considers that the principles of adaptive management should be applied in an attempt to resolve the many uncertainties associated with CALM's current proposal.

## Appendix A Terms of Reference - Technical Advisory Panel

### Objective:

To provide independent advice on technical issues relating to the impacts of forest management on the environment and the functioning of the forest ecosystem, with an emphasis on the Jarrah forest indicating the need and priority for further research where relevant.

### Form of Advice:

The Authority has identified several key subject areas in which advice is needed. These key areas derive from CALM's proposals and the requirements of the environmental conditions on WACAP and the 1987 Management Plans. In each of these key areas there are a number of scientific issues on which advice is sought, and these have been framed as questions.

The Authority has grouped the questions together in order to cover as much material within the time available and would be happy to receive your grouped answers. Definitive answers are not expected, we will discuss issues rather than exact details.

In answering these questions the EPA would appreciate an indication of the status of knowledge in that particular field; if widely accepted scientific information exists; if the area is scientifically controversial, and if there is a need for further research. The TAP is also expected to consult with CALM on these issues.

The advice of the TAP will provide a form of scientific peer review of CALM's documentation. It should also identify the environmental trade-offs implied in the management strategies.

### Key Issues

#### Road, river and stream zones

*Under condition 3 of the WACAP approval CALM is required to develop "in consultation with the public, a detailed proposal for those (road river and stream) zones".*

- Will the proposed stream reserve system protect the entire riparian ecosystem or is it principally designed to ensure WAWA potability standards are maintained?
- Can the proposed changes to buffer zone widths along streams and rivers be justified on the basis of the existing quantitative research by WAWA or CALM? Are there divergent views on this issue in the professional research community? If so what are they.
- Is the "fixed width" buffer zone philosophy within each stream order appropriate or should there be greater flexibility according to broader catchment management objectives.
- Is the current stream monitoring program extensive and sophisticated enough to provide a realistic overview of water quality in forest catchments? Are the criteria used by WAWA appropriate for the protection of aquatic ecosystems?
- Is there evidence to support the view that there has been no increase in stream salinity levels in the South West forest catchments in the past decade (?) resulting from forestry management? Are salinity and turbidity levels in the majority of river systems likely to be maintained, reduced or increased under the proposed management strategy.

- To what extent will the proposed logging of the road zones reduce their value as faunal refuges and corridors?

### High Value Old Growth Forest

*Under condition 4 of the WACAP approval CALM is required to "identify within old growth State forest: (1) additional areas of high value old growth forest meriting special treatment in the sense that they should be managed and harvested flexibly rather than subjected to broad-scale clear-felling; and (2) areas which should be excluded from harvesting to protect their exceptional scenic, faunal and other amenity values."*

- Is CALM's proposed definition of old growth forest ecologically appropriate?
- According to the Resource Assessment Commission (RAC) and the draft Commonwealth "New Focus" Forest Policy statement, protection of old growth values is "a matter of urgency". The RAC suggests that WA has the lowest proportion of old growth in reserves of all Australian states. To what extent will the old growth values of forest listed by AHC for old growth values but within State forest be impacted/protected by the CALM/AHC agreed logging procedures for these areas?
- The American literature mentions the significance of old growth heartwood (lignin) for the development of humus and mycorrhiza. Is there any evidence of this in WA?

### New Jarrah Silviculture

*Under condition 5 of the WACAP approval CALM is required to refer to the Authority for assessment "any proposal to harvest wood from the salt risk zones of the Central and Northern Forest Regions, by more intensive methods than selection cut harvesting".*

- Is it possible to determine the spatial and temporal management thresholds for stand species/age composition to ensure that "non-favoured" species are not selected out of the ecosystem by the proposed silvicultural techniques?
- Assuming that it takes about 20 years for Jarrah forest to recover crown density after intensive logging, is there any research to suggest how long it takes for crown density to recover after coppice poisoning in conjunction with intensive logging?
- What quantitative data are there to support the ten square metre per hectare basal area criteria used in jarrah silviculture. What are the ecological implications for managing the overall resource in this basal area regime or elsewhere?
- Is the proposed distribution of trees between the age classes balanced enough to create a structurally mature forest? What are the ecological implications if a forest consists of a limited number of discrete age classes rather than a mix of individuals representing all ages of classes through to 200 plus years?
- Page S1 of the Draft Forest Management Strategies document says "... There is no evidence that any of (the major biotic and abiotic) processes are being impaired under existing forest management strategies."  
Is there evidence of non-major abiotic/biotic processes being impaired under existing strategies and if so, what are the long term implications?
- What are the ecological implications/costs of using the chemical Tordon in the JSI?
- Is the linkage system proposed for the Karri forest also suitable for Jarrah?

- Is there evidence of degradation in forest soil structure/nutrient status as a result of current or past forest management practices in the Southern Forests.
- What data are there on whether 15 'habitat' trees per 5 hectares are adequate for faunal conservation? How long would such trees be expected to last? How can potential replacements develop from selected crop trees? What measures are suitable for selected crop trees?
- What measures are suitable for non-mammal faunal conservation?
- It has been estimated that 127 million cubic metres of increased streamflow can be achieved by Jarrah thinning, however that only 48 million cubic metres of this could be utilised because of increased evaporation and system collection limitations. What is the basal area which would be required in order to produce the 48 million cubic metres over all forest zones? What is the basal area which would be required if this extra were to be collected from the higher rainfall zone only?
- What evidence is there that a minimum of 15m<sup>2</sup>/ha basal area and temporary exclusion zones will be sufficient to prevent salinity increases in the intermediate and low rainfall zones?
- After coppice poisoning it has been found that groundwater rises with no levelling off for at least 4 years. Does any other research suggest how long groundwater would take to stabilise after coppice poisoning? What is the significance of this ground water rise?
- Has any salinity/groundwater research been undertaken for the central or northern forests in relation to intensive integrated logging and thinning?
- What fire regimes would improve the availability of nitrogen and phosphorus? What other management practices might improve nutrient availability? In some Eastern States forestry operations the bark is removed in the forest. Would this technique significantly improve nutrient recycling in karri or jarrah forests?
- Do the hydrological conditions in a logged/thinned forest tend to favour the spread of phytophthora? Is there sufficient cause for concern to justify monitoring or the consideration of management alternatives? Is information available on any connection between the condition of the litter layer and *Phytophthora cinnamomi* ?
- Do the conditions in a logged/thinned forest tend to favour the activity of jarrah leaf miner? What about gum leaf skeletoniser?
- What will be the ecological cost of the *Banksia grandis* reduction program? Is it likely that the *B. grandis* population is currently greater than it was in the pre-european times?
- What is understood of the ecological role of the soil/litter flora and fauna in WA forests? What is known of the relationship between the condition of the forest canopy and the activity of soil/litter flora and fauna?
- Is the proposed Jarrah silviculture sufficiently flexible in the field to adjust for the many environmental variables encountered in addition to soil and climate.

### **Fire Management and Ecology**

- Is the current state of knowledge with regard to the life cycles of plants and animals adequate to determine that fire management regimes will ensure the maintenance of species diversity at the local level.

- What fire regimes would favour mycorrhizal fungi?
- Are the proposed fire management regimes for old growth forests and conservation areas appropriate given the structural/species/habitat objectives for these areas?
- What impact is the current high frequency fire management program having on the relative species abundance, age structure, habitat diversity?
- Does high frequency burning select for pyrogenic vegetation types on sites where fire sensitive (less pyrogenic) species once dominated (e.g. sites that may have experienced relatively low fire frequencies in the past such as wetlands, lee side on hills)?
- What percentage of the total forest area should be subjected to each intensity/frequency management regime? What are the likely ecological implications of the current biased towards spring burning? If there is a problem what is the appropriate "mix" of spring and autumn burning regimes?
- What is the evidence for an explosion in the fox population? Is the current fire management regime a likely cause of the problem?

### **Marri in salt risk zones**

*Under condition 6 of the WACAP approval, prior to supplying Marri from the salt risk zones to WACAP, CALM is required to prepare to the Authority's satisfaction an Environmental Management Programme giving "prior details of salt risk areas to be harvested, harvesting methods and safeguards to be applied, monitoring techniques proposed and feed-back mechanisms which would be used to modify management if salt impacts were found."*

- Will the application of the proposed river and stream zones, phased logging (i.e. no more than 70% of the forest taken in any second order stream catchment in the intermediate & low rainfall zones) and the new jarrah and karri silviculture adequately ensure no unacceptable increases in salinity?
- Is the proposed stream monitoring programme adequate to determine the impact of salinity on logging and to enable early detection of problems and implementation of modified management practices if necessary?

### **Management adjacent to reserves**

*Under condition 3 of the Region Management Plans approval CALM is required (in relation to the planned reservation of parts of Dalgapur, Lennard, Mullalyup, Preston, Noggerup, Mowen & Dardanup MPAs) to prepare "detailed management proposals for those proportions of the MPAs which have the capacity for direct interaction with the reserved area and will remain within State forest, to ensure protection of the ecological values within the Nature Reserves and Conservation Parks."*

- CALM states that "there is no evidence that any existing management practice in areas adjacent to the conservation reserves has any detrimental effect on the ecological values of the reserves". Can this statement be verified? A possible inference is that there is therefore no cause for concern because the lack of evidence follows adequate investigation. Has the investigation been adequate?

### **Karri Silviculture changes**

- What rotation length gives a mature forest in different Karri forest areas (i.e. is it 250 years, 400 years etc)?

- CALM is understood to apply karri silviculture (which favours the regeneration of karri rather than mixed forest) to jarrah/karri mixed forest with four or more karri trees per hectare. Are there any likely negative environmental impacts from this practice?
- What Old Growth will be left outside the reservesystem after the first rotation ?

### **Reserve system changes**

CALM has proposed changes to the reserve system in South-West Forests

- Is there sufficient research data to assess with reasonable certainty the conservation adequacy of karri reserves, riparian zones, linkage corridors? If not, what are the research priorities?
- Should CALM identify more specifically the species to be conserved in each conservation area and develop more specific active management plans to achieve those conservation objectives?
- Is CALM's assessment that parts of Jardee proposed conservation park and D'Entrecasteaux National Park should become multiple use forest (proposals document p24) appropriate on the basis of the representation of their conservation values elsewhere in the reserve system?

### **Timber strategy amendments**

- The implication from Table 12 is that all the elements of the Standing Timber Volume could be removed from the forest (if markets were available). What would be the ecological implications of this complete removal of the forest biomass on nutrients, disease risk, local hydrology, faunal habitats, etc?
- Is the proposed increase in harvest an indication of more removal per unit area only or also of more area cut over per annum? What are the ecological implications of each of these intensifications of harvest?
- Given the likely increase in scientific knowledge over the next decade is it likely that the "sustainable yield" indicated in Table 13 will need to be revised?

### **Monitoring and Research priorities**

- Are the current monitoring techniques adequate to provide early warning of an impending environmental problem in the Southern forests?
- Is there a case to require CALM to avoid management practices which increase or decrease nutrient status outside a "virgin" or "normal range"?
- Is there evidence of any mammal, bird, reptile or other terrestrial vertebrate population having fallen to a critical level locally or regionally as a result of current management practices?

## Appendix B TAP Response to Selected EPA Questions

- Will the proposed stream reserve system protect the entire riparian ecosystem or is it principally designed to ensure WAWA potability standards are maintained?

Comparison of macro-invertebrate communities in the streams of the catchments was made eight years after logging (Growthns and Davis, 1991). They found the macro-invertebrate community in the stream with no buffer showed differences in composition to that in the nearby unlogged catchment. However, there was no statistically significant difference in either richness or total invertebrate abundance. Observed responses included some taxa being more and other taxa being less abundant in the clear-felled areas than in the undisturbed areas. These responses were probably due to increases in salinity (Growthns and Davis, 1991). However the amount of coarse and fine particulate organic matter were also identified as different, and there was a reduction in nitrogen.

Storey et al. (1991) found that while reduced flow below a dam had an impact on the macro-invertebrate fauna, confluence with a major tributary allowed recovery of the macro-invertebrate community to that expected from an unimpounded river on the Darling Scarp.

Studies in Victoria have suggested that direct adverse biological effects may occur in freshwater rivers and streams when salinity is increased to around 1000 mg L<sup>-1</sup> TSS (Hart et al. 1991). However it must be stressed that there are considerable uncertainties in the scientific information used to assess the affects of salinity increases (Hart et al. 1990) and they may not be readily transferred to Western Australian conditions.

In the jarrah forest CALM has proposed to maintain a 15 m<sup>2</sup>/ha basal area and to ensure that 30% of the vegetation remains uncut in salt sensitive areas. This will limit the risk of salt mobilisation compared with the prescriptions carried out in the southern jarrah forest research catchments. However the proposed prescription does not specifically ensure that any more than about 5% of the lower slope areas (for 30 m wide buffers) it will be available to transpire additional up-slope soil water and groundwater discharge from the logging operation. If groundwater tables are within 4 m of the surface at the end of summer and less than 5% of the up-slope logged area is maintained in a riparian zone, then there is the potential that salts in the groundwater could contribute to the streams even with 15 m<sup>2</sup>/ha basal area retained up-slope.

If the increased salinities at low flows were considered to result in unacceptable impact to high conservation value areas, then the temporary retention of larger lower slope buffer areas would be required. A phased logging prescription or temporary exclusion zone would minimise the chance of high low flow salinities.

The thinning of jarrah forest to 15 m<sup>2</sup>/ha in the intermediate rainfall zone needs further investigation. Two catchment experiments are being operated in the intermediate rainfall zone, in the Yarragil region, which will investigate the salinity response from thinning treatments down to 15 m<sup>2</sup>/ha in a high salt storage and moderate depth to groundwater areas. These catchments provide an opportunity to evaluate the 1992 Jarrah Silviculture prescriptions with and without phased logging.

- What quantitative data are there to support the ten square metre per hectare basal area criteria used in jarrah silviculture. What are the ecological implications for managing the overall resource in this basal area regime or elsewhere?

The reduction of basal area from about 28 to 10 square metres per hectare in the high rainfall zone has been shown to increase growth on the remaining stems and is therefore a

valid and commonly employed silvicultural option for increasing the production of merchantable wood. Thinning to the lower basal area decreases leaf area index and hence significantly reduces water transpired from the canopy. The rate of increase in total leaf area index following thinning is difficult to predict, it depends on a number of factors including year to year variations between seasons, the rate of growth of understorey, coppice stems and previously suppressed lignotubers and the increase in leaf area of the canopy.

- Is the linkage system proposed for the Karri forest also suitable for Jarrah?

Answers from CALM suggest that these linkage zones are implicit in jarrah forests given the heterogeneous nature of this forest type and the logging regime proposed. A map, as prepared for Jarrah Silviculture Training Brief, would prove useful in the final document to highlight this. The circumstances of linkage zones in jarrah could realistically follow the view expressed by Wardell-Johnson et al. (1991) "*We believe that option five [Retain strips or patches of mature forest within harvested areas] remains the most valuable for wildlife conservation and should continue to be the first priority in multiple use forest containing karri*".

- What data are there on whether 15 'habitat' trees per 5 hectares are adequate for faunal conservation? How long would such trees be expected to last? How can potential replacements develop from selected crop trees? What measures are suitable for selected crop trees?

There is no baseline information on the natural occurrence and use of hollows by vertebrates in mature forests. Hollows in mature and senescent trees are essential as rest sites or nest sites and, consequently, for the survival of the many obligate hollow users amongst bird and mammal species in the south western forests. The figure of '15 habitat trees/5 hectares' comes from a single study of the requirements of hollow (den) trees for the Common Brushtail Possum, (Inions 1985). It takes no account of the other 19 mammals and 31 bird species that require hollows for breeding or shelter in south western forests (Christensen 1988). Christensen (1988) presents data on hollow numbers and size in different forest tree species, but presents no data on the size or age of trees that were examined or the criteria for their selection. This is an area where both experimental and observational research is needed

- What evidence is there that a minimum of 15 square metre per ha basal area and temporary exclusion zones will be sufficient to prevent salinity increases in the intermediate and low rainfall zones?

The intermediate and low rainfall zones currently have basal areas just above 20 square metres per hectare and below. A decrease to 15 square metres per hectare would probably have little if any effect. A more important consideration is what proportion of catchments is to be logged.

- What measures are suitable for non-mammal fauna conservation?

Retention of large areas of unmodified habitat is also the key component for non-mammal faunal conservation. Corridors are important in linking these areas so that movement of the more mobile fauna can occur. Corridors that are of suitable size for the persistence or movement of larger vertebrate species will, in nearly all cases, be suitable for the smaller and less mobile invertebrate fauna.

- What fire regimes would improve the availability of nitrogen and phosphorus

Fire regimes resulting in ashing of litter and wood debris release phosphorus from the organic to the more available mineral form. The increase in available phosphorus in the soil is short lived because it is rapidly taken up by vegetation. Hence burning may have a transient effect but unless the fires are frequent and of the intensity of those producing ash beds, phosphorus availability in the long term should be little affected. In bark in jarrah-marri and karri forest would be of the order of 5 kg/ha. This can be compared with readily extractable contents of about 15 kg/ha in jarrah forest soils and 25-55 kg/ha in karri forest soils. If it is economically possible and there are no other hazards to be considered it would be preferable to leave bark in the forest.

The situation with nitrogen is different in that the content of jarrah forest soils is particularly low and the nitrogen in vegetation and litter is volatilised when this material is burnt. Comparison with nitrogen contents published for other Australian Forests indicates that the content of nitrogen in the top metre of Jarrah forest soils is about a third of that in the next least well supplied forest soil. While there are mechanisms for replenishing nitrogen through fixation the extent of this depends on the distribution of nitrogen fixing plant species. Species such as the acacias and macrozamia respond to burning and thereby provide for replenishment of nitrogen lost through fires. However the extent to which this occurs is difficult to estimate in view of the variations in factors that affect fixation rates such as; age of plants, seasonal conditions and the distribution of these nitrogen fixing species throughout the forests. Variation in the distribution of nitrogen fixing species is particularly wide in Jarrah forest in which it is common to find areas where these species are sparse or absent. In the karri forest nitrogen fixing species are often dense and actively fix nitrogen for a longer period in the season. The nitrogen in bark would be about 50 kg/ha in jarrah and karri forests While this is only a few percent of that in the top metre of soil it is about equal to the content of litter in jarrah forest and about 20% of the content of litter in karri forest. As for phosphorus a conservative approach would be to leave bark in the forest in logging operations.

- In some Eastern States forestry operations the bark is removed in the forest. Would this technique significantly improve nutrient recycling in karri or jarrah forests?

Benefits in retaining bark. Again it is a trade-off decision. A fairly significant amount of nutrients are removed in bark when compared to the overall amount of nutrients present in the part of the tree that is removed and in this respect it would be beneficial to leave these large amounts of organic matter behind but this does pose the question of whether this is a fire risk. This is the trade-off. In many local species there is also a problem in that the bark is quite difficult to remove. This may be economically undesirable to remove it in the forest. New technology is however being developed.

- Do the conditions in a logged/thinned forest tend to favour the activity of jarrah leaf miner? What about gum leaf skeletoniser?

Abbott (1992) has recently collated information on this problem. He concluded (p4)-  
*"Taken together this new information conclusively proves that jarrah leafminer outbreak invaded State forest east of Manjimup from the low quality jarrah forest along the upper reaches of the Perup and Tone Rivers"* However, he makes no mention of correlations between damage levels and disturbance history of the forest.

A factor affecting the population of leaf miner or any leaf-eating insect is the palatability of their food source. In as far as logging/thinning or any other management practice increases the flush of new and more palatable leaves in the overstorey and understorey the indigenous leaf-eating insects will be favoured if they are present. (See "The Jarrah Forest" p 128.)

- What will be the ecological cost of the *Banksia grandis* reduction program? Is it likely that the *B. grandis* population is currently greater than it was in the pre-european times?

Problems considering the range of understorey species which can act as a food base for the fungus. The implications for dieback in the southern forest in relation to conservation of species of the susceptible groups is still underestimated. Focus has been unnecessarily upon *B.grandis*. Many other understorey species also act as reservoirs (zamia palms, dryandras, blackboys etc) - why are these not removed?

- What is known of the relationship between the condition of the forest canopy and the activity of soil/litter flora and fauna?

There is no research data on the processes which involve soil litter flora and fauna of W.A. forests. Majer and Abbott (1989) when evaluating the influence of disturbances on the soil-litter invertebrates of the jarrah forest concluded that they were well understood. However, as Wardell-Johnson and Nichols (1991) point out-"*The importance of taxonomic resolution remains critical in studies of the effects of forest operations on invertebrate communities*". In other words the discussion needs to be at the level of genera and species rather than classes and orders.

- Is the current state of knowledge with regard to the life cycles of plants and animals adequate to determine that fire management regimes will ensure the maintenance of species diversity at the local level.

Current literature on the impact of fire on faunal assemblages concentrates on changes recorded in post fire successional stages, and should be supplemented by studies involving pre-and post-burn situations. There are very few invertebrate species for which anything is known of life history strategies.

- What fire regimes would favour mycorrhizal fungi?

Species of fungi that require the conditions associated with a litter layer will not be favoured by a regime where the litter layer is frequently removed by burning. Species that are more prevalent in the mineral soil will be less affected. Mineralisation of nutrients through ashing will favour mycorrhizal fungi as much as any ecosystem component provided the fungi and/or its habitat are not destroyed in fires. Fruiting of fungi is often observed following fire.

- Is there evidence of degradation in forest soil structure/nutrient status as a result of current or past forest management practices in the Southern Forests.

The problem with statements such as "*No conclusive evidence has been produced to show deterioration of any forest ecosystem due to loss of nutrients*" ( FMS p 42), is that it is difficult to prove or disprove especially for long-term effects.

In assessing nutritional effects due to forest disturbance three approaches are commonly applied.

(a) The forest ecosystem can be monitored for changes in plant growth rates or characteristics such as the size of nutrient pools.

