Assessment of Ecologically Sustainable Forest Management in the South-West Forest Region of Western Australia

Acknowledgments

This report is the work of members of the expert advisory group. The group was supported by members of the Project Management Group and officers of the Western Australian Department of Conservation and Land Management, and various Commonwealth Government departments.

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The expert advisory group also gratefully acknowledges the editing assistance of WordsWorth Writing.

Summary

The expert advisory group has assessed ecologically sustainable forest management in the South-West Forest Region against the two overarching principles and six management system criteria used in the Regional Forest Agreement process. As in previous assessments of other Regions, it is important to understand that no established system of weights exists for these principles and criteria, nor are there standards by which they can be gauged. In any event, community expectations of forest management will vary over time. The group has therefore concentrated on (1) determining the current status of management systems, and (2) recommending changes to processes that will not only improve current systems but will ensure continuing (or periodic) review and improvement.

The expert advisory group would wish to stress that this report must be read in the light of the approach taken in reviewing systems and making recommendations. The process of review adopted by the group tends to concentrate attention on deficiencies, even when much of the process is adequate.

The expert advisory group also wishes to acknowledge that time did not permit as thorough a process of public comment and involvement in its work as it would have desired. While its report and recommendations will be available for further comment, the group believes that it would have benefited from greater interchange with stakeholders.

By comparison with other forest regions in Australia, the South-West Forest Region is characterised by a pattern of conservation reserves, and forests available for wood production that are largely contiguous and closely related in most aspects of forest management, including fire management. These factors have a major bearing on the existing processes and improvements recommended by the expert advisory group.

The commitment and the policy framework

As is the case elsewhere in Australia, a joint review of Commonwealth and State Acts is needed to achieve consistency and minimise duplication in the legislation of the two governments, and to create a clear delineation of responsibilities for each level of government.

The State legislative framework for the South-West Forest Region involves a number of Acts, among which the *Conservation and Land Management Act 1984* and the *Environmental Protection Act 1986* are perhaps the key acts in relation to many aspects of ecologically sustainable forest management. The Conservation and Land Management Act established a single department, CALM, to manage the forest estate on an integrated basis and this is one of the major strengths of the Western Australian system, given the characteristics of the Region. The legislative and policy processes and single administrative department

also enable Region-wide and integrated planning, supplemented by individual management plans for specific areas.

On the other hand, the tangled web of processes associated with the Conservation and Land Management Act, Environmental Protection Act, and the determination of ministerial conditions on the outcomes of respective reviews required under those Acts, creates overlap and confusion to the detriment of integrated planning and the pursuit of the principles underpinning ecologically sustainable forest management. The principles need to be incorporated in the relevant legislation. Provision also needs to be made for joint reviews to satisfy the two principal Acts, and therefore address the strategic issues of balancing and integrating forest uses, including social, economic and environmental implications. Similarly, both Acts need to be reviewed to enable periodic independent and transparent audits of compliance with forest management processes and subsequent joint reviews of processes and codes.

Other specific changes to the Conservation and Land Management Act include ensuring the Executive Director of CALM does not serve on either the Lands and Forest Commission or the National Parks and Nature Conservation Authority, in order to avoid perceptions of conflict of interest; and enabling licences for the sale of wood to extend beyond the period of the management plan.

The *Wildlife Conservation Act 1950* is outdated and needs to be revised to meet contemporary requirements and formalise the responsibility of CALM for the protection and maintenance of both flora and fauna on all tenures.

The processes by which CALM develops formal strategy documents, a Forest Management Plan, Policy Statements, and guidelines are generally appropriate for the pursuit of ecologically sustainable forest management. However, the draft Nature Conservation Strategy for Western Australia needs to be completed and implemented by CALM as soon as possible.

CALM also needs to develop Policy Statements on the productive capacity of former mine sites, the maintenance of carbon and hydrological cycles, water, and natural and cultural heritage.

The relevant land management agencies appropriately co-ordinate many of their activities on private land through the Memorandum of Understanding for the protection of remnant vegetation on private land. However, in addition to changes recommended by the expert advisory group in the subsequent section on Planning, this Memorandum needs to be extended to clarify responsibility for the pursuit of ecologically sustainable forest management on private forests.

Planning

The administrative arrangements for the imposition of ministerial conditions concerning forest management need to be made more efficient. At each review, previous conditions need to be revoked and replaced by ones consistent with the terms of the currently gazetted plan.

CALM has generally well developed processes for strategic and operational planning for most aspects of forest management. A particular strength of this processes is the use of structural and age-class goals spanning all CALM-managed native forests in the South-West Forest Region. These processes are supported by comprehensive inventories of the forest resource and sophisticated planning models, based on considerable research. In many cases, planning is

supplemented by codes of practice, guidelines or manuals which provide more detailed prescriptions for field staff and operators.

Planning to deal with the more prominent threats such as major fires, major pests and diseases such as dieback, and endangered species are generally well covered and backed by substantial research effort. The more general issues of biodiversity, health and vitality, and heritage conservation have not been as thoroughly addressed. The expert advisory group has identified a number of specific recommendations with respect to planning for biodiversity, prescribed burning, mining, heritage conservation and operational planning which would improve planning processes for these.

Whilst a number of agencies have some specific responsibilities for private forests, there is no mechanism for the coordinated collection of data, or for the integration of planning objectives across the range of forest values. Whether through the above Memorandum or other means, the Government of Western Australia needs to facilitate an integrated approach to collect and promulgate basic information on forests on private land, and on the impacts of plantation development on regional values. Further attention also needs to be given to ensuring that timber harvesting and subsequent operations on private forests are carried out in a manner that will result in appropriate standards of reforestation.

Implementation

Most accountabilities and responsibilities for implementation appear to be satisfactory.

The CALM processes of implementation have generally been adequate to achieve the integration across all uses and thus a balanced use of native forests. However, the recent introduction of a commercial State Forest Resources Business Unit has blurred previously clear responsibilities for integration in field management of CALM-managed native forests. The expert advisory group believes that integration should be the paramount consideration if Western Australia is to maintain its progress in the pursuit of ecologically sustainable forest management. Thus, if there is to be a separate commercial unit for native forest management, it should embrace all uses and values, with the non-commercial values being funded through community service contracts from the policy department. Alternatively, integration could be achieved through a public service entity which forms an integral part of CALM.

Not surprisingly, many of the matters requiring improvement by CALM which were discussed under `Planning' also require contingent improvements in implementation. The expert advisory group has accordingly made recommendations concerning prescribed burning, forest health surveillance, and heritage management. In addition, some aspects of transparency in relation to Policy Statements, public participation in relation to indigenous cultural heritage, human resource management, and adequacy and clarity of some key documents require attention by CALM.

Monitoring and compliance

While reporting of the outcomes of operations is generally adequate, periodic reporting on compliance with all provisions of relevant management plans, including progress with the structural goals prescribed within the Forest Management Plan, needs to be introduced.

Information about forest values is fundamental to planning for ecologically sustainable forest management. It is essential that CALM fully implements Policy Statement No. 28 which sets out a strong approach to monitoring forest composition and impacts of management on biodiversity, soil and water and other environmental values. CALM should also develop and regularly monitor a set of indicators of ecological sustainability in relation to the principles of ecologically sustainable forest management. Furthermore, CALM needs to complete its centralised databases and make them available to Regional and District staff. These databases should be linked to those of other government agencies where applicable.

Aboriginal field officers should be employed to monitor CALM activities which have the potential to damage indigenous cultural heritage.

CALM has an internal audit unit which operates effectively. However, an independent evaluation of a sample of CALM operational practices should be carried out on an annual basis and reported in the annual report.

Review and improvement

Although many components of a system for ongoing review of the management system exist informally within CALM, the Government of Western Australia should implement a more formal review of the environmental management system. In view of the central role played by the Code of Harvesting Practice and the Timber Harvesting Manual, CALM should implement frequent internal review and periodic (at least every five years) external review of these documents.

A new process has been proposed by CALM for the formal involvement of Regional and District staff in setting priorities for research and development and planning implementation of research results in forest management. This process potentially ties research and development strongly into the cycle of continual review and improvement of the environmental management system. With the addition of one improvement regarding financial management, it should be implemented and its success assessed periodically.

The role of the Forest Monitoring and Research Committee needs clarification to make it a peak advisory committee, but ensuring it does not have responsibility for approving research. Other ways of strengthening review and improvement processes include developing joint assessment processes across all relevant agencies of priorities for collecting data on biodiversity; ensuring that conditions for restoration of former mine sites address all forest values; establishing a cross-agency heritage research program, and developing coordinated mechanisms for fostering research and development in relation to new technologies for timber harvesting.

Concluding remarks

The expert advisory group considers that the current environment management system for the South-West Forest Region meets many of the requirements of a system to pursue ecologically sustainable forest management. The strengths of the system include a well developed system for integrated planning and implementation on a Regional basis, supplemented by individual management plans for specific areas. The predominantly top-down approach uses modern technology, research, specialist skills and professional judgment to advantage.

Deficiencies include overlapping and sometimes inconsistent Commonwealth and State legislation; duplication of processes due to the provisions of two overlapping pieces of State legislation and associated administrative arrangements; insufficient monitoring of outcomes of forest management to provide for continuing improvement, and gaps in legislation, policy formulation, planning and implementation concerning specific areas - notably flora and fauna legislation, biodiversity, heritage management and private forests.

Recommendations

The expert advisory group submits the following recommendations for consideration in developing the Regional Forest Agreement for the South-West Forest Region.

1. The commitment and the policy framework

The Commonwealth and Western Australian Governments should:

1.1 Systematically and jointly review relevant Commonwealth and State Acts to achieve consistency and minimise duplication; develop standard heritage criteria and assessment processes, and create a clear delineation of responsibilities for each level of government.

The Government of Western Australia should:

1.2 Amend the Conservation and Land Management Act, *Mining Act 1978* and other relevant legislation for the South-West Forest Region to explicitly incorporate the two overarching principles and the six specific principles of ecologically sustainable forest management used in the Regional Forest Agreement process.

1.3 Revise the Wildlife Conservation Act to:

- include explicit requirements to conserve genetic, species and ecosystem diversity;
- include a requirement to prepare and regularly review a state-wide strategy for conservation of biodiversity;
- establish an explicit system of categorising threatened species, and communities, threatening processes and critical habitats, and
- formalise the responsibility of CALM for the protection and maintenance of both flora and fauna on all tenures, including the preparation of recovery plans for rare and endangered species.

1.4 Change the Conservation and Land Management Act to ensure the Executive Director of CALM does not serve on either the Lands and Forest Commission or the National Parks and Nature Conservation Authority, in order to avoid perceptions of conflict of interest. The composition of the Lands and Forest Commission should include an independent Chair, a community representative, and three experts with experience in relevant aspects of forest management including wood production and nature conservation.

1.5 Review and, where necessary, amend the review provisions of the Environmental Protection Act and Conservation and Land Management Act to:

- encompass a joint review of environment protection, management plan requirements, and environmental management systems; such that the

strategic issues of balancing and integrating forest uses, including social, economic and environmental implications, can be considered together. The review process should include some expert representation from outside the State, and

- enable periodic independent and transparent audits of compliance with forest management processes, including codes of practice, and for subsequent joint reviews of those processes and codes.

1.6 Review the Conservation and Land Management Act to:

- enable licences for the sale of wood to extend beyond the period of the management plan;
- make some or all long-term licences renewable as well as transferable, and
- introduce a declining ratchet provision in the volumes to be sold beyond the initial ten years of any longer term licence.

CALM should:

1.7 Revise the draft Nature Conservation Strategy for Western Australia in the light of public comment already received and approve and implement the strategy as soon as possible.

1.8 Develop Policy Statements:

- dealing with the productive capacity of former mine sites, and other principles underpinning ecologically sustainable forest management;
- on the maintenance of carbon and hydrological cycles at the ecosystem level to assist integrated planning and implementation;
- on water and revise these periodically to facilitate the preparation of the next Forest Management Plan, and
- on natural and cultural heritage, including geoconservation and cultural values, in collaboration with other relevant agencies.

The relevant land management agencies should:

1.9 adopt a new Memorandum of Understanding for the protection of remnant vegetation on private land to clarify responsibility for the pursuit of ecologically sustainable forest management in private forests.

2. Planning

The Government of Western Australia should:

2.1 Facilitate an integrated approach by relevant agencies to assess:

- areas of native forest and present and planned plantations on private land, and
- impacts of plantation development on regional values such as water yields, social, roading/infrastructure issues, and industry development.

The Minister, controlling bodies and Executive Director of CALM should:

2.2 Determine a schedule for concurrent development of strategies and a new Forest Management Plan spanning all State public tenures in the South-West

Forest Region. Where previous ministerial conditions have been imposed, these conditions and references to other previous plans should be revoked and replaced by a complete set of conditions consistent with the terms of the currently gazetted plan.

CALM should:

2.3 Complete a set of official guidelines and manuals for assessment of flora and fauna, consistent with a revised Wildlife Conservation Act and a finalised Nature Conservation Strategy.

2.4 Develop a formal process to appraise and meet data requirements to support assessment of risk to biodiversity from forest management practices, including those associated with timber harvesting, protection from fire, and conservation.

2.5 With other relevant agencies, develop a cost-effective and appropriate set of performance indicators for effective monitoring of plans relating to biodiversity, as well as other values.

2.6 Address the ecological basis for burning regimes in all forest ecosystems in planning for fire management. Annual District burning plans should be available for public access and medium-term (five to seven years) fire management plans should be published. Such plans should be prepared in conjunction with the medium-term integrated harvesting and regeneration plans specified within the Manual of Harvesting Specifications.

2.7 Explicitly define water quality in the Code of Practice for Plantations, Manual of Harvesting Specifications, and Code of Practice for Timber Harvesting in Western Australia.

2.8 Complete and use soil and landform assessment methods, and develop manuals for using this information in planning in the southern forests.

2.9 In consultation with the mining industry, review the present strategies and operations to establish formal requirements for conservation or re-establishment of all forest values, including productive capacity, on former mining sites, consistent with incorporation of the principles of ecologically sustainable forest management into the CALM and the Mining Acts (see also Recommendation 1.4).

2.10 Involve communities in planning for cultural heritage conservation.

2.11 Assess natural and cultural heritage resources through systematic surveys and the development of databases and integrate the conservation of natural and cultural heritage values into the management and planning process through training and more explicit processes and guidelines.

2.12 Extend the use of operational planning on a periodic (say five yearly) and integrated basis and introduce the opportunity for public comment on these `look ahead' plans.

The relevant land management agencies should:

2.13 Adopt a new Memorandum of Understanding for the protection of remnant vegetation on private land to ensure that harvesting is carried out in a manner

that will lead to adequate stocking after harvest of retained growing stock or new regeneration for all timber harvesting operations.

3. Implementation

The Government of Western Australia and CALM should:

3.1 Ensure that the management of CALM lands in the South-West Forest Region is placed under a single integrated management entity, either as a:

- public service entity being an integral part of CALM, or
- separate commercial entity with its own board of management, chief executive, and commercial objectives.

CALM should:

3.2 Review the CALMfire process for setting priorities for the use of prescribed fire and change the weighting given to different values to better reflect the two over-arching and six specific principles of ecologically sustainable forest management and the current knowledge of the response and resilience to fire of ecosystems in the South-West Forest Region.

3.3 Implement a District-level forest health surveillance system (including private forests) to provide early warning of potential pest disease and weed problems, develop an associated action plan, and undertake risk analyses for likely incursions or outbreaks.

3.4 Give the Director of Regional Services explicit responsibilities for cultural and natural heritage management matters.

3.5 Revise the two existing Codes of Practice and accompanying Manual to make them easier for field operators and field staff to understand.

3.6 Give increased attention to skill requirements, staff training, and the contracting of external services to ensure timely access to the range of skills needed to implement ecologically sustainable forest management.

3.7 Release draft Policy Statements related to ecologically sustainable forest management for public comment prior to finalisation.

3.8 Develop appropriate processes to facilitate consultation with and involvement of Aboriginal communities in the development of policies and procedures for heritage conservation.

4. Monitoring and compliance

The Lands and Forest Commission and the National Parks and Nature Conservation Authority should:

4.1 Jointly report on compliance with all provisions of relevant management plans, including periodic reporting of progress with the structural goals prescribed within the Forest Management Plan.

CALM should:

4.2 Complete the revision of Policy Statement No. 28 to include the current objectives and a commitment to develop and regularly monitor a set of indicators of ecological sustainability in relation to all of the principles of ecologically sustainable forest management. The revised policy should be implemented as soon as possible.

4.3 Collate and maintain a database on forest soils (including soil nutrients) and carbon, using data from researchers within and outside CALM.

4.4 Employ Aboriginal heritage officers in the field monitoring of CALM activities and to maintain the indigenous places database, as well as communicate with Aboriginal communities on the protocols for data entry and retrieval; and:

- link CALM heritage databases to the CALM geographic information system and to databases of other agencies;
- commission experts to explore the feasibility of developing sensitivity indicators which might be applied to the location of prehistoric Aboriginal sites, and
- sponsor research on the ability of prescribed buffer zones to conserve a representative sample of cultural heritage values.

4.5 Continue to operate the CALM Management Audit Branch as an internal audit of CALM planning and implementation priorities. In addition, there should be an external, independent audit of a sample of operational practices on an annual basis. Performance criteria and the results of the external audit should be published in the annual report of CALM.

5. Review and improvement

CALM should:

5.1 Implement frequent (about one to two yearly) internal review and periodic (about five yearly) external review of the Code of Harvesting Practice and Timber Harvesting Manual.

5.2 Encourage the implementation of the new processes for formal involvement of Regional and District staff in setting priorities for research and development, and planning implementation of research results in management. Strategic research should continue to be funded from the Programs, but regions should also purchase research using funds under their control. CALM should periodically assess whether the processes are meeting the research needs of the Regions and Districts.

5.3 Retain the Forest Monitoring and Research Committee as a peak committee for advising on research priorities within CALM, but the committee should not have authority or responsibility for funding or the detail of the research program. CALM should ensure that the Forest Monitoring and Research Committee represents a wide range of stakeholder interests relevant to ecologically sustainable forest management.