(b) The response of the ecosystem to different levels of imposed disturbance can be assessed by measuring changes in nutrient flux rates.

(c) Changes in nutrient status of the ecosystem can be predicted from simulation modelling.

The first approach (a) is least sensitive because of the natural buffering of responses to disturbance, changes are likely to require long-term measurements (perhaps over one or

more rotations) and variability in natural ecosystems makes small changes in ecosystem difficult to detect.

The second approach (b) has potential but has only been applied to a limited extent in jarrah and karri forests. Combined with approach (c) it may be possible to set up some general principles for conservative management of nutrients in natural ecosystems.

The statement "*analysis of the nutrient budgets shows that the quantity of nutrient leaving the ecosystem are relatively small when compared with the stores of nutrients in the ecosystem and inputs over the time period considered*" (FMS p 42), can be reasonably substantiated. The jarrah and karri forest have been subjected to a large amount of research and the information about ecosystem nutrient pools and fluxes is as extensive as any in Australia.

Data on rates of nitrogen fixation are less reliable than that on nutrient stores because of uncertainties in the experimental procedures available for measuring N-fixation and the extreme variability in the type and distribution of N-fixing flora, especially in the jarrah forest. The assumed rate of N input in karri forest (10 kg/ha/year) is realistic for forest areas with a good cover of *Bossiaea laideawiana* and probably for other *Bossiaea* and *Acacia* species in that region. However the rates for jarrah forest (9 kg/ha/year) are probably optimistic as the distribution of N-fixing plants is patchy and there are large areas of forest where they are present in very low numbers or absent.

Experimental data for losses of N through volatilisation during prescribed burning and slash burning are limited.

As indicated previously the amounts of nitrogen in jarrah forest soils are very low and the proportion of the nitrogen of the ecosystem stored in trees is large compared with that in other commercial eucalypt forests in Australia.

The budgets in Table 6 (FMS) are sensitive to these considerations and should be treated with caution. A conservative approach should be recommended for the long-term management of the nutrient status, particularly in the jarrah forest.

- Are the current monitoring techniques adequate to provide early warning of an impending environmental problem in the Southern forests?

There is a need to monitor the impact of forest disturbances on the forest hydrology and water quality of water resources. Current research programs have targeted forest management and bauxite mining in the Northern Jarrah Forest and logging in the Southern Forest.

If the appropriate silvicultural management is carried out then there should be no requirement for additional localised monitoring of the hydrology. However at the medium-scale (10-50 km<sup>2</sup>) there is a paucity of information on the hydrologic impact of forestry operations. Consequently a number of medium-scale catchments should be monitored to determine the more regional impacts of land use practices on water resources in forested areas.

There is considerable uncertainty on the affects of salinity increases on the aquatic environment (particularly macroinvertebrates) within the forest of south-west Western Australia. The current research into the effects of forestry activities on aquatic biota and water quality should include the effect of salinity increases.

- Is there a case to require CALM to avoid management practices which increase or decrease nutrient status outside a "virgin" or "normal range"?

It would be fair to indicate that the disturbance to nutrient status due to forest management could not be considered large from the short-term viewpoint. Relatively small additions of nutrients would replace losses and larger additions may introduce other problems. However for the longer-term conservative management is desirable and it would seem particularly valuable to consider practices that result in soil organic matter being maintained or preferably increased if this can be achieved without increasing wildfire risks.

- The American literature mentions the significance of old growth heartwood (lignin) for the development of humus and mycorrhiza. Is there any evidence of this in WA.

In Western Australia, there are no reports of the significance of wood on the forest floor in relation to mycorrhizal fungi, but the presence of a litter layer is important for some species of ectomycorrhizal fungi.

The American literature indicates that rotting wood and litter may serve as a refuge for ectomycorrhizal fungi during periods of drought, wildfire or forest disturbance.- Decaying logs acting as reservoirs of moisture and ectomycorrhizal activity.

A study of the distribution of ectomycorrhizal roots in Jarrah forest (Malajczuk and Hingston 1981) showed the number of ectomycorrhizal root tips was greater in litter and the surface 0-5 cm of the soil than deeper in the soil. Comparison of the numbers of ectomycorrhizae in sites burnt 1, 6, and 45 years previously indicated that the 45 years unburnt site had the most. However the numbers in 6 and 45 years unburnt sites did not differ significantly and the numbers in the 1 year unburnt site, though significantly lower, approached those found in the other two sites in the winter - spring part of the year. In a later study Malajczuk, Dell and Bougher obtained similar responses to burning and identified the dominant fungal species forming mycorrhizae in several Jarrah and karri sites.

## Appendix C. Example of Table outlining Trade-offs

	Possible Goals of Forest Management	Goals Achieved by	Measure of Success	Preferred by
1	Yield of quality timber at maximum growth rates	Thinning, regeneration, absence of wildfire	Volume or \$ value	Economists
2	Maintenance of ecologically sustainable harvest	Minimum loss of soil and nutrients, regeneration on a sustainable basis	Judged over some appropriate time span	Foresters
3	Reduced fire risk to resource either forest values or water harvest	Hazard reduction burn	Amount of fire damaged timber, maintenance of yield of quality and quantity of water	Field personnel e.g. forestry, water supply engineer
4	Retention of biodiversity	Maintain patchiness in space and time	Must it be local diversity or species richness or species retained somewhere?	Biologists; foresters who see contribution to 2 above
5	Reduced risk of life and property	Reduction of fuel	No losses incurred	Emergency services
6	Satisfy statutory requirements e.g. Bush Fires Act	As specified in statute	As measured by legal requirements	Enforcement agencies legal and insurance public liability
7	Discharge management responsibilities of 'owner' of property	Demonstrate 'due care' etc. requirements of common law	To be seen to be doing something that does not place public at risk	Legal profession as demonstrably satisfying common law requirements
8	Control pathogens e.g. <i>Phytophthora</i>	Hot burns to regenerate Nitrogen fixing legume	Retention of timber and understorey	Foresters, biologists

Not only are there likely differences in first preferences among participants, but they may well have different orders for preference for alternative goals: (when > means preferred to)

Economists	1 > 2 > 3 > 5 > 6 > 4 > 7 > 8
Field Personnel	3 > 5 > 1 > 2 > 4 > 6 > 7 > 8
Biologists	8 > 4 > 2 > 1 > 3 > 5 > 6 > 7
Emergency Services	5 > 6 > 3 > 7 > 1 > 2 > 4 > 8
Legal (Public Liability)	7 > 6 > 5 > 3 > 1 > 2 > 4 > 8
Forestry	8 > 2 > 1 > 4 > 7 > 3 > 5 > 6

} A solution to these disparate preferences requires a series of trade-offs between goals, preferences and the resources available for achieving them.

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## **Appendix 3**

**CALM's response to questions referred to the Technical Advisory  
Panel**



## RESPONSE TO EPA TECHNICAL ADVISORY PANEL TERMS OF REFERENCE

### Road, River and Stream Zones

- *Will the proposed stream reserve system protect the entire riparian ecosystem or is it principally designed to ensure WAWA potability standards are maintained?*

The proposals for protection of riparian zones by extending buffers to all streams is designed to maintain or enhance the multiple values of water, aesthetics and nature conservation. The case to support the redistribution of road and stream zones (favouring additional stream buffers) to protect these three values is set out in papers delivered by CALM staff to a seminar, held in July 1991, which addressed this issue.

The flexibility in width of riparian zones proposed in the draft is aimed principally at ensuring that riparian ecotype vegetation which fringes forest streams can be included in the riparian zones. Because these riparian vegetation types vary in width according to landform, soil and topographic conditions, flexibility in width is essential.

Potable water standards will be maintained not only by the riparian zones but also by phased logging and modified thinning intensity prescriptions.

- *Can the proposed changes to buffer zone widths along streams and rivers be justified on the basis of the existing quantitative research by WAWA or CALM? Are there divergent views on this issue in the professional research community? If so what are they?*

The changes proposed to stream and river buffer zone widths cannot be precisely justified by research conducted by CALM or WAWA.

There is no research data for wildlife or water values in south-west forests which directly addresses the question of buffer width.

Some research conducted in WA compares the impact of 100 metre buffer with no buffer. It is inappropriate to extrapolate the benefits or disbenefits of smaller widths than 100 metres in WA forests from existing research.

What is unanimously agreed in the scientific community is that a buffer system which protects all streams is far superior than one which protects selected streams with wide buffers (Wardell-Johnson *et al.*, 1991; Borg *et al.*, 1987).

- *Is the "fixed width" buffer zone philosophy within each stream order appropriate or should there be greater flexibility according to broader catchment management objectives?*

The proposed stream buffer zone has sufficient flexibility to permit the riparian ecotype vegetation to be targeted when buffers are demarcated.

It could be argued that more/wider stream buffers would be more valuable in the intermediate rainfall zone (in lieu of the low rainfall zone) if water was the only forest value protected by those riparian zones. However, to do this would potentially reduce the delivery of wildlife values at the local level in the low rainfall zone.

Similarly any variation to buffer zone width or allocation in harnessed/unharnessed catchments would also potentially reduce the protection of nature conservation values at the local level in areas where reduced buffers were allocated.

- *Is the current stream monitoring program extensive and sophisticated enough to provide a realistic overview of water quality in forest catchments? Are the criteria used by WAWA appropriate for the protection of aquatic ecosystems?*

The current stream monitoring program is sufficiently extensive and sophisticated to identify impacts of forest harvesting on water quality at the regional scale.

The CALM EMP for harvesting in the salt sensitive zone proposed monitoring of second order catchments to identify changes to water quality which might result from logging. Monitoring of experimental catchments is also continuing to detect trends in water quality following timber harvest. These detailed results can be used to interpret and extrapolate changes detected at the local level.

It is not known if the water quality criteria used by WAWA for domestic consumption are appropriate for the protection of aquatic ecosystems because very little research has been done on the effect of changes to water quality on aquatic biota in WA.

- *Is there evidence to support the view that there has been no increase in stream salinity levels in the south-west forest catchments in the past decade (?) resulting from forestry management? Are salinity and turbidity levels in the majority of river systems likely to be maintained, reduced or increased under the proposed management strategy?*

The best evidence to support the view that there has been no increase in stream salinity levels in south-west forest catchments resulting from forestry management is found in a 1988 WAWA publication (WS27). This publication shows the results of extensive sampling carried out. A table showing salinity trends for 17 fully forested catchments indicates that salinity has declined in all but one of these catchments. This trend is evident despite a history of extensive logging in many of these catchments.

If there were any increases in salinity and turbidity in streams of the south-west resulting from logging operations they are likely to be reduced as a result of the draft proposals because they give greater stream side protection than is contained in existing management.

- *To what extent will the proposed logging of the road zones reduce their value as faunal refuges and corridors?*

No logging is proposed in stream and river zones.

Thinning in regrowth forests within road zones is unlikely to reduce faunal values because thinning is possible in only a small portion of the zone (4 500 hectares out of 72 000 hectares) and prescriptions require retention of habitat trees, undisturbed scrub patches and ground logs which favour wildlife habitat values.

### High Value Old Growth Forest

- *Is CALM's proposed definition of old growth forest ecologically appropriate?*

Old growth is not an ecological concept, however, old trees are an element of the ecology of a forest. A definition of a component of a forest cannot be ecologically appropriate or inappropriate, it merely defines broadly or narrowly a component of an ecosystem, the forest.

- *According to the Resource Assessment Commission (RAC) and the draft Commonwealth "New Focus" Forest Policy statement, protection of old growth values is "a matter of urgency". The RAC suggests that WA has the lowest proportion of old growth in reserves of all Australian States. To what extent will the old growth values of forest listed by AHC for old growth values but within State forest be impacted/protected by the CALM/AHC agreed logging procedures for these areas?*

The RAC Final Report did not suggest WA had the lowest proportion of unlogged forest in conservation reserves, in fact the percentage for dry and wet sclerophyll forests throughout Australia are fairly similar (RAC Final Report, Table 6.2). It is not the intention of the CALM/AHC agreement to "protect" old growth values outside reserves. The agreement with the AHC provides for management of old growth on a regional basis through:

- preservation in reserves and protected zones (>50 percent of all expressions);
- minimising impact outside reserves;
- ensuring the creation of old growth through rotation lengths which allow its development 120-240 years.

- *The American literature mentions the significance of old growth heartwood (lignin) for the development of humus and mycorrhiza. Is there any evidence of this in WA?*

No. We would appreciate copies of the American literature.

### **New Jarrah Silviculture**

- *Is it possible to determine the spatial and temporal management thresholds for stand species/age composition to ensure that "non-favoured" species are not selected out of the ecosystem by the proposed silvicultural techniques?*

Variation in the forest is such that it would not be reasonable to manage to a specific threshold. There is no intention to eliminate so-called 'non-favoured species'. There are deliberate attempts to retain mixtures where they occur. It is generally the case that these species are abundantly represented in the regeneration even when they are less common in the mature overstorey. There is no evidence that these practices have resulted in a loss of these species in the past.

- *Assuming that it takes about 20 years for jarrah forest to recover crown density after intensive logging, is there any research to suggest how long it takes for crown density to recover after coppice poisoning in conjunction with intensive logging?*

Coppice poisoning is undertaken in association with thinning as a deliberate attempt to maintain a lower stand density. The original crown density will not return until the stand again achieves maximum density through growth. This time depends on the intensity and frequency of thinning.

- *What quantitative data are there to support the ten square metre per hectare basal area criteria used in jarrah silviculture. What are the ecological implications for managing the overall resource in this basal area regime or elsewhere?*

Thinning some stands to a density of 10 square metres is based on published research dating from the 1960s as well as on principles of stand dynamics that are common to many species. It is the lowest density that produces maximum stand growth in average jarrah forest. As stated in the forest strategy and the silvicultural specifications there is no intention of managing the overall forest area to this regime. A relatively small proportion of the forest would be at this density at any time or will ever be thinned to this density.

- *Is the proposed distribution of trees between the be classes balanced enough to create a structurally mature forest? What are the ecological implications if a forest consists of a limited number of discrete age classes rather than a mix of individuals representing all ages of classes through to 200 plus years?*

It is not clear what the questioner means by a structurally mature forest. Most natural jarrah stands consist of relatively few age classes, though the age classes present may be quite diverse. A stand consisting of all age classes through to 200 years plus would be extremely unusual. The jarrah forest that is harvested will ultimately consist of

small patches of different age trees up to the rotation age that is chosen for the forest. Each of these patches are capable of achieving structural maturity if the rotation is long enough. Intermixed in these patches will be trees that are already old (habitat trees), while patches of unharvested forest will occur throughout the forest as stream buffers and other reserves. In the future there is the option of keeping some patches, portions of patches or individual trees to a much greater rotation than may be chosen for the rest of the forest. We are not aware of any adverse ecological effects on the forest managed in this way. It can however be adopted as new information becomes available.

- *Page S1 of the Draft Forest Management Strategy documents says "... There is no evidence that any of (the major biotic and abiotic) processes are being impaired under existing forest management strategies".*

*Is there evidence of non-major abiotic/biotic processes being impaired under existing strategies and if so, what are the long term implications?*

CALM is not aware of any.

- *What are the ecological implications/costs of using the chemical Tordon in the JSI?*

We are not aware of any adverse ecological implications of the use of Tordon TCH used in the way that it is, i.e. by injection.

- *Is the linkage system proposed for the karri forest also suitable for jarrah?*

The linkage used in jarrah forest is more diverse, in the form of dispersed habitat retention and a similar retention of retained stream buffers and in general a wider variety of silvicultural practice in the harvested areas.

- *Is there evidence of degradation in forest soil structure/nutrient status as a result of current or past forest management practices in the southern forests?*

No. Forest soil structure will inevitably be affected to some degree by compaction from machinery use, especially in moist soil periods, but control mechanisms are designed to keep these affects within acceptable limits. There are no known nor expected nutritional effects of proposed management practices. Extensive research has been conducted by CSIRO on nutrient budgets and we are not aware that this research has shown any significant nutrient depletion as a consequence of forest management practices.

- *What data are there on whether 15 'habitat' trees per five hectares are adequate for faunal conservation? How long would such trees be expected to last? How can potential replacements develop from selected crop trees? What measures are suitable for selected crop trees?*

Studies in Perup, noted as a fauna rich area in the eastern jarrah forest, have shown that possums use between two and seven habitat trees per hectare (Inions).

Elsewhere (Harvey) studies of hollow occupation (Fannt, unpublished) have shown that very few of the available hollows have signs of occupation.

The number of habitat trees per coupe will be greater than three per hectare. On the cut-over portions three per hectare will be retained, in the uncut areas (stream zones, high value landscape areas, diverse vegetation types) there are to be significantly more.

The habitat trees can be expected to last until replacement trees are available to take their place. Habitat trees are selected as vigorous mature trees in preference to senescent. As such they are likely to live for the 100-150 years that replacement trees will take to develop.

Crop trees have large vigorous crowns. These are desirable for the development of hollows, viz. brittle branches and rapid growth. If it is needed to keep potential crop trees to replace habitat trees they are the most suitable as both species are retained and they have the greatest potential for hollow development.

• *What measures are suitable for non-mammal faunal conservation?*

Measures adopted:

- maintain flora species richness of sites;
- maintain habitat elements which take a long time to replace - logs, large secondary storey species etc;
- maintain diverse landforms undisturbed, e.g. rock outcrops - these are frequently rich in species;
- diversity of burning regimes;
- low disturbance in species rich stream zones.

- *It has been estimated that 127 million cubic metres of increased streamflow can be achieved by jarrah thinning, however that only 48 million cubic metres of this could be utilised because of increased evaporation and system collection limitations. What is the basal area which would be required in order to produce the 48 million cubic metres over all forest zones? What is the basal area which would be required if this extra were to be collected from the higher rainfall zone only?*

Increased water yields will only be sought in the high rainfall zone where thinning is to 10 square metres per hectare. In intermediate rainfall zone it is not intended to thin to gain water flow - hence thinning to 15 square metres per hectare.

The proportion of the forest thinned in any one year would be relatively minor (only 20 percent of the NJF is thinnable) and the basal area reduction will be significantly less than the basal area increment of the forest. A stand when thinned to 10 square metres per hectare will be left to grow on to 25-30 square metres per hectare before rethinning. The average stand basal area over this period would be 17-20 square metres per hectare.

- *What evidence is there that a minimum of 15 square metres per hectare basal area and temporary exclusion zones will be sufficient to prevent salinity increases in the intermediate and low rainfall zones?*

In the low rainfall zone the logging trials (including clearfelling without stream zones or TEAS) have failed to produce saline streamflow. Regrowth rapidly regains much of the leaf area of the former stand. In the intermediate rainfall zone the March Road catchment which was a worse case scenario of a large coupe (200 hectares) and no stream zone produced saline outflows, however, increases only ranged between 400 mg/l TSS in a low rainfall year to 100 mg/l in an average rainfall year. The catchment where a 100 metre zone was retained (April Road) lead to increases of only 50 mg/l TSS. The 1992 proposals for zones on all streams including 30 percent retained canopy in any second order catchment will result in a situation closer to the April Road result than the March Road one. They will not prevent all saline flows but contain them to what is considered to be an acceptable level.

- *After coppice poisoning it has been found that groundwater rises with no levelling off for at least four years. Does any other research suggest how long groundwater would take to stabilise after coppice poisoning? What is the significance of this groundwater rise?*

In the intermediate rainfall zones the clearfelled coupe at April Road which contained stream zones in only some of the streams, and had no TEAS strips failed to produce any salinity problems. TEAS strips and 15 square metres per hectare in thinnings as well as stream zones represents a much lesser intensity of operation.

The groundwater rise depends on the basal area of the retained stand, the development of regeneration and retention of stream zones etc. In clearfell coupes levelling off of groundwater rises occurred after three to four years. In thinned forest the gradient of the increase is likely to be less.

- *Has any salinity/groundwater research been undertaken for the central or northern forests in relation to intensive integrated logging and thinning?*

Yes, in the Dwellingup area.

- *What fire regimes would improve the availability of nitrogen and phosphorus? What other management practices might improve nutrient availability? In some Eastern States forestry operations the bark is removed in the forest. Would this technique significantly improve nutrient recycling in karri or jarrah forests?*

Regular burning is likely to increase nutrient availability by mineralizing stored nutrients.

Increases in nutrients might be gained through fertilisation.

There is some evidence (CSIRO) that there will be short-term reductions in nutrient availability due to removal of bark with the log. The proportion of total nutrients removed in harvesting is relatively low however (see p.38 of the Strategy).

- *Do the hydrological conditions in a logged/thinned forest tend to favour the spread of Phytophthora? Is there sufficient cause for concern to justify monitoring or the consideration of management alternatives? Is information available on any connection between the condition of the litter layer and Phytophthora cinnamomi?*

There is no evidence to suggest that logging or thinning affect hydrology such that the spread of Phytophthora is favoured. In fact it may be reduced if reduction of banksia populations is carried out in conjunction with logging.

There is no evidence of any connection between the litter layer and Phytophthora activity.

- *Do the conditions in a logged/thinned forest tend to favour the activity of jarrah leaf miner? What about gum leaf skeletoniser?*

From his work with CSIRO Mazenec postulated a model which ascribed disturbance (spring burning, logging) as the driving force of leaf miner activity. Although there are field examples which comply with this model it is far from conclusive. Work done by CALM shows clearly that leaf miner has invaded the main jarrah forest from north-east of Manjimup and has spread in a fairly uniform manner west then north (Abbott, 1992, CALM Technical Report No. 28). A recent analysis of this spread (Abbott in prep.) has failed to identify any correlation between the cut-out boundary (i.e. the line to the north of which leaf miner failed to complete its life cycle) and logging or burning.

No correlation has been detected for outbreak of gumleaf skeletoniser and management activities.

- *What will be the ecological cost of the Banksia grandis reduction program? Is it likely that the B. grandis population is currently greater than it was in the pre-European times?*

There is no known evidence of any adverse effect of reducing B. grandis densities. There is a suggestion that banksia populations were significantly less in pre-European times than currently, because banksia being a pioneering species has benefited by the reduction in jarrah competition as a result of logging.

- *What is understood of the ecological role of soil/litter flora and fauna in WA forests? What is known of the relationship between the condition of the forest canopy and the activity of soil/litter flora and fauna?*

Very little is known of this complex and difficult relationship.

- *Is the proposed jarrah silviculture sufficiently flexible in the field to adjust for the many environmental variables encountered in addition to soil and climate?*

Yes, it is proposed to be flexible to cater for all values.

### **Fire Management and Ecology**

- *Is the current state of knowledge with regard to the life cycles of plants and animals adequate to determine that fire management regimes will ensure the maintenance of species diversity at the local level.*

If one wishes to consider the knowledge of individual species' responses to fire, then it is clearly small, and considering the complexity of the studies required and the number of species involved, it is always likely to remain small.

However, when one looks at the work that has been done on individual species, the long-term monitoring plot results and considers that in light of the identified traits plants, in particular, have developed to adapt to a fire prone environment, it must be reasoned that in all probability current fire management will maintain species diversity at the local level. It is clear that species diversity reduces with increasing time since fire, however, this is reversible as the propagules are still on site waiting for a fire to release them.

- *What fire regimes would favour mycorrhizal fungi?*

CALM does not wish to develop a fire regime which favours mycorrhizal fungi but sees them as one component of the biodiversity which must be maintained. There has not been any work done to identify the answer to this question, however, it is reasonable to assume a fire regime with diversity such as that practiced by CALM which ensured regeneration and development of the full suite of plants, would ensure maintenance of mycorrhizal fungi. Research on *Bettongia pencillatta*, which has a large mycorrhizal fungi component in its diet, supports this contention.

- *Are the proposed fire management regimes for old growth forests and conservation areas appropriate given the structural/species/habitat objectives for these areas?*

Unless the fire is being prescribed to kill the overstorey and promote regeneration, or possibly promote hollow development in mature and senescent trees, neither of which CALM has attempted to do nor is planning, the fire management regime is independent of the age of the overstorey.

Fire management regimes for areas managed primarily for nature conservation values attempt to create diversity through variation in time between burns (5-10 years, 15-20 years and no burning) and season of burning. In the absence of perfect knowledge, to manage for diversity is believed to be the most appropriate course of action.

- *What impact is the current high frequency fire management program having on the relative species abundance, age structure, habitat diversity?*

The question contains a relative term "high" without defining what it is high compared to. CALM does not believe the current fire management regimes' fire frequency is inappropriate in relation to the regeneration strategies of known plants and animals or the estimated pre-European fire frequency.

- *Does high frequency burning select for pyrogenic vegetation types on sites where fire sensitive (less pyrogenic) species once dominated (e.g. sites that may have experienced relatively low fire frequencies in the past such as wetlands, lee side on hills)?*

It could do so, and over the last 100 000 years is probably a major factor in determining the vegetation types that currently exist in the forest. High frequency (every three years) burning is very difficult to achieve even if it was set as a management objective. Sites that experienced low fire frequency naturally continue to do so under CALM's fire management regimes, because the conditions which caused them to remain unburnt naturally (fuel moisture and low fuel accumulation) cause them to remain unburnt in broad area prescribed burning.

CALM does not intend to attempt to do it, nor is there any known reason to want to do it.

- *What percentage of the total forest area should be subjected to each intensity/frequency management regime? What are the likely ecological implications of the current bias towards spring burning? If there is a problem what is the appropriate "mix" of spring and autumn burning regimes?*

In general, no area of forest should be subject to one particular intensity/frequency regime. CALM's approach is that wherever possible areas of forest should have a diversity in frequency and season. For example, an individual area being managed under a vegetation management regime might have a spring burn, followed six years later by another spring burn, then 10 years later by an autumn burn. For protection reasons, however, it may be desirable to reduce fuels on a regular five year basis such as around a town. Whilst there is a bias toward "spring" burning, the term actually includes a wide range of conditions as it is used as a generic term to cover the period October to January. There is a difference in ecosystem response to spring and autumn fire because of soil moisture. Spring burning favours root stock response, whilst autumn burning seed reproducers. This effect is never permanent and can be reversed with change in season. The ability to do more autumn burns is constrained by the shortness and unpredictability of the season.

- *What is the evidence for an explosion in the fox population? Is the current fire management regime a likely cause of the problem?*

The fox population has not exploded, it has merely moved into and established a presence in almost all terrestrial ecosystems in WA. Evidence of the impact of the fox on native fauna is dramatic and can be seen in the population explosion of native animals when the fox is controlled such as at Dryandra and Tutanning.

There is no relationship between fire management regimes and fox spread. There is evidence, however, that fire management regimes can be tailored to provide vegetation which protects animals from fox predation, e.g. the woylie at Perup.

### **Marri in Salt Risk Zones**

- *Will the application of the proposed river and stream zones, phased logging (i.e. no more than 70 percent of the forest taken in any second order stream catchment in the intermediate and low rainfall zones) and the new jarrah and karri silviculture adequately ensure no unacceptable increases in salinity?*

This depends on the definition of unacceptable. Research shows that there will be small transient increases in salinity which will be no threat to water potability. The impact of these transient increases is not known on the aquatic biota. It is reasonable to regard them as acceptable, however, because of the small number of streams affected in any year, the likelihood that there is some adaption or tolerance to such

events which would also occur as a result of defoliation from wildfire and the opportunities to recolonise that exist from downstream sources.

- *Is the proposed stream monitoring program adequate to determine the impact of salinity on logging and to enable early detection of problems and implementation of modified management practices if necessary?*

The current stream monitoring program is sufficiently extensive and sophisticated to identify impacts of forest harvesting on water quality at the regional scale.

Monitoring of experimental catchments is continuing. These detailed results can be used to interpret and extrapolate changes detected at the local level.

It is not known if the water quality criteria used by WAWA for domestic consumption are appropriate for the protection of aquatic ecosystems because very little research has been done on the effect of changes to water quality on aquatic biota in WA.

### Management Adjacent to Reserves

- *CALM states that "there is no evidence that any existing management practice in areas adjacent to the conservation reserves has any detrimental effect on the ecological values of the reserves". Can this statement be verified? A possible inference is that there is therefore no cause for concern because the lack of evidence follows adequate investigation. Has the investigation been adequate?*

CALM believes the ecological values of State forest subject to logging, among other management practices, are not detrimentally affected, hence there is no reason to believe any adverse effects should flow into adjacent reserves. State forest, which is managed in sympathy with the objectives for nature conservation reserves, is the ideal land use to protect reserve values.

### Karri Silviculture Changes

- *What rotation length gives a mature forest in different karri forest areas (i.e. is it 250 years, 400 years etc)?*

Karri forest is considered to reach the mature stage of development between 100 and 140 years of age. This stage ends at about 200-270 years of age at which time there is considerable mortality of trees in the stand and the stand is classified as senescent. In a natural forest, regeneration begins to fill the vacancies created by the death of the older trees. A few individuals may live to 350 years but these are properly considered to be rare individuals rather than a stage of stand development. For more detail of all the stages, see the Forest Strategy.

It is likely that in pre-European times a proportion of individually regenerated karri stands never reached maturity because of the occurrence of high intensity fires.

- *CALM is understood to apply karri silviculture (which favours the regeneration of karri rather than mixed forest) to jarrah/karri mixed forest with four or more karri trees per hectare. Are there any likely negative environmental impacts from this practice?*

CALM recognises three stages of the transition from jarrah/marri to karri. In the intermediate stage (two to eight mature karri trees per hectare), the stand is regenerated using a combination of jarrah and karri techniques to develop a mixed regeneration. In the past, experimental trials with mixed karri/marri stands even where no marri seed source was retained, 20 percent of the dominant trees in the regeneration are marri after 20 years.

*What old growth will be left outside the reserves system after the first rotation?*

This question attempts to separate the nature conservation reserve system from the multiple purpose State forest. Such a view is at odds with the philosophy of the Forest Strategy which treated the forest as a whole, such that the forest structure in the reserves complements that in the multiple purpose forest in achieving ecologically sustainable management. In CALM's view it is a mistake to see the tenures as different areas of management to be treated in isolation.

However, the answer to the question, assuming the "first rotation" end is the time when the last of the mature karri in the current yield strategy is harvested (which is sometime toward the middle of the next century), is about 29 000 hectares. This is made up of about 20 000 hectares in zones on roads and streams, 3 000 hectares retained in in-coupe patches and 6 000 hectares of regrowth which will have reached the mature stage.

### **Reserve System Changes**

- *Is there sufficient research data to assess with reasonable certainty the conservation adequacy of karri reserves, riparian zones, linkage corridors? If not, what are the research priorities?*

If the answer to the question "what is sufficient?" were known this could be answered. The proposals are based on current knowledge and ecological principles, and hence, are adequate with "reasonable certainty". It should be emphasised that 46 percent of the karri forest is managed as a priority for conservation values.

- *Should CALM identify more specifically the species to be conserved in each conservation area and develop more specific active management plans to achieve those conservation objectives?*

The nature conservation reserve system is not designed to be a "zoo" for particular animal or plant species, but a representative area of vegetation types in which the tree component is not disturbed by man. It represents a component of a range of habitats which is the forest as a whole, and consequently is not an end in itself but part of a larger total.

The approach outlined in the question would be self defeating, as to manage specifically to maximise one or a number of species is likely to disfavour a range of others. Given the current level of knowledge the only realistic option available is to manage for diversity. Notwithstanding this, endangered species, such as the woylie and tammar wallaby, have been identified and are favoured.

- *Is CALM's assessment that parts of Jardee proposed conservation park and D'Entrecasteaux National Park should become multiple use forest (proposals document p24) appropriate on the basis of the representation of their conservation values elsewhere in the reserve system?*

Both areas relate to proposals in the 1987 Regional Management Plans. Jardee is too small (10 hectares) to justify conservation park status and D'Entrecasteaux, an area near Northcliffe, isolated from the rest of D'Entrecasteaux and thus presenting management difficulties.

None have conservation values peculiar to them.

## Timber Strategy Amendments

- *The implication from Table 123 is that all the elements of the Standing Timber Volume could be removed from the forest (if markets were available). What would be the ecological implications of this complete removal of the forest biomass on nutrients, disease risk, local hydrology, faunal habitats etc?*

The impact on hydrology, faunal habitat and disease risk will not change because the material is currently being felled but only the saleable proportion removed. Removal of the additional logs would represent a small additional loss of nutrients, however, as eucalypts effectively remove nutrients from wood, it is a very small component of the total budgets.

- *Is the proposed increase in harvest an indication of more removal per unit area only or also of more area cut-over per annum? What are the ecological implications of each of these intensifications of harvest?*

The proposed addition to potential yield (not harvest) will come from removing more from the same area. Area cut-over each year varies according to the productivity of the forest and the proportion of saleable products in the trees harvested.

- *Given the likely increase in scientific knowledge over the next decade is it likely that the "sustainable yield" indicated in Table 13 will need to be revised?*

Sustainable yields are reviewed every time the plans are reviewed, currently a maximum of 10 years.

## Monitoring and Research Priorities

- *Are the current monitoring techniques adequate to provide early warning of an impending environmental problem in the southern forests?*

There are no known impending environmental problems in the southern forests or the northern and central forests either. Current monitoring and incidental observation should, however, pick up any significant problems as they manifest.

- *Is there a case to require CALM to avoid management practices which increase or decrease nutrient status outside a "virgin" or "normal range"?*

No, because it would be impossible to measure or define what a normal range is. Nutrient budgets do not suggest any cause for concern within the existing rotation period, however, monitoring of productivity will give an early indication of any nutrient declines.

- *Is there evidence of any mammal, bird, reptile or other terrestrial vertebrate population having fallen to a critical level locally or regionally as a result of current management practices?*

No. All research clearly implicates clearing for agriculture and introduced predators, mainly the fox as the principle threat to species.



## **Appendix 4**

**Report by Dr Ken Shepherd, ANUTECH, on CALM's proposals**



***REVIEW OF WESTERN AUSTRALIA FOREST  
MANAGEMENT STRATEGIES***

**A Critique of CALM Draft Documents**

**Report to**

**The Environmental Protection Authority of Western Australia**

**by  
K.R. Shepherd  
ANUTECH Pty Ltd**

**July 1992**

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## Abbreviations Used in the Report

AFC	Australian Forestry Ministerial Council
ANZECC	Australian and New Zealand Environment and Conservation Ministerial Council
AHC	Australian Heritage Commission.
CALM	The Department of Conservation and Land Management, Western Australia.
CSIRO	Commonwealth Scientific and Industrial Research organisation.
ESD	Ecologically sustainable development.
EPA	Environmental protection Authority, Western Australia.
ERMP	Environmental Review and Management Program.
RAC	Resource Assessment Commission
UNCED	United Nations Commission on Environment and Development
WACAP	Western Australian Chip and Pulp Company.

## EXECUTIVE SUMMARY

This Report is a critique of four documents produced in draft for public comment by the Department of Conservation and Land Management of Western Australia (CALM).

- Proposals to Amend the 1987 Forest Management Plans and Timber Strategy and Proposals to Meet Ministerial Conditions on the Regional Plans and WACAP ERMP - Formal Assessment Under Part IV of the EPA Act. February 1992.
- *A Nature Conservation Strategy for Western Australia* January 1992.
- *Management Strategies for the South-West Forests of Western Australia. A Review.* February 1992.
- Australian Heritage Commission/ Department of Conservation and Land Management.- National Estate Values in the Southern Forest Region of South-West Western Australia. In 5 parts.

The Report does not attempt to address all of the issues raised but provides support to the work of the Technical Appraisal Panel appointed by the EPA. It is a review of the overall documentation and a discussion of the management strategies proposed to meet environmental objectives, including environmental implications of silvicultural activities in the south-west forests.

The Report looks at the CALM Proposals from an international prospective, a national perspective and as a professional response to a complex of State management problems, many of which fall within the portfolio of this one Government Department.

### General Comments

The CALM Proposals provide an excellent framework within which management may respond to a complex set of conservation and environmental issues. The world community, the Australian community, and the people of Western Australia in particular, have indicated they want the environment and conservation of elements of that environment to be given a higher priority in day-to-day management than in the past. The CALM Proposals have done this in ways which are entirely consistent with the thrust of the current environmental and conservation debate. However, the community also recognises that there are limited resources available for the implementation of these management responses and there are social and economic consequences of altering present practices, especially where they impact adversely on commercial use of forest resources. The timber industry employs many people in the State and contributes significantly to the value of commerce. The CALM Proposals recognise these impacts and have given them due recognition in framing the overall management responses.

The in-principle approval of what constitutes an entirely acceptable response to the process of formal assessment under Part IV of the EPA Act should not be delayed because of dispute over matters of detail. There are undoubtedly matters of detail which need to be resolved. Often these will best be resolved over time as new scientific and operational evidence comes to light. It would be entirely appropriate for the Environmental Protection Authority to work co-operatively with CALM to resolve these matters within the context of an agreed framework based on the CALM Proposals. A useful model has been the way in which the Australian Heritage Commission has recently resolved problems of determining an appropriate allocation of forested land to the National Estate in the south-west of the State.

### THE CALM PROPOSALS IN AN INTERNATIONAL CONTEXT

1. In 1983 the United Nations established the World Commission on Environment and Development to address the question "A Global Agenda for Change". The Commission

reported in *Our Common Future*, a book which set the international agenda for discussion on questions of sustainable development and the conservation of biological diversity. It would be undesirable for the CALM Proposals to be at odds with a document which has received world-wide attention and acclaim. However, the CALM Proposals are an excellent working example for a single State of the principles for conservation and development outlined by the World Commission. The proposals provide adequate solutions within the present context of the society, taking account of the conservation ethic under which that society operates. My only criticism would be that the Proposals could be more frank with the public and admit more explicitly that efforts to save particular species will be limited by resources and circumstances and that hard choices will have to be made with selective discretion. No one cares for the prospect of consigning threatened species to oblivion but in certain circumstances such decisions may have to be made for the greater good.

2. Viewed from the perspective of the UNCED Draft Convention on Biological Diversity, the CALM draft *A Nature Conservation Strategy for Western Australia* should be seen as an outstanding document of its kind. The conservation strategy clearly states its aims, defines its area of interest, places the document in a global, national and state context, and proceeds to analyse the problems of conservation for the State. The CALM Proposals would be the envy of many conservation-minded groups in other countries.
3. The CALM Proposals are in good agreement with what has been attempted in the recent UNCED non-legally binding statement on forests to find world consensus on the management, conservation and sustainable development of all types of forest.
4. In relation to Australia's international treaties and obligations, the CALM Draft of *A Nature Conservation Strategy for Western Australia* sets out clearly and succinctly the International Agreements to which Australia is a party and which Western Australia is obliged to observe.

#### THE CALM PROPOSALS IN A NATIONAL CONTEXT

5. The CALM Draft of *A Nature Conservation Strategy for Western Australia* takes note of Australian Government legislation which relates to the CALM Proposals. The significance of all of this legislation is clearly stated in the CALM Proposals. An interested reader can readily ascertain the relationships of this complex of legislation to local actions and controls.
6. It is abundantly clear that the principles of the *National Conservation Strategy* are being followed in the CALM Proposals. Extinctions and the causes of extinctions are recognised. Responsibility is accepted for protecting endangered species. The overall aims and objectives of the State conservation strategy follow closely those of the national document.
7. The RAC tasks have significant similarities to those outlined in the CALM Proposals. A positive recommendation of the RAC - Forest and Timber Inquiry Final Report was the implementation of a National Forest Policy. A Draft was distributed this month. A second strong recommendation was for the implementation of a national policy on deforestation to minimise forest-clearing activity.

The second option given to governments to follow by the RAC for old-growth forests has been adopted in the Western Australian forests of the south-west, resulting in the retention of significant additional areas of old-growth retained in reserves. The RAC recommended that state and territory authorities undertake comprehensive reviews of land which might have wilderness qualities and this has been done for wilderness in the south-west. Other areas of the state may deserve such status and appropriate protection.

Concerning resource security, the RAC preferred to strengthen and revise agreements between forest management agencies and industry, particularly through the development of enforceable contracts with clear provisions for compensation. Ultimately this may allow Australian forest industries to become larger and leaner and to compete internationally. The CALM proposals do not suggest how Western Australia will treat these problems but it is my understanding they are being addressed.

I conclude that the RAC findings apply equally to Western Australia as to Australia as a whole and that cessation of wood production activities in native forests is not justified. However, I agree also with the RAC that there are inherent uncertainties about long term effects and the precautionary principle must apply requiring systematic long term monitoring of impacts and adequate codes of forest practice and their enforcement.

The RAC did not see the State Forest Services playing a passive role in managing forest land under their jurisdiction but being active managers in all senses of the word and the CALM Proposals are clearly consistent with this finding.

In terms of broad principles, and viewed against the background of the enormously comprehensive RAC Inquiry, it is very difficult to find fault with the CALM Proposals. They embody the current knowledge of the ecological processes of the forests, first, in the context of the capabilities of the authority to carry out the work required, and second, within the ethical, social and economic context of the State.

8. The Australian National Report to UNCED is a comprehensive resume of achievements over the past decade. An evaluation of the CALM Proposals vis-a-vis this resume impressed me with their adequacy. They contain adequate and comprehensive management proposals by CALM to cope with the problems of conserving biological diversity in Western Australia and with multiple use of parts of the forest resource of the south-west within a framework of ecologically sustainable development.
9. Much of the discussion in the Draft Report of the Ecologically Sustainable Development Working Groups has been overtaken by the release of the Draft National Forest Policy. Nevertheless, it is still useful to consider the CALM Proposals against the background of the ESD Draft Report. In general the CALM Proposals are in good agreement with the Draft Report but do not conform well with some ESD recommendations in that they pay little attention to private forests and less to the possible use of conflict resolution methods for settling disputes. The Documents explain in great detail how the public resources will be managed on their behalf but do not explain how CALM has satisfactorily resolved competing uses, where these various uses are, or have been, in dispute. The Working Group on Ecologically Sustainable Forest Use considers that State and local governments should adopt consistent and comprehensive legislative controls over the permanent clearing of private and Crown land for non-forestry purposes. The *Nature Conservation Strategy* deals with issues relating to private land but stops short of recommending government regulation of remnant vegetation on such lands, in spite of the acknowledged value of such remnants for the conservation of biological diversity.
10. The Draft National Forest Policy Statement was issued on 7 July, 1992, for public comment. It outlines agreed objectives and policies for the future of Australia's public and private forests and, as such, has a bearing on the CALM Proposals. The CALM Proposals adhere substantially to the intent of the Draft Statement. There is unanimity on policies that 'further clearing of public native forests for non-forest use or plantation establishment should be avoided' but the Draft Statement and the CALM Proposals are equally soft on private forest in that 'Sustainable management of private native forests should be encouraged ...' There is little evident support for the stronger position advocated by a current enquiry by the House of Representatives Standing Committee on the Environment, which has said the Federal Government should push the states and territories to adopt laws similar to those in South Australia, where landowners have to

get approval before clearing any bush. Most applications for clearing are refused on the basis that the native vegetation at stake is biologically important. Provisions in the Draft National Forest Policy relating to woodchip exports strengthen the position of CALM as a manager of commercial forests in the State as many of the requirements under the four relevant clauses freeing up approvals for export have already been agreed between the Commonwealth and the State of Western Australia.