5.4 Establish scientific advisory committees to facilitate input of external advice to research projects and to aid integration of CALM's strategic research planning with research priorities of other organisations, agencies and institutions.

5.5 In consultation with harvesting operators, develop mechanisms for fostering research and development and transferring new technology in harvesting operations.

5.6 Initiate a cross-agency cultural and natural heritage research program.

5.7 Develop further its social and economic research program.

The Western Australian Museum, CALM and other relevant institutions should:

5.8 Develop formal processes for jointly determining priorities for collection of fauna data and for maintaining a consolidated database.

The relevant land management agencies should:

5.9 Ensure that the requirements for restoration of former mine sites take account of the full range of values related to ecologically sustainable forest management and so guide research and development by the mining industry.

Introduction and methodology

Background

The Commonwealth and Western Australian Governments agreed to jointly assess the performance of the forest management systems and processes in Western Australia in achieving the objectives of ecologically sustainable forest management. This report assesses the quality and integrity of the Western Australian and national systems and processes for achieving ecological sustainable forest management; it also assesses approaches to management of forests in Western Australia for all Crown tenures and private land within the area specified for the Regional Forest Agreement. The assessment will provide a basis for accreditation of management systems and associated processes through the Regional Forest Agreement.

The need for ecologically sustainable forest management is recognised in the National Forest Policy Statement (Commonwealth of Australia 1992). It is specifically emphasised in the national goals relating to conservation, wood production and industry development, private native forests, tourism and other economic and social opportunities, and public awareness, education and involvement.

The National Forest Policy Statement draws on the work of the Ecologically Sustainable Development Working Group on Forest Use to provide a definition for ecologically sustainable forest management. This definition specifies three requirements for sustainable forest use:

- maintaining ecological processes within forests (the formation of soil, energy flows, and the carbon, nutrient and water cycles);
- maintaining the biological diversity of forests, and
- increasing the net social benefit derived from the mixture of forest uses, within ecological constraints, whilst maintaining options for the future.
- The National Forest Policy Statement provides guidance for ecologically sustainable forest management within a Regional Forest Agreement.
- The Commonwealth–State Regional Forest Agreement resulting from the comprehensive regional assessment will cover guidelines for ecologically sustainable management of the forests in question, taking into account the existing regulatory framework in the State and building on forest management strategies and practices. In this respect, the guidelines will cover, for example, management for sustainable yield, the application and reporting of codes of

practice, and the protection of rare and endangered species and national estate values. They may also specify the levels and types of disturbance that are acceptable for a particular forest so as not to adversely affect national estate and other conservation values of that forest.

- The Scoping Agreement for the Western Australia–Commonwealth Regional Forest Agreement notes that ecologically sustainable forest management will require a variety of mechanisms: the implementation of a comprehensive, adequate and representative reserve system; complementary off-reserve management; appropriate codes of forest practice, and management plans are but a few of the many mechanisms needed. An integral part of this process is the consideration of economic and social factors. Performance indicators relating to ecologically sustainable forest management are also required.

The Conceptual Approach

A general approach to the assessment of ecologically sustainable forest management was discussed in April 1996 by the Commonwealth and all State Governments involved in developing Regional Forest Agreements. National criteria (see Table 1) were jointly developed for the assessment of management systems relevant to ecologically sustainable forest management, using as guides the National Forest Policy Statement, the Montreal Process, Forest Stewardship Council processes, the Australian Forestry Council Principles for Environmental Care in Native Hardwood Logging, the outcomes of the United Nations Conference on Environment and Development, and the ISO 14000 Management System Series. The principles and criteria were agreed to for application in the assessment of ecologically sustainable forest management for the purpose of the Regional Forest Agreement process across Australia.

Table 1 reflects the framework adopted by the expert advisory group.

The assessment process agreed has several important elements:

- examining current management systems and planning processes in the context of national principles for ecologically sustainable forest management;
- ensuring that all the environment and heritage, and social and economic projects that are part of the comprehensive Regional assessment identify those management matters and threatening processes which are related to the assessed values;
- ensuring that environmental attributes (e.g., soil and water) that are relevant to forest management but not subject to assessment through a separate project are evaluated as part of the management assessment, and
- ensuring that all management matters are considered within an integrated framework to achieve complementary approaches across all forest types and tenures.

Table 1 Ecologically sustainable forest management principles and assessment criteria

Principles	
The specific principles to be applied are:	

1. Conservation of biological diversity

2. Maintenance of productive capacity of forest ecosystems

3. Maintenance of forest ecosystem health and vitality

4. Conservation and maintenance of soil and water resources

5. Maintenance of global carbon cycles

6a. Protection of natural and cultural heritage values

6b. Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies

The assessment will be consistent with the principles of environmental policy expressed in the Intergovernmental Agreement on the Environment and National Forest Policy Statement.

Assessment criteria	Description
Public transparency	Type and level of scrutiny—parliamentary, administrative Consultation—opportunity for public comment and advisory group involvement Access to information—process for access to supporting information Public involvement—opportunity for individual stakeholder or community groups to be involved in the decision-making process Reporting—mechanism for reporting of processes and outcomes for all system criteria
Scientific and technical basis	Mechanism for assessing adequacy of information (scientific/peer review) Process for incorporation of information in decision-making process
Indicators, standards and monitoring	Trend measurements—process for assessment of change Monitoring regimes—process for regular monitoring of indicators Standards—process for designation of quantifiable measures against which the quality or performance of a characteristic or attribute is assessed Performance targets—process for designation of

	specified goals Performance verification—process for ensuring achievement of standards and targets
Review/implementation of change	Mechanisms for review, feedback and continual improvement, internal/external, periodicity Actions—process for implementing and operationalising outcomes of review
Education and training	Identification—of education and training needs Implementation—delivery of education and training programs
Compliance	Audit arrangements, penalties, incentives—processes that ensure compliance with stated goals or objectives

Note:

Conservation includes both protection and maintenance.

Assessment Criteria: Discussion of Principles

The first task in the assessment of ecologically sustainable forest management is to examine the basis and adequacy of current management systems. Table 1 lists the criteria used by the expert advisory group. Structural and organisational elements of the Western Australian management system have been described in a background report prepared by the program management group for use by the expert advisory group.

To be consistent with the principles expressed under the Intergovernmental Agreement on the Environment and the National Forest Policy Statement, the expert advisory group has placed the six principles identified in Table 1 in the context of the overarching statements of ecologically sustainable forest management, *viz* intergenerational equity and the precautionary principle. The first statement, intergenerational equity, undertakes to 'maintain the full suite of forest values for present and future generations'. The time scale over which the principles apply must be considered in relation to intergenerational equity and the capacity of the forest management system to meet all principles of ecologically sustainable forest management in the long-term. The expert advisory group was mindful of this in its consideration of the six principles.

The second statement undertakes to 'use the precautionary principle for prevention of environmental degradation'. The expert advisory group paid particular attention to those Western Australian processes of forest management dealing with 'risk assessment' and 'risk management' to minimise environmental impacts and avoid serious or irreversible damage to the environment.

Incorporation of the 'precautionary principle' in decision making has been endorsed by State and Commonwealth Governments . It is defined thus:

`where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to

prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by

I. careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment;

II. an assessment of the risk-weighted consequences of various options.'

(Commonwealth of Australia 1992, p. 49)

The following six principles are discussed in the remainder of this section:

Principle 1 Conservation of biological diversity

Maintenance of biodiversity is a fundamental goal of conservation management and a prerequisite for achieving ecologically sustainable forest use. In the National Forest Policy Statement biodiversity is defined as the variety of all life forms, the plants, animals and micro-organisms, the genes they constitute, and the ecosystems they inhabit. Incorporated in the concept is variation occurring at three levels: ecosystem, species and genetic.

Principle 2 Maintenance of productive capacity of forest ecosystems

Productive capacity refers to the ability of a forest to produce biomass. Sustainability of forest ecosystems' biomass production (whether the biomass is used by humans or as part of nutrient and energy cycles) is essential to the well-being of all living things. Implicit in the term 'sustainability' is the notion that irreversible damage should not be imposed on the capacity of the forest to supply goods or services to present and future generations. In this assessment, the expert advisory group has considered both sustainability (defined as the capacity for continued productivity where the primary requirement is for site and soil protection and for adequate regeneration and protection) and sustainable yield (defined as the capacity to maintain relatively consistent levels of production or products over an extended period).

Principle 3 Maintenance of forest ecosystem health and vitality

Incorporated in Principle 3 is the concept of ecological integrity, whereby the health and vitality of an ecosystem are maintained under changing environmental conditions. Structures and functions may change in ecosystems as a result of threatening processes such as land clearing, fire, pollution or the activity of pests and diseases. These processes can cause major changes in species composition, loss of vital biological components such as decomposers, pollinators and food-chain relationships, and degradation of ecosystem processes (soil formation, energy flows and the carbon, nutrient and water cycles).

Thus, the concept of ecological integrity can be of use in determining thresholds of environmental change whereby each threshold results in a reorganisation of the ecosystem to a different level. Within ecologically sustainable forest management, the properties and processes of forest ecosystems over management periods become important considerations in the maintenance of ecological integrity.

Principle 4 Conservation and maintenance of soil and water resources

Forests contribute enormously to the maintenance and conservation of the soil resource, they afford protection for water catchments, and they maintain the quality and quantity of water. Forest disturbance can affect soil and water values and management aims to ensure that these resources are protected and maintained in the long term, including those relating to the maintenance of geoheritage values.

Principle 5 Maintenance of global carbon cycles

Carbon is stored in Australian forests as living plant, microbial and animal biomass and dead organic matter in the form of debris or soil carbon. As a general rule, carbon is accumulated and stored in growing forests, and these forests contribute to carbon storage. There remains considerable debate about the role of old forests in carbon storage, some may be, at best, carbon neutral where the amount of carbon accumulated through photosynthesis is lost back to the atmosphere via decomposition of dead organic matter. Forests that are managed on short rotations for pulp, or those that are regularly burnt, or are subject to heavy soil disturbance may be carbon negative.

Principle 6a Protection of natural and cultural heritage values

Heritage encompasses archaeological sites, historic places and customs (cultural heritage), and natural values or objects (natural heritage) that are of aesthetic and social value and are passed down to the present generation from past generations. These factors can be used to monitor changes in the forest ecosystem.

In this report a distinction is made between natural heritage values and other natural values such as biological diversity which are included as ecologically sustainable forest management principles. There are a number of other natural attributes of the environment which arise from human perceptions of the environment and its values. These include such matters as wilderness, scientific collection sites, type specimen localities, and attributes of geoheritage such as caves and karst landforms, other spectacular or representative landforms, etc. These values are not included explicitly in the other ecologically sustainable forest management principles and so are dealt with separately in this principle.

Principle 6b Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies

The basis of this principle is the promotion of forest-related economic activity that is consistent with maintenance of the environment whilst satisfying socio-economic requirements for income, employment, goods and services. Implicit in this is the optimum use of the forest economy's capital stock (human, made by humans, and natural resources) so that it is managed in such a way as to maximise the long-term welfare of or benefit to society in terms of the goods and services it requires. The forest economy covers timber, other forest products and uses, water supply, minerals, grazing, recreation and tourism. Some of these values are implicitly covered in the consideration of natural heritage values. Non-indigenous and indigenous cultural heritage values have been given particular consideration under this principle.

Method of Assessment

The assessment of ecologically sustainable forest management is done in two stages. The first stage involves assessment of forest management systems with opportunity for public input and consultation. This report represents the completion of the first stage. The second stage involves integrating the assessment of management systems with the information from other Regional Forest Agreement projects and developing options for achieving ecologically sustainable outcomes for the Western Australia–Commonwealth Regional Forest Agreement.

Figure 2 The Expert Advisory Group's terms of reference

The terms of reference for the expert advisory group are as follows:
A. To assess the scope, quality and integrity of forest management systems/processes used in Western Australia to deliver ecologically sustainable forest management. - Assessment to be based on the Background document produced by the Project Management Group and any other material considered necessary; - The expert advisory group, in undertaking the assessment may consult with other parties as necessary; - The assessment is to concentrate on the processes through which standards and prescriptions are developed including their scientific underpinning rather than the detail of those standards or prescriptions; - Assessment is to identify systems/processes which are effective in achieving ecologically sustainable forest management objectives, any significant gaps or deficiencies in the management and planning systems and controls and to identify cost-effective options for improvement and actions to address any gaps or deficiencies, including the identification of appropriate performance indicators relating to systems and processes, and - Assessment is to cover all forest tenures and uses within the defined Regional Forest Assessment boundary. B. To produce an ecologically sustainable forest management Assessment Report to the Steering Committee. - Assessment to be structured and reported according to the designated ecologically sustainable forest management framework. C. To consider any changes necessary to the recommendations based on a review of public comments on the Assessment Report.

Preparation of the Assessment

In undertaking this assessment of ecologically sustainable forest management systems, the expert advisory group has drawn extensively on the background report and other documentation drawn together by the Project Management Group and their colleagues, as well as on material from sources external to

governments. In addition, members of the expert advisory group has met with and been briefed by Government officials and other stakeholders.

Public Comment and Consultation

The assessment of ecologically sustainable forest management systems has included meetings with stakeholder groups, conversations with individual stakeholders and consideration of a number of written submissions. The recommendations in this report are preliminary and will be reconsidered after any public submissions received following publication of the assessment. Any changes will be forwarded to the Regional Forest Agreement Steering Committee for their consideration as part of Regional Forest Agreement outcomes. The expert advisory group is aware of a number of other reports which are being completed as part of the Western Australian Regional Forest Agreement process and which will impact directly or indirectly on this assessment of ecologically sustainable forest management. Those reports will need to be read in concert with the current report and commented upon accordingly.

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Collie Hardwood Plantation Agreement Act 1995

Conservation and Land Management Act 1984

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Country Areas Water Supply Act 1947

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Environmental Protection Act 1986

Forest Management Regulations 1993

Heritage of Western Australia Act 1990

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Metropolitan Water Supply Sewerage and Drainage Act 1909

Mining Act 1978

Mining Act 1978, Mining Regulations 1981

Occupational Health Safety and Welfare Act 1984

Soil and Land Conservation Act 1945

Timber Industry Regulation Act 1926

Water Agencies Restructure (Transitional and Consequential Provisions) Act 1995

Water and Rivers Commission Act 1995

Water Corporation Act 1995

Wesply (Dardanup) Agreement Authorization Act 1975

Western Australian Tourism Commission Amendment Act 1994

Wildlife Conservation Act 1950

Wood Chipping Industry Agreement Act 1969

Chapter 1 The commitment and the policy framework

The commitment and the policy framework have been examined to determine whether sufficient policies or legislation, or both, exist to establish appropriate processes for dealing with the principle under review. It has not been possible to review in detail individual policies or pieces of legislation in the time available. However, the expert advisory group has drawn attention to the main deficiencies and strengths in the policy and legislative framework.

In addition to commitments under State legislation and policies, Western Australia is committed to a range of international treaties, conventions, national legislation and policies covering a wide range of aspects of ecologically sustainable forest management. A list of the relevant documents is given in Appendix 1 at the end of this chapter. There is a degree of overlap in the responsibilities of the Commonwealth and State Governments for such commitments and there is a need to ensure cost-effective approaches.

The Commonwealth and Western Australian Governments should systematically and jointly review relevant Commonwealth and State Acts to achieve consistency and minimise duplication, develop standard heritage criteria and assessment processes, and create a clear delineation of responsibilities for each level of government (see Recommendation 1.1).

The approach currently adopted to assess ecologically sustainable forest management has been to evaluate forest management against two general and six specific principles outlined in the conceptual approach in the section `Introduction and Methodology'.

These principles are in accord with the criteria enunciated in other national approaches to ecologically sustainable forest management, such as the Ecologically Sustainable Development Principles and the National Forest Policy Statement, as well as the processes adopted internationally, for example, by ISO 14000 Management System Series and the Montreal Process. A demonstrated commitment to these principles should be made by their incorporation into the *Conservation and Land Management Act 1984* and other relevant legislation for the South-West Forest Region so that they apply to all forest users.

The Government of Western Australia should amend the Conservation and Land Management Act, *Mining Act 1978* and other relevant legislation for the South-West Forest Region to explicitly incorporate the two over-arching principles and the six specific principles of ecologically sustainable forest management used in the Regional Forest Agreement process (see Recommendation 1.2).

A particular characteristic of the commitment and policy framework in Western Australia is the multitude of documents in which policy is defined. CALM issues Policy Statements, of which there are currently 54. Management plans also contain statements of policy not documented formally elsewhere.

The process by which the `Forest Management Plan 1994-2003' was developed has led to a lack of clarity in policy. This management plan was preceded by the 1992 draft `Management Strategies for the South-West Forests of Western Australia' which explained the reasoning behind many policies, and in particular indicated that CALM accepts principles identified by the Commonwealth Working Group on Ecological Sustainable Forest Use (and gave a definition of those principles).

However, the subsequent Forest Management Plan is a much briefer document which does not always enunciate these principles and other policies as clearly as the draft document.

Conservation of biological diversity

- The current system
- Analysis and comment

Commitment and policy with respect to protecting and maintaining biodiversity has the following key elements:

- various Commonwealth legislation committing Australia to international treaties, conventions and initiatives;
- Commonwealth legislation regulating the export of wildlife, timber and areas of outstanding universal natural value under certain conditions;
- commitment by Western Australia to various national policies and agreements relating to ecologically sustainable forest management;
- various State legislation, especially the Conservation and Land Management Act; the *Wildlife Conservation Act 1950*; and the *Environmental Protection Act 1986*;
- various CALM Policy Statements (especially nos 9, 13, 28, 31, 33, 44, 50) and Procedural Instructions;
- legislation and regulations with respect to land clearing (especially the *Soil and Land Conservation Act 1945-1988*, the *Country Areas Water Supply Act 1947*), and

Memorandum of Understanding between the Commissioner for Soil and Land Conservation, the Environmental Protection Authority, the Department of Environmental Protection, Agriculture Western Australia, CALM, and the Water and Rivers Commission, for the protection of remnant vegetation on private land in the agriculture region of Western Australia.