11. There are significant areas of forest in the South-west listed on the AHC Register of the National Estate, many of which are designated for timber production. The AHC and CALM agreed to work on a joint assessment of the national estate values of the south-west forests. A number of new areas were recommended for addition to the Register. The AHC considered the joint work to be a suitable framework for Commonwealth consideration of export woodchip licences under section 30 of the Australian Heritage Commission Act 1975. CALM stated that it will protect the national estate values on CALM land within the Southern Forest Region, within the context of maintaining timber volumes to industry as specified in the 1987 Timber Strategy, and maintaining other values specified in the 1991 (1992) Draft Forest Strategy. This agreement satisfies much of what is required in the new Draft National Forest Policy to free up approvals for the export of woodchips, as noted under 10 above.

#### **THE CALM PROPOSALS AS A PROFESSIONAL RESPONSE TO A COMPLEX MANAGEMENT ISSUE**

12. A reading of the CALM Proposals is a revelation to anyone not aware of the complexity of the management tasks of an agency such as CALM. In common with almost all government services in Australia today, CALM staff are expected to undertake these tasks against a background of constrained budgets and sometimes faced with a hostile element of the public. Much of the expertise on the environment, biodiversity and ecology of the forests of Western Australia and the consequences of manipulating those forests in one way or another is resident within CALM. Resource information has been collected and allowable harvest calculated by the service and must be taken by the public as a fair and accurate record of these matters. It is not possible to duplicate many of the extremely complex functions of a government department without similar resources and, therefore, the public have to be persuaded that the department is providing a fair and accurate answer to questions on many matters relevant to the Proposals.

We are told the sustainable yield is not much less than in the 1987 Timber Strategy but the practical significance of this is not given and the impact of this on the timber industry is to all practical purposes ignored in the CALM Proposals. This is regrettable since one purpose of the Proposals is to demonstrate their social and economic impacts, as well as the conservation and sustainable development impacts. A tabular presentation must surely be possible.

13. *A Nature Conservation Strategy for Western Australia* is the result of a decade of careful development of an adequate and workable response to the need to protect all of the the physical and biological resources of nature of the State. An achievable goal is seen to be nature conservation and management integrated with all development, industrial, and natural resource management activities in the State.
14. The environmental impacts of forestry operations must be viewed within an appropriate time frame and, in most instances, this time frame is in terms of decades rather than days or months. This applies to the recovery of vegetation, the cyclical changes in the wildlife population which will relate to the vegetation change. For wildlife, as with forest cover or habitat, the effects of time are critical and the population changes which take place for individual species are quite dynamic. Some species build up quickly to unusually high numbers then fade away as the niche structure favours other species. The whole regenerative process may take a century or more. There is ample reason for adequate long-term monitoring of ecological processes in the forests of the south-west.

One reason for public disquiet about the Proposals is that they do not provide adequate reassurance of this capacity to monitor change.

In my opinion, the Forest Services in Australia generally and CALM in particular have not adequately explained and reinforced this concept of 'time' to the general public, the concept of slow and progressive change in the structure and pattern of the forests under management. Publicity material should emphasise the 'time' factor to the utmost until it is properly appreciated by the public at large.

15. It is only possible in a very general sense to provide some comment on the environmental implications of the proposed silvicultural activities in the forests of the south-west. As the majority of the expertise on the environment, biodiversity and ecology of the forests of Western Australia and the consequences of manipulating those forests in one way or another is resident within CALM itself, I can only comment as an informed outsider and provide one professional's view.

The flora and fauna of Western Australia is of world significance for the protection of global biodiversity and management of the forested lands must take account of such a responsibility. In evaluating the CALM Proposals the essential question is whether they are in conflict with this responsibility. Some of the silvicultural methods applied to forests in the south-west today are more intensive than in an earlier age but they are backed by a much better knowledge of both the structure and the ecology of the forest. There is contention concerning protection of the forest in that many are critical of the current prescriptions for control burning. By and large, the Department has managed the difficult problem of fire management well and there is ample evidence that continuing research will result in changed prescriptions as new evidence comes to light

The major threat posed by the fox to native mammals is accepted and the solutions proposed applauded but the danger also posed by feral cats to wildlife should be resolved quickly. Research in the eastern states certainly places the cat as a major feral pest and active research is going on to find adequate measures to control it.

The major discussion centres on determining a desirable forest structure. It is an interesting discussion but may confuse a member of the interested public. A section goes on to explain how the nature of the dynamics of the regeneration, maturation and senescence of a forest or forest tree, leads to a certain structure of the forest and of areas within the forest. However, there is no indication given of the present state of the karri forests vis-a-vis this ideal age class distribution, at least in broad terms. CALM is less than frank about the present state of the jarrah forests and does not explain well to the reader the dynamics of the system and the effects of elapsed time.

Significant areas are being proposed for transfer into other systems of tenure in line with conservation principles. The results of the joint AHC-CALM survey of the resources of the area have been incorporated, with proposals for additions to the Register of the National Estate. The initiatives to place far larger areas in riparian zones are commended but there is a conflict of values in recommendations reducing roadside corridors and keeping the roads within the corridors.

Mention was made under sections 7 and 10 of codes of forest practice. Codes of forest practice issued by CALM to cover logging operations are comprehensive and detailed and totally in accord with the Draft National Forest Policy. They provide an adequate set of administrative instruments to control operations on forest lands administered by CALM and on private land where operations are being conducted by CALM. There are administrative arrangements in place for regular revision of the codes and for the incorporation of the results of current research findings. There is no indication given as to whether there is any provision of independent audit of these codes.

Monitoring has cropped up frequently throughout this discussion. It is incumbent on CALM to monitor the effects of many of its forest practices if answers to many of the difficult questions are to be found but the capacity within CALM to carry out such monitoring is limited. The community may have to decide whether it really needs answers to some questions and, if so, how it can provided the resources needed.

The impact on the timber industry of the *Management Strategies* is not well explained in the CALM Proposals. I repeat what is said under 12. above that this is regrettable since one purpose of the Proposals is to demonstrate their social and economic impacts, as well as the conservation and sustainable development impacts.

## PREAMBLE

This Report is a critique of four closely associated documents, three produced in draft for public comment by the Department of Conservation and Land Management of Western Australia (CALM), the fourth by the Australian Heritage Commission (AHC) in association with CALM. The Report is a response to a brief to ANUTECH Pty Ltd by the Environmental Protection Authority of Western Australia (EPA) and has been written by Dr K.R. Shepherd, Manager of the Forestry and Environment Division, on behalf of the Company. The four documents are:

- Proposals to Amend the 1987 Forest Management Plans and Timber Strategy and Proposals to Meet Ministerial Conditions on the Regional Plans and WACAP ERMP - Formal Assessment Under Part IV of the EPA Act. February 1992.
- *A Nature Conservation Strategy for Western Australia* January 1992.
- *Management Strategies for the South-West Forests of Western Australia. A Review.* February 1992.
- Australian Heritage Commission/ Department of Conservation and Land Management. - National Estate Values in the Southern Forest Region of South-West Western Australia. In 5 parts.

The documentation which has been placed before the public for consideration and comment is certainly voluminous and it is easily seen why many genuinely interested readers have complained of information overload. The *Management Strategies* is particularly long and detailed and one wonders whether some judicious editing would not have made it both easier to read and more readily understood. The length and detail tend to obscure and confuse.

This Report does not attempt to address all of the issues raised in what will be referred to in the remainder of the text as the 'CALM Proposals', or sometimes more generally as 'the Documents'. More than a thousand submissions were received by the EPA following release of the documents for public comment. The EPA set up a Technical Advisory Panel (TAP) to respond to specific questions relating to the science behind forest management practices raised in the public responses. This Report is a review of the overall documentation and a discussion of the management strategies proposed to meet environmental objectives, including environmental implications of silvicultural activities in the south-west forests. It can also be seen as support to the work of the TAP,

It has only been possible in the short time available to overview the Documents. However, the 'Listing of Documents Consulted' reveals there is a wealth of information on which the CALM Proposals are based. The Listing represents a part only of the literature on which current management of forests in Western Australia is based. Much of the literature derives from research carried out in the jarrah and karri forests by researchers employed by CALM and other Government instrumentalities, CSIRO and the Universities, and community organisations.

The Report is in four parts. The first makes some general comments about the CALM Proposals and recommends a course of action which would lead to adoption in-principle of the major thrust of the Proposals with later resolution of specific points of detail. The second looks at the CALM Proposals from an international perspective. How do they compare with what the world in general is attempting to achieve in the field of conservation of biological diversity and in moving towards sustainable development of natural resources? The third looks at the Proposals from a national perspective. Australia has achieved a great deal in the field of conservation of natural resources in the past twenty years and is now addressing very seriously some of the difficult problems of sustainable development of scarce natural resources in the face of an increasingly difficult world economic climate. Finally, the Report looks at the CALM Proposals as a professional response to a complex of State management problems, many of which fall within the portfolio of this one Government Department. For the CALM Proposals to be credible in the eyes of the general public they must be justifiable in all of these contexts.

## Part I General Comments

The Documents reviewed here fulfil obligations resulting from conditions imposed by the Minister for the Environment when approving the 1987 Forests Management Plans and Timber Strategy and the WACAP ERMP. In addition they propose a range of amendments to the Regional Management Plans for the south-west forests. The CALM Proposals provide an excellent framework within which management may respond to a complex set of conservation and environmental issues. The complexity of the issues is amply demonstrated in the draft *Nature Conservation Strategy for Western Australia*, and in the explanations given in the *Draft Management Strategies* of both the tasks which CALM has to carry out and the manner of the responses to those tasks. The world community, the Australian community, and the people of Western Australia in particular, have indicated in recent decades that they want the environment and conservation of elements of that environment to be given a higher priority in day-to-day management than in the past. Forests, forested land and the biological diversity of forests have commanded particular attention in much of the community discussions. The CALM Proposals are a response to this community pressure for change.

The Documents, in my opinion, respond in ways which are entirely consistent with the thrust of the current environmental and conservation debate. The level of agreement is the subject of much of the material provided in Parts II and III of the Report. The principles of conservation of biological diversity and of sustainable development have been extensively explored in recent years, culminating with the recent UNCED meeting in Rio de Janeiro. It would be unacceptable for the CALM Proposals to be out of step with this debate but they are not.

In judging the adequacy of the Documents we should not lose sight of the fact that the community also recognises there are limited resources available for the implementation of these management responses and there are social and economic consequences of altering present practices. The most important of the latter is where proposed changes impact adversely on commercial use of forest resources. The timber industry employs many people in the State. It contributes significantly to the value of commerce and has the potential, with improved technology and good marketing, to increase the value added component of the wood harvested from the forests. However, these things are only possible when that industry has an assured supply of the raw materials on which it is based and so can plan to employ its limited investment capital to best advantage. The CALM Proposals recognise these impacts and have given them due recognition in framing the overall management responses.

The in-principle approval of what constitutes an entirely acceptable response to the process of formal assessment under Part IV of the EPA Act should not be delayed because of dispute over matters of detail. The Australian economy requires decisive action at the present time, not procrastination. This applies as much to decisions on conservation strategies as to those pertaining to industrial expansion and development. The interdependence of the two is what sustainable development is all about. There are undoubtedly matters of detail in the present Proposals which need to be resolved. Often these will best be resolved over time as new scientific and operational evidence comes to light. It would be entirely appropriate for the Environmental Protection Authority to work co-operatively with CALM to resolve these matters within the context of an agreed framework based on the CALM Proposals. A useful model has been the way in which the Australian Heritage Commission has recently resolved problems of determining an appropriate allocation of forested land in the south-west of the State to the National Estate.

## Part II. THE CALM PROPOSALS IN AN INTERNATIONAL CONTEXT

Here we might usefully consider the CALM Proposals from an international perspective. In the following sections the Proposals are compared with a number of recent world initiatives which have attempted to achieve significant levels of conservation of biological diversity. A number of important international initiatives have been taken recently in a world grappling with the problems of achieving sustainable development of natural resources. Australia has been a party to these initiatives and so it is entirely appropriate that each individual State in Australia should attempt to live up to the standards being set internationally and to which we as a nation are signatories. It would be highly undesirable, in my opinion, for the CALM Proposals to be out of step with world opinion. It would be far preferable if they were leading the way and setting an example for others both within and outside Australia.

### 1. From the perspective of *Our Common Future*.

In 1983 the United Nations established the World Commission on Environment and Development, an independent body, linked to but outside the control of governments and the UN system. The Commission, chaired by the Prime Minister of Norway, Gro Harlem Brundtland, was given the task of addressing the question "A Global Agenda for Change". The Commission reported to the world in 1987 in a book entitled *Our Common Future*. This book set the international agenda for discussion on questions of sustainable development and the conservation of biological diversity. Clearly, it would be highly undesirable for the CALM Proposals to be at serious odds with a document which has received world-wide attention and acclaim.

In *Our Common Future* much of the discussion of forests in the world is concerned with preventing further destruction of what is forest left, with the emphasis on the tropical forests. In common with most of Australia, the era of destruction of forests in Western Australia is past. Only minor clearing of forested land is likely in the future and proposed policy changes discussed in later sections of this Report make this even less likely. Of most relevance in this present discussion is the Chapter - Species and Ecosystems: Resources for Development, and it begins with a challenge which cannot be ignored:

The challenge facing nations today is no longer deciding whether conservation is a good idea, but rather how it can be implemented in the national interest and within the means available in each country.

The CALM Proposals are an outstanding response to this form of challenge in that the World Commission on Environment and Development approach is one of Anticipate and Prevent (p 157), where:

The historical approach of establishing national parks that are somewhat isolated from the greater society has been overtaken by a new approach to conservation of species and ecosystems that can be characterized as "anticipate and prevent". This involves adding a new dimension to the now-traditional and yet viable and necessary step of protective areas.

Development patterns, therefore, need to be altered to make them compatible with conservation in a wider dimension, and in this process:

it is hoped that sectoral interests will better perceive their interrelationships with other sectors and new potentials for conservation and development will be revealed.

The CALM Proposals are addressing all of these issues and attempting to integrate the possibilities for conservation into all sectors of the community. The World Commission saw the preparation of a National Conservation Strategy as a means of bringing the processes of conservation and development together as a useful tool and this has already been done for Australia (see section 6). As part of national action, the World Commission suggests that:

Governments need to follow a new approach in this field - one of anticipating the impact of their policies in numerous sectors and acting to prevent undesirable consequences. They should review

programmes in areas such as agriculture, forestry, and settlements that serve to degrade and destroy species' habitats. ... Governments need to reinforce and expand existing strategies. Urgent needs include better wildlife and protected-area management, more protected areas of a non-conventional type.

All of these things are being addressed in the CALM Proposals. The Proposals also address the problems of how best to use the limited resources at the Department's disposal for dealing with conservation priorities. The World Commission makes these interesting points in this regard:

Explicit efforts to save particular species will be possible for only relatively few of the more spectacular or important ones. Agonizing as it will be to make such choices, planners need to make conservation strategies as systematically selective as possible. No one cares for the prospect of consigning threatened species to oblivion. But insofar as choices are already being made, unwittingly, they should be made with selective discretion that takes into account the impact of a species upon the biosphere or on the integrity of a given ecosystem.

This problem is addressed in the *Nature Conservation Strategy* quite specifically (at p 78-81) but not quite as bluntly as this quotation suggests. The CALM document outlines the procedures it would follow in setting priorities for action on threatened species. However, it may be useful for the Department to be more frank with the public and to admit that 'explicit efforts to save particular species' will be limited by resources and circumstances and that 'choices ... should be [and will be] made with selective discretion' when this is necessary. Admittedly, the adequacy of existing coordinating mechanisms (at p 97) indicate where some of the limitations are but it would still be useful to spell out the specific message more clearly.

In summary, the CALM Proposals are an excellent working example for a single State of the principles for conservation and development outlined by the World Commission on Environment and Development. The proposals provide adequate solutions within the present context of the society, taking account of the conservation ethic under which that society operates. My only criticism would be that the Proposals could be more frank with the public and admit more explicitly that efforts to save particular species will be limited by resources and circumstances and that hard choices will have to be made with selective discretion. No one cares for the prospect of consigning threatened species to oblivion but in certain circumstances such decisions may have to be made for the greater good.

## **2. UNCED Draft Convention on Biological Diversity.**

The UNCED Draft Convention on Biological Diversity is a first attempt to attain some level of consensus on how to deal with this problem on a world scale. Importantly it explores ways in which the more developed nations can assist the less developed nations to achieve the objectives of the Convention. The objectives are stated as:

the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.

It is instructive in trying to place the CALM Proposals in a world context to quote some of the remarks of Ros Kelly, Minister for the Arts, Sport, the Environment and Territories on her return from UNCED (Kelly 1992):

UNCED was a consensus process, and consensus is about finding solutions through negotiation and compromise. But we have achieved that consensus, and we now have a baseline from which to start.

And I must say that as the Earth Summit went on, and negotiations continued, I became increasingly aware that Australia was doing or had put the processes in place to do many of the things we were talking about. We are already on the right path, but we can and must do more.

On a global scale, our environmental problems are relatively small. We do not experience the scale or extremes of poverty, the population pressures or the pollution levels of the magnitude

that plague mega-cities such as Rio de Janeiro and Sao Paulo. We have not suffered major environmental disasters such as Chernobyl or Bhopal.

Community awareness of the environment, and the need to protect it, is relatively high.

Earlier in her speech, the Minister noted the difficulties inherent in the process of trying to achieve consensus and change when she said:

There are undoubtedly those who will be critical that it (referring to the Earth Summit) did not go far enough and others who will continue to protest that we are moving too quickly to elevate environmental concerns into mainstream decision-making.

The Minister could take some encouragement from an article in *The Australian* on 4 August, 1992 (We're green and we mean it, p 3), which reports Australia as the second most environmentally conscious country, after The Netherlands, in a comparison covering 14 nations.

The Draft Convention contains 42 Articles. The first states the objectives, the second defines terms, the third and fourth relate to matters of national jurisdiction and jurisdictional scope, and the fifth to cooperation between Contracting Parties to the Convention. We should focus attention on Articles 6, 7, 8, 10, 12, 13 and 14. Articles 9, 11, and 19 to 42 are not particularly relevant to the present discussion although very important in the terms of international cooperation.

The CALM Proposals are in excellent agreement with Article 6 *General Measures for Conservation and Sustainable Use*, in that they:

- a) Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, *inter alia*, the measures set out in this Convention relevant to the Contracting Parties concerned; and
- b) Integrate as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies.

The CALM document *A Nature Conservation Strategy for Western Australia* should be seen as an outstanding document of its kind. It is for a large part of the world's land area, some 253 million hectares. This is an area five times the size of France or Thailand, only a little smaller than India, about equal to Zaire in the African continent and with Argentina in the South American continent. The Strategy amply justifies the Minister's remarks, quoted above, that "I became increasingly aware that Australia was doing or had put the processes in place to do many of the things we were talking about" (i.e. at UNCED). The conservation strategy clearly states its aims, defines its area of interest, places the document in a global, national and state context, and then proceeds to analyse the problems of conservation for the State. It goes on to provide adequate solutions within the present context of the society. It takes account of the conservation ethic under which that society operates. It notes that achieving change is difficult (as was acknowledged by Ms Kelly above):

Public recognition of the importance of conservation is increasing. But recognition can be difficult to convert into active support. (p 107).

Many of the public responses to the CALM Proposals from individuals and groups interested in conservation urge more extreme measures than those advocated in the documents, particularly in the *Management Strategies*. It is stated that procedures will be modified as knowledge of the systems evolves. However, the managing authority recognizes that it has to carry the general public with it if the measures advocated are to succeed. It would be a brave government instrumentality which moved too far ahead of an evolving land ethic in Australia, even though that ethic has undergone rapid change in recent decades. This question was well documented for the Resource Assessment Commission enquiry into forestry (RAC 1992).

The CALM Proposals and the past efforts of CALM and others in Western Australia have placed the State in an excellent position vis-a-vis Article 7 *Identification and Monitoring*, whereby a Party undertakes to:

- a) Identify components of biological diversity important for its conservation and sustainable use
- b) Monitor through sampling and other techniques, the components of biological diversity identified ...
- c) Identify processes and categories of activities which are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity, and monitor their effects through sampling and other techniques ...

The same applies to Article 8 *In-situ Conservation* where each Contracting Party undertakes, as far as possible and as appropriate, to:

- a) Establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity;
- b) Develop where necessary, guidelines for the selection, establishment and management of protected areas or areas where special measures need to be taken to conserve biological diversity;
- c) Regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas with a view to ensuring their conservation and sustainable use;

There are 10 other clauses to this Article all of which are satisfied. CALM has taken account of protecting ecosystems, promoting sound and sustainable development, rehabilitation of degraded ecosystems, control of risks, control or eradication of alien species, taken account of innovations and practices of indigenous peoples, and developed and maintained necessary legislation and /or other regulatory provisions.

For a State Government Department with the wide-ranging responsibilities which CALM has we need to take close account of how well its actions relate to Article 10 *Sustainable Use of Components of Biological Diversity*. The five parts of this Article are as follows:

- a) Integrate consideration of the conservation and sustainable use of biological resources into national decision-making;
- b) Adopt measures relating to the use of biological resources to avoid or minimize adverse impacts on biological diversity;
- c) Protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation of sustainable use requirements;
- d) Support local populations to develop and implement remedial action in degraded areas where biological diversity has been reduced; and
- e) Encourage cooperation between its governmental authorities and its private sector in developing methods for sustainable use of biological resources.

It is my opinion that, in an international context, the CALM Proposals are admirable and would be the envy of many conservation-minded groups in other countries. What is more, from the evidence of my recent inspections of forests and forest operations in the south-west forests, the rhetoric is matched by actions on the ground.

The CALM Proposals are well in line with Articles 11 *Research and Training* and 13 *Public Education and Awareness*. Article 14 *Impact Assessment and Minimizing Adverse Impact* is the last one of significant interest to this critique as it relates to the very process under which the Proposals have been produced. The Proposals have been produced because the State of Western Australia, as with all of the other States of Australia, has (quoting Article 14):

- appropriate procedures requiring environmental impact assessment of its proposed projects that are likely to have significant adverse impacts on biological diversity ... and
- appropriate arrangements to ensure that the environmental consequences of its programmes and policies that are likely to have adverse impacts on biological diversity are duly taken into account

The relevant network of Commonwealth and State legislation is discussed more fully under section 6, below. It is sufficient to note here that in terms of the UNCED Draft Convention, Australia, and Western Australia in particular, is already observing what most of the Convention requires and has been doing so for many years.

In conclusion, I repeat that The CALM document *A Nature Conservation Strategy for Western Australia* should be seen as an outstanding document of its kind. The conservation strategy clearly states its aims, defines its area of interest, places the document in a global, national and state context, and proceeds to analyse the problems of conservation for the State. The CALM Proposals are admirable and would be the envy of many conservation-minded groups in other countries.

### **3. UNCED non-legally binding authoritative statement of principles for a global consensus on the management, conservation and sustainable development of all types of forest.**

The CALM Draft Proposals relate in most respects very commendably to what is contained in the UNCED statement on forests. This is not altogether surprising as the statement is fairly broad, reflecting no doubt the number of compromises needed to produce any sort of document at all. The Preamble to the statement notes that :

the subject of forests is related to the entire range of environmental and development issues and opportunities, including the right of socio-economic development on a sustainable basis.

Western Australians are already:

committing themselves to the prompt implementation of these (the statement) principles

by supporting the processes behind the CALM Proposals, and in:

Recognizing that the responsibility for forest management, conservation and sustainable development is in many states allocated among federal/national, state/provincial and local levels of government, each State in accordance with its constitution and/or national legislation, should pursue these principles at the appropriate level of government.

The fifteen Principles/Elements of the statement sit well with the CALM Proposals. They recognize that:

States have .... the sovereign right to exploit their own resources pursuant to their own environmental policies (but also that they) do not cause damage to the environment of other States or of other areas beyond the limits of national jurisdiction.

They note that forest resources should be sustainably managed, require timely reliable and accurate information for decision-making purposes, and that all parties in the community should be part of that decision-making process. All forests are part of the global ecosystem and States should recognize their responsibilities in this regard.

The statement notes that all countries should pay due attention to both their production and consumption of forest products as part of a world effort to eradicate poverty and promote food security. Thus:

Efforts should be made to promote a supportive international economic climate conducive to sustained and environmentally sound development of forests in all countries, which include, *inter alia*, the promotion of sustainable patterns of production and consumption, the eradication of poverty and the promotion of food security.

The present author sees this as a responsibility for every state to attain reasonable self-sufficiency as far as possible in forest products, and especially in a state such as Western Australia which has a large area of productive forest compared to its population. I, personally, do not support one argument put to me during discussions in Perth that the State has forests so rare and valuable in nature as to warrant rejecting a responsibility to use at least part of those forests to help to sustain the State's own forest product requirements. Such a responsibility

could, of course, be met by using the products of native forests already heavily modified as a consequence of past use or of plantations created on what is now non-forested land.

The statement expounds the principles of conservation which are well enshrined in the CALM Proposals where:

National policies and/or legislation aimed at management, conservation and sustainable development of forests should include the protection of ecologically viable representative or unique examples of forests, including primary/old-growth forests, cultural, spiritual, historical, religious and other unique and valued forests of national importance.

A number of the items in the statement are concerned with the poorer, less-developed countries of the world which are struggling against much more difficult problems of poverty and population pressure than is Western Australia and so do not warrant particular attention in the present context. However, taking account of recent arguments in Australia that imports of certain timbers should be banned because of an apparent lack of a conservation ethic in the state of origin, we should note that:

Unilateral measures, incompatible with international obligations or agreements, to restrict and/or ban international trade in timber or other forest products should be removed or avoided, in order to attain long-term sustainable forest management.

In conclusion, the CALM Proposals are in good agreement with what has been attempted at the UNCED meeting to find world consensus on the management, conservation and sustainable development of all types of forest.

#### **4. In relation to Australia's international treaties and obligations.**

The CALM Draft of *A Nature Conservation Strategy for Western Australia* sets out clearly and succinctly the International Agreements to which Australia is a party and which Western Australia is obliged to observe (p 15-16). The State is responsible for wetlands which are part of a world network needed for the adequate conservation of waterfowl. The State also has responsibilities in association with the Commonwealth Government for Shark Bay, listed on the World Heritage Register. CALM is responsible for implementation in Western Australia of international agreements which fall within a general coordinating role of the Australian National Parks and Wildlife Service. The CALM Proposals clearly recognize these wider responsibilities for conservation of biological diversity and the management of particular habitats and areas of international significance.

### Part III

## THE CALM PROPOSALS IN A NATIONAL CONTEXT

In this second part we consider the CALM Proposals from a national perspective. Australia has undertaken a number of initiatives in recent years intended to improve on what are already commendable levels of conservation of biological diversity and forest practice by world standards. Some of these have been prompted by world developments of which we were most often a part. Others have been distinctly Australian, generated by changing perceptions of forested land and forests on the part of the Australian public and translated into policy and legislation by governments. In the following sections the Proposals are compared with a number of significant national initiatives. It would be disappointing to find Western Australia not conforming and preferable for it to be at the forefront of Australian conservation.

### 5. Australian Government legislation.

The CALM Draft of *A Nature Conservation Strategy for Western Australia* takes note of Australian Government legislation which relates to the CALM Proposals (p 17-18). Four Acts as they relate to nature conservation have significance for Western Australia;

Australian Heritage Commission Act 1975,  
World Heritage Properties Conservation Act 1983,  
The National Parks and Wildlife Conservation Act 1975, and  
Wildlife Protection (Regulation of Exports and Imports) Act 1982.

There are two additional pieces of Commonwealth legislation of relevance to the Proposals, (Review of Management Strategies p 102):

Environment Protection (Impact of Proposals) Act 1974, and  
Customs Act 1901.

the latter being the authority under which export licences for forest products are issued by the Commonwealth, although not clearly acknowledged as such in the documents.

The significance of all of this legislation is clearly stated in the CALM Proposals. An interested reader can readily ascertain the relationships of this complex of legislation to local actions and controls.

### 6. The National Conservation Strategy

The *National Conservation Strategy* makes a point of the flora and fauna of Australia being characterised by high natural diversity, high endemism and particular susceptibility to extinctions and declines. The *Nature Conservation Strategy for Western Australia* clearly is in complete agreement with this view and points out the possibly more notable nature of some of the fauna and flora of the State and the climatic, fire, and other environmental factors which might easily lead to further extinctions. The fragility of the ecosystems is given adequate emphasis.

It is abundantly clear that the principles of the *National Conservation Strategy* are being followed in the CALM Proposals. Extinctions and the causes of extinctions are recognised. Responsibility is accepted for protecting endangered species. The overall aims and objectives of the State conservation strategy follow closely those of the national document.

### 7. Resource Assessment Commission - Forest and Timber Inquiry Final Report.

The first reference given to the Resource Assessment Commission (RAC), set up by the Commonwealth Government in 1989, was to conduct an inquiry into options for the use of

Australia's forest and timber resources. The RAC was faced with a very similar set of tasks for the whole of Australia to those embodied in the CALM Proposals. The similarities in tasks can be gauged by studying the RAC outline of the problems in their Introduction as follows:

1.02. In recent years there have emerged within the community serious divisions about the use of forest and timber resources. The most severe conflicts have centred on public native forests, particularly areas that have traditionally been used for wood production.

1.03. Most conservation groups and large sections of the community oppose logging of public native forests, arguing that greater benefits will accrue to the community if as much as possible of the nation's natural forest ecosystem is maintained. ...

1.05. The forest management agencies generally maintain that logging is compatible with conservation and ecological goals, provided adequate areas of forest are placed in conservation reserves and appropriate measures are taken within production areas to mitigate the effects of logging. This view is also reflected in industry's position in relation to the forest resource. ...

1.09. The lack of coordination and communication between the large number of state, territory and Commonwealth agencies involved in forestry-related decisions has led to a confusion of goals, tasks and administrative procedures. ...

1.10. With a history of dependence on public forest resources, industry finds itself in a difficult position. Because of uncertainty about raw material supplies, investment plans have been curtailed and commercial opportunities foregone. Conservation groups have been equally dissatisfied with the lack of a coherent and consistent approach to policy.

1.22. Against this background ... the Prime Minister requested the RAC to conduct an inquiry into options for the use of Australia's forest and timber resources.

One very positive recommendation of the RAC Report was for the implementation of a National Forest Policy, released in July and discussed under 10 below.

A second strong recommendation was for the implementation of a national policy on deforestation to minimise forest-clearing activity. Discussion is proceeding on this matter and it is also discussed in several other parts of this Report.

Considerable attention was given to options for use of the remaining old-growth forests. The RAC suggested there were two options available to governments:

The first option is to require a rapid cessation of all logging operations within those forests.

The second option is for forest management agencies to prepare comprehensive management plans that identify and rank old-growth forests in terms of their range of values. Under this option it may be decided that after adequate protection of examples of old-growth forests some old growth may be available for logging.

If we study the CALM Proposals, read in conjunction with Australian Heritage Commission/ Department of Conservation and Land Management (1992), we see that this second option has been adopted in a very comprehensive manner in the Western Australian forests of the south-west, erring on the conservative side in the retention of old-growth areas in reserves.

The RAC also gave attention to wilderness and wilderness values, recommending that state and territory authorities undertake comprehensive reviews of land which might possess such qualities with a view to protection. The CALM Proposals report on such a review and contain recommendations on land with wilderness status in the south-west. There are no doubt other areas within the state deserving of such status and appropriate protection.

Concerning the vexed question of resource security the RAC's:

preferred approach ... is to strengthen and revise agreements between forest management agencies and industry, particularly through the development of enforceable contracts with clear provisions for compensation. A system of long-term tradeable rights incorporating periodic review should be considered carefully by governments. The question of Commonwealth government involvement in these processes is best dealt with through the intergovernmental institutional arrangements that the Inquiry proposes.

These institutional and contractual arrangements are, I understand, being addressed at present in Western Australia. However, further discussion of these matters is not appropriate here. This discussion has also moved forward with the release of the Draft National Forest Policy, see section 10. Recent studies have emphasised the need for Australian forest industries to become larger and leaner to be able to compete internationally. This will require guaranteed security of resources (FAFPIC 1990). My own opinions are much in line with the RAC findings, as I consider it essential for Australia to develop an industrial forest base which is internationally competitive, partly based on our native forests, but with a major plantation component (Shepherd 1991).

A point of interest to the present discussion of the RAC Report involves integrated management of forested lands. The RAC was of the opinion:

At a state and territory level an integrated body responsible for conservation, land and forest management, both within and outside reserves, is the best way of ensuring that conservation goals are met in all forest tenures.

The administrative arrangements in Western Australia conform with these RAC findings with CALM being responsible for a highly integrated form of land management involving a multiplicity of goals, including conservation.

The evidence given to the RAC enquiry came from all of the States in Australia, including Western Australia. A reading of a great deal of the material related to the CALM Proposals, leads me to the conclusion that the RAC findings apply equally to Western Australia as to Australia as a whole. The RAC concluded:

After taking the precautionary principle and intergenerational equity into account ... the cessation of wood production activities in native forests is not justified on the basis of the evidence before it.

However, I agree also with the rest of the findings of the RAC:

The Inquiry strongly emphasises that there are inherent uncertainties about long term effects and therefore the precautionary principle must form the basis for all future policies and practices relating to the management of forests for wood production and for minimising the impacts of this activity. This is particularly important given the current trends towards increasing intensity of wood production regimes.

Arising out of this discussion the RAC wanted 'systematic long term monitoring' of impacts and strongly recommended 'independent audits of the adequacy of forest codes of practice and their enforcement'. The unacceptable impacts of woodchipping on forests was seen to be best controlled through codes of practice (i.e. where land use decisions were made to allow woodchipping) than to 'impose import sanctions or engage in other forms of intervention in established commercial activities'. I will return to these particulars topic later in section 15.

However, arising out of the evidence was a further conclusion which clearly indicates that the RAC did not see the State Forest Services playing a passive role in managing forest land under their jurisdiction but being active managers in all senses of the word. Thus we have:

Conservation and forest management agencies should place greater emphasis on developing strategies for active management of ecological processes in forests to maintain the values and benefits of the forest estate.

The CALM Proposals are clearly consistent with this finding of the RAC. There may well be (in fact the public submissions show there is) dispute on the detail of methods of management. The TAP established by the EPA will no doubt attempt to resolve disputes involving the scientific basis of some of the specifics of the CALM recommendations. There will need to be alterations in specific methods as the scientific evidence indicates this is necessary, and CALM has shown every willingness to do this. However, viewed in broad principles, and against the background of the enormously comprehensive RAC Inquiry, it is very difficult to find fault with the CALM Proposals. They embody the current knowledge of the ecological processes of

the forests, first in the context of the capabilities of the authority to carry out the work required, and second, within the ethical, social and economic context of the State.

In summary, the RAC tasks have significant similarities to those outlined in the CALM Proposals. A positive recommendation of the RAC Report was the implementation of a National Forest Policy and a Draft was distributed in July. A second strong recommendation was for the implementation of a national policy on deforestation to minimise forest-clearing activity.

The second option given to governments to follow by the RAC for old-growth forests has been adopted in the Western Australian forests of the south-west, resulting in the retention of significant additional areas of old-growth retained in reserves. The RAC recommended that state and territory authorities undertake comprehensive reviews of land which might have wilderness qualities and this has been done for wilderness in the south-west. Other areas of the state may deserve such status and appropriate protection.

Concerning resource security, the RAC preferred to strengthen and revise agreements between forest management agencies and industry, particularly through the development of enforceable contracts with clear provisions for compensation. Ultimately this may allow Australian forest industries to become larger and leaner and to compete internationally. The CALM proposals do not suggest how Western Australia will treat these problems but it is my understanding they are being addressed.

I conclude that the RAC findings apply equally to Western Australia as to Australia as a whole and that cessation of wood production activities in native forests is not justified. However, I agree also with the RAC that there are inherent uncertainties about long term effects and the precautionary principle must apply requiring systematic long term monitoring of impacts and adequate codes of forest practice and their enforcement.

The RAC did not see the State Forest Services playing a passive role in managing forest land under their jurisdiction but being active managers in all senses of the word and the CALM Proposals are clearly consistent with this finding.

In terms of broad principles, and viewed against the background of the enormously comprehensive RAC Inquiry, it is very difficult to find fault with the CALM Proposals. They embody the current knowledge of the ecological processes of the forests, first, in the context of the capabilities of the authority to carry out the work required, and second, within the ethical, social and economic context of the State.

## **8. United Nations Conference on Environment and Development - Australian National Report.**

In the Message from the Prime Minister which appears at the beginning of this publication Mr Keating notes:

In this report Australia chronicles its own performance over the past twenty years, noting our successes and failures and the changes in our perception and approach. It details Government programs and policies to address environmental and developmental problems, as well as the processes we now have in place to deal with conflict over access and use of resources. The views and commentary of a wide range of non-government organisations and concerned individuals are also included.

There is an emerging international community and political will to accept the principles of ecologically sustainable development as the basis for future development. The United Nations Conference on Environment and Development has challenged all countries to assess and evaluate their role in promoting this objective. Its success will be a measure of the extent to which all nations succeed in promoting this approach as a priority in dealing with the complex issues involved.

A reading of this document reinforces the view expressed above, under section 2, that the CALM document *A Nature Conservation Strategy* is outstanding, and the *Management Strategies* represent an extremely realistic and achievable response to the problems facing CALM in the south-west forests. We can note that the unique nature of the Australian flora and fauna (p 92) has been equally well recognised in the CALM Proposals.

In this regard the UNCED Report recognises that :

Ecotourism is also a rapidly expanding sector of the industry which, as a whole, is one of Australia's top foreign exchange earners. Further, whilst the potential of Australia's biological diversity as a source of food and useful pharmaceutical, medicinal and industrial products has scarcely been realised, attention is now being given to development of novel Australian bioresources and biotechniques.

The maintenance of biodiversity is also important for Australia's indigenous peoples. Protection of traditional food plants is vital for the protection of cultural identity and future education of young people and land users. (p 93)

Appropriate recognition of the potential of ecotourism is given in the CALM Proposals and this has already obviously become a primary reason for tourism within the south-west region.

It is also worth noting particularly the section dealing with Off-Reserve Protection (at p 94 of the National Report), which says:

Most biological diversity does and will continue to exist 'off-reserve' in areas privately owned and outside Australia's system of national parks, wildlife reserves and recreation areas.

The Report also has this to say about Wilderness:

The protection of Australia's remaining wilderness areas is a key issue, particularly given the special vulnerability of wilderness to development pressures. In recognition of the importance of wilderness, preparation of a National Wilderness Inventory is underway. The Inventory is a necessary management tool for identifying and predicting the effect that development proposals may have on wilderness qualities. (p 108)

At p 160 we can note the statements relating to the development of Codes of Forest Practice (which are in place in Western Australia and which are discussed later, see sections 11 and 15):

The Standing Committee of the Australian Forestry Council recently released *Forest Practices Related to Wood Production in Native Forests: National Principles*.

As poor logging practices can have considerable detrimental impact on non-wood values, State and Territory Governments are addressing the issue through the evolution of codes of forest management practice. Most States already have Forest Practices in place. (p 160)

We might also note that the Report (at p 227) details a number of inventories established for specific purposes which are maintained at the Commonwealth level, but input and cooperation is required at the State level and Western Australia is playing its part in all of these:

- National Forest Inventory
- National Wilderness Inventory
- National Index of Ecosystems
- Australian Biological Resources Study

In conclusion, the Australian National Report to UNCED is a comprehensive resume of achievements over the past decade. An evaluation of the CALM Proposals vis-a-vis this resume impressed me with their adequacy. They contain adequate and comprehensive management proposals by CALM to cope with the problems of conserving biological diversity in Western Australia and with multiple use of parts of the forest resource of the south-west within a framework of ecologically sustainable development.

## 9. Ecologically Sustainable Development Working Groups - Draft Report - Executive Summaries.

Much of what is relevant to the present discussion in the Draft Report of the Ecologically Sustainable Development Working Groups has been overtaken by the release on 7 July, 1992, of the Draft National Forest Policy (see 12. below). Draft recommendation 16 reads as follows:

that the Commonwealth, in collaboration with the States, develop a National Forest Policy Strategy which clarifies forest policy objectives

- including Commonwealth objectives in respect of environmental protection and conservation of forest ecosystems, biodiversity, and other forest values.

Nevertheless, it is still useful to consider the CALM Proposals against the background of the ESD Draft Report. The Proposals are well in line with the ESD Draft Recommendation 13: - that the States review their current land-use decision-making processes with a view to ensuring that these processes have all of seven stated outcomes, including to:

- identify and consider all tangible and intangible forest values and potential uses and benefits;
- recognise the benefits to the community which can be derived across the spectrum of land tenure ...;
- incorporate extensive public consultations;
- take account of objectives of other tiers of government ...;
- take account of the need to address commercial and conservation issues ...;
- recognise the contribution of private forests to both commercial development and conservation benefits, and
- use conflict resolution mechanisms.

Where the CALM Proposals do not conform reasonably well to these ESD recommendations is that they pay relatively scant attention to private forests and do not pay any attention to the possible use of conflict resolution methods for settling disputes. Chapter 10 of the *Nature Conservation Strategy* deals extensively with *consultation* and *liaison* but not with *conflict resolution* where ultimately trade-offs have to be made to settle an issue in dispute, a situation hinted at but not directly stated at the foot of p 97. The Documents, in general, are very strong on the how and the where but are not at all specific about resolution of conflict where dispute exists. Clearly it is seen that:

CALM's role is to manage the public resource on behalf of the Western Australian community. In doing so it seeks to identify the needs of society and to devise management systems *which satisfactorily reconcile competing uses.* (Review of Management Strategies, p 105, author's emphasis)

The Documents explain in great detail how the public resources will be managed on their behalf but do not explain how CALM has satisfactorily resolved competing uses, where these various uses are, or have been, in dispute.

Much of the ESD Draft Report is concerned with Commonwealth-State interrelationships which are not altogether relevant to the present discussion but several Draft Recommendations reinforce much of what has been said already above, such as number 32:

that the strategic and operational forest management plans which are developed by forest management agencies responsible for conservation and economic uses be based on the following principles

- all forest values and future benefits, including heritage values, being taken into account to assess the most suitable management approach to optimise benefits to the community;
- full public consultation; and
- uses which do not foreclose future options.

Western Australia is clearly the only State to conform with Draft Resolution 35:

that the States consider cooperative arrangements with the Australian Heritage Commission to jointly identify areas and sites of national estate significance, to jointly assess the degree to which such sites are adequately represented in the reserve system, and to discuss possible management approaches for heritage sites outside of the reserve system for entire regions.

The five points which follow have all been taken into account in the exercise so successfully carried out in Western Australia recently, concluding with the publication of the joint report on National Estate Values in the Southern Forest Region of South-West Western Australia (Australian Heritage Commission/ Department of Conservation and Land Management. 1992) - See 12 below.

The ESD Draft Report is concerned with Codes of Practice and environmental prescriptions which it considers should be applied to private forest operations and all other uses of public forests - Draft Recommendations 1, 2 and 3 - p 29. In Draft Recommendation 4 the Working Group on Ecologically Sustainable Forest Use considers that State and local governments should adopt consistent and comprehensive legislative controls over the permanent clearing of private and Crown land for non-forestry purposes. The CALM Proposals do not address this issue very fully. The *Nature Conservation Strategy* notes (at p 85):

There is currently a government moratorium on any further releases of Crown land for agricultural purposes. Thus, the major issue of concern for nature conservation is how much of the remnant vegetation on farms in highly cleared areas can be retained, and how well can it be managed. ... Some liaison structures relating to land care already exist. These largely aim to prevent degradation of soil and water resources upon which farm productivity depends, and to improve the sustainability of farming processes.