The current system

Within Western Australia, the Soil and Land Conservation Act and the Country Areas Water Supply Act provide for protection of vegetation on all land tenures if clearing is likely to affect land degradation or water quality or yield.

The Wildlife Conservation Act allows the Minister to declare flora or fauna as protected, including those likely to become extinct, rare, or otherwise in need of special protection. Such species cannot be taken (removed, interfered with, injured or destroyed) without the written consent of the Minister.

The Conservation and Land Management Act gives CALM responsibility for the conservation and protection of indigenous flora and fauna on all tenures, including private land. Provisions of the Conservation and Land Management Act relating to the protection of indigenous flora are binding on the Crown, but those relating to fauna conservation are not. The Conservation and Land Management Act includes provisions about management plans requiring national parks and conservation parks to be managed to protect indigenous flora and fauna, and nature reserves to be managed to protect and care for indigenous flora and fauna.

The Western Australian Environmental Protection Act established the Environmental Protection Authority. The formal environmental impact assessment is the most significant way the Environmental Protection Act affects forest management. The Environmental Protection Authority usually assesses major

wood resource projects, forest management plans and mining proposals. The Environmental Protection Authority reports its assessment to the Minister for the Environment, who usually imposes `conditions' on approval of the project.

The State and local governments in Western Australia, as well as some private organisations commit themselves to maintenance of elements of biodiversity via a range of policy initiatives, mostly directed at retaining remnant vegetation. These policies and initiatives include the following:

- the May 1995 Government Memorandum of Understanding for the management and protection of remnant vegetation in agricultural areas;
- the Remnant Vegetation Protection Scheme;
- the Roadside Conservation Committee;
- various projects under the National Vegetation Initiative within the Natural Heritage Trust;
- town planning schemes pursuant to the Town Planning and Development Act;
- clearing controls administered through the Soil and Land Conservation Act;
- Land Conservation District Committees and Integrated Catchment Management Groups;
- the Gordon Reid Foundation for Conservation (funded by the Lotteries Commission);
- a pilot Land for Wildlife (established by CALM), and
- the Perth Environment project (a Ministry for Planning initiative).

In 1992, CALM released a draft `Nature Conservation Strategy for Western Australia'. This strategy was open to public participation, but the final version is yet to be released because of current litigation. The draft strategy draws together CALM's existing nature conservation policies, and introduces new ones where gaps exist, into a comprehensive strategy for nature conservation in Western Australia which addresses all essential elements of maintenance of biodiversity in an ecologically sustainable forest management framework. The overall objective of the strategy is to conserve in perpetuity the widest possible diversity of indigenous landscapes, ecosystems and species (including their genetic variability) in natural habitats in Western Australia.

CALM has a process of developing formal (internal) Policy Statements that are signed by the Executive Director once approved by CALM's Executive Committee and controlling bodies. A subset of these policies is particularly relevant to the objective of maintaining biodiversity in Western Australian forests.

- Policy Statement No. 9 commits CALM to identify, locate and seek to conserve threatened flora. It outlines strategies for identifying and storing information on threatened flora and procedures to be followed when conducting field operations.
- Policy Statement No. 27 aims to work with the rural community to retain, restore and increase tree and shrub cover in rural areas to achieve sustainable economic land use and the conservation of natural species and processes.
- Policy Statement No. 28 proposes a detailed framework for establishing Regional datasets on flora and fauna, establishing benchmarks against which to assess environmental change, a system of monitoring sites and adequate staffing and funding to carry out a monitoring program.
- Policy Statement No. 31 sets out the selection and management of reserves to ensure the long-term maintenance of species and genetic diversity

and the persistence of those habitats, indigenous species and ecological processes that comprise Western Australian ecosystems.

- Policy Statement No. 33 aims to conserve threatened and specially protected fauna in the wild and commits CALM to identify, locate and seek to conserve threatened and specially protected fauna and to implement management practices to conserve them. It also commits CALM to seek to reserve and manage lands critical to their survival, undertake and promote research on them, liaise with other land managers and publicise the need for their conservation. Strategies to effect these commitments are also outlined in the policy.
- Policy Statement No. 44 has the objective to conserve and manage threatened, specially protected, or harvested taxa of flora and fauna and their habitats, threatened ecological communities and other taxa in need of intensive management by the preparation and implementation of written wildlife management programs. The policy commits CALM to preparing recovery plans for threatened taxa and communities according to priorities laid down by Corporate Executive and the National Parks and Nature Conservation Authority. Strategies are provided for the implementation of the policy elements.
- Policy Statement No. 50 defines the threat categories for species to ensure resources are allocated to those in highest need. The ranking procedure will occur at least every two years and involves a panel of six to ten scientists with a wide knowledge of the conservation status of the Western Australian flora and fauna scoring each threatened species according to set criteria.

Environmental protection policies are declared under Part III of the Environmental Protection Act. These give statutory protection to specific parts of the environment. Currently these policies take about five years from initiation to gazettal, and have public participation. About fifty policies are to be developed over the next few years. Currently four policies are being developed (South-West Wetlands; Groundwater; Swan-Canning Estuary, and Western Swamp Tortoise). The Environmental Protection Authority also develops non-statutory policies, which are not subjected to public participation.

In the following assessment, only the major strengths of these elements of commitment to maintaining biodiversity in Western Australian forests are discussed.

Analysis and comment

A strength of the management system in Western Australia is that a single agency, CALM, has legislated responsibility under the Conservation and Land Management Act to enforce the Wildlife Conservation Act. CALM interprets this responsibility in statements of objectives and policy in its corporate strategic plan, annual reports and management plans at various levels.

It has been recognised within CALM for sometime that the Wildlife Conservation Act is deficient with respect to conservation of biodiversity. CALM staff, as well as the expert advisory group, have the following particular concerns.

- The Wildlife Conservation Act concentrates on protection of a limited set of species, and not the diversity of genes, species, species assemblages, and ecosystems that constitute biodiversity.
- The Wildlife Conservation Act does not include a requirement to prepare a state-wide strategy for conservation of biodiversity.

- The Wildlife Conservation Act recognises only species that are extinct, or are likely to become extinct, in the near future and gives no legal status to species under longer term threat.
- Threatening processes are not recognised in the Wildlife Conservation Act, nor is there provision for conserving habitat that is under threat.
- The Crown is not bound by the conditions of the Wildlife Conservation Act with respect to fauna.
- The categories of threat for species and communities need to be compiled in one place and incorporated into legislation or a policy document.

Most of these deficiencies have been addressed in the various Policy Statements listed above. However, it is unclear what degree of commitment is attached to these policies as they can be withdrawn unilaterally and several key requirements have not been implemented (sometimes due to insufficient resources as discussed in later chapters of this report). While Policy Statements such as these are welcome, they do not replace the stronger commitment afforded by legislation. A proposed bill to replace the Wildlife Conservation Act has been under development for some time.

The Government of Western Australia should revise the Wildlife Conservation Act to:

- Include explicit requirements to conserve genetic, species and ecosystem diversity;
- Include a requirement to prepare and regularly review a state-wide strategy for conservation of biodiversity;
- Establish an explicit system of categorising threatened species, and communities, threatening processes and critical habitats, and
- Formalise the responsibility of CALM for the protection and maintenance of both flora and fauna on all tenures, including the preparation of recovery plans for rare and endangered species (see Recommendation 1.3).

The existence of the Mining Act and the Memorandum of Understanding for the protection of remnant vegetation on private land are strengths of the system as they require reference of sensitive issues on public and private land, including those concerning flora and fauna and their habitats, to the Environmental Protection Authority for assessment. It is questionable how well such assessment can be made with respect to private land due to lack of inventory data (see Chapter 4), and this emphasises the need for a strong nature conservation strategy which contains a policy for assessing data needs for effective management of biodiversity across tenures in Western Australian forests and commits resources to meeting those needs.

CALM should revise the draft Nature Conservation Strategy for Western Australia in the light of public comment already received, and approve and implement the strategy as soon as possible (see Recommendation 1.7).

CALM should consider issuing corporate licences for the collection of wildflowers and seed harvesting.

Maintenance of productive capacity of forest ecosystems

- The current system
- Analysis and comment

The two principal elements of the processes relating to maintaining the productive capacity and sustainability of forest ecosystems are the determination of the sustainable yield of wood from State forests, and the regulation of private forests.

In the context of Principle 3, 'sustainable' is defined as the capacity for continued productivity where the primary requirement is for site and soil protection and for adequate regeneration and protection. 'Sustained yield' is defined as the capacity for relatively consistent levels of production of a product or products for an extended period.

The current system

State legislation and policies

The Conservation and Land Management Act and the Soil and Land Conservation Act provide the principal basis for maintenance of productive capacity.

The Conservation and Land Management Act (Part II, section 9) provides restrictions on the abolition of State forest or the changing of the purposes for which State forest are being managed for under section 60 (3) (a) or 60A except by virtue of an Act of Parliament. Part III; sections 19(c) and 2(c) require the controlling bodies to consider any change in purpose or boundary alteration in respect of land in which it is vested.

Section 55 (1a) requires a management plan for any indigenous State forest or timber reserve to specify the purpose for which it is being managed and if that purpose includes timber production it must be `...on a sustained yield basis'.

The Forest Management Plan was approved by the Minister for the Environment pursuant to section 60 of the Conservation and Land Management Act. The preparation of the plan involved an extensive period of public participation which followed the release of the draft Management Strategies in February 1992. The Environmental Protection Authority reviewed the draft Management Strategies in accordance with the Conservation and Land Management Act.

The Environmental Protection Authority made a number of recommendations which were subsequently examined by an Appeals Committee then adopted by the Minister and issued as ministerial conditions in December 1992. The Conditions provided for a further examination by a Scientific and Administrative Committee appointed by the Minister for the Environment. A final ministerial determination was made on 16 August 1993 which implemented the Forest Management Plan. This determination included the quantity of the annual sustainable timber resource which is available for allocation. The annual sustainable timber resource was calculated on the basis of gross bole volume increment. Limits were set for the volume of first grade karri sawlogs and the volume of first and second grade jarrah sawlogs.

The gazettal of approval of the Forest Management Plan did not revoke the 1987 Forest Regional Management Plans for the Northern Forest, Central Forest and Southern Forest Regions. Where both the Forest Management Plan and the 1987 Plans deal with the same issue, such as tenure, the provisions of the Forest Management Plan replace those of the 1987 Plans. The native forest timber supply proposals in the Forest Management Plan replaced those in the 1987 Timber Strategy. The 1987 Plans remain current for all issues not covered in the Forest Management Plan.

CALM has developed a Policy Statement (No. 10) which provides for the rehabilitation of disturbed land to best suit the designated land use and prevent or suppress weed invasions.

CALM processes ensure senior level commitment to environmental policies. Draft policy statements are considered at a meeting of CALM's Corporate Executive, and if approved, the Executive Director personally signs each Policy Statement.

Mining

Mineral development in Western Australia is regulated under the Mining Act. Mineral development projects are administered under appropriate controls covering project management, operation and post-mining rehabilitation. Protection is accomplished primarily by setting conditions.

The Department of Minerals and Energy develops the conditions in consultation with appropriate Government agencies, including CALM if CALM land is involved. Companies operating under State Agreement Acts, including bauxite and coal mining companies operating in the forest zone, have specific requirements for environmental controls, including rehabilitation.

State Agreement Acts are administered by the Department of Resources Development.

The Department of Minerals and Energy has guidelines under the Conservation and Land Management Act for the application of environmental conditions for exploration and development on conservation reserves. There are a number of separate guidelines, including guidelines for the following:

- existing national parks, nature reserves and conservation reserves;
- proposed conservation reserves;
- State forests and timber reserves in the South-West Forest Region (prospecting and exploration licences and mining leases), and
- mining leases on proposed reserves not vested in the National Parks and Nature Conservation Authority.

Typically the proponent is required to specify techniques, prescriptions and timetables for rehabilitation of areas likely to be disturbed. Annual progress reports are required.

Recent agreement acts for mining projects in the South-West include requirements for rehabilitation. Rehabilitation requirements for some of the earlier mining projects, such as coal and tin, were less stringent.

CALM has working arrangements with ALCOA covering all aspects of the company's operations on State forest, including:

- exploration and development;
- salvage logging, minor forest produce removal, clearing, burning prior to mining;
- rehabilitation after mining, and
- & dieback forest rehabilitation.

Private forests

There are legislative constraints on the clearing of some private native forest, but there is no legislative basis for ensuring sustainable management of these forests. Legislative controls on clearing are provided under the Soil and Land Conservation Act and the Country Areas Water Supply Act. These controls are augmented by a State Cabinet direction which led to the Memorandum of Understanding between the Commissioner for Soil and Land Conservation, Environmental Protection Authority, Department of Environmental Protection, Agriculture Western Australia, CALM and the Water and Rivers Commission.

This Memorandum enables a number of specific statutory requirements to be met in a co-ordinated process. The primary objectives of the memorandum are to reverse land degradation and biodiversity loss.

None of the above processes directly take account of the productive capacity of the private forests in terms of sustainable wood production, as measured by the area, structure, type and growth of the forests.

CALM, under specific objectives of the Forest Management Plan, seeks to encourage the development of commercially viable tree crops and to provide advice on the management of native forest on private property.

Analysis and comment

State legislation and policies

There is clear legislative and policy commitment to the achievement of sustainable timber production from State forests. The annual sustainable timber resource which is available for allocation is determined from, and does not exceed, the estimated annual sustainable gross bole increment.

The ministerial determination of annual allocations applies for a ten year period, from 1 January 1994 until 31 December 2003. The time period for most wood supply contracts corresponds to the period of the Forest Management Plan, although the Executive Director may enter into contracts with a fifteen year life. The calculation of sustainable gross bole increment is carried out on a continuing basis, although no adjustment to the annual allocations can be made without amendment of the Forest Management Plan through the legislative processes. As a result, there is no statutory commitment for the quantum of annual allocations beyond 2003.

The absence of longer term resource allocations will result in increasing uncertainty for long-term planning during the life of the Forest Management Plan - a matter taken up in a later chapter.

There is clear legislative and policy commitment to minimise environmental impact and to rehabilitate forest areas following mining activity. However, this commitment does not address the issues of ecological sustainability. In particular, there appears to be no legislative or policy commitment to specifically maintain the productive capacity of the ecosystems which are subject to mining. The incorporation in the Mining Act of the principles underpinning ecologically sustainable forest would rectify the legislative deficiency (see Recommendation 1.2), but a Policy Statement is required to guide restoration, with due account of the post-mining landform and current best practice for rehabilitation, and to address the other principles underpinning ecologically sustainable forest management.

CALM should develop a Policy Statement dealing with the productive capacity of former mine sites, and addressing the other principles underpinning ecologically sustainable forest management (see Recommendation 1.8).

Private Forest

The productive capacity of the private forest estate is indirectly subject to regulation through legislative processes which seek to reverse land degradation and the loss of biodiversity. In addition, CALM, through the Forest Management Plan, seeks to foster and encourage the development and management of forests on private land (see Recommendation 1.9).

Maintenance of forest ecosystem health and vitality

- The current system
- Analysis and comment

The current system

The current system relies jointly on the *Agricultural and Related Resources Protection Act 1976,* and on the Conservation and Land Management Act respectively to provide for the control of feral animals, and declared plants and animals, and for the protection of trees from forest diseases.

These Acts provide the legislative base and are backed up by a number of Policy Statements which more directly provide a framework for implementation of pest and disease control measures and which may be rigorously enforced.

Fire management has long been one of the major concerns of CALM and its predecessor because of the long dry, hot summers and extreme fire conditions typically experienced in the South-West Forest Region. The Conservation and Land Management Act and the *Bush Fires Act 1954* provide the primary legislative framework for fire management. Fire management strategies are prescribed in the Forest Management Plan. Further details are provided in Policy Statement No. 19 which deals with the use of fire as a management tool.

Analysis and comment

The current legislative framework is sufficient to allow for the detection and control of most pests and diseases, but there are some anomalies which need to be addressed through alterations to current Acts. Reliance on the Agricultural and Related Resources Protection Act for declared weeds has resulted in a preponderance of declared plants which are of economic significance, possibly at the expense of those having direct impacts on native biodiversity. CALM has produced a draft revised Wildlife Protection Bill which specifically recognises environmental weeds. This Bill should be enacted as soon as possible. The Conservation and Land Management Act recognises the significance of diseases to trees, but it should apply more generally to other biota. Similarly, the parts of the Conservation and Land Management Act relating to forest diseases do not apply to private land. The system of development of Policy Statements and their implementation through management plans is useful, but suffers from the fact that a particular policy may be withdrawn or rendered inactive unilaterally by CALM without public input.

Fire management on public and private land is covered by an appropriate legislative and policy framework.

Conservation and maintenance of soil and water resources and maintenance of global carbon cycles

- The current system
- Analysis and comment

The current system

Australia is a signatory to two international treaties of relevance:

- the United Nations Framework Convention on Biological Diversity (the Santiago Declaration leading to the Montreal Process), and
- the United Nations Conference on Environment and Development, Conventions and Agreements 1992 (the Rio Declaration and Agenda 21 leading to the National Strategy for the Conservation of Australia's Biological Diversity).

Both treaties deal with soil, water and carbon values.

Within Australia, the Council of Australian Governments has produced a range of agreed policies since 1992 which include the following: Intergovernmental Agreement on the Environment 1992; National Strategy for Ecologically Sustainable Development 1992; National Forest Policy Statement 1992; Water Resource Policy 1994; National Strategy for the Conservation of Australia's Biodiversity, and the National Competition Policy 1995, which provide a policy framework and most have as common elements the need to maintain water yield and soil and water quality and carbon balance.

Of the Western Australian legislation, the Soil and Land Conservation Act is perhaps the most pertinent to the aim of maintenance of soil values, but is intended to deal largely with physical degradation (soil erosion), rather than chemical or biological degradation. The Soil and Land Conservation Act has had numerous amendments.

The Conservation and Land Management Act, the Country Areas Water Supply Act, the *Local Government Act 1902*, the *Metropolitan Water Supply,* and the *Sewerage and Drainage Act 1909* are all partially prescriptive of water yield and to a lesser extent, quality, from forests and plantations within the South-West Forest Region. The *Environmental Protection Act 1986* is also relevant to forests, but is largely a `policing' rather than a `prescriptive' Act.

Policies of the newly formed Water and Rivers Commission, as well as those of the Waterways Commission, Water Resources Commission and the Water Corporation, are relevant to both native forest and plantations at a variety of scales. Policy development by the Water and Rivers Commission is a consultative process with involvement from CALM, as well as other stakeholders, but is incomplete.

Of special importance in Western Australia is the interaction between mining and forest management. Mining leases cover a large proportion of the jarrah forest and the mining industry is dealt with under the Mining Act and a variety of specific State Agreement Acts (e.g., Alcoa 1961, Worsely 1973). Policy in respect of soil and water is further developed independently and largely voluntarily by

individual companies, and in joint `working arrangements' developed by CALM and the mining companies.

CALM publishes relevant Policy Statements in a number of documents (e.g., Forest Management Plan, Code of Practice for Timber Plantations, Timber Harvesting in Western Australia incorporating the Code of Harvesting Practice and the Manual of Harvesting Specifications). The Forest Management Plan states as policy that: water quality will be maintained, there will be no loss of soil by disturbance, and there will be no net loss of nutrients from ecosystems.

There appears to be no explicit legislation or policy for the maintenance of global carbon cycles though it might be considered that policy commitments to maintenance of productivity and no net loss of soil cover this requirement.

Analysis and comment

Particular difficulties arise through the separation of ecosystem components (soil, water, flora and fauna) in legislation and in policy documents. Most of these cycles cannot be simply separated into soil or vegetation or animal components - they require consideration as integrated units or of ecosystems. Maintaining nutrient cycles cannot be measured using soil parameters alone since much of the nutrient capital of an ecosystem may reside within the vegetation. Similarly, maintaining carbon cycles depends as much upon maintaining soil carbon and litter layer carbon, as it does upon maintaining plant biomass. Without consideration of plant growth and its relationship to the development of leaf area, the expert advisory group cannot assess the maintenance of the hydrological cycle.

CALM should develop Policy Statements on the maintenance of carbon and hydrological cycles at the ecosystem level which, like that already published for nutrients, will assist integrated planning and implementation (see Recommendation 1.8).

Legislation

Western Australian legislation in this area lags behind both the current state of knowledge and national and international government agreements. The relevant Acts focus on a number of specific aspects of soil and water (e.g., water yield, salinity, and to a lesser extent, the concentrations of pesticides and herbicides), but are not generally prescriptive of other soil and water values recognised as critical in these agreements. In part, this has arisen due to the relatively benign topographic and geomorphic features of the landscape of the South-West Forest Region of Western Australia which have ensured that the obvious signs of degradation of soil or water are easily recognised and relatively small in scale. Furthermore, early research studies supported the inference that soil and water values were being maintained in areas managed for timber production.

The various pieces of general legislation addressing soil and water values in forests subject to mining generally require that landforms be returned to a state approximating the pre-mining landform and that water quality and yield be `maintained'. Although some mining produces landforms which cannot be returned to such a state, mining companies and industries as a whole have voluntarily developed policy and `codes of practice' which seek to redevelop the major energy, carbon, nutrient and hydrological cycles.

Redevelopment of hydrological cycles to a condition approximating those which existed before mining is an aim of mining companies. The expert advisory group acknowledges that this aim is presently being met by the major companies concerned to the best of current knowledge. However, this does not ensure a continuing commitment if the economic circumstances of the mining industry were to change for the worse, therefore raising questions about the sustainability of these practices.

This underscores the need for the principles underpinning Regional Forest Agreement process to be included in the Conservation and Land Management Act, Mining Act and other relevant legislation to encompass the protection of soil, water and carbon values, among other things (see Recommendation 1.2).

Policy

The social and economic importance of water yield and quality is likely to increase in coming years. In the absence of major changes in species composition or productivity rates, the evidence suggests that hydrological cycles can be maintained in forests and plantations used for timber production, just as well as those set aside for conservation purposes. Harvesting has significant local short-term effects on water yield, but these are balanced out appropriately at the regional scale by the structural and age-class goals in the Forest Management Plan.

At the present time, CALM policy on water is continuously developed and modified in light of an informal process. CALM staff work closely with their counterparts in other State government departments in those processes. In this way, the policy development process is adaptive, reducing the need for, or extent of, external review of policy after its development. Nevertheless, the present informal process should be formalised.

CALM should prepare a Policy Statement on water and revise it periodically to facilitate the preparation of the next Forest Management Plan (see Recommendation 1.8).

Many of the principles underpinning ecologically sustainable forest management are not always clearly enunciated in the Forest Management Plan. For example, carbon cycles are not necessarily protected by just ensuring there is no net loss of soil. Carbon storage in litter and in the surface soil horizon may be greatly modified by many forest practices.

Without being prescriptive, policy with respect to soil should be expanded to seek to maintain soil characteristics such as bulk density, organic matter content and nutrient content, not simply to reduce soil loss.

Protection of natural and cultural heritage values

- The current system
- Analysis and comment

The current system

Indigenous cultural heritage

Archaeological sites within the South-West Forest Region of Western Australia are regarded as some of the oldest on the continent, with some sites dating to 27,000 years and 32,000 years before present. In 1975, a major study of the use of fire as a land management tool by Aboriginal populations in the South-West Forest Region was published. In 1989 and 1995, studies were undertaken of the Aboriginal significance of rivers and wetlands in the Perth-Bunbury Region and Busselton-Walpole Region by the Water and Rivers Commission. These studies indicate that the South-West Forest Region requires more intensive and detailed studies.

Historic Aboriginal populations are known to have changed the vegetational and faunal composition of the forests through burning. A considerable reservoir of traditional knowledge is held by the indigenous Nyungar population which is resident in the South-West Forest Region of Western Australia.

The Australian Heritage Commission maintains the Register of the National Estate and initiates programs designed to enhance the register, as well as participating in the Regional Forest Agreement process.

The Commonwealth *Native Title Act 1993* has provision for the lodging of claims, tribunal hearings and restitution of access or custodianship to indigenous communities. Forty-seven, at times overlapping, claims extend over the South-West Forest Region. The Nyungar Land Council established under the Native Title Act in 1995, is progressing those claims which fall within its area of responsibility.

The Aboriginal and Torres Strait Islander Commission maintains local and regional councils within the South-West Forest Region which actively seek greater involvement in land management matters.

At the State level, the *Aboriginal Heritage Act 1972* provides protection for indigenous objects and places of significance. The following documents prepared by the Western Australian Museum and the Department of Aboriginal Sites provide guidelines for the management of indigenous heritage:

- guidelines for Aboriginal Heritage Assessment in Western Australia, draft of January 1994;
- notes on the Recognition of Aboriginal Sites, and
- access Policy to the Register System held by the Department of Aboriginal Sites under Section 38 of the Aboriginal Heritage Act as at October 1993.

Prosecution of violations of the Act have proven to be difficult because it must be demonstrated that the action was 'knowingly' committed.

A field survey for and assessment of National Estate values of Aboriginal sites in the Southern Forests Region (stage 1) was commissioned in 1992 by the Australian Heritage Commission. The aims of the study were to compile historic and contemporary information about Aboriginal sites, and liaise with relevant Aboriginal communities about custodianship and control of information relating to Aboriginal sites. The study focused on baseline archaeological and ethnographic data.

A Commission of Elders was constituted by the Aboriginal Affairs Department and is an important consultative body. Under the Aboriginal Affairs Planning Authority Act, the Aboriginal Lands Trust has been established to provide advice to the Government on matters dealing with Aboriginal lands. Lands held by the Trust in the South-West Forest Region are small, and in either fringe urban settings, or once were Aboriginal farming reserves. The Aboriginal Lands Trust has a network of regional representatives which within the South-West Forest Region are pressing CALM for greater involvement in land management matters, the development of forest plantations on community-held lands and community-based social justice programs on CALM lands.

Nyungar seek a joint management agreement with CALM in the South-West Forest Region and unrestricted access to forests including national parks and nature reserves for a full range of spiritual, cultural and recreational purposes including hunting. Nyungar also seek identification of their sites, appropriate consultation before heritage places are endangered, erection of monuments, and recognition of claims on particularly significant sites. In addition, they seek the creation of employment in and a share of the benefits of forest-based industries.

The Nyungar wish to have more time to consider issues pertaining to the South-West Forest Region, as well as participate in developing and reviewing the Regional Forest Agreement.

Other cultural heritage

Places of cultural significance reflect a spectrum of activities including timber towns, sawmills, transport systems, water control structures such as dams and weirs, tree nurseries and communities whose economic base has shifted throughout the years from timbering or farming to tourism and recreation.

Protection is provided for historical built structures under the provisions of the *Heritage of Western Australia Act 1990,* the objectives of which are to conserve cultural heritage, to facilitate development which is in harmony with cultural values, and to promote public awareness.

A register has been established which is based upon assessments of aesthetic value, historic value, scientific value, social value, rarity and representativeness. Development of places entered on the register must be referred to the Heritage Council for advice, and action taken under that advice must be consistent with conservation aims unless there is no feasible or prudent alternative, and all adverse effects must be minimised. The Heritage Council may compulsorily acquire land, heritage agreements may be entered into, and conservation orders may be made when and where appropriate under the terms of the Heritage of Western Australia Act. State-wide municipal heritage inventories are a requirement of the Heritage of Western Australia Act.

In an attempt to address the scant information available on the heritage of the South-West Forest Region, the Western Australia National Estate Cultural Values

Projects have been initiated as part of the Regional Forest Agreement process. These include validation of existing data for entry on the interim list, the preparation of a thematic history of the Region, and a consideration of social and aesthetic values.

Studies have been undertaken by the Water and Rivers Commission of the historical association of rivers and wetlands in the Busselton-Walpole Region and the Perth-Bunbury Region. Historic places within the South-West Forest Region are entered on the Register of the National Estate under the provision of the *Australian Heritage Commission Act 1975.*

No natural area or historic place within the area covered by the Regional Forest Agreement is inscribed or in the process of nomination for entry on the World Heritage List, nor is it anticipated that any area will meet with the requirements of the *World Heritage Properties Conservation Act 1983.*

Local government instrumentalities develop municipal inventories and are concerned with visual amenity and aesthetic values of the built environment.

Natural heritage values

Matters directly relating to biodiversity are covered under Principle 1.

The primary means for protection of natural heritage values is through incorporating areas in a State reserve or by listing within local planning instruments. An assessment of natural values has been undertaken jointly between CALM and the Australian Heritage Commission. The values considered primarily relate to flora and fauna habitats. Geoconservation and aesthetic values of natural landscape were not considered.

As part of the process leading up to the Regional Forest Agreement, a study was undertaken and published in 1992, `National Estate Values in the Southern Forests of South-West Western Australia'. Preparation of the report involved a systematic review of the Region, an analysis of the level of protection of areas identified as having national estate values and a discussion of management practices. Forty four places met the threshold for significance while a further forty were deemed to be significant due to the presence of rare or endangered species.

In the South-West Forest Region, the only areas formally recognised as wilderness are those in the Nornalup-Walpole National Park, being so designated in the Park Management Plan. Some other areas such as those along the Bibulman Track are locally referred to as wilderness and informally receive management treatment which considers that value. As part of the Regional Forest Agreement process, places with wilderness qualities are to be identified, an inventory is to be developed and the reservation of such places is to be assessed

Geoconservation values are not referred to specifically within either the legislation or planning documents, but may be considered within the broader category of landforms.

A policy statement was issued in 1989 for 'Visual Resource Management on Lands and Waters Managed by CALM'. The objective of the statement is to ensure that all practices on land and water managed by CALM are planned and carried out in ways that sustain the beauty of the natural environment. The policy calls for the

development of a visual resource management system with data being progressively entered into the departmental database, the preparation of guidelines and prescriptions, and the development of training programs, as well as scenic quality research.

Analysis and comment

The absence of the objective of heritage conservation in the Conservation and Land Management Act is simply a product of history, this Act having been constructed prior to establishment of standards in that area. As a result, no mention can be found of the ICOMOS Burra Charter in any CALM policy or operational guidelines and this should be rectified.

Indigenous cultural heritage

It is understood that claims under the Native Title Act are of considerable concern to local government authorities. However, Aboriginal communities in the South-West Forest Region express a feeling of deep-seated loss. Aboriginals elsewhere in Western Australia have large tracts of land while the indigenous peoples of the South-West Forest Region perceive that they are not fully recognised at the State level.

CALM does not have an effective framework for cultural heritage management. Critical elements of a system are not present and there are no formal linkages or agreements with the Aboriginal Affairs Department which maintains organisational structures designed to implement indigenous cultural heritage conservation.

Mining ventures are required to register their interests under the provisions of the Native Title Act, and to meet with requirements for Aboriginal community consultation. Environmental audits and processes for assessing exploration and mining applications provide opportunities for consideration of socio-economic, environmental and cultural values and for public participation. In contrast, CALM does not vigorously pursue the identification of indigenous heritage places which are endangered through their activities.

In addition to consultation with Aboriginal people, CALM should reach a formal agreement on information exchange and the development of management procedures with the Aboriginal Affairs Department in order to manage better both the tangible and intangible indigenous values in the South-West Forest Region.

Other cultural heritage

The legislative instruments of Western Australia provide a framework for management of other cultural heritage. Cultural values can be identified across all tenures, listed and protected. Areas of particular significance can be incorporated within State or local government reserves.

The current system makes provision for appropriate and consistent legislative protection at all levels of governmental activity. It is understood that the majority of the local government authorities have developed municipal heritage inventories, but that the quality and completeness varies.

Natural heritage

The legislative and policy requirements with respect to geoconservation and cultural values are far from comprehensive at the State level. There is no legislation comparable to the Australian Heritage Commission Act which facilitates the listing of places with significant wilderness or geoconservation values.

The Forest Management Plan outlines the policy approach to the conservation of natural heritage. It is based on the joint inventory of national estate values conducted with the Australian Heritage Commission, and centres around adequate representation in the reserve system and consideration of the minimisation of impact in planning activities to which some values are sensitive. Nevertheless, CALM does not have a policy statement on natural heritage to address issues such as the protection of endemic values.

In collaboration with other relevant agencies, CALM should develop a Policy Statement on natural heritage, including geoconservation and cultural values (see Recommendation 1.8).

Consistency between Commonwealth and State legislation

The Australian Aboriginal Heritage Act takes an appropriately different approach from the national Australian Heritage Commission Act. The Heritage of Western Australia Act, with few exceptions, embodies the spirit of the Commonwealth legislation. Entries in the State Aboriginal sites register are closely scrutinised by a committee and categorised into 'open' and 'closed'.

Provisions for placement of places on the Western Australian Heritage Places Register are similar to those pertaining to entry on the Register of the National Estate which is maintained by the Australian Heritage Commission. Classifications of special values and the criteria for recognising those values should be consistent.

Recent joint State-Commonwealth action to implement the provisions of the Intergovernmental Agreement on the Environment should ensure the following:

- standard criteria for heritage significance at national, State and regional levels (for use by all relevant levels);
- standard assessment processes, and
- clear delineation of the heritage responsibilities of each level of government.

Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies

- The current system
- Analysis and comment

International, Commonwealth and State agreements, laws and commitments that incorporate provisions for appropriate management underpin the current approach to maintaining socio-economic, natural and cultural heritage values.

Some background material on socio-economic data and issues is provided in the Forest Management Plan and precursor documents, but a comprehensive and up-to-date review is lacking. A socio-economic assessment is currently in progress as part of the Regional Forest Agreement process. Any implications for processes concerning regional employment or socio-economic matters will be considered in preparing the final report.

The current system

General legislation and policy

The legislation and policy framework in Western Australia makes provision for maintaining and enhancing socio-economic benefits to meet the needs of societies through:

- consideration of the legislative provisions of the Conservation and Land Management Act (as amended by the *Conservation and Land Management Amendment Act 1993*);
- policy advice from the Lands and Forest Commission, the National Parks and Nature Conservation Authority, and the Forest Production Council, and
- management plans prescribed under the Conservation and Land Management Act (as amended).

The Conservation and Land Management Act (as amended) established an integrated forest (and land) management department, CALM, under the direction of an Executive Director. The Department is subject to the direction and control of the Minister. The Act also established three controlling bodies with specific functions.

Among other things, the functions of the Land and Forest Commission include the following:

- vesting of State forests, timber reserves and related lands under its control;
- development of policies to achieve or promote the objectives for these lands as specified in the Act, and
- submission to the Minister of proposed management plans for the lands vested in its control and the monitoring of the carrying out of those plans.

Those of the National Parks and Nature Conservation Authority include the following:

- vesting of national parks, conservation reserves, nature reserves and related lands under its control;

- development of policies to preserve the natural environment and provide facilities for enjoyment of that environment by the community, promote an appreciation of flora and fauna and the natural environment, and achieve and promote other objectives specified in the Act, and
- submission to the Minister of proposed management plans for the lands vested in its control and the monitoring and carrying out of those plans.

Those of the Forest Production Council include the following:

- advising the Minister on matters pertaining to production from State forests and timber reserves in a manner consistent with the maintenance of other forest values; and on the use, processing, and marketing of forest produce, and
- advising the Minister on research to achieve and promote the objectives specified in the Conservation and Land Management Act and on the contents of proposed management plans so far as they relate to timber production from State forest and timber reserves.

Balanced use

The Conservation and Land Management Act (as amended) is an Act, `to make better provision for the use, protection and management of certain public lands and waters and the flora and fauna thereof, and to establish authorities to be responsible therefor, and for incidental or connected purposes.' No references to balanced use or integration of objectives are given. The stated objectives of management plans include:

- achieving the optimum yield in production consistent with the satisfaction of long-term social and economic needs on State forests and reserves;
- fulfilling the demand for recreation consistent with the proper maintenance and restoration of the natural environment; protecting indigenous flora and fauna; and preserving features of archaeological, historic or scientific interest on national parks and conservation parks, and
- maintaining and restoring the natural environment; protecting, caring for and promoting the study of indigenous flora and fauna; and preserving features of archaeological, historic or scientific interest on nature reserves.