The section goes on to explain the various avenues available to *encourage* private landholders to not clear remnant vegetation but obviously stops short of recommendations in line with the ESD Draft Recommendation 4. However, the *Nature Conservation Strategy* it does recognise the problem dealt with in Draft Recommendation 9:

that incentives be provided for private forest owners to maintain and manage forests for nature conservation and maintain important habitat of rare or endangered species which are inadequately reserved

- by providing technical advice and support on ways of managing forests sympathetically with nature conservation goals, and
- by financial support, by paying management fees, or by purchase, if necessary.

Chapter 7 of the *Nature Conservation Strategy* deals with issues relating to private land but stops short of recommending government regulation of remnant vegetation on such lands, in spite of the acknowledged value of such remnants for the conservation of biological diversity (Saunders *et al.* 1987). This is not altogether surprising given the reluctance of all governments in Australia to place constraints on the use of privately owned rural land, even in the face of clearly demonstrable loss of *sustainable productivity* and *conservation values* in many situations as a consequence. However, in the Draft National Forest Strategy (see 10 below) there is a recommendation for the States to take a stronger line on this matter.

The *Management Strategies* (at p 188, almost at the last page) points out that there is 507 000 ha of native forest on private property in the south-west, which compares to a State Forest estate managed by CALM for the whole of Western Australia of 1 750 467 ha. The *Management Strategies* (at p 189) reveals that private forest owners:

have been given the opportunity to use CALM's logging contractors and log buyers for the harvesting and marketing of their timber

and does note:

It is proposed to expand this concept [management schemes for plantations on private land] to include the management of native vegetation on private property.

but this appears to be seen more in terms of restoring forests on private property for the purposes of harvest and maintenance of local and regional environmental quality rather than conservation of biological diversity. However, it should be said that the use of CALM logging contractors for the harvesting of private land has probably firmed the resolve of many landowners to retain their forest as the CALM arrangements guarantee them a fair price for their harvest. In the long term conservation of biological diversity will be enhanced.

The idea of establishing a Private Forest Council to progress the role of sustainable private forest management, as appears in the ESD Draft Recommendation 28, does not receive recognition anywhere in the CALM proposals.

In summary, much of the discussion in the Draft Report of the Ecologically Sustainable Development Working Groups has been overtaken by the release of the Draft National Forest Policy. Nevertheless, it is still useful to consider the CALM Proposals against the background of the ESD Draft Report. In general the CALM Proposals are in good agreement with the Draft Report but do not conform well with some ESD recommendations in that they pay little attention to private forests and less to the possible use of conflict resolution methods for settling disputes. The Documents explain in great detail how the public resources will be managed on their behalf but do not explain how CALM has satisfactorily resolved competing uses, where these various uses are, or have been, in dispute. The Working Group on Ecologically Sustainable Forest Use considers that State and local governments should adopt consistent and comprehensive legislative controls over the permanent clearing of private and Crown land for non-forestry purposes. The *Nature Conservation Strategy* deals with issues relating to private land but stops short of recommending government regulation of remnant vegetation on such lands, in spite of the acknowledged value of such remnants for the conservation of biological diversity

## 10. The Draft National Forest Policy

A Draft National Forest Policy Statement was issued on 7 July, 1992, for public comment. Titled "A New Focus for Australia's Forests", the Statement has been jointly developed by Commonwealth, State and Territory officials under the auspices of the Australian Forestry Ministerial Council (AFC) and the Australian and New Zealand Environment and Conservation Ministerial Council (ANZECC). The Statement outlines agreed objectives and policies for the future of Australia's public and private forests and as such has a bearing on the CALM Proposals. The Statement builds on three of the documents mentioned above, the National Conservation Strategy, the Resource Assessment Commission - Forest and Timber Inquiry Final Report, and the Ecologically Sustainable Development Working Group on Forest Use.

The Statement notes:

That managing Australia's forests in a sustainable manner calls for policies that are capable of adapting to change. Such change may involve several aspects: the way society values forests; public resource management objectives and approaches; and the opportunities for regional development.

All of these things are involved in the CALM Proposals and the various strategies put forward to meet the objectives of the exercise represent a substantial change in the way in which forests in the south-west of the State will be managed in the future. The CALM Proposals also adhere to the wishes of the Statement where it says:

The Governments sees this statement as taking a direction that differs in a number of ways from the approach in the past. They acknowledge that, at the strategic planning and operational management level, there should be greater integration of objectives between Governments and between Governments and the community.

The 'Vision' of the Statement is essentially what has been discussed in the sections above, one of operating in an ecologically sustainable manner in which biodiversity and other conservation values are protected. However, there is also a vision of a major plantation industry, a dynamic and modern wood processing industry that is internationally competitive and that all of this

industry will be innovative, highly skilled and technically advanced. The vision is underpinned by a number of agreed approaches to forest management, among them the following:

- Governments should set the regulatory framework for the use of native forests in order to achieve social and environmental objectives. Within these constraints, market forces should determine the extent of resource use and the nature of industry operations, within the parameters of government policy.
- Commercial uses of forests (including wood production) that are based on ecologically sustainable practices are legitimate activities. In that context, the establishment of plantations for wood production should be determined on the basis of economic viability.
- Governments should seek complementary management of forests for all uses through integrated strategic planning and operational management.

In the present context we need to examine the Specific Objectives and Policies to see how these might influence an opinion of the CALM Proposals. Two of the principle conservation objectives of the Statement are the maintenance of a permanent forest estate in Australia and the protection of nature conservation values in forests. No problem exists here for pages 4 and 5 of the Draft policy. Western Australia has already complied with the requirements of the section dealing with 'Protection of old-growth and wilderness values through a transition strategy' (p 7). The Statement places new reliance on the adoption of the:

AFC's set of national principles of forest practices related to wood production in native forests [and recommends that these] should be applied to all public and private native forests in Australia.

and goes on to recommend that :

these codes of practice may take different forms in different States, but they will be effective, preferably legislatively based or enforceable through contractual agreements, and they should reflect 'best available practices'.

The Governments<sup>1</sup> agree that it is desirable to maintain and protect existing forest and:

Accordingly, the Governments will adopt the policy that further clearing of public native forests for non-forest use or plantation establishment should be avoided or limited to those instances in which national and regional conservation and catchment management objectives are not compromised.

and will seek to ensure that local governments and other authorities do likewise. The Statement goes on to recognise that sustainable management of private native forest is desirable but suggests milder recommendations for controls on clearing and operations, where it says:

Sustainable management of private native forests will be encouraged through a combination of measures that may include dissemination of information about and technical support for forest management, education programs, conservation incentives, land clearing controls, harvesting controls, and codes of forest practice.

The Statement recognizes the inconsistency which can arise where codes of practice are applied to private forests but are not stipulated for other uses of private lands. This has important implications for remnants of native vegetation on farming land (see 9 above):

Accordingly, State Governments will review and further develop standards relating to other private land uses.

However, the Statement does not offer any help in resolving the question of when is a private forest not a forest and merely private land used for other purposes? It is of interest here to note an item in *The Canberra Times*, 21 July, 1992, relating to the House of Representatives

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<sup>1</sup>The term 'the Governments' refers collectively to the Governments of the Commonwealth, the States and the Territories.

Standing Committee on the Environment, presently examining the role of community-based programs in maintaining biodiversity:

In relation to land clearing, the committee said continued clearing in many parts of the country contradicted programs like One Billion Trees and Save the Bush.

It said the Federal Government should push the states and territories to adopt laws similar to those in South Australia, where landowners have to get approval before clearing any bush. In S.A. 96 percent of applications for clearing are refused on the basis that the native vegetation at stake is biologically important.

Sustainable economic use of native forests and plantations is a major objective of the Statement.

Accordingly, the Governments will cooperate in providing resource security for existing and new industries involving:

- resource security based on the Commonwealth giving full faith and credit to the outcomes of accredited assessment processes which will normally be State processes of land use planning and resource assessment, consistent with Schedule 2 of the Intergovernmental Agreement on the Environment;
- resource security will satisfy the requirements of potential investors in either industrial infrastructure and/or forest development, including plantations;
- where a project proposal has been approved, State Governments guaranteeing the long term supply of wood resources to industry in contractual agreements, with the Commonwealth agreeing not to review the decision other than in exceptional or unforeseen circumstances or where expressly provided for.

Important provisions which are critically related to the CALM Proposals are found at p 10. The sections deal with export of woodchips derived from integrated sawlog and pulplog harvesting operations and sawmill residues which enable the community to derive a return from felled wood that is unsuitable as sawlogs or is not required by domestic processors. A considerable tonnage of wood from the south-west forests finds its way into woodchip exports, particularly wood from marri trees. Thus:

- The Commonwealth will consider longer term approvals for the export of woodchips from native forests, including managed regrowth forests, where those forests have been subject to an agreed joint State-Commonwealth comprehensive regional assessment of conservation values and where, as appropriate, management plans have been agreed between the State and the Commonwealth, and harvesting is subject to the application of codes of practice. These longer term approvals will be consistent with other Commonwealth Government policies and commitments.
- The implementation of the agreed State - Australian Heritage Commission management plans for national estate forests and the application of harvesting codes of practice will be regarded as meeting the Commonwealth's obligations under s. 30 of the *Australian Heritage Commission Act 1974*.
- In relation to pulpwood production from native forests, the Governments will ensure that domestic processors are given the first opportunity to purchase the resource at a price that ensures an adequate return to the forest management agency or the private grower. This policy will come into effect when consideration is given to major changes or renewals to wood resource access.
- The Commonwealth Government will review the adequacy of existing mechanisms to prevent transfer pricing by woodchip exporters.

These provisions in the Draft National Forest Policy strengthen the position of CALM as a manager of commercial forests in the State as many of the requirements under these four clauses have already been agreed between the Commonwealth and the State of Western Australia (Australian Heritage Commission/ Department of Conservation and Land Management 1992).

The Draft National Forest Policy Statement outlines agreed objectives and policies for the future of Australia's public and private forests and as such has a bearing on the CALM Proposals. The CALM Proposals adhere substantially to the intent of the Draft Statement. There is unanimity on policies that 'further clearing of public native forests for non-forest use or plantation

establishment should be avoided' but both the Draft Statement and the CALM Proposals are equally soft on private forest in that "Sustainable management of private native forests should be encouraged....' There is little evident support for the stronger position advocated by the House of Representatives Standing Committee on the Environment noted above. Provisions in the Draft National Forest Policy relating to woodchip exports strengthen the position of CALM as a manager of commercial forests in the State as many of the requirements under the four relevant clauses freeing up approvals for export have already been agreed between the Commonwealth and the State of Western Australia.

#### **11. Australian Heritage Commission/ Department of Conservation and Land Management - National Estate Values in the Southern Forest Region of South-West Western Australia**

There are significant areas of forest listed on the Register of the National Estate, many of which are designated for timber production. Such forests, in Tasmania, in the south-east of New South Wales, and in the south-west of Western Australia, have become the focus of community controversy as to the appropriateness of various logging practices. As the joint AHC/CALM report states:

One result has been an undifferentiated perception by the general public that areas of national estate forests should not be logged; regardless of the values for which they are listed, or their management regime.

and goes on later to say:

The combination of the general level of debate about the National Estate and the lack of systematic cooperative surveys has led to a situation where neither the conservation of the forests, nor the needs of development and industry were being met in the most effective manner.

The AHC and CALM agreed to work on a joint assessment of the National Estate Values of the South Eastern Forests (Australian Heritage Commission/ Department of Conservation and Land Management 1992.), following on from a detailed submission made by the AHC to the Resources Assessment Commission inquiry into Australia's Forest and Timber Resources. The work was to involve:

- a) joint identification of all areas in the region of national estate significance, for all national estate values;
- b) joint analysis of the extent to which identified national estate values in the region are protected within existing nature conservation reserves; and
- c) joint discussion about management options in non-reserved areas for the protection of identified values.

In arriving at the result of any assessment of the forests in question, the AHC was guided by the following principles:

- a) protection should be focussed on the regional occurrence of each value, taking into account its abundance, spatial and temporal distribution, spatial characteristics, variation, and condition, rather than on individual locations of the value in isolation;
- b) for sensitive national estate values, the highest level of protection is obtained through reservation;
- c) all sensitive national estate values should have adequate representation in nature conservation reserves; and
- d) management outside nature conservation reserves should be aimed at minimising the adverse impacts of management operations on national estate values which may be sensitive to disturbances.

AHC judgements were based on Criteria for the Register of the National Estate. A number of new areas were recommended for addition to the Register of the National Estate. Information on forest areas and forest values came mainly from the data base of the CALM, but other published and unpublished records, and professional opinion was employed where required.

The AHC and CALM developed a Memorandum of Understanding to provide an agreed basis for applying the results of the joint work, in which the AHC states:

- it considers the joint work to be an adequate assessment of those national estate values listed in this report; and
- it considers the joint work to be a suitable framework for Commonwealth consideration of export woodchip licences under section 30 of the Australian Heritage Commission Act 1975.

In turn, CALM states:

that it will protect the national estate values on CALM land within the Southern Forest Region, within the context of maintaining timber volumes to industry as specified in the 1987 Timber Strategy, and maintaining other values specified in the 1991 (1992) Draft Forest Strategy.

The results of the joint study have been reported as a major step forward in securing a rational basis for both conservation and sustainable development in significant forested areas of Australia. Presumably, similar approaches will be applied in other States where such problems await resolution. For this process to succeed a significant GIS for data storage and retrieval is required, as was used in the Western Australian exercise. This emphasises the importance of the work of the National Forest Inventory, involving as it does the resources of the DPIE group in Canberra and the cooperating resources of the various forest authorities in the States.

In summary, there are significant areas of forest in the South-west listed on the Register of the National Estate, many of which are designated for timber production. The AHC and CALM agreed to work on a joint assessment of the national estate values of the south-west forests. As a consequence, a number of new areas were recommended for addition to the Register of the National Estate. The AHC considered the joint work to be a suitable framework for Commonwealth consideration of export woodchip licences under section 30 of the Australian Heritage Commission Act 1975. CALM stated that it will protect the national estate values on CALM land within the Southern Forest Region, within the context of maintaining timber volumes to industry as specified in the 1987 Timber Strategy (Department of Conservation and Land Management, 1987a), and maintaining other values specified in the 1991 (1992) Draft Forest Strategy. This agreement satisfies much of what is required in the new Draft National Forest Policy to free up approvals for the export of woodchips, as noted under 10 above.

**Part IV**  
**THE CALM PROPOSALS AS A PROFESSIONAL**  
**RESPONSE TO A COMPLEX MANAGEMENT ISSUE.**

In this Part of the Report we consider the CALM Proposals at the State level. In the following sections the Proposals are examined to try to place the complexity of the role of CALM in perspective, to highlight the change in conservation strategy in only a decade, and to emphasise the need to adopt a long-time vision when trying to understand the effects of silvicultural and management prescriptions and practices. Finally, I have made comment on the current silvicultural proposals in the jarrah and karri forests. These comments must be taken as observations by an informed outsider who has a genuine interest in our national heritage of biological diversity and of the welfare of the forests of Australia.

## **12. CALM's State Responsibilities.**

A reading of the CALM Proposals must surely be a revelation to anyone not aware of the complexity of the management tasks of an agency such as CALM. If nothing else these Documents have done service in spelling out the myriad of tasks and interlocking responsibilities with which the Department is charged. Yet, in common with almost all government services in Australia today, the staff of CALM is expected to undertake these tasks with constrained budgets and in recent times has often been faced with considerable hostility from some elements of the public.

In assessing the CALM Proposals it is useful to examine the range of responsibilities and obligations incumbent on CALM, gleaned from various parts of the *Management Strategies* and other sources:

- CALM is expected to conserve the biological diversity of lands under its jurisdiction and to maintain ecological values (S-1 and S-2)
- CALM has contractual obligations to provide the raw materials for a range of forest-based industries, for use as posts and poles and as fuelwood, for charcoal, for sawing into lumber, for use in crafts, and for woodchipping (Department of Conservation and Land Management 1987a).
- It is incumbent on CALM to maintain maps, and a comprehensive inventory of the State's forest resources for management purposes, including the calculation of a sustainable yield from the forested land available for harvesting.
- The public expect to obtain a large range of values from the forest, many of which must involve CALM in some way, including recreation, water catchment protection, landscape, heritage, wilderness, honey, wildflowers, gravel, tourism, grazing, opportunities for scientific study, minerals and defence training (p S-2).
- There are statutory requirements for management of forests in Western Australia influenced by 17 Acts of State Parliament ... and ... two Commonwealth Acts (S-3)
- CALM has a responsibility 'to protect community and environmental values on and adjacent to land managed by the Department from damage from wildfire. The secondary goal is to use fire as a management tool to achieve land management objectives ...' (p 125)
- CALM has responsibilities in the prevention of disease, the control of weeds, the eradication of feral animals, and in minimising the effects of damaging insects in the forested areas of the State. (p 125-8)
- CALM has to conduct research into a wide range of topics, spanning an equally wide range of scientific disciplines, including forest wildlife and ecology, forest management, inventory, soil science, fire science, wood science and forest engineering. (p 176-182)

CALM, as have comparable forest organisations in the other States and overseas, has coped with this diversity of obligations without massive increases in funding by becoming cleverer and by adopting new technologies. It is a much leaner and meaner organisation than it used to be. In the field CALM operations have been mechanised and ancillary services reduced or

contracted out wherever possible. Communications have been simplified and speeded up through the use of the latest technologies. Far fewer people are needed to achieve the same result than only a decade ago.

Forest services in Australia are amongst the leaders in the world in the use of computer technology applied to forestry. They are well to the fore in the use of Geographic Information Systems (GIS) to store vast arrays of data on trees, shrubs, herbs, soils, birds, insects, animals, fungi, in fact everything that makes up the resource we call 'the forest'. These data are being collected by individual observation, from aerial photographs and from satellite imagery. Individual staff members are amongst the leading exponents of complex modelling systems for forecasting future growth and for the calculation of sustainable yield, behaviour of ecosystems under set conditions, and of fire behaviour under given climatic and fuel conditions.

Much of the major thrust into research of forest ecosystems has come from the forest services. Witness to this is the vast amount of information gathered in the past two or three decades on the forests of the south-west of Western Australia on which the CALM Proposals are largely based. Forest zoology has blossomed in Australia in recent years, with much of the expertise resident in one or other of the forest services. Much the same applies to soils, to pathology, forest ecology and to many other areas of expertise. It certainly applies to the collection of information on timber resources and the calculation of a sustainable annual harvest. This is a highly skilled and complex task, requiring considerable human and scientific resources. The results obtained should be accepted by the public as a fair and accurate record of these matters. It is not possible to duplicate many of the extremely complex functions of a government department without similar resources and, therefore, the public have to be persuaded that the Department is providing fair and accurate answers to many matters under review in the CALM Proposals. For, example, we must accept the calculation of allowable cut as it would be impossible, without very considerable resources, to attempt a check of this figure.

However, there are aspects of the CALM Proposals which is difficult to come to grips with from the various documents. One of these is the commitments of the State for timber production. The section in *Management Strategies* dealing with Timber Harvesting (p 167) does not relate in any way to commitments. Tables 20 and 23 (at pages 171 and 174) provide estimates of standing volume but the management significance of this is not apparent, and the calculations of sustainable yield in Table 24 on p 175 are not related to what the State must provide under existing commitments. The sustainable yield proposed in the 1987 Timber Strategy will we are told be little altered by the current proposals. However, because of alterations in stream boundaries and road corridors the yield will now come from different areas of the forest. Even a small alteration in yield may be important to some part of the timber industry if it is regionally based. The impact on the timber industry of the *Management Strategies* is not well explained in the CALM Proposals. This is regrettable since one purpose of the Proposals is to demonstrate their social and economic impacts, as well as the conservation and sustainable development impacts. I understand there is to be another CALM document which explores these matters in detail but it would be useful if some of this were to be explained in the *Management Strategies*. A simple tabular presentation must surely be possible without getting too involved in detailed analysis of the timber industry itself.

In conclusion, much of the expertise on the environment, biodiversity and ecology of the forests of Western Australia and the consequences of manipulating those forests in one way or another is resident within CALM. The resource information and allowable harvest has been collected and calculated by the service and must be taken by the public as a fair and accurate record of these matters. It is not possible to duplicate many of the extremely complex functions of a government department without similar resources and, therefore, the public have to be persuaded that the department is providing a fair and accurate answer to questions on many matters, within the capabilities they have to do so.

We are told the sustainable yield not much less than in the 1987 Timber Strategy but the practical significance of this is not given and the impact of this on the timber industry is to all practical purposes ignored in the CALM Proposals. This is regrettable since one purpose of the

Proposals is to demonstrate their social and economic impacts, as well as the conservation and sustainable development impacts. A tabular presentation must surely be possible.

### **13. Evolution of the State Conservation Strategy - 1983 - 1987 - 1992.**

There are three conservation strategies which have been issued for Western Australia within a decade. The first, *A Conservation Strategy for Western Australia* (Department of Conservation and Environment 1983) was part of the Australian response to the World Conservation Strategy of March, 1980. This strategy includes a wide-ranging coverage of the natural environment of the State, conservation of flora and fauna, forests, pastoralism, agriculture, mining, fisheries, water, marine and coastal waters and air. It reviews the current regional and land use planning of the day and, finally, provides for the major elements of a conservation strategy. By present day standards these 'elements' were rather broad and lack the more specific thrust of the latest version. It notes in the closing comments (p87) that:

To a large extent, much of our present day-to-day contribution to conservation for sustainable development is reactive, that is, responding to development proposals with the aim of guiding these along avenues which minimise environmental impact. ... In the long term, there is a need to become, more involved in the planning of development, ...

This first strategy was seen as part of a continuing process of formulating and applying a conservation strategy.

A National Conservation Strategy was agreed at a conference in June, 1983. This strategy was endorsed by Western Australia in February, 1985, committing the State 'to the objectives, principles and major goals set out for sustainable development and living resource conservation in Australia as a whole'. As a consequence, *A Conservation Strategy for Western Australia* was produced and published in January 1987 (Department of Conservation and Land Management. 1987d). This strategy makes almost no reference to the first. It is a relatively short policy-type document, lacking in specifics. It contains definitions, objectives and principles of conservation, reiterating much of the National Conservation Strategy for Australia. There is a brief description of the environment, followed by strategy directions. Implementation is considered in half a page. It is little more than a directional document, pointing the way and providing the principles to be followed in making working arrangements.

The third version is reviewed as part of the CALM Proposals (Department of Conservation and Land Management. 1992a). *A Nature Conservation Strategy for Western Australia* makes little reference to earlier versions. The current strategy is supported by a number of CALM policy statements on environmental matters, seen as interim strategies (Department of Conservation and Land Management 1986a & b; 1987b & c; 1989; 1990c, d, & e; 1991b). *A Nature Conservation Strategy for Western Australia* is the result of a decade of careful development of an adequate and workable response to the need to protect all of the the physical and biological resources of nature of the State. An achievable goal is seen to be nature conservation and management integrated with all development, industrial, and natural resource management activities in the State.

### **14. The 'Time' Factor and the CALM Proposals.**

It is difficult for many people not directly associated with the day-to day care of forested land as part of their working life to appreciate fully the concept of 'time' in forestry. Many of the public criticisms reported concerning forest practices stem from a lack of appreciation of the effects of a reasonable lapse of time. Thus we read reports on forest practices in terms of 'woodchipping results in the destruction of the forest', 'clearfelling leads to the extinction of species', etc. These things are simply not true and many of the misunderstandings stem from a lack of appreciation of the time needed for the natural processes in forests to take place. Almost every hectare of State Forest country logged for woodchips in Australia and retained as native forest has been regenerated. Satellite imagery of the Eden forests in the South-east of New South Wales provides excellent evidence of this as it shows the gradual merging of logged areas back

into the fabric of forest cover with time. However, the process takes at least five years before it is impossible to distinguish on the satellite image previously logged from unlogged areas.

One of the things I can remember clearly from my student days under Dr Max Jacobs, one of Australia's leading eucalypt silviculturalists, was his advice never to judge the results of a regeneration operation until at least 5 years after it was completed. It is difficult to persuade an occasional forest visitor of this fact when the area seen adjoining the road has been logged only recently. Members of the public rarely seek out areas of regeneration dating back 10, 20 or 40 years earlier for comparison. Few members of the public have been privileged to visit areas of regenerated forest dating back for many decades, such as the 1939 regeneration of Mountain Ash in Victoria, the 1917 regeneration of Alpine Ash on Bago State Forest in southern NSW, or the magnificent 1875 regeneration of karri at the Hundred Year Forest in the south-west of WA. The environmental impacts of forestry operations must be viewed within an appropriate time frame and, in most instances, this time frame is in terms of decades rather than months. This applies equally to the recovery of vegetation and the changes in the wildlife population which relate closely to the vegetation cycle.

We have also all read reports of forestry operations causing the extinction of species. Most species extinctions in Australia have resulted from loss of habitat, mainly due to clearing of land for agriculture. Hence the concern expressed in a number of earlier sections of this Report for the need to prevent further loss of remnant native vegetation on private land. The effects of well managed forestry harvesting on wildlife populations has been to cause perturbations in local population numbers but not extinctions. The RAC Report states (at p 32 in the Overview) that:

logging is likely to increase the risk of extinction of some species, but [the RAC] received no evidence to suggest that increased risks present an immediate threat to the ecological processes on which the forest systems depend. It is impossible to guarantee, however, that future impacts and extinctions may not become a threat. The Inquiry recommends that all management plans and codes of practice explicitly include mitigation measures, and provide for monitoring and assessment of the risks to identified species or groups of organisms.

For wildlife, as with forest cover or habitat, the effects of time are critical and the population changes which take place for individual species are dynamic. Some species build up quickly to unusually high numbers following regeneration of the forest then decline as the niche structures favour other species. The whole regenerative process may take a century or more. For this reason, the RAC call for "monitoring and assessment of risks" is very sensible and the forest authorities must be provided with the capacity to do this work. One reason for public disquiet about the Proposals is that they do not provide adequate reassurance of this capacity for monitoring in the long-term.

In my opinion, the Forest Services in Australia have not adequately explained and reinforced this concept of 'time' to the general public. Publicity material should emphasise the 'time' factor to the utmost until it is properly appreciated by the public at large. I am not suggesting propaganda. The forest profession has an obligation to portray its activities with honesty, and indeed, the public has shown itself to be unwilling to accept anything less. This means that while the Forest Services should, for example, signpost areas of forest in an appropriate way to reinforce the 'time' message, they should also make the public aware of factors subject to change under certain management regimes. The forest is not 'destroyed' by clearfelling, but it does undergo changes that may still be observable in a hundred years. An old-growth forest (i.e. forest with a preponderance of mature to senescent trees coupled with a lack of disturbance) will not be the same after logging but over time and with sympathetic treatment and protection it will return to something very close to the original. I have had this argument put to me in terms of old-masters, the regenerated forest is like a copy of the original and can never be anything more than a copy. It may well be a copy but Nature is capable of producing very fine copies indeed.

## 15. One Professional's Comments on the Silvicultural and Management Proposals.

I have been asked to provide some comment on the environmental implications of the proposed silvicultural activities in the forests of the south-west. It is only possible to do this in a very general sense, taking into account the published information available on those forests and relating this to accepted professional practice in other parts of the world. An important aspect of this discussion is the one noted above. By far and away the majority of the expertise on the environment, biodiversity and ecology of the forests of Western Australia and the consequences of manipulating those forests is in one way or another resident within CALM itself. I can only comment as an informed outsider with a long standing interest in the welfare of the forests of Australia and of the world in general and provide one professional's view.

Foresters and ecologists have studied the forests of Western Australia for more than a century and a half (Pate and Beard (1984) report on letters from the first resident botanist in WA in the late 1830s) but most of the applied forestry research has been carried out over the past 60 years. Most of the forest wildlife research is much more recent, covering only two or three decades. It is now apparent that the flora and fauna of the State is highly diverse and there is a large number of endemic species resulting from several factors such as isolation, climate, soils, and extremes of ecological processes (CALM 1992, Pate and Beard 1984). Hence, the flora and fauna of Western Australia is of world significance for the protection of global biodiversity and management of the forested lands must take account of such a responsibility.

In evaluating the CALM Proposals the essential question is whether the silvicultural procedures recommended, in one way or another, are in conflict with this responsibility. Some of the silvicultural methods applied to forests in the south-west today are more intensive than in an earlier age but they are backed by a much better knowledge of both the structure and the ecology of the forest. The heart of these methods is explained in Chapter 7 of the *Management Strategies*. As an 'informed' reader I found this Chapter unsatisfactory and it must undoubtedly be confusing to the lay reader.

Dealing with the various sections in turn, there can be little dispute with 'Providing Security of Tenure for all Forested Lands'. However, there is contention concerning 'Protection of the Forest' in that many of the public responses are critical of the current prescriptions for control burning. Few can argue with the statement:

that the strategic use of prescribed fire is the only way in which fuel can be maintained at levels that allow fires to be controlled and managed in the forest. (p 125 of the Management Strategies)

CALM has the responsibility 'to protect community and environmental values on and adjacent to land managed by the Department from damage or destruction by wildfire' (p 125). It also uses fire as a silvicultural tool in regenerative processes. Thus we have:

The principle fire management goal of CALM is to protect community and environmental values on and adjacent to land managed by the Department from damage or destruction from wildfire. The secondary goal is to use fire as a management tool to achieve land management objectives in accordance with designated land use priorities. (p 125)

There can be little doubt that, with such a mixed bag of objectives, the prescribed burning prescriptions used in the forests of Western Australia, and in the south-west in particular, would have to involve considerable compromise. Given the weather conditions of the region, they would need to err on the side of caution (and memories of the Dwellingup fire would tend to reinforce this view). The success of the Department's efforts in fire management are judged in terms of reduced wildfire, thus (p 125):

CALM's fire management approach in WA's forests has been remarkably successful. Although fire starts in the native forest continue to exceed 100 each year and fire weather conditions have been extreme, few large and damaging wildfires have occurred since the implementation of regular prescribed burning, and *loss of life from forest fires has been avoided*. (Author's emphasis)

By and large, the Department has managed this difficult problem well and there is ample evidence that continuing research will result in changed prescriptions (see p 178, long-term fire research programs). We have to take into account CALM's legal responsibilities to protect life and property. There is considerable debate within CALM itself about the use of fire. My inspections in the field revealed that there is great flexibility in the application of so-called prescriptions which belies the impression we are given in some quarters of very fixed and rigid applications of burning practices. This may be so along the routes most frequented by the public and where the danger of accidental fire is greatest, but in other areas of the forest the situation is quite different. There is also a lack of capacity to keep up with the requirements of current prescribed burning practices. The organisation is actively engaged in research into the effects of fire on the forest, both to timber values and to conservation values. There is a real danger in opting for too prescriptive an approach to fire management and, in so doing, limiting the capacity of CALM to modify its practices in the light of new knowledge.

However, the question remains whether the prevention of wildfire and the protection of life and property should be the main criteria of 'success' of the Department's efforts in fire management. There is contention about burning prescriptions, based on suspected deleterious long-term ecological effects and more discussion of this is warranted in the *Management Strategies*. It may be time for the community to re-assess CALM's fire prevention and protection responsibilities and for the Department to have a changed brief from the community against which 'success' is to be measured..

I am not competent to comment on 'Disease Prevention Strategy'. This topic is one which the TAP is discussing, as members of that Panel are expert in this field. It can safely be excluded from the present Report. Little comment need also be given also to the 'Weeds Control Strategy' in the present context, nor to 'Insect Control Strategy'. However, some comment is called for on the 'Feral Animals Control Strategy' as it concentrates so heavily on the fox, in spite of the listing of other feral animals known to be a major threat to native wildlife, notably the cat. Perhaps this concentration on the fox is because more is known of its effects, as is implied in the *Nature Conservation Strategy* (at p 91):

Less is known about the population effects of the cat on native species, and it is important that this issue is resolved so that joint control programs for foxes and cats can be conducted if necessary.

The major threat posed by the fox to native mammals is accepted and the solutions proposed applauded. In a Letter to the Editor (*Canberra Times*, 8 August, 1992) the Minister for the Environment, Ros Kelly confirmed that the major thrust of research into this problem was being conducted by CALM at a cost of nearly \$400 000. However, the danger also posed by feral cats to wildlife should be resolved quickly. Research in the eastern states certainly places the cat as a major feral pest and active research is going on to find adequate measures to control it.

The major discussion must centre on 'Determining a Desirable Forest Structure'. I found this to be an extremely interesting discussion but wondered where it would leave the average member of the interested public. I agree with the statement:

If the structure of the forest is manipulated to maximise any particular forest value, it is probable that other forest values would be reduced and that ecological processes could be impaired. (p 128)

Herein lies the dilemma for the forest manager who must manage the forest for multiple use.

This section goes on to explain how the nature of the dynamics of the regeneration, maturation and senescence of a forest or forest tree, leads to a certain structure of the forest and of areas within the forest. The discussion is well based on published research material (Bradshaw 1985, 1986; Rayner 1992; White 1971). For the karri forest this leads to the simple table on p 133:

Stages of Development	Percentage Representation
Establishment	4%
Juvenile	8%
Immature	48%
Mature/Senescent	40%

The reader can appreciate that the total forest area would need to be made up of areas of these forms of karri stands, that is, establishing areas 0 to 8 years old, juvenile areas ranging between 9 and 24 years of age, immature or pole type forest from 25 to 120 years of age, with the remainder of the forest being mature or senescent. These individual areas of each 'Stage' would result from regeneration following harvesting or wildfire, with many of the mature and senescent areas being made up by the retained old-growth forest in conservation reserves, streamside reserves and road borders. The sum of each would equal the appropriate proportion of the total area. However, there is no pictorial representation of them which might assist the reader to identify with these 'Stages of Development', nor is there an indication of the present state of the karri forests and this ideal distribution. There is no attempt to portray the dynamics of change with time in a tract of forested country which is made up of a mosaic of 'blocks', some harvested, some retained for visual benefit, some as streamside reserves, larger areas as conservation reserves or as National Park. I expected to be given some indication of the present state of the karri forests vis-a-vis this ideal age class distribution, at least in broad terms.

It is more difficult even to conceptualise the structure of the jarrah forest which is of an uneven aged nature. However, in the figure on p 134 we are given an indication of the frequency of occurrence of diameter classes in four virgin jarrah stands and these are compared to that for the jarrah forest reserved for multiple purpose management. The reader is reassured by this figure that the managed forests conform *overall* reasonably well with the virgin forest in that all diameter classes are represented in adequate proportions. However, we are not told anything of the extent of variations to this pattern. The overall figure is, no doubt, heavily influenced by the area of old-growth jarrah forest, areas in stream reserves and roadside corridors, etc. My unease on this point is reinforced by my understanding that the future harvest will come from smaller trees, indicating younger ages in the commercial sectors of the forests. Once again, I feel that CALM has not presented an adequate picture of the state of the jarrah forests and does not explain well to the reader the dynamics of the system and the effects of elapsed time, of what we may have in say 10, 20, 40, 80 and 160 years. The existence of bauxite mining areas is acknowledged but nothing is said of the effects these will have on the idealised structure.

I am not sufficiently familiar with the south-west to be able to comment on the detail of Establishment and Management of a Reserve System (p 134) but these proposals are impressive. Significant areas are being proposed for transfer into different systems of tenure in line with conservation principles. The results of the joint AHC-CALM survey of the resources of the area have been incorporated, with proposals for additions to the Register of the National Estate.

Managing the Visual Landscape on Forest Lands is very lengthy and very detailed. It is hard to see the reason for such a lengthy treatment of this topic. It is a matter of some dispute as to which is the more important value to retain, visual value or conservation value. At p 157 there is a section 'Identifying Areas of Special Significance' which deals in some detail with proposed changes to the treatment of retained roadside movement and linkage zones and the various streamside (riparian) zones. I would see these two sections as being in direct conflict and this illustrates one area where CALM could explain more adequately a major conservation conflict. The initiatives to place far larger areas in riparian zones I commend as it is an excellent way to assist with flora and fauna conservation. However, if wildlife conservation is the primary value being defended, it would be preferable for all of the remaining roadside corridors to be on one side of the road (Saunders 1991). This naturally is quite at odds with the Visual

Landscape requirements, although as one public respondent said it would serve the purpose of making all of CALM's work in harvesting more open to the public gaze. Be that as it may, the conflict in management objectives in these sets of proposals is not well explained. CALM has opted to conserve landscape values above conservation values in the roadside corridors but the *Management Strategies* are none too open about either the conflict of values or the reasons for the recommendations.

There is a surprising lack of comment on codes of forest practice in the discussions generally in the *Management Strategies*, and in Chapter 7 in particular. The RAC Report (Section 7) and the Draft National Forest Policy (section 10) both make significant mention of the value of codes of forest practice as instruments for safeguarding conservation and environmental values. CALM has an impressive array of manuals and guidelines which are intended to guide staff and others associated with operations in the forest as to how they should go about their tasks (see Table 25 CALM manuals and guidelines, p 183 of the *Management Strategies*). We note that 'Forest practice codes are reviewed and reissued annually to reflect the results of the year's monitoring'. Notable in this listing are *Code of Logging Practice* (CALM 1990a) and *Manual of Logging Specifications* (CALM 1990b).

The *Code of Logging Practice* was originally issued in 1986 and has been revised and reprinted four times since. The Code includes general guidelines to those engaged in logging, as well as specific instructions concerning felling, trimming and crosscutting, extraction, roading, and loading and hauling. An extensive section deals with environmental protection, including jarrah dieback, fire, soil, noxious weeds, feral animals, rare flora and fauna and water. As an instrument of management the code is totally acceptable in terms of the RAC Report and the Draft National Forest Policy, including provision for regular update and revision. Within this process of revision there may be a need for independent audit, as recommended by the RAC.

The first edition of the *Manual of Logging Specifications* was issued in November, 1987, reissued in November, 1989, and again in November, 1990. To quote:

The "Manual of Logging Specifications" contains detailed specifications necessary for the management of all logging operations, both hardwood and softwood, conducted on State forest and other Crown land under CALM control ... These specifications also apply to logging operations conducted by CALM on private land.

Of the seven Sections in the Manual five are relevant to the present discussion. These are:

Planning, in which harvesting plans are required and their form specified;

Road Construction and Maintenance, which details methods for selecting routes, construction and maintenance and for gravelling;

Silviculture, which deals with current specifications, advanced burning and with karri silviculture;

Coupe Management, dealing with all aspects of demarcation, falling, extraction etc, and including all forms of bush signs and marks to indicate areas of concern, as well as safety for the public; and

Environmental Protection, where instructions are to be found concerning the protection of all of the conservation and environmental values discussed in the CALM Proposals.

The codes of forest practice issued by CALM are comprehensive and detailed and totally in accord with the Draft National Forest Policy. They provide an adequate set of administrative instruments to control operations on forest lands controlled by CALM and on private land where operations are being conducted by CALM. There are administrative arrangements in place for regular revision of the codes and for the incorporation of the results of current research findings. There is no indication given as to whether there is any provision for independent audit of these codes.

The subject of monitoring has cropped up quite frequently throughout this discussion. It is incumbent on CALM to monitor the effects of many of its forest practices if answers to many of the difficult questions are to be found. What are the long-term consequences of controlled burning practices? Does clearcutting of karri result in extinctions of flora or fauna? Will cutting in the intermediate jarrah zone result in excessive salination of streams? The list of questions can be extended considerably. The capacity within CALM to carry out such monitoring is limited. The community may have to decide whether it really needs answers to such questions and, if so, how it can provided the resources needed.

Finally, I re-emphasise the comments made above concerning the commitments of the State for timber production. The impacts of the *Management Strategies* on the timber industry are not clear. This is regrettable since one purpose of the Proposals is to demonstrate social and economic impacts, as well as conservation and sustainable development impacts, and this is not done.

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## **Appendix 5**

**Environmental conditions and commitments set on the WACAP  
proposal and the 1987 Forest Management Plans**



**STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED  
(PURSUANT TO THE  
PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)**

**NORTHERN, CENTRAL AND SOUTHERN FOREST REGION  
MANAGEMENT PLAN•**

**DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT**

This proposal may be implemented subject to the following conditions:

1. The proponent fulfilling the commitments given in the Management plans.
2. Noting that:
  - (1) Beavis-Giblett Block is proposed to remain as State Forest;
  - (2) the Block will be managed as a strategic fire buffer;
  - (3) the purpose and tenure of the Block will be reviewed at the expiry of the term of the Southern Forest Region Management Plan, within 10 years;
  - (4) the Executive Director has undertaken that the Block will not be logged for 15 years, thereby preserving the option for its reservation as intact forest at some time in the future;

the Beavis-Giblett Block shall be managed accordingly, subject to the undertaking referred to above.

3. Management plans that will be prepared for those proposed Nature Reserves and Conservation Parks related to the existing Dalgarp, Lennard, Mullalyup, Preston, Noggerup, Mowen and Dardanup Management Priority Areas shall include detailed management proposals for those portions of the Management Priority Areas which have the capacity for direct interaction with the reserved area and will remain within State Forest, to ensure protection of the ecological values within the Mature Reserve and Conservation parks.
4. As the viewshed from the Blackwood River within the Blackwood River Management Priority Area will be reserved as a Conservation Park, the remainder of the existing Management Priority Area shall be managed to ensure protection of the conservation, landscape and recreation values within the Conservation Park. The area management plan for the Conservation Park shall include detailed management proposals for that portion of the Management Priority Area that will remain within State forest.

5. Noting that:

- (1) CALM is now preparing a review of road, river and stream zones, including an analysis of results of research on logging in trial areas;

the existing area and purpose of the system of road, river and stream zones in the Southern Forest Region shall not be altered (in accordance with the proponent's commitments) and no logging shall occur in these zones, until the proposed review by the proponent has been completed and the Environmental Protection Authority has reported on them. This review should include consideration of silvicultural practices within the zones.

6. Noting that:

- (1) all State Forest includes significant conservation values;
- (2) the need for on-going management of these values in production State Forest has been recognised by CALM;
- (3) monitoring and research of environmental impacts is part of CALM's activities; and
- (4) CALM has a commitment to providing public information;

the proponent shall continue to make public, on a regular basis, the monitoring, and reporting of environmental impacts of management of State Forest.

MINISTER FOR ENVIRONMENT

10 FEB 1988

**STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED  
(PURSUANT TO THE  
PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)**

**THE WEST AUSTRALIAN WOODCHIP INDUSTRY**

**WA CHIP AND PULP CO. PTY. LTD.**

This proposal may be implemented subject to the following conditions:

1 The proponent shall adhere to the proposal as assessed by the Environmental Protection Authority and shall fulfil the commitments made in the Supplement to the Environmental Review and Management Programme for the proposal (copy of commitments attached).

2 The volume of chip log production from old growth Forest within State Forest described in the Timber Production Strategy shall be strictly observed by not exceeding the following amounts:

1988 - 1990	-	583,000	cubic metres
1991 - 1995	•	553,000	cubic metres
1996 • 1998	-	442,000	cubic metres

I

3 No logging shall occur in existing Road, River and Stream zones until the Department of Conservation and Land Management -has developed, in consultation with the public, a detail proposal for those zones and the Environmental Protection Authority has assessed and accepted the proposal.

- 4 (I) The Department of Conservation and Land Management (as part of the review and development of a detail proposal for Road, River and Stream zones required in condition 3), shall identify within old growth State Forest:

additional areas of high value old growth forest meriting special treatment in the sense that they should be managed and harvested flexibly rather than be subject to broad-scale clearfelling; and

areas which should be excluded from harvesting to protect their exceptional scenic, faunal, and other amenity values.