Public involvement in policy

Public involvement in state-wide policy is achieved through the provisions for notification of and seeking submissions regarding proposed management plans, as specified in the Conservation and Land Management Act. There are also provisions for notifying relevant local government bodies and soliciting submissions from them. There is no formal process for public input into the development of CALM Policy Statements.

Following approval by the Minister, notice of approval of the plan must be published in the `Gazette', together with a note showing any modifications made by the Minister.

Commercial sale processes

For wood and wood products from public native forests, the majority (90+ per cent) of wood is sold by CALM under long-term licences, commencing from the

initiation of the current management plan for State forest and timber reserves in 1987, and initially of ten years duration.

The provisions include a `take and pay' clause, or permanent loss of the unutilised volume. Resale by purchasers is possible and the licences themselves are also transferable, both subject to notification. Because the market is dominated by one major purchaser, pricing is established by bilateral bargaining over stumpage price with provision for further adjustments over time. The Department also manages the logging and log haulage using private contractors who bid on an open tender basis. Some short-terms sales of wood are made by auction or tender.

For park entrance and similar fees, approval by the National Parks and Nature Conservation Authority is required before obtaining ministerial approval. A general increase in these fees has recently been approved.

Recreation and tourism

Tourism is a major activity in Western Australia. The Western Australian Tourism Commission and Environmental Protection Authority have prepared the following guidelines:

- an `Administrative Guide to Environmental Requirements for Tourism Developments in Western Australia, 1989', and
- the `Eco-Ethics of Tourism Development'.

'A Nature-Based Tourism Strategy for Western Australia', drafted jointly in 1997 by the Western Australian Tourism Commission and CALM, establishes a framework for managing nature-based tourism and recreation, including Aboriginal cultural heritage. This is a detailed document which describes the characteristics of nature-based tourism and specifies a strategy for nature-based tourism.

The code of ethics which is appended to the strategy specifies conditions for environmentally responsible development for remote environments, State forests and national parks.

Providing world-class recreation services and facilities for visitors to lands and waters managed by CALM based upon the State's natural and cultural heritage is the overarching principal of the tourism development strategy.

CALM has prepared a 'Recreation and Tourism Strategy 1996-2000'. Additional guidelines are found within the draft Management Strategies.

The need to preserve visual amenity in order to enhance visitor experience is recognised by CALM. A Policy Statement No. 34 was issued in 1989 for 'Visual Resource Management on Lands and Waters Managed by CALM'. As previously stated, the objective of this Statement is to ensure that all land and water uses managed by CALM are planned and carried out in ways that sustain the beauty of the natural environment.

Analysis and comment

General legislation and policy

The Conservation and Land Management Act encompasses much public land outside of the South-West Forest Region of the Regional Forest Agreement process, and thus any comments relating to commitment and policy for this Region need also to be reviewed in a broader perspective; one that is outside the terms of reference of this expert advisory group.

For the South-West Forest Region, the first two bodies described in the preceding section provide vehicles for advice to the Minister regarding socio-economic benefits through the proposed management plans. The Lands and Forest Commission is a three-person body, and includes the Executive Director of CALM. Its breadth of advice might otherwise be limited without the provision for additional advice from the Forest Production Council. The National Parks and Nature Conservation Authority is a fourteen person body with broad representation of expert and community groups. The Executive Director chairs the Forest Production Council. The Commission and Authority are independently chaired.

All three bodies, especially the first two, lack substantive resources and their role seems overshadowed by that of the Department and the Executive Director.

To avoid perceptions of conflict of interest, the Executive Director of CALM should not serve on either the Lands and Forest Commission or the National Parks and Nature Conservation Authority. The composition of the Lands and Forest Commission should include an independent Chair, a community representative, and three experts with experience in relevant aspects of forest management including wood production and nature conservation (see Recommendation 1.4).

Balanced use

The wording of the principles underpinning ecologically sustainable forest management (and the National Forest Policy Statement) indicates that the principles cannot be interpreted independently of one another. Integration to achieve a balanced use of the forest concerned is an essential part of the process. The objectives of management plans specified in the Conservation and Land Management Act are broadly consistent with ecologically sustainable forest management, but appear independent of one another. Other than the reference to the Forest Production Council's advice on timber production being `consistent with the maintenance of other forest values' in the Conservation and Land Management Act, there do not appear to be any explicit provisions for balanced use, although the administrative bodies and their roles have clear implications for pursuing balanced use.

In this regard, and more generally in relation to the overall objectives, greater clarity of direction would be achieved by incorporating the objectives of ecologically sustainable forest management in the Regional Forest Agreement process, as the principal objectives of the Conservation and Land Management Act (see Recommendation 1.2). In Chapter 2, further details are given regarding the tangled web that has arisen from the provisions of the present legislation and planning processes. In addition to the confusion and disputation that this web has caused, the processes fail to address the integration of environmental, social and economic issues concerning balanced land use that lie at the heart of ecologically sustainable forest management.

The current Environmental Protection Authority review process (see Principles 1 and 2 above) necessarily focuses on the environmental issues. Without detracting from this need, the expert advisory group believes that a broader review is needed to encompass the issues of balancing forest uses, including the social and economic implications, as well as the environmental. Strategic planning for all forest values cannot sensibly be partitioned and each considered independently.

Consideration should therefore be given to replacing the present Environmental Protection Authority review process with a more broadly based review, preparatory to sending the integrated plan for the South-West Forest Region to the Minister for consideration. Some expert representation from outside the State in this process would assist in providing a broader and more independent and objective review, as was done in the Meagher Report.

The Government of Western Australia should review and, where necessary, amend the review provisions of the Environmental Protection Act and Conservation and Land Management Act to encompass a joint review of environment protection, management plan requirements, and environmental management systems; such that the strategic issues of balancing and integrating forest uses, including social, economic and environmental implications, can be considered together. The review process should include some expert representation from outside the State (see Recommendation 1.5).

As indicated in Chapter 4, similar provision should also be made for periodic independent and transparent audits of compliance with forest management processes, including codes of practice, and subsequent reviews of those processes.

The Government of Western Australia should review and, where necessary, amend the review provisions of the Environmental Protection Act and Conservation and Land Management Act to enable periodic independent and transparent audits of compliance with forest management processes, including codes of practice, and for subsequent joint reviews of those processes and codes (see Recommendation 1.5). Public involvement in policy

At the Regional level, the provisions for public involvement seem appropriate. However, the processes involved in developing Policy Statements could benefit from public input.

Commercial sale processes

The principal problem with the present system of long-term sale of wood is that the length of the licence is limited to the maximum period of the plan (i.e., ten years). This is insufficient for major new investment in a new sawmill and associated further processing. The need for such decisions is emerging now, because existing licences only have six years to run.

Mechanisms need to be developed to remove the tie of the duration of the licence to the period of the plan, and to allow at least ten and preferably fifteen year licences in the case of larger developments.

The use of renewable transferable licences should also be considered to enable new entrants to bid, but the existing holder to retain the licence, subject to matching the highest bid. Sufficient flexibility in future levels of the harvest can still be achieved by using a declining ratchet provision in the licence annual volume beyond the first ten years, say to two-thirds of the initial volume, with the

expectation that the foregone volume would be made available through open auction or tender, other things being equal.

The Government of Western Australia should review the Conservation and Land Management Act to:

- Enable licences for the sale of wood to extend beyond the period of the management plan;
- Make some or all long-term licences renewable as well as transferable, and
- Introduce a declining ratchet provision in the volumes to be sold beyond the initial ten years of any longer term licence (see Recommendation 1.6).

Recreation and tourism

The commitments and policy framework established for recreation and tourism seem appropriate for the process of ecologically sustainable forest management in the South-West Forest Region.

Access to appropriate lands for nature-based cultural eco-tourism ventures is a relatively high priority amongst both indigenous and mainstream communities within the South-West Forest Region.

Private forests

Neither the existing legislation nor the Memorandum of Understanding for the protection of remnant vegetation on private land make provision for the pursuit of the principles, other than those concerning biodiversity and degradation, underpinning ecologically sustainable forest management in private forests. The expert advisory group believes that the legislation and Memorandum of Understanding are deficient in this respect. As noted earlier, the principles underpinning ecologically sustainable forest management need to be incorporated in the Conservation and Land Management Act and to embrace all forests, whether publicly or privately owned (see Recommendation 1.2). In addition the Memorandum of Understanding needs to be extended to allocate administrative responsibility for these matters on private forests.

The relevant land management agencies should adopt a new Memorandum of Understanding for the protection of remnant vegetation on private land to clarify responsibility for the pursuit of ecologically sustainable forest management in private forests (see Recommendation 1.9).

Chapter 2: Planning

Overview of land management planning in Western Australia

The following government agencies have direct statutory roles relating to environmental management and planning.

- Ministry for Planning - land use planning;
- Environmental Protection Authority - protection of the environment and control of pollution;
- Department of Conservation and Land Management (CALM) - management of national parks, marine parks, nature reserves and State forests;
- Water and Rivers Commission - management of the State's water resources;
- Agriculture Western Australia - management of agricultural and pastoral land, and conservation and land degradation problems;
- Fisheries Department - management of the State's wild fisheries and aquaculture industry;
- Department of Transport - management of the environmental impacts of transport, and
- Department of Minerals and Energy - management of access to mineral resources.

The Department of Resources Development and various local governments are also involved in land use planning.

The Ministry for Planning is Western Australia's principal land use planning agency. It supports the Western Australian Planning Commission and the Minister for Planning in developing and administering the West Australian land use planning system. The Planning Commission responsibilities include State and regional land use planning. Land use planning at the local level is generally the responsibility of local government, with the exception of subdivision which is a responsibility of the Planning Commission. Statements of planning policy may be prepared by the Commission under section 5AA of the *Town Planning and Development Act 1928*. The purpose of preparing a State Planning Strategy is to ensure that an overview is achieved and coordination provided. Local government must ensure that local planning schemes are prepared with regard to the provisions of a State Planning Strategy. The Commission has a Rural Land Use Planning Policy, which aims to provide local authorities with a method to plan for social and economic needs of rural communities and to resolve conflicts over land use. Local authorities may prepare a Local Rural Strategy, which is not legally binding like a Town Planning Scheme. These strategies are prepared in consultation with local groups, individuals, authorities and Land Conservation District Committees.

On its formation in 1986, CALM inherited the former Forest Department's 1982 General Working Plan, which was due to expire in 1987. This plan embraced all three of the former departmental regions (north, central and south) and had two parts: the first dealing with general strategies for managing forest values, and the second, a confidential part dealing with timber supply.

In accordance with sections 53-61 of the *Conservation and Land Management Act 1984*, CALM began developing proposed management plans for the same regions (north, central and south) to replace the earlier General Working Plan. Virtually the same process for management planning applies across all tenures. Draft

management plans must be open to public submissions for a minimum period of two months. Once approved by the Minister, a management plan applies for a maximum of ten years. Where there is no management plan, specific necessary or compatible operations described in the Conservation and Land Management Act (section 33) are allowed. These must be consistent with the objectives for the area concerned as described in the Conservation and Land Management Act, whether it is national park, marine park, nature reserve, marine nature reserve, State forest or other reserve.

These plans were initiated through both the Lands and Forest Commission and the National Parks and Nature Conservation Authority, thus embracing all tenures. The purposes of management are specified in the Conservation and Land Management Act. Priorities and methods may vary according to tenure and purpose. Much of the initial strategic planning was devoted to land use changes to establish a conservation reserve system and the general policies and strategies for managing the range of forest values.

CALM planning policy provides for a hierarchy of plans: state-wide plans; regional management plans, and area management plans.

A state-wide plan, the CALM Strategic Plan 1989-1993, was published in December 1988. This plan included background information about CALM, objectives, strategies and outcomes. The intention was to review the plan annually in time for preparation of the department's operational plan, during the annual budgeting process. The plan has not been formally revised to date.

Management planning for the South-West Forest Region is currently covered by two overlapping processes: firstly, three regional plans which were prepared in 1987, and secondly, the `Forest Management Plan 1994-2003'.

Two separate documents, the Timber Strategy and the Conservation and Recreation Strategies, were written as supplements to each of the three regional plans. The Timber Strategy provided details of the levels of sustained yield and the allocation of log supplies to industry, replacing the part two of the 1982 General Working Plan. It committed CALM to a new inventory of the jarrah forest and a subsequent review of the sustained yield during 1991. This was released for public comment along with copies of the three regional plans.

At about the same time, the Western Australian Chip and Pulp Company sought renewal of their export licence, triggering a requirement that they prepare a combined Environmental Review and Management Program review and Environmental Impact Statement for the Environmental Protection Authority and the Commonwealth Department of the Environment. This document was prepared in conjunction with CALM because detailed information about forest management in the licence area was needed.

The State Environmental Protection Authority assessed the three proposed management plans and made a report and recommendations for each. The Minister approved each plan subject to a set of conditions.

In 1990, arising from joint Commonwealth and State concerns, the Australian Heritage Commission and CALM agreed to a regional assessment of National Estate values. At about this time, research results became available on the nature conservation values of road, river and stream reserves and on the hydrological issues concerning the risk of increasing salinity as a result of logging. In the light of these developments, CALM decided to rewrite the now approved three regional

Management Plans and Timber Strategy. It also decided to rewrite the Conservation and Recreation Strategies, this time on a state-wide basis, to provide an umbrella document (Draft Nature Conservation Strategy for Western Australia) for all regional plans within the South-West Forest Region and elsewhere.

The Lands and Forest Commission and the National Parks and Nature Conservation Authority, accepted these proposals and initiated work in their respective areas. The framework of these plans changed relative to the previous three integrated regional plans in that the Forest Management Plan now provided strategies that reflected the overall conservation strategy but prescribed activities only for State forest and timber reserves. The area covered by the Forest Management Plan was the South-West forests in their entirety, not as three separate regions used earlier. Existing and proposed conservation reserves were to be covered by existing or new management plans for each area. The two draft documents, the state-wide Draft Nature Conservation Strategy and the draft Management Strategies for the South-West forests of Western Australia were released in early 1992.

The Environmental Protection Authority made a series of recommendations which were subsequently investigated and reported upon by a judge (T. Barnett) appointed by the Minister under the Environmental Protection Act. The judge's report was considered by the Minister just prior to an election, resulting in the 1992 ministerial conditions, including the need for a further review of some issues, such as the calculations of sustained yield of wood.

The incoming government instigated the further review in 1993 by an Expert Scientific and Administrative Committee, chaired by T. Meagher. This report clarified matters concerning the sustained yield and enabled the Minister to designate the yield for a ten-year period. The draft Management Strategies were then amended and gazetted as the Forest Management Plan 1994-2003.

The Forest Management Plan complies broadly with the principles set out in the 1992 Australian National Forest Policy Statement and is also in accordance with the nationally adopted principles of ecologically sustainable development for forests and the National Conservation Strategy (see suggested revisions of Conservation and Land Management Act and other relevant legislation in Recommendations 1.2 to 1.6). The 1994 plan does not totally replace all of the issues contained within the 1987 plans and, as a result, the 1987 plans remain current for all issues not covered in the 1994 plan.

Area management plans apply to specific areas such as one or more national parks, nature reserves, etc. The plans are prepared only where there are requirements above and beyond those which can be considered by a regional management plan. The plans are prepared by CALM in accordance with priorities determined by the National Parks and Nature Conservation Authority. Area management plan coverage within the Regional Forest Agreement area includes:

- Mooradung Nature Reserve 1985-1995
- Nature Reserves of the Shires of York and Northam 1987-1997
- Lane Poole Reserve 1990-2000
- Leeuwin-Naturaliste National Park 1989-1999
- Waroona Reservoir and Catchment Area 1990-2000
- Logue Brook Reservoir and Catchment Area 1990-2000
- John Forrest National Park 1994-2004
- Shannon National Park, and

- Walpole-Nornalup National Park.

Priorities for the preparation of management plans are set from time-to-time by the CALM Corporate Executive after consultation with the relevant controlling bodies. CALM plantations are managed under the 1987 Forest Region Management Plans and Timber Strategy. In addition to the statutory management plans, issue plans, operational plans, manuals and prescriptions are prepared by CALM, including:

Issue plans:

- Dieback protection;
- Fire protection (Fire Control Working Plans for CALM Districts), and
- Integrated harvesting and regeneration plans. The Manual of Harvesting Specifications (1996) requires three levels of integrated harvesting plans. Long-term plans are strategic level plans which are required to be prepared at least once every five years for a minimum thirty year planning horizon. Medium term plans are required to be prepared annually for a seven to twelve year planning horizon. Short-term plans are produced annually for a one to two year period.

Operational plans:

- Feral animal control
- Noxious weed eradication
- Planting
- Road construction and maintenance.

Manuals:

- Dieback hygiene manual
- Plantation manuals
- Chemicals manual
- Timber harvesting manual, incorporating the Code of Harvesting Practice and the Manual of Harvesting Specifications.

The preparation of policies is the responsibility of the respective directors covering each policy area. The Conservation and Land Management Act (section 36) provides for an Executive Director and section 42 requires that there be directors of Nature Conservation, Forests and National Parks. Currently there are also directors for Project Management; Corporate Services; Corporate Relations; Science and Information, and Regional Services. Draft policies are endorsed by the Executive Director following consideration by the CALM Corporate Executive. The preparation of policies involves consultation within the Department and with external parties if necessary. Consultation also occurs with the relevant controlling bodies, which approve all policies and may also initiate preparation of policies. Implementation of policies is the responsibility of the director(s) involved.

The Environmental Protection Authority has responsibilities for planning under the *Environmental Protection Act 1986*. The Act is binding on all land except in areas covered by State Agreement Acts assented to before 1 January 1972. The objectives of the Environmental Protection Authority are to use its best endeavours to protect the environment and to prevent, control and abate pollution. Any development which affects the environment may be referred to the Environmental Protection Authority for an assessment of its impact. The

Environmental Protection Authority sets an assessment level for each proposal, based on the location, size and environmental issues involved. Information about each proposal is published in a daily newspaper. People may appeal about the level of assessment proposed. The levels of assessment are: not assessed; informal review; consultative environmental review; public environmental review, and environmental review and management program.