- (2) Within the constraints imposed by the Timber Production Strategy on the volume of sawlog timber, the Department of Conservation and Land Management shall prepare and implement a scheme of management for these special areas.

- 5 Any proposal to harvest wood from the salt risk zones of the Central and Northern Forest Regions, by more intensive methods than selection cut harvesting shall be referred to the Authority for assessment.
- 6 Marri resource in the salt- risk zones of the Southern Forest Region shall not be supplied to WACAP until an Environment Management Programme for these zones has been prepared to the satisfaction of the Environmental Protection Authority. The Management Programme shall give prior details of salt risk areas to be harvested, harvesting methods and safeguards to be applied, monitoring techniques proposed and feed-back mechanisms which would be used to modify management, if salt impacts were found.

- 7 The proponent shall not use wood for woodchipping or obtain woodchips derived from the clearing of remnant native vegetation on private property after the date of this statement, except for individual cases, or in circumstances authorised by the Minister for Environment before clearing commences.

- 8 The proponent shall not use wood for woodchipping or obtain woodchips derived from plantations on private property which were established by the clearing (after the date of this Statement) of remnant native vegetation, except in individual cases, or in circumstances where clearing was authorised by the Minister for
- Environment before clearing operations commenced.
- 9 Approvals, including the Forest Produce Licence or log sale agreements, for the proponents woodchip operations based on State Forest resource, shall be linked specifically to the duration of the Timber Production Strategy and Forest Region Management Plans. Approvals issued to the proponent shall be reviewed no later than at the expiry of the present Management Plans (presently planned for February 1998)

- 10 The proponent shall, in consultation with the Department of Conservation and Land Management, contribute to and or participate in monitoring and management with respect to the environmental impact of this proposal to the satisfaction of the Minister for Environment. The detailed objectives and priorities for research into this monitoring and management shall be determined by the Steering Committee for Research and Land Use and Water Supply, following wide consultation including the public.
- II The proponent and the Department of Conservation and Land Management shall report to the Environmental Protection Authority briefly annually and comprehensively after each five year period (1993 and thereafter) on the monitoring and management of the environmental impacts of the proposal.

The conditions contained in this Statement shall be implemented forthwith.

- 13 These conditions apply to the use of wood for woodchips from the State Forest in the North, Central and Southern Forest Regions.

# ENVIRONMENTAL PROTECTION ACT 1986

## (SECTION 18(1))

### DELEGATION (No. 2)

Pursuant to Section 1B of the Environmental Protection Act 1986, I, Barry James Hodge, Minister for Environment, hereby delegate as follows

Person to whom delegation applies:

This delegation is made to the person for the time being holding or acting in the, office as The Commissioner of Soil Conservation appointed under section 7 of the Soil and Land Conservation Act 1945 (as amended).

Powers and Duties delegated:

- (1) power to authorize W.A. Chip and Pulp Company Pty Ltd to use wood for woodchipping or obtain woodchips derived from the clearing of remnant native vegetation on private property as provided for in Condition 7 of the Minister for Environment's Statement of 28 September 1988 issued pursuant to section 45(7) of the Environmental protection Act 1986 that the woodchipping proposal by W.A. Chip and Pulp Company Pty Ltd may be implemented.
- (2) power to authorize W.A. Chip and Pulp Company Pty Ltd to use wood for woodchipping or obtain woodchips derived from tree plantations established by clearing of remnant native vegetation subsequent to 28 September 1988 as provided for in Condition 8 of the Minister for Environment's Statement of 28 September 1988 issued pursuant to section 45(7) of the Environmental protection Act 1986 that the woodchipping proposal by W.A. Chip and Pulp Company Pty Ltd may be implemented.

Provided that the person to whom this delegation applies:

- (a) when giving a permit to clear land, and including permission to clear land to meet the requirements of the Soil and Land Conservation Act, shall ensure that not less than twenty percent of the total area proposed for clearing, remains uncleared;
- (b) has regard to the conservation of flora and fauna and protection of landscape amenity values of the (not less than) twenty percent area;
- (c) may require the (not less than) twenty percent area to be properly fenced and protected from degradation including grazing; and
- (d) may exercise discretion in ensuring that not less than twenty percent area applied for, remains uncleared provided that the location, area and purpose of each exemption is available as public information.

Dated this sixteenth

day of January 1989

Barry Hodge, MLA  
MINISTER FOR ENVIRONMENT

## **LIST OF COMMITMENTS MADE BY WA CHIP AND PULP CO PTY LTD IN THE SUPPLEMENT TO THE ERMP**

### **WACAP'S COMMITMENT TO THE SOCIAL ENVIRONMENT**

- WACAP makes a firm commitment to continue supplying the worlds paper industry with this specialised resource.
- WACAP is committed to maintain and strengthen its contributions to the Regional, State and Australian economies.
- WACAP is committed to expanding its role in supporting the people of Australia, particularly those in the south - west region

### **WACAP'S COMMITMENT TO THE NATURAL ENVIRONMENT**

- WACAP sees its role as including the task of educating the general public that its operations are carried out within a framework of environmentally protective regulations and practices. These are based on continuing scientific research into the environmental effects of modern forest management.
- WACAP accepts a responsibility to continue to utilise the natural paperwood resource obtained from forest residue left behind from harvesting of sawable timber in the south- west forests, and to ensure that its activities and operations within the broader context are consistent with genuine conservation of that resource in terms of the definition of conservation referred to in Section 7.1, with respect to protection and enhancement of the forest environment.

### **WACAP Environmental Commitments in State Forests**

- WACAP will observe all controls and operating conditions imposed on it through the published codes, Acts and licences listed above.
- WACAP will require that all its harvesting contractors engaged to harvest logs and deliver them to the Diamond Mill be familiar with the contents of CALM's management policies and regulations, and agree to abide by them
- WACAP will report to CALM any incidences of malpractice that come to its attention Penalties for breaches of regulations will be the responsibility of CALM
- WACAP will monitor the effectiveness of the various cement procedures and will, if necessary, make recommendations to CALM the EPA or other relevant bodies, to further improve and strengthen the effectiveness of these documents in achieving their goals-
- WACAP will support the education and instruction of all forest workers in appropriate levels of conservation knowledge and skills-

### **Conservation of Ecological Values**

- WACAP will comply and co-operate with all authorities under the

Government and will abide by the newly promulgated Timber Strategy and Regional Management Plans and any documents relating to them

- WACAP will respect the annual harvest quotas from State forest established by CALM on the basis of sustainable yield
- WACAP will respect the boundaries of the various kinds of forest areas (such as State Forest, Timber Reserves, National Parks, Nature Reserves and Conservation Parks) as demarcated by CALM or other government departments-
- WACAP will ensure that any permitted tree harvesting is confined within the boundaries laid down by CALM
- WACAP will adhere to CALM's directions with respect to nesting operations for subsequent optimal forest re-growth.
- WACAP will avoid any forest practices contrary to sound forest development as specified by CALM

### Water Quality

- WACAP will continue its cooperative and cordial relations with the appropriate authorities - CALM and the Water Authority of Western Australia
- WACAP will continue its corporate membership of the WAWA's Water Quality research Committee initiated In 1986, or any replacement or similar committee
- WACAP will retain buffer zones demarcated by CALM
- WACAP will observe proper management in all phases of operation to avoid excessive movement of soil (refer to section 7.31.8)
- WACAP will continue to be responsible for the construction and maintenance of the primary log haul routes, giving due consideration to factors such as:
  - topography,
  - drainage pattern,
  - slope,
  - erosion hazard,
  - dieback hygiene, and
  - safety

subject to CALM responsibility to approve location of the routes.

- WACAP will continue to minimise soil erosion on road-ways in winter conditions by:
  - sealing major log road surfaces in susceptible flat areas, and
  - spreading ground cover on susceptible drainage gullies beside roads-
- WACAP will continue to direct main road runoff into forest area to allow settlement of any dust or gravel carried by the water.
- WACAP will continue to cooperate with CALM and all other relevant authorities in preventing and controlling bush fires- This will help minimise the turbidity of streams that can occur when wild-fires destroy vegetation and expose soils to erosion through

- wind and rain (refer to section 7.3)>.
- WACAP will continue to recycle mill process water to the furthest practicable extent
- WACAP will continue to contain liquid outflow in storage dams-
- WACAP will continue to ensure that periodic excess water discharge into nearby waterways is carried out in accordance with the provisions of the Effluent Disposal Licence granted by the Environmental Protection Authority of Western Australia
- WACAP will monitor potential leachates from the paperwood stockpile and take corrective action to mitigate water quality if required (refer to section 7.31.11)

### **Protection of Forest Productivity**

- WACAP will promote overall forest productivity by adhering to the recommended silvicultural management programme laid down by CALM
- WACAP will minimise the erosion of forest soils by avoiding excessive movement of soil during harvesting and road construction (refer to section 7.31.8>.
- WACAP will continue to coordinate the rehabilitation of combed soil on behalf of the timber industry, by:
  - ripping landings and major snig tracks to a depth of approximately 0.5m,
  - arranging the bulldozer and driver
  - servicing the machine, and
  - programming the sequence of operations.
- WACAP will employ forest hygiene procedures as recommended by CALM to minimise spread of diseases, weeds or pests-
- WACAP will monitor to avoid damage to retained trees during harvesting.
- WACAP will report known incidences of contractors violating the terms of the Code of logging Practice, although the imposition of penalties will be the responsibility of CALM
- WACAP will make recommendations to CALM for improvements which will lead to protection of forest productivity.

### **Fire prevention and Control**

- WACAP will retain appropriate buffers- as demarcated by CALM
- WACAP will maintain constant vigilance for wildfire outbreaks, and alert appropriate authorities-
- WACAP will train company personnel in fire-fighting procedures and provide firefighting equipment in emergencies

### **Recolonisation by Flora and Fauna**

- WACAP will respect the boundaries of forest reserves of all kinds as determined by CALM including

- road reserves,
- river and stream reserves,
- National Parks, and
- other classes of reserve.

### **Genetic Diversity**

WACAP is committed to cooperating with CALM in maintaining genetic diversity of the State forests. CALM is responsible for this, through utilisation of seed trees, control of seed collection and planting through its system of reserves and through its wood production and silvicultural practices.

### **Landscape Values**

- WACAP will retain appropriate buffer zones where required by CALM
- WACAP will plan haulage road placement taking into consideration the visual aspects of the road (See section 7.31.9)
- WACAP will apply prescribed remedial treatments to aid forest regrowth

### **Soil Protection**

- WACAP will respect "Special Care zones" comprising all slopes greater than 20 degrees or slopes exceeding 15 degrees if they border on recognised water courses.
- WACAP will restrict harvesting activities in these zones to a narrow range of soil moisture conditions.
- WACAP will minimise machine movements.
- WACAP will avoid downhill snig and scrub-rolling except where this is impractical.
- WACAP will complete soil rehabilitation prior to the first winter after regeneration burning
- WACAP will locate log landing and loading areas more than 50m from recognised water courses, except where this is impractical.
- WACAP will lay snig tracks parallel to recognised water courses except where this is impractical, and will not cross them unless unavoidable.
- WACAP will not allow logging roads to enter stream reserves except where this is impractical and approved by CALM, in which case bridges or culverts will be installed
- WACAP will apply stabilising treatments to minimise erosion of sites which may be at risk (those close to water courses) such as spreading bark on disturbed areas, and installing silt traps.
- WACAP will install cross drains across snig tracks and roads at the completion of harvesting in accordance with the Industry Control Specifications-
- WACAP will strive to minimise soil disturbance and will observe the specifications designed for this purpose, including cessation of activities during or immediately

following heavy rain

WACAP will ensure that contractors involved in falling and snig trees in areas designated by CALM continue to obey the rules laid down by CALM in the Code of hardwood logging

### **Haulage Roads**

WACAP will prepare plans for its haulage roads constructed by WACAP contractors with a view to safeguarding many factors, including;

- public safety,
- erosion avoidance, and
- noise reduction

WACAP will submit these plans to CALM for approval at least 2 months prior to clearing for in-coupe roads, and at least 3 months prior to clearing for major roads. These plans will show:

- proposed road alignments or alternatives,
- the differentiation between new clearing and upgrading of existing roads,
- proposals for creek or river crossings,
  - location of proposed gravel pits with details of quantities to be extracted

o WACAP will mark the route in the field at least 6 weeks prior to clearing, following approval of these preliminary plans.

o WACAP will locate the roads leased on consideration of various factors, including;

- disease,
- erosion,
- sedimentation,
- safety, and
- visual amenity.
- WACAP will observe CALM's specifications which include maximum clearing widths of 12m for major roads and 8m for in-coupe roads.
- WACAP will observe the detailed specifications for minimisation of erosion (see Section 7.3.1.8) and for installation of drains and silt traps to control runoff and sedimentation from roads and borrow pits.
- WACAP will maintain these roads by:
  - clearing culverts and silt traps, and
  - slashing scrub to maintain visibility.
- WACAP will minimise inconvenience and risks to other users of the forest by:
  - utilising the private timber road system to the maximum extent possible,
  - monitoring traffic control, and
  - installing hazard warning signs for the protection of the public

### **Recreation**

- WACAP will have regard for landscaping and visual amenity (section 7.31.7),
- WACAP will use private forest roads as much as possible to separate industrial traffic from tourist traffic

- WACAP will contribute to maintain ecological values (section 7.31-. 1),
- WACAP will provide and maintain appropriate safety direction and information signs
- WACAP will contribute to enhancing water quality (section 7.3.1.2)
- WACAP will contribute to the optimal growth of new forests (section 7.31.3)
- WACAP will co-operate in preventing and controlling wildfires (section 7.3.1A) and
- WACAP will contribute to conserving the flora and fauna of the region (section 7.31.5) including genetic diversity (section 7.31.6)
- WACAP will continue to encourage the public to inspect it's facilities at the Diamond Mill, which is a popular local tourist attraction in its own right.

#### **Mill and Port Operations.**

- WACAP will continue to recycle liquid outflow to the maximum extent possible
- WACAP will carry out discharge of excess quantities, when necessary, in accordance with the terms of the Effluent Disposal Licence issued by the Environmental Protection Authority.
- WACAP will minimise water quality impact in the unlikely event that leachate is detected from the paperwood stockpiles.
- WACAP will continue to comply with applicable noise regulations
- WACAP will continue to hire employees exposed to potentially damaging noise levels to use hearing protection equipment.

#### **Utilisation Standards**

- WACAP will prevent logs or parts of logs being processed into paperwood, if they could be commercially utilised as sawn timber.
- WACAP will ensure that contractors on site in forest coupes accurately separate logs into piles of either sawlogs or paperwood logs, according to the criteria laid down by CALM
- WACAP will encourage sawmillers to reclaim logs from paperwoorl log piles in the forest landings, for production into sawn timber.
- WACAP will cooperate with CALM officers to ensure that paperwood logs delivered to the Diamond Mill are indeed below sawing quality. WACAP will set aside any logs which WACAP consider to have saw milling potential for inspection by CALM officers and sawmillers
- WACAP will utilise the new process developed at its own initiative which recovers sections of paperwood logs that contain potential "saw-wood"<sup>o</sup>, and will make this available to CALM at regular intervals, for auction to saw millers

- WACAP will monitor the performance of its machinery to ensure that recovery of products is maximised
- WACAP will continue its policy of full public disclosure of the log selection and utilisation procedures laid down by CALM .Public tours showing all aspects of the operation are available
- WACAP will encourage all workers in the forest to take instruction on maximum utilisation procedures and will support such instruction

#### **WACAP Environmental Commitments on private Property Owned by WACAP**

- WACAP will comply with the requirements of the Country Areas Water Supply Act (1947-78) by:
  - obtaining licences to clear any land in declared water catchment areas, abiding - by the conditions of any licence, and
  - maintaining the trees in a responsible and professional manner.
- WACAP will comply with the Soil and Land Conservation Act (1945-82) by:
  - obtaining licences for clearing native trees covering an area greater than 1 hectare, complying with the conditions of these licences, ensuring that its operations, even if not restricted by a licence, do not cause land degradation.
- WACAP will comply with the Bush Fires Act (1954-79) by:
  - establishing firebreaks on external boundaries of at least the minimum width as specified In each Shire,
  - establishing internal subdivision firebreaks as specified by the relevant Shire, obtaining necessary permits to light fires for whatever reason, and obeying the instructions of any duly authorised officer in the case of a bush fire
- WACAP will continue to manage young regrowing native trees on land purchased by WACAP. should those trees, in WA's opinion, be of sufficient quality and quantity for retention as future sawlogs and paperwood trees.
- WACAP will develop a code of harvesting practice based on CALM's Code of Hardwood Logging Practice and its complementary Manual of Hardwood Specifications and other similar codes in force in other parts of Australia This code will include management practices for:
  - river and stream crossings,
  - road construction,
  - road drainage,
  - log storage and sorting area plant,
  - snig track placement,
  - soil disturbance during wet weather,
  - rehabilitation of log storage and sorting areas,
  - harvesting of steep slopes,
  - maximum utilisation of each tree, and
  - retention of vegetation alongside perennial and other recognised streams
- WACAP will ensure the maximum commercial utilisation of tree by:
  - selling all sawlogs produced to sawmillers, be they general purpose or salvage

quality,

holding auctions of any logs which WACAP considers to have sawlog potential but which are not taken by sawmillers from the land,

segregating the classes of logs at the storage and sorting areas so that accidental inclusions of sawlogs into paperwood is either nil or minimal, and

checking and segregating possible sawlogs or saw-wood sections after delivery to the Diamond Mill.

- WACAP will ensure that its contractors conduct their business in a safe manner, whether they be conducting harvesting routine management, or planting activities. Where there are potential hazards, contractors will be required to place notices of such where the public may be endangered (ie: signs warning of trucks entering the public road from private property).
- WACAP will continue to take reasonable precautions to minimise fire damage by:
  - discussing with officers of the Bush Fires Board,
  - becoming financial members of the local fire brigade in each area where WACAP has a plantation,
  - liaising with Shire appointed fire officers, and
  - maintaining fire fighting equipment in its own right.
- WACAP will continue to establish trial and demonstration plantings aimed at increasing the efficiency of tree establishment, growth and harvesting and will inform other landowners of such improvements-
- WACAP will ensure the genetic diversity and integrity of the tree farms under its supervision by maintaining controls on the use of seed in regeneration

#### **WACAP Environmental Commitments on - Private Property Owned by Others, Mainly Farmers**

- WACAP will continue to liaise with bodies such as the Western Australian Farmer's Federation (WAFF) to educate and motivate farmers into establishing tree plantations on private property.
- WACAP will develop a Code of harvesting practice for contractors harvesting wood from private property where the subsequent land use is tree farming and will request that participants of WACAP's various Tree Farming Incentive Schemes adopt this code. The code will be similar to that being developed on WACAP's private land, based on CALM's Code of Hardwood practice and its complementary Manual of Hardwood Logging Specifications and other similar codes in force in other parts of Australia. The code will include management practices for:

river and stream crossings

road construction,

road drainage,

log storage and sorting area placement,

snig track placement

soil disturbance during wet weather,

rehabilitation of log storage and sorting areas,

harvesting of steep slopes,

maximum utilisation of each tree, and

retention of vegetation alongside perennial and other recognised streams.

- WACAP supervisors will visit the site of harvesting operations on private property to monitor production
- WACAP's supervisors will administer the code and enforce penalties to the extent of WACAP's authority.
- WACAP will reduce paperwood supply quotas of harvesting contractors who do not carry out the harvesting operation in an acceptable manner.
- WACAP will engage additional qualified staff as required
- WACAP will continue to rigorously enforce safety rules and regulations covering private harvesting operations and road rules, including the compulsory wearing of:—
  - hard hats,
  - safety boots, and
  - hearing protection
- WACAP's supervisors will impose any penalties which are legally enforceable by WACAP along the lines of:
  - initial warnings
  - suspensions, or
  - life time bans from working as supplier to WACAP.
- WACAP will continue to support afforestation of previously cleared land and reforestation of new areas, through differential incentive payments and technical assistance to landholders
- WACAP will not accept paperwood logs from private land unless the landholder demonstrates that the necessary Government permits-to-clear have been obtained
- WACAP will not solicit logs from private sources and will continue to pay only modest stumpage rates for the paperwood which it purchases from landowners clearing for agricultural purposes, thus minimising the incentive for the private landowner to clear native forest for agricultural purposes
- WACAP will continue to reduce air pollution and convert a residue product into a marketable resource, by encouraging private landowners to salvage cleared timber which would otherwise be burnt (once a decision to clear land has been made by the private landowner).
- WACAP will further offset the impact of pasture clearing by establishing a minimum of 5ha of tree plantation for every 1000 tonnes of paperwood it receives from private property, including WACAP-owned land. These tree plantations will be established

either on WACAP-owned land, or on other private land through one of its private Forestry Incentive Schemes-

### **ARCHAEOLOGICAL AND ETHNOGRAPHIC SITES**

- WACAP will take measures to inform all personnel associated with the woodchipping activities of their obligations under the Act.
- WACAP will modify its operations in accordance with CALM directions, if necessary, to avoid damage to Aboriginal sites.

### **RESEARCH**

- WACAP commits to continuing either sponsorship or self-conducted research aimed at, among other things
  - improved tree establishment procedures,
  - improved tree protection procedures,
  - improved tree growth,
  - improved utilisation of timber produced
  - improved harvesting techniques
  - new products manufactured from trees,
  - new manufacturing processes,
  - establishing new markets for products,
  - maintaining existing markets for products, and
  - adjusting current practices if better management techniques are identified and quantified
- WACAP will encourage and agitate for more research effort by CALM into improving the growth, health and quality for sawlog and paperwood use of CALM's native trees and production forests.