Public participation is required for consultative environmental review, public environmental review and environmental review and management program. The formal environmental impact assessment is the most significant way the Environmental Protection Act affects forest management. The Environmental Protection Authority assesses any forest management plan or major wood resource projects. Recommendations from the Environmental Protection Authority may lead to the Minister placing conditions on the implementation of the project or plan proposals.

Planning by the Water and Rivers Commission is primarily undertaken through Regional Water Resource Reviews and Development Plans. These plans assess water supply and demand, and identify possible environmental, social and cultural constraints. Plans are to be prepared for the ten regions in the State. Water allocation management plans are the primary means of providing a framework for water allocation. These plans provide an indication of the magnitude of the water resources and associated environmental values within each Region. They also indicate the amounts of water that can be allocated to human consumptive uses (scheme and self-supply) while preserving those environmental values. Public participation is part of the process in compiling these plans.

Agriculture Western Australia has responsibilities for providing advice on the management of agricultural and pastoral land and for the management of conservation and land degradation problems. This department administers the *Soil and Land Conservation Act 1945*, which covers the conservation of soil and land resources and the control of erosion, excessive salinity and flooding. CALM coordinates the policies and activities of government departments and public authorities in relation to land degradation matters. The Soil Conservation Advisory Committee provides advice and assessment of land degradation matters. The committee is chaired by the Commissioner of Soil and Land Conservation from Agriculture Western Australia and members include representatives from CALM, the Environmental Protection Authority and the Water and Rivers Commission. Soil Conservation Districts can be proclaimed under the Soil and Land Conservation Act. Each District has an advisory committee which predominantly comprises local land-users. CALM participates if wildlife or conservation issues are involved.

Planning for mineral development in Western Australia is regulated by the Department of Minerals and Energy under the *Mining Act 1978*. Mineral development projects are administered under appropriate controls which cover project management, operation and post-mining rehabilitation. Measures to protect the environment are accomplished primarily by setting conditions, developed by the department in consultation with other government agencies. The Mining Regulations 1981 provide a means of policing mining operations. Under these regulations, environmental inspectors may ask mining tenement holders to change their operations or cease work.

Companies can be fined and if necessary forfeit their tenement. CALM places endorsements on titles when granted. These endorsements advise tenement holders of the requirements under other Acts for environmental protection.

These Acts include the Environmental Protection Act*,* Conservation and Land Management Act*, Wildlife Conservation Act 1950, Bushfires Act 1954* and the *Aboriginal Heritage Act 1972.* Under standard conditions on exploration licences, explorers must submit a Ground Disturbing Approval Application before commencing exploration. A notice of intent for assessment and approval must be submitted before an owner may start a new mining project or an extension to an existing mine.

There is little or no public participation in the process of setting environmental conditions but mining projects are subject to the provisions of the Environmental Protection Act, which usually involve public participation. Summary pages from the Notice of Intent are available to the public from the Department of Minerals and Energy and the Department of Environmental Protection. All tenements are advertised in the daily newspaper, ensuring that mining notices are readily available to the public.

All mining projects approved under the Mining Act which have an expected life of more than two years must submit an annual environmental report. This report covers aspects such as major mining activities in the past year and proposed activities for the next year, and environmental management and rehabilitation plans for the past year and the next year.

Guidelines have been prepared by the Department of Minerals and Energy and CALM to assist miners and explorers to protect Declared Rare Flora. Mining companies working with CALM have developed dieback management procedures to lessen the risk of spreading *Phytophthora cinnamomi* to uninfected sites. Other guidelines have been developed by the Department of Minerals and Energy in consultation with CALM and other bodies in relation to mineral exploration and development on conservation reserves and other environmentally sensitive land.

The Chamber of Minerals and Energy has also prepared guidelines for industry including the `Code of Practice for Exploration in Environmentally Sensitive Areas'.

Responsibility for the coordination of planning and approval processes for major projects sits with the Department of Resources Development. Major projects are often covered by State Agreement Acts. During negotiations various issues have to be addressed, generally under headings such as environmental issues, native title, Aboriginal heritage, planning process/local government, infrastructure and local content. Many of the negotiations are confidential and there is little or no formal public participation in drawing up Agreement Acts. The Acts are subject to parliamentary debate, providing a mechanism for public input. The environmental protection aspects of the projects are subject to the requirements under the Environmental Protection Act, which usually involve public participation. Agreement Acts specify the rights and obligations of the State and the developer and allow for normal laws to be varied, if necessary.

Planning is also carried out by Main Roads Western Australia and the Department of Transport. Main Roads Western Australia released long-term (twenty five year) regional road development strategies for public comment in early 1997. Local government was closely involved in drawing up these plans. Government departments, including CALM, were consulted. Local government and Main Roads Western Australia also have short-term operational road development plans. Overall transport planning (including road, rail, air, sea) is the responsibility of the Department of Transport.

Environmental management and planning on private land is subject to the statutory requirements of local government and State government agencies, including the Ministry for Planning, Department of Environmental Protection, Department of CALM, Water Resources Commission, Agriculture Western Australia, Department of Transport, and Department of Minerals and Energy.

Various areas are subject to plans, policies or strategies, including the following:

- Regional, town and shire plans;
- Regional strategies;
- Local government town planning schemes and rural strategies, and
- Protection policies and guidelines relating to proclaimed groundwater protection areas and catchments.

The clearing of native vegetation is subject to formal planning and approval processes. Some farmers and private forest managers undertake property-based planning. However, there is no mechanism for the integrated planning of forest management on private land at a regional scale.

Maintenance of productive capacity of forest ecosystems
Maintenance of forest ecosystem health and vitality
Conservation and maintenance of soil and water resources and maintenance of global carbon cycles
Protection of natural and cultural heritage
Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies

Maintenance of productive capacity of forest ecosystems

- The current system
- Analysis and comment

The main steps in planning and implementing sustainable yield are as follows.

- identifying gross and net areas available for production;
- estimating standing volume in terms of various products;
- determining growth or volume in the future;
- modelling potential wood flows into the future and determining sustainable yield;
- setting allowable harvest levels;
- harvesting according to planned regimes, with appropriate silvicultural practices and in a way that does not damage the future potential of the site;
- regenerating after harvest where appropriate, and
- maintaining and protecting the forest estate (discussed under Principle 3).

The last three steps are also the key areas in the maintenance of productive capacity and sustainability, regardless of whether the purpose is a sustained or non-declining yield of a particular product.

The current system

Identifying gross and net areas available for production

The net area of forest potentially available for harvest on CALM-managed lands is determined by overlaying tenure (including both formal and informal reserves) with forest type using well developed geographic information systems. Potential harvest areas are then stratified into patches of forest of homogeneous species composition, stand structure and logging history. These strata are identified by the overlay of a variety of maps through the use of the computer-based Forest Management Information System. The source data for these maps have been derived from historical records and interpretation of aerial photography. The regrowth forests are further stratified on the basis of their year of regeneration, site index, stocking density and thinning history.

There is an annual update of the key land themes and base data. In addition to the stratification of datasets, the geographic information system also contains numerous datasets required for the definition of local constraints such as the location of burning buffers, recreation sites, and research trials. These map layers are utilised at the short-term logging plan preparation described later.

The area of native forests on private land is estimated to be 198,000 ha, or about nine per cent of the total forest area within the Regional Forest Agreement region. This estimate is based upon aerial photo interpretation and some ground truthing. The estimate represents a substantial reduction on a 1992 estimate of 507,000 ha by the Resource Assessment Commission. The forest areas are highly fragmented with approximately ninety per cent of the resource consisting of patches which are less than 50 ha in area. Individually, these patches are not currently significant in terms of wood production, although they may have high value for nature conservation and other uses. In contrast, an estimated 50,000 ha is made up of individual patches which are larger than 500 ha, including two patches which are each in excess of 5,000 ha. Collectively, the private forests

could potentially make a small but important contribution to the net area available for the total sustained yield from the forests within the Regional Forest Agreement region.

Remnant vegetation on private land is currently being mapped using satellite imagery by the Bureau of Resource Sciences, CALM and the Department of Agriculture. The custodian of this database is the Commissioner for Soil and Land Conservation. This is not a statutory responsibility, but has been negotiated through the Western Australian Land Information System Forum. The role of the Commissioner for Soil and Land Conservation is to regulate land clearing, not to collect information on areas potentially available for wood production.

There is very little information with respect to the future management intent of private forest owners. The strategic control of plantation development is largely left to local government planning schemes. Strategic planning at various levels is carried out by CALM's Plantations Group and by private sector interests. However, there is no coordinated planning with respect to the development of plantations on private land.

Estimating standing volume in terms of various products

The current inventory systems are described in internal documents and were detailed in the draft Management Strategies. The jarrah inventory system was the subject of a technical review by Drs Turner and Wood of the Australian National University for the Barnett Inquiry in 1992.

Inventory systems for the jarrah and karri forest types reflect differences in forest homogeneity, structure and management. The current strategic-level jarrah inventory was completed in 1991. The design adopted was a systematic (non-stratified) multi-phase approach using single samples per sample point. In the first phase, over 32,000 photo plots were measured, while in the second, 2,800 ground plots were measured. Over one million trees are recorded in the current database. A systematic sample was adopted for plot location due to both the absence of an adequate site quality stratification over extensive areas and because future flexibility in resource compilations was paramount. A series of permanent inventory plots is intended to be re-measured to provide growth data for inventory update models. This approach is sensible where complex land use decisions are constantly being re-evaluated for slow growing species over large geographical areas. The Inventory Resource and Information System was developed to store, manipulate and report on jarrah inventory. This system can also be used for operational planning purposes as the estimates within strategic strata provide a first approximation for likely removals to varying silvicultural prescriptions.

The mature karri forests were assessed over the period from 1973 to 1984 by a Management Level Inventory using systematically located striplines. This inventory is used for operational and strategic planning. The inventory is updated with representative utilisation data which are derived from the Logging Operation Information System.

There is no integrated process for the accurate estimation of standing volume across the private forest estate, although individual inventory systems may cover some of the larger commercial forests.

Determining growth or volume in the future

Growth projection is accomplished by CALM through the use of periodic re-measurement of sample plots within the stands or, more generally, the development of growth simulators. Such models are developed using growth data collected from the range of inventory and silvicultural experiments. Over 1,000 permanent sample plots have been established since 1916 throughout the jarrah and karri forests to measure tree and stand development. These plots are re-measured on a frequency of three to ten years depending on the age and stand structure. In addition, numerous research trials are monitored. When combined, the available database which contributes to the prediction of stand growth is estimated to exceed over a quarter of a million tree increment records.

Yield regimes for jarrah strata are derived from the jarrah inventory stand tables and estimates of harvested volumes from representative strata within the Logging Operation Information System. A cohort model is under development for simulating the growth and yield of regrowth stands. Yield regimes for mature karri strata are derived from the Management Level Inventory and estimates of harvested volumes from similar strata within the Logging Operation Information System. Stand growth estimates can also be derived for some strata from the permanent sample plots dataset. A computer sub-system (Hardwood Permanent Plot) processes the data and provides tabular summaries by forest or stratum aggregation.

Growth projection for regrowth stands is performed using an individual-tree level simulator called KARSIM, which uses a network of over two hundred and thirty permanent sample plots from the age and geographical distribution of the regrowth estate.

The output from the growth projection stage is a set of yield tables which predict the future flow of wood and condition of stands. These projected yields are then validated against known volumes obtained from harvesting forest of similar strata as defined by the species, structure and history. Accurate removals data by product are obtained from the Logging Operation Information System.

Monitoring of post-harvest utilisation in cut-over jarrah stands is undertaken by re-measurement of select jarrah inventory ground plots (on a stratum basis).

There is no process in place for the determination of growth rates across the private forest estate, although individual growth models may be applied by some forest growers, particularly with respect to plantations.

Modelling potential wood flows into the future and determination of sustained yield

Yield regulation involves determining the sequence of harvests at the strategic (long-term) level. The planning period exceeds one hundred years for karri and two hundred years for jarrah. ORACLE-based computer systems are used for scheduling in jarrah (FORSCHED) and karri (KARSCED). The spatial feasibility of scheduled timber harvest is evaluated before adopting a forest plan. Factors considered include requirements for the location of wildlife habitat reserves and linking corridors; age and stand structure classes; fuel reduction buffers; protection of fire-sensitive areas; visual amenity; seasonal access; soil protection; disease protection, and the optimum economic location of roading. Short-term harvest scheduling is carried out through the use of a MAP-INFO based planning tool (Hardwood Integrated Planning System).

There are no formal procedures for estimating the sustainable yield from the forests on private land.

Setting the allowable cut

The sustainable yield of products from the jarrah and karri forests was calculated for the draft Management Strategies on the basis of the assumptions listed below:

- exclusion of the following areas from the total area of forest available for timber harvesting:
- all existing reserves and reserves proposed in the draft Management Strategies;
- all river and stream zones and roadside zones in the Southern Forest Region proposed in the draft Management Strategies, and
- areas of old-growth karri forest within the multiple-purpose forest proposed for retention in the draft Management Strategies;
- application of the silvicultural regimes described in the draft Management Strategies;
- a minimum crown diameter of 20 cm for jarrah, marri and karri sawlogs, and
- achievement of the regional forest structural objectives for the jarrah and karri forests as described in the draft Management Strategies.

The Minister for Environment made a determination of the annual sustainable timber resource available for allocation on 16 August 1993. The determination applies from 1 January 1994 until 31 December 2003. Details are provided in the Forest Management Plan. In summary, the Minister agreed to an average annual harvest of 214,000 m^3 of first grade karri saw logs and 203,000 m^3 of other logs; 490,000 m^3 of jarrah first, and second grade saw logs and 559,000 m^3 of marri.

No allowable cut is set for private forests. It would be difficult to do so given the small size of most privately owned forests and their fragmented character. For private native forest used for timber production, the important measure is to ensure that, other than in the thinning of regrowth, harvesting is carried out in a manner that will lead to adequate regeneration or to provide for subsequent artificial regeneration measures (see Recommendation 2.13).

Harvesting according to planned regimes

A number of silvicultural specifications have been developed by CALM. Specifications 1/95 and 2/95 deal with the silvicultural practice in the jarrah and karri forest respectively. The operational implementation of silvicultural regimes commences with the generation of annual harvesting plans. These plans identify areas (coupes) available for harvesting, proposed silvicultural regimes and estimated yields. The Hardwood Integrated Planning System is used to determine the areas and yields available at the individual stand level. From the annual harvesting plan, coupe concept plans are prepared for each discrete coupe. Pre-harvest checklists are an important step in the preparation of approved plans at the coupe level.

The application of specific silvicultural prescriptions is achieved through tree-marking, using trained staff employed by CALM. The Code of Practice and the Timber Harvesting Manual contain prescriptions which aim to provide environmental protection, particularly in the areas of dieback disease, soils, retained trees and fire.

Regeneration strategies

CALM silvicultural specifications provide details on the methods used for regenerating different forest types, the stocking standards to be achieved, and the survey methods to be undertaken.

Regeneration requirements are formally considered on CALM lands during the pre-harvest checklist phase of the planning process. Information on seed crops and the stocking of advanced growth is used to formulate the final silvicultural regime for each coupe.

Detailed procedures exist for the regeneration of sites following mining activity.

There is little planning for the regeneration of native forests on private land. Regeneration after harvesting may be specified as a condition of a clearing licence or in response to the conditions of woodchip export licences. The export licences require five ha of reforestation to be established for every 1,000 tonnes of wood harvested from private property. However, the majority of this requirement is met through the planting of blue gum plantations, often on cleared land, and there is virtually no planning for the regeneration of native forest.

Analysis and comment

Identifying gross and net areas

The net area available for wood production is the largest variable in the calculation of sustained yield. Procedures within CALM enable accurate adjustments to be made to estimates of sustained yield in response to any changes in net area arising from land use decisions. However, on private land there is no formal process to provide an accurate estimate of net area available for wood production. There is a need to integrate the planning of forest management on private land in order to provide information on the sustained yield which is likely to be available from all of the forests within the Regional Forest Agreement Region, and to enable an assessment of the impacts of forest management on other regional values such as water yields, socio-economic issues, roading/infrastructure issues and industry development. In particular, an integrated strategic planning mechanism would be highly desirable with respect to plantation development on private lands.

Land tenures managed by CALM which are available for wood production are detailed in the Forest Management Plan. Timber reserves are managed on the same basis as State forest. However, the category is transitional and after formal evaluation reserves may be changed to a more appropriate tenure such as State forest or nature reserve.

Estimating standing volume in terms of various products

CALM has a well developed inventory system which is capable of producing resource estimates with a precision suitable for strategic planning. The system has been used for a number of years and has been subject to a number of reviews and regular improvement.

Systems have been developed to monitor actual product removals, which can be compared with inventory estimates to provide a means of detecting and allowing

for biases inherent in such complex systems. These adjustments are critical and will improve as more data become available.

Systems exist to link inventory data to a geographic information system database containing net harvestable areas for the whole forest, enabling rapid determination of total volumes and sensitivity analysis of proposed changes.

Determining growth or volume in the future

Public forest is well covered by a series of growth plots and the systems of establishment, research and re-measurement are appropriate.

Continued monitoring and adjustment of growth models will be required in order to ensure accurate estimates of growth in stands arising from the current silvicultural specifications for jarrah and karri. In particular, the effect of initial stocking (planting rate) and time of thinning on the growth and clear bole development of karri may require continued monitoring, especially on sites where the original proportion of karri was low.

Modelling potential wood flows into the future and determination of sustained yield

The FORSCHED system was endorsed as an appropriate tool for determining sustained yield by the 1993 Meagher Report. KARSCHED is a similar system which facilitates long-term determination of sustained yield under various wood production scenarios. Both systems involve relatively complex and iterative processes, the details of which are not easily published for public information. However, the principles and data which underpin the determination of sustained yield are of major interest to the wider community. A useful summary of the principles and data was provided in the draft Management Strategies, but there is little explanation provided in the Forest Management Plan.

The expert advisory group notes that the mechanisms used by CALM for the determination of sustained yield are the subject of a separate study under the Regional Forest Agreement process.

The lack of data and systems for determining the sustainable cut from private land means that the sustainability of wood production from the total forest estate within the Regional Forest Agreement Region cannot be determined.

Setting the allowable cut

The calculation of sustained yield from CALM-managed forests is clearly detailed in the draft Management Strategies. These calculations were subject to review by the Environmental Protection Authority and subsequent Barnett and Meagher Inquiries prior to the 1993 ministerial determination which set the sustained levels within the Forest Management Plan. This approval process was rather convoluted and, as a result, the determination of sustained yield is not readily transparent to the public.

Harvesting according to planned regimes

The hierarchy of planning instruments within CALM is confusing. There is little transparency of the linkages between the strategic planning documents and the local operational plans.

CALM has developed a comprehensive set of silvicultural specifications. These have been developed on the basis of research and adaptive management techniques over many years. This is an active process and prescriptions can be amended in response to new information or policy changes.

Regeneration strategies

An appropriate system exists for developing regeneration techniques for various forest types.

There is no formal process for specifying regeneration requirements on private land after harvest, other than in a general manner through the regulation of tree removals under the clearing controls of the Memorandum of Understanding. A new Memorandum of Understanding between the relevant agencies should be adopted to include such provisions for all timber production operations, including harvesting of pulpwood.

The responsible agency under the proposed new Memorandum of Understanding for the protection of native vegetation on private land should ensure that harvesting is carried out in a manner that will lead to adequate stocking after harvest of retained growing stock or new regeneration for all timber harvesting operations (see Recommendation 2.13).

The Government of Western Australia should facilitate an integrated approach by relevant agencies to assess:

- Areas of native forest and present and planned plantations on private land, and
- Impacts of plantation development on regional values such as water yields, social, roading/infrastructure issues, and industry development (see Recommendation 2.1).

Maintenance of forest ecosystem health and vitality

- The current system
- Analysis and comment

The current system

Strategic and operational planning for managing pests, diseases and weeds

Planning for pest, disease and weed management is shared among agencies depending on legislated responsibilities as outlined above although joint plans are produced for some species of concern. The major pests and diseases in the South-West Forest Region are foxes, cats and dieback diseases caused by *Phytophthora* spp. and there is detailed planning undertaken on public lands to ensure their control or mitigate their impact.

There are plans in place also for early detection of some commercial pests such as *Sirex* wasp, but there is no coordinated strategy to deal with new pests. Operational plans and manuals for specific pests and diseases (dieback hygiene, feral animal control and noxious weed control) are produced within CALM for application on public land, and an inter-agency group has produced guidelines to minimise the risk of dieback spread in mining areas.

Planning for private land in the South-West Forest Region appears to be fragmented and generally lacks cohesion for the control of pests, diseases and weeds other than those of direct agricultural significance.

Fire Management

Fire management planning is well integrated within CALM. Fire management planning includes aspects relating to suppression, hazard reduction, habitat management and silvicultural prescription. Strategic and operational planning is based on a systematic approach to the assessment of wildfire threat. The Wildfire Threat Analysis is undertaken at the strategic level across all tenures within the Regional Forest Agreement area. The analysis identifies values requiring protection, risk of ignition and the ease of suppression. From this analysis, optimal fire management strategies are determined, using various responses such as planned burning, early detection, rapid suppression, etc. The minimum allocation of human resources within CALM is primarily determined on the basis of the fire management strategy.

The broad strategic planning of fire management involves an integrated approach between the Districts, Regions and Business Units. District Fire Management Plans are prepared on the basis of this strategic planning.

The fire management policy and procedures have been the subject of extensive review. In 1994 a review was conducted into CALM's prescribed burning policy and practices, as required in the 1992 ministerial conditions. The Fire Review Panel provided a strong endorsement of the current policy and practices, including planning systems such as the Wildfire Threat Analysis.

Analysis and comment

Strategic and operational planning for managing pests, diseases and weeds

The overriding concern about the threats posed to biodiversity by foxes and *Phytophthora* spp. and to commercial production by *Phytophthora* spp. has understandably resulted in very successful application of plans and actions to achieve control of their adverse impacts on public lands. Such work should continue. However, there appears to be no systematic planning approach undertaken to establish forest health surveillance for diseases, pests and weeds other than those major ones outlined above on public lands**,** together with some pests of commercial significance in native forest (jarrah leaf miner, gum leaf skeletoniser and bullseye borer) and in softwood plantations, for example, *Sirex* sp.

The deficiencies apparent in the current system of planning on private land would be rectified in part by the ability to declare environmental weeds, but would also need some mechanisms to allow for implementation of disease management planning on private lands. There is a need for very active co-operation between agencies with respect to mining in dieback sensitive areas.

Fire Management

Fire management is based upon a sound planning framework with good integration across tenures and activities within CALM. However, the linkages between the planning of activities such as logging and planned burning are not readily transparent. As a result, some elements of the public perceive that the planning of fire management is subservient to logging, and that other values are compromised, particularly within reserve areas. In addition, there is some continuing public concern in relation to the ecological sustainability of burning, particularly in terms of the: long-term impacts of burning on forest productivity; interaction with diseases and with other biota; relationship between CALM's burning regimes and those previously used by the Aboriginal community; blanket use of prescribed fire regimes at the landscape level in areas of high habitat heterogeneity, and issue of smoke pollution.

CALM planning for fire management should address the ecological basis for burning regimes in all forest ecosystems. Annual District burning plans should be available for public access and medium-term (five to seven years) fire management plans should be published. Such plans should be prepared in conjunction with the medium-term integrated harvesting and regeneration plans specified within the Manual of Harvesting Specifications (see Recommendation 2.6).

Conservation and maintenance of soil and water resources and maintenance of global carbon cycles

- The current system
- Analysis and comment

The current system

The major planning document is the Forest Management Plan which largely supersedes the previous Regional Management Plans. The Forest Management Plan is supported by the Manual of Harvesting Specifications (1996), the Code of Practice for Timber Harvesting in Western Australia (1997), the Code of Practice for Timber Plantations in Western Australia (1997), as well as guidelines and operational plans (e.g., harvesting concept plans, roading plans, silviculture plans, etc).

A full understanding of the planning framework for the maintenance of soil, water and carbon values requires that the Forest Management Plan be read in conjunction with the draft Management Strategies, and the special ministerial conditions that resulted from the Environmental Protection Authority review of that draft, as well as other ministerial conditions. In contrast with some other Australian forest regions, the high degree of control vested in CALM over aspects of the commercial timber production (including hygiene, harvesting and roading, as well as silviculture and yield regulation) should provide for a simpler planning environment.

As mentioned in the Forest Management Plan, there is considerable further planning in consultation with other agencies responsible for aspects of the land management within the Regional Forest Agreement boundary. Most significant is the on-going consultation and planning with agencies responsible for water yield and quality, especially the yield and salinity of surface and sub-surface water resources. The primary documentation here is provided in Regional Water Resource Reviews and Development Plans in which the State is divided into ten Regions. These plans provide for the provision of water within environmental, social and cultural restraints to towns, industry and all other land owners and stakeholders. Such plans are drawn up with major inputs from Water Resources Allocation Committee (which in turn has more than ten advisory committees). Within the Regional Forest Agreement Region, planning for the management of surface and groundwater resources has long had a major involvement in planning of forest management. For example, the new policies of the Water and Rivers Commission will have a major bearing on planning in this area as will the development of new knowledge of the environmental requirements for surface flow.

Specific initiatives such as the West Australian Salinity Action Plan encompass a number of the Regions identified in the Regional Water Resource Reviews and Development Plans. Similarly, an Integrated Catchment Management Plan has been developed for the Swan-Avon Region and further Integrated Catchment Management Plans being developed elsewhere will identify areas of land which will also overlap with those identified in the West Australian Salinity Action Plan, or in Regional Water Resource Reviews and Development Plans.

As with planning for commercial timber production, strategic and operational planning of mining in West Australia is exhaustive, long-term undertakings involving a high degree of collaboration and co-operation among government

departments, industry and other stakeholders. CALM works closely with companies, the industry as a whole and other stakeholders in that long-term planning. Water values are a primary concern for all parties in mining and commercial timber production.

While there is no explicit planning for the maintenance of global carbon cycles, planning for sustained productivity can provide indirect but effective planning when coupled with planning for the maintenance of soil properties. Fire planning also has a significant bearing on maintenance of carbon cycles.

Analysis and comment

Planning for water values in the Regional Forest Agreement region is complex and involves many layers and the close collaboration of a number of government departments.

Changes in the structure of those departments whose prime responsibility is water management (and the resultant changes in their policy) have made the planning process even more difficult. Nonetheless, there is a high standard of awareness within CALM of the state of external planning for water.

The largely complete set of policies with respect to soil, water and carbon stated in the Forest Management Plan are not always carried forward into the manuals or codes or subsequent, more detailed area-based or coupe-specific plans. For example, `water quality' is further defined as `physical, chemical or biological' in the Code of Practice for Plantations, but remains `water purity' (without further definition) in the Code for Timber Harvesting and the Manual of Harvesting Specifications.

CALM should explicitly define water quality in the Code of Practice for Plantations, Manual of Harvesting Specifications, and Code of Practice for Timber Harvesting in Western Australia (see Recommendation 2.7).

The planning subordinate to the Forest Management Plan deals almost solely with the physical aspects of soils. In Western Australia, dieback is a serious threat to forests and the disease is spread by the movement of propagules associated with the soil. Moreover, the disease is spread readily in water-logged soils. Clearly, the focus on soil physical properties is warranted on this basis and on the more general basis that erosion, compaction and water logging have other serious effects on productivity, biodiversity and other values.

Nonetheless, there is a need for a balanced consideration of soil values and in particular of forms of soil degradation other than physical erosion.

The carbon content is an important characteristic of forest soils and can be markedly affected by fire and other disturbances, as are other nutrient elements. The carbon content and that of some nutrient elements can vary greatly across soil types. Hence, in areas where soil types change quickly (e.g., in some southern forests) the `risk' of degradation of carbon and nutrient values may also change quickly. Thus, most of the planning for soil values seeks to either prevent soil movement as is the case of planning for disease control, or limit the amount of soil damage (where damage is defined as either the loss of the surface horizon, mixing of horizons or other physical degradation such as compaction to a level which inhibits seedling germination and growth) to a pre-set amount (usually ten per cent of the area affected) as is the case in much of the road, harvesting and coupe management planning.

Given the potential variation in soil types across coupes or roads as noted above, a ten per cent areal limit may have an impact that is considerably more or less than ten per cent on potential productivity, carbon balance, nutrient cycles and hydrological cycles of the site.

Planning should focus on the broader aim of maintaining a soil properties and preventing soil loss or other degradation in accordance with the principles of the need to maintain carbon and nutrient cycles, etc., in the long-term, bearing in mind previous comments about the need to use an ecosystem approach rather than separation of the ecosystem into soil (including the litter layer) and vegetation components.

The planning framework would benefit greatly from incorporation of soil/landform database, especially on non-lateric landforms where soil types vary greatly across short distances. That database should be designed to inform the planning process through identification of relationships among species composition, productivity (incorporating nutrient and water attributes), and soil types and landforms. Some of this work has already been completed or is underway. There is less need for such information in northern forests. Coupled with the substantial body of research, this information can be used to develop guidelines for assessing the likelihood of physical damage before harvesting and to prepare guidelines to avoid that damage, as have been developed in other States. Arbitrary limits to the area of damage can then be replaced by limits which are more soil, site or region specific.

CALM should complete and use soil and landform assessment methods, and develop manuals for using this information in planning in the southern forests (see Recommendation 2.8).

The mining industry and individual companies have their own, largely self-imposed plans and planning processes which specify in some detail the nature of actions designed for the conservation or re-establishment of soil and water values.

These voluntary guidelines may work well at present but, as has been noted elsewhere, when economic conditions change the adherence to voluntary guidelines may be less rigorous. Planning for mine rehabilitation is critical to the long-term management of the forests since control of land previously used for mining will revert to CALM and will become subject to a different set of legislation and policy. Clearly, the planning for mine rehabilitation should have, in the least, similar guidelines to those contained in the Forest Management Plan and be subject to a similar level of public scrutiny.

Consistent with incorporation of the principles of ecological sustainable forest management into the CALM and the Mining Acts (see Recommendation 1.2), CALM and the mining industry should review the present strategies and operations to establish formal requirements for conservation or re-establishment of all forest values, including productive capacity, on former mining sites (see Recommendation 2.9).

Fire management plans and silvicultural plans generally take little account of the need to maintain global carbon cycles or nutrient cycles. Further research is needed to enable this to proceed.

Protection of natural and cultural heritage

The current system

There is no stand-alone plan for natural heritage. The Forest Management Plan outlines an approach to natural heritage conservation based upon a joint inventory of National Estate values, conducted by CALM and the Australian Heritage Commission, to assess the adequacy and representativeness of the reserve system and to minimise the risk to heritage values. Planning for roading and timber harvesting operations take into account National Estate values and Aboriginal sites which are known to the field staff. Geoconservation values are only considered with respect to soil movement resulting from impacts. The prime means of protecting natural heritage values is through reservation.

The pre-harvesting check-list to be completed by the forest officer-in-charge of operations requires the signing off of the following heritage related matters:

- register of the National Estate;
- known cultural (Aboriginal, archaeological and historical) sites in the area that need to be excluded from harvesting, and
- visual landscape considerations that require modification of harvesting or other operations.

The database of Aboriginal sites is held by the Public Policy Section of the South-West Division (previously the Heritage and Culture Division) of the Aboriginal Affairs Department with clear-cut guidelines regarding confidentiality. Approximately seventy per cent of the indexed places have an 'open information access code'. The Aboriginal Affairs Department maintains a productive relationship with the Western Australia Museum and seeks similar relationships with land management agencies.

CALM has considered the special needs of Aboriginal communities using public land in the South-West Forest Region. The publication ‘Aboriginal Activities and Nature Conservation in the South-West of Western Australia’ identified current and desired activities, as well as the conservation status of plants and animals which are used by those communities. The paper also identified steps required to plan for the management of nature conservation in relation to Aboriginal activities.

Wilderness areas are designated in management plans for areas such as the Nuyts Wilderness area within the Walpole-Nornalup National Park. These areas are small, primarily oriented towards recreation and most likely would not meet with international standards for wilderness. As part of the Regional Forest Agreement process, areas with wilderness qualities are to be identified, an inventory is to be developed and the reservation of such places is to be assessed.

The draft Management Strategies consider the managing of the visual landscape on forest lands. This includes the following:

- defining visual landscape types

- defining scenic quality
- defining viewer sensitivity levels
- classifying visual landscape management zones, and
- implementation of the Visual Resource Management System.

The Visual Resource Management System has been developed over the last fifteen to twenty years. It is backed by field research of public sensitivity to different harvesting methods and intensities. It now forms a geographic information system data layer which identifies three levels of sensitivity which are built into silvicultural specifications. However, there is no ongoing research in this area.

A study to develop a system for classifying the broader landscape of Western Australia has been initiated by CALM, the Department of Planning and Urban Development and the Department of Environmental Protection.

Analysis and comment

Planning documents express a commitment to heritage conservation. However, there are no detailed scientific studies of cultural and natural values in forests to support the planning activities of CALM other than those being undertaken as part of the Regional Forest Agreement process. On technical and scientific grounds, the system does not operate effectively. Cultural heritage management systems should be based upon inventories of site records and assessment of the significance of those sites. CALM does not maintain databases at the integrated-agency level which could facilitate the process of heritage management. Consideration should be given to making the 'open' site records at the Department of Aboriginal Affairs available to appropriate land management agencies such that the data can be integrated within geographic information systems. There are no processes for assessing significance as a tool of risk management, defining the values which are most important and managing for those values.

The assessment of the significance of heritage resources requires further attention in the planning process. Although mention is made of heritage values in management plans, heritage information is sparse and only available in an unsystematic fashion at the operational level. CALM planning does not have the necessary heritage specialist to effectively manage natural and cultural heritage values. Heritage databases are not available at any level and heritage values appear to receive only cursory attention. In addition, land management officers are not well informed on heritage matters.

Forests offer the most difficult situation known for archaeological site management for three primary reasons: a varying density of sites, poor visibility, and the dearth of artefacts at many sites. Although adopted in part by other government agencies such as the Water Authority, site surveys and predictive modeling appear not to be a feature of the CALM planning operations. The question of how to manage the archaeological resources in forested lands needs to be investigated and resolved.

Heritage managers are placing increasing importance on community perceptions of heritage values and adopting appropriate processes to determine where those values lie. Methodologies have been developed by the Australian Heritage Commission for community identification and assessment. CALM planning needs to incorporate social science expertise, particularly indigenous expertise, within its scientific research and planning teams. Social values are taken into account in

a reactive fashion during the planning process. Community workshops are not conducted to gauge public responses to activities and corporate image.

CALM should involve communities in planning for cultural heritage conservation (see Recommendation 2.10).

The publication 'Aboriginal Activities and Nature Conservation in the South-West of Western Australia' was welcomed as a starting point by Aboriginal communities. The study appears to have lost impetus and has not proceeded beyond the initial phase.

There are no provisions for natural and cultural heritage expertise to be injected into the forestry operational planning system and attitudes. Attitudinal changes are occurring with respect to the corporate image and are being projected to the public and at the 'coal face', but deficiencies in cultural or natural heritage planning at other levels need rectifying.

CALM should assess natural and cultural heritage resources through systematic surveys and the development of databases and integrate the conservation of natural and cultural heritage values into the management and planning process through training and more explicit processes and guidelines (see Recommendation 2.11).

Although CALM has devoted resources to the development of a visual resource management system, the all essential manual has not been produced.

Heritage management must take into account, not only the significant features of a place, but also the broader cultural landscape and texture. Criteria for evaluating impacts on cultural landscapes do not appear to be formulated although of concern to local government authorities. There seem to be no guidelines with respect to coordinating geoconservation values with scenic and aesthetic values.

Private land carrying forest and native vegetation is relatively small in extent and fragmented in location. The review process concerning the protection of remnant vegetation on private land appears to be thorough and soundly based. However, more specific guidelines on natural and cultural heritage values would be advantageous, as noted earlier.

In this regard, the clearing of forested lands for agricultural or other purposes, as well as the establishment of tree plantations on agricultural lands could well pose a threat to heritage values. In forest operations not covered by Code of Practice for Timber Plantations in Western Australia (e.g., small-scale clearing for agricultural, industrial or residential purposes, as well as the conversion of pasture lands to timber plantations) special attention must be paid by local government and other authorities to situations, particularly undisturbed grasslands or forest remnants, that may contain significant natural and cultural heritage values.

Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies

The current system

Complex trade-offs are necessary between competing ecological, soil and water, heritage and socio-economic values. These trade-offs are not confined to State forests and timber reserves; they are evident in and across all public land tenures because of the concentrated and largely contiguous character of the South-West Forest Region and its location relative to major centres of population and industry.

The following documents reflect the current approach to strategic planning:

- 'Management Strategies for the South-West Forests of Western Australia: A review', draft of February 1992, the Department of Conservation and Land Management;
- 'A Nature-Based Tourism Strategy for Western Australia', August 1997, Department of Conservation and Land Management;
- 'Memorandum of Understanding between the Commissioner for Soil and Land Conservation, Environmental Protection Authority, Department of Environmental Protection, Agriculture Western Australia, Department of Conservation and Land Management and Water and Rivers Commission, for the protection of remnant vegetation on private land in the agricultural region of Western Australia';
- 'Recreation and Tourism Strategy 1996-2000', Department of Conservation and Land Management;
- 'The Eco Ethics of Tourism Development', 1989 Western Australian Tourism Commission and Environmental Protection Authority;
- 'An Administrative Guide to Environmental Requirements for Tourism Developments in Western Australia', 1989 Western Australian Tourism Commission and Environmental Protection Authority;
- 'Visual Resource Management on Lands and Waters Managed by CALM', Policy Statement No. 34, November 1989, Department of Conservation and Land Management;
- 'Forest Management Plan 1994-2003', Department of Conservation and Land Management;
- 'Science and Information Division Strategic Plan 1995-1999', Department of Conservation and Land Management, and
- T'he integrated approach to conservation, public land and wildlife management and commercial forestry - case study Western Australia', by S.R. Shea, 1997, Department of Conservation and Land Management.

Nature-based tourism is one of the fastest growing sectors of the tourist industry. Eco-tourism refers to an experience in a remote or natural area which fosters an understanding and appreciation of natural values and which sustains the resources, culture and economy of the local community. The nature-based tourism strategy for Western Australia acknowledges the importance of the natural environment. CALM has a developed policy in relation to recreation, tourism and visitor services. The policy spells out the principles and controls relating to CALM’s recreation objective. Sections of the policy consider economic issues such as fees and charges, commercial concessions, leases and

overnight stays. There is a perception by members of the public that nature-based tourism requires public participation in the preparation of planning guidelines in order to facilitate investment by tour operators.

The ensuing sections deal first with strategic planning for public forests, operational planning for public forests, and planning for private forests including plantations (whether public or private). Because these processes have important deficiencies in relation to planning for cultural sites, the final section deals specifically with planning for cultural values.

Strategic planning for public forests

For all practical purposes, planning for publicly-owned pine plantations can be treated with other private forests and plantations.

The overview of the planning process at the beginning of this chapter provides a summary of the rather convoluted history and processes leading to the present arrangements. These have been described in some detail because they highlight the issues relating to the present processes.

Operational planning for public forests

The documents which reflect the current approach to operational planning including the maintenance of natural and cultural heritage values are the Code of Harvesting Practice, and Code of Practice for Timber Plantations in Western Australia.

For timber resources on public lands, the existing system has been based on a physical map and transparent overlay system to zone and demarcate the details of coupes, reserves, buffer strips and the like.

Planning for private forests

As indicated earlier, strategic and operational planning for publicly-owned pine plantations can be treated as if they were privately owned. References to plantations may be assumed to include these plantations.

Private property owners are responsible for planning on their land. Numerous restrictions exist on what can be done under various Acts, Regulations and local government by-laws and planning schemes. Clearing is restricted under a direction from State Cabinet that resulted in a Memorandum of Understanding between the relevant departments concerning the review process.

No specific strategic planning system applies to private forests other than the broad framework of the state-wide legislation, the codes of practice, and the memorandum of inter-agency understanding.

Analysis and comment

Strategic planning for public forests

Because of the complex history of its development, the current Forest Management Plan and its associated conditions needs to be read in conjunction with other plans and conditions.

- Ministerial conditions concerning forest management established for the Western Australian Chip and Pulp Coy, following consideration of the Environmental Review and Management Program review. However, the company has no responsibility for forest management, nor powers to implement them. Discussions between the Western Australian Chip and Pulp Coy, CALM and the Environmental Protection Authority have not been able to resolve ownership of these conditions.
- The 1987 Regional Management Plans still apply to land vested in the National Parks and Nature Conservation Authority and, where not otherwise covered by the 1994 Forest Management Plan (e.g., plantations), to State forests and timber reserves.
- Ministerial conditions placed on the 1987 Regional Management Plans.

The tangled web of overlapping conditions and plans is not a desirable outcome and reinforces the need for the legislative changes to enable a review of the Environmental Protection Act and Conservation and Land Management Act described in Chapter 1 (see Recommendation 1.5).

In terms of an effective system for planning ecologically sustainable management on public land, the expert advisory group believes that concurrent development of strategies and plans for State Forest and timber reserves and for national parks, conservation parks and nature reserves is essential for the South-West Forest Region, given the inter-relationships involved and the contiguous nature of the public forests.

This principle is already partly embodied in the Forest Management Plan, where attention is given to ensuring sufficient representation of immature, mature and senescent development stages, and to providing fire management strategies across all public forests. It should be extended more generally to cover greater detail of representation of vegetation types, and tourist, recreational and water planning, and to integrate fire management strategies in greater detail across tenures. The integration across tenures is an essential component in ensuring that long-term multiple values are maintained and enhanced in a balanced way. Furthermore, where ministerial conditions are imposed, previous conditions and plans should be revoked and replaced by a complete set of conditions consistent with the terms of the currently gazetted plan, if confusion and even worse outcomes are to be avoided.

The Minister, controlling bodies and Executive Director of CALM should determine a schedule for concurrent development of strategies and a new Forest Management Plan spanning all State public tenures in the South-West Forest Region. Where previous ministerial conditions have been imposed, these conditions and references to other previous plans should be revoked and replaced by a complete set of conditions consistent with the terms of the currently gazetted plan (see Recommendation 2.2).

Leaving aside the institutional processes discussed earlier, strategic planning for all public lands has been carried out at a technically satisfactory and often admirable level on all public lands. In the case of timber resources on State forest and timber reserves, advanced techniques of inventory have been developed and applied to good effect. The inventory data are utilised in strategic planning processes using various simulations models that enable the `what if' questions about alternative strategies to be addressed appropriately. Earlier reviews of sustained yield calculation are supportive of the techniques used and suggest only minor improvements.

The analysis and comments from the preceding principles also show that the technical bases for strategic planning are well developed, generally transparent, and make appropriate provision for public participation. The major deficiencies lie in the final institutional processes.

However, strategic plans and policy commitments applying to the full suite of natural and cultural heritage values are not supported by an approved Nature Conservation Strategy setting out guidelines for the South-West Forest Region, and hence Recommendation 1.7 is especially important.

Operational planning for public forests

Reference has already been made to some of the shortcomings of the code documents, specially in relation to soil and water values.

For timber resources on public lands, the existing system has been functional and useful at an operational level, but is quite unwieldy and unsuitable for informing the public as to the proposed geographic pattern of operations. Recent advances in developing a Hardwood Integrated Planning System, to provide coupe mapping on a five to seven year look-ahead basis, offer the opportunity to open this level of planning to public participation and comment, while retaining the flexibility for minor operational changes to suit climatic or other unexpected influences.

This level of participation is likely to become more important in the future as the interactions between timber harvesters, bee-keepers, tourist operators, Aboriginal groups, recreationists, environmentalists, and the like become more frequent and complex. These interactions will not be confined to the areas involved in timber harvesting and any provisions for greater public participation should cover all public lands.

CALM should extend the use of operational planning on a periodic (say 5 yearly) and integrated basis and introduce the opportunity for public comment on these `look ahead' plans (see Recommendation 2.12).

Planning for private forests

Given their nature, planning needs for private forests are best developed through the collection of data and promulgation of inventories, as discussed in Chapter 4.

Chapter 3: Implementation

The administrative structures in CALM is complex. CALM was established as an integrated land management agency, and it is generally difficult to consider implementation, principle by principle, as has been the case in Chapters 1 and 2. Rather, the focus on implementation needs to be on the present organisational structures within CALM, and their efficacy in delivering systems and processes consistent with ecologically sustainable forest management. For this reason, this chapter is structured under the following main headings:

- accountabilities and responsibilities
- operational controls and emergency preparedness
- resourcing of implementation
- documentation
- knowledge, skills and training, and
- communication and transparency.

Accountabilities and responsibilities

- The current system
- Analysis and comment

The current system

The current system of responsibilities for the various principles is summarised below.

Principle 1 Conservation of biological diversity

Regional and District (i.e., Regional Services) staff are responsible for control of operations within there administrative boundaries, except for those operations managed exclusively by State Forest Resources Business Unit or Plantations Group staff. Advice and guidance are provided by Nature Conservation Division. Some advice is also provided by Science and Information Division.

Principle 2 Maintenance of the productive capacity of forest ecosystems

State Forest Resources Business Unit or Plantations Group staff are responsible for timber production activities under this heading, for example, forest regeneration. Regional and District staff have responsibility for non-timber activities, for example, apiary sites.

Principle 3 Maintenance of ecosystem health and vitality

State Forest Resources Business Unit or Plantations Group staff are responsible for timber production activities under this heading, for example, protection of State forest from dieback (during harvesting but not after), weeds and pests. Much of the weed and pest control work is carried out by District staff working for the business units. The Business Unit has the responsibility for conserving cultural heritage values during timber harvesting.

Principle 4 Conservation and maintenance of soil and water resources

State Forest Resources Business Unit or Plantations Group staff are responsible for timber production activities under this heading, for example, protection of soil and water values on State forest. Regional and District staff manage CALM conservation lands.

Principle 5 Maintenance of global carbon cycles

State Forest Resources Business Unit or Plantations Group staff are responsible for timber production activities under this heading. Regional and District staff manage CALM conservation lands.

Principle 6a Protection of natural and cultural heritage values

Principle 6b Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies

State Forest Resources Business Unit or Plantations Group staff are responsible for timber production activities under these headings. Regional and District staff manage CALM conservation lands.

Analysis and comment

The present structure of CALM is, like that of many government departments, a result of historical changes which have increased in pace over the past two decades or so. In common with much of Australia, forested regions were originally managed on a District and then Regional basis with fairly clear hierarchical structures.

Recent moves to put such departments on a more commercial footing have brought with them increasing complexity and a blurring of the lines of accountability and responsibility. There is some evidence that District staff working for the State Forest Resources Business Unit or the Plantations Group, while at the same time answering to District and Regional leadership, can be unsure as to lines of responsibility and accountability.

Operational controls and emergency preparedness

Operational controls and emergency preparedness

Again, for the sake of clarity, this section departs from the structure of much of the rest of this document and deals with each of a number of activities individually rather than collectively. The activities are timber production; nature conservation; heritage values; pests, diseases and weeds; recreation and tourism; mining; minor forest products; apiary products; grazing, and water management.

Timber production: The current system

State forests

The Director of Forests is responsible for timber production in native forests managed by CALM. Two branches (Forest Management and Forest Resources Services) and two business units (State Forest Resources Business Unit and Sandalwood Business Unit) report to the Director. The Plantations Group manages the production of softwood and hardwood plantation timber and reports directly to the Executive Director.

The State Forest Resources Business Unit manages silvicultural practices, regeneration operations, timber harvesting of native forest and sale of log timber. It advises on timber quality, wood technology and marketing. The State Forest Resources Business Unit reports to the Director of Forests. The Unit is administered by a manager, who is assisted by a silvicultural officer, scientific adviser, marketing manager, and monitoring and training officer.

Three cell managers report to the Manager of State Forest Resources Business Unit. The three cells cover the northern, central and southern sectors of State forest. Each cell has staff in control of silviculture, roading, coupe management and log adjudication. The manager of CALM's timber technology centre at Harvey also reports to the manager of the State Forest Resources Business Unit.

The silvicultural officer draws up silvicultural specifications and assists in their implementation. The silvicultural officers in each cell implement these specifications.

The monitoring and training officer coordinates and carries out training of State Forest Resources Business Unit staff and contractors. This officer also provides a type of internal operational audit service for the Business Unit.

Harvesting contractors, who contract to CALM, undertake the harvesting of native forests and plantations. Contracts are let through competitive tender. The contracts specify that the contractor is responsible for the establishment of the coupe, the maintenance of environmental standards during the harvesting and the rehabilitation work required to complete the coupe. The Timber Harvesting Manual and the Code of Harvesting Practice set out the standards of performance for all coupe management activities and are a schedule to contracts. Training of contractors is part of the process to ensure competency of contractors.

A CALM forest officer, who periodically visits the contractor and inspects his work, supervises each contractor. Checklists are provided in the Manual (CLM 105, 106) to record the results of inspections. As each section of a coupe (fallers block) is completed it must be jointly certified by the contractor and the CALM forester as meeting the Manual standards. Contracts provide financial penalties for some offences (crop tree damage). However, most corrective action is undertaken by negotiation and if necessary ultimate exclusion from further contracts.

Most of the coupe demarcation, tree marking and regeneration work is done by District (i.e., Regional Services) staff, supervised by State Forest Resources Business Unit staff. CALM officers who are responsible for coupe demarcation are internally trained and accredited. Training and attendance at accredited courses is required for harvesting contractors, and there is formal training in silviculture and the Code of Harvesting Practice.

Relevant documents used for the implementation of timber production objectives from State forests include: Timber Harvesting in Western Australia; Guidelines for Managing and Conserving Tingle, and the Silvicultural Guidelines (Specifications).

Operational controls for timber production include the following:

- staff hierarchy and list of duties for which each person is responsible;
- staff and contractor training and appraisal;
- compliance with *Conservation and Land Management Act 1984*, regulations, policies, manuals, and guidelines;
- compliance with management plans, business plan, and harvesting and regeneration plans;
- forms, checklists, performance indicators, and reports, and
- monitoring, supervision and auditing.

Forest Management Branch carries out timber inventories, disease mapping and database management for the State Forest Resources Business Unit and the Plantations Group and prepares harvesting plans.

Plantations

The Plantations Group develops silvicultural guidelines and practices for plantations and manages establishment, tending and harvesting operations in CALM plantations. It also manages nurseries and seed supplies. The Group is also responsible for farm forestry.

The manager of this Group is assisted by special projects officers and technical advisers. There are four units within the Group. The Softwood Plantations Group manages the establishment, tending and harvesting of softwood plantations. The Share Farming Business Unit manages share farms on the south coast, lower west, northern maritime pine, pine share farms and mallet plantations. The Plant Propagation Business Unit manages CALM nurseries, and seed and tree breeding work. The Farm Forestry Unit manages the oil mallee project and provides farm forestry planning and advisory services.

Contractors working directly for CALM implement the harvesting and re-establishment of pine. Contracts are let on the basis of competitive tenders. Contracts specify work requirements and success criteria including specifications in the Timber Harvesting Manual and the Code of Harvesting Practice. Forest officers periodically check the work of contractors to ensure it conforms to contract requirements. Manuals exist or are being prepared for the full range of plantation based activities. The following list shows those in use:

- Pine Management Guide (Plantations Manual)
- Forest Operation Control Information System Manual
- Afforestation Handbook Part A - *Pinus radiata*
- Afforestation Handbook Part B - *Eucalyptus globulus*
- Company Afforestation Handbooks (Mitsui etc)
- Herbicides Manual
- Insect Manual
- Plantation Manual (being drafted)
- Field Guidelines for Maritime Pine (being drafted), and
- Code of Practice for Timber Plantations in Western Australia.

Private forests

As noted earlier, the private forests within the South-West Forest Region are small and fragmented and the annual cut on private land is about 10 per cent of the total cut in state forests. Logging in these forests is under private control and adoption of codes of practice for harvesting and regeneration is largely voluntary. In cases where private forests are considered remnants the `Memorandum of Understanding for the Protection of Remnant Vegetation on Private Land in the Agricultural Region of Western Australia 1997' provides guidance. This Memorandum of Understanding was developed to cover areas where the existing Acts (Conservation and Land Management Act, *Soil and Land Conservation Act 1945-1988*, *Wildlife Conservation Act 1950*, and the *Country Areas Water Supply Act 1947*) had no jurisdiction and was intended to provide a framework and guideline for clearing of land for agricultural purposes.

Other than the voluntary Code of Practice for Timber Plantations and controls on clearing of remnant vegetation, there are few operational controls for timber production and other forest management activities on private land.

Timber production and overall operation: Analysis and comment

State forests

Wood production within CALM forests is implemented through integrated processes which are all largely controlled by CALM. CALM is responsible for all activities, although some, such as road construction and harvesting, are carried out by private contractors to CALM. One perception from industry is that further efficiencies could be achieved by providing more opportunities for involvement by the private sector.

Harvesting and regeneration of native forests and plantations, and establishment of new plantations, have the greatest potential impacts on soil and water resources within the South-West Forest Region. In native forests, District or Business Unit staff in direct control of harvesting operations have responsibilities for practices which might affect these values (according to the principles outlined in the `Forest Management Plan 1994-2003', the Code of Harvesting Practice, and the Manual of Harvesting Specifications, and further documented in harvesting plans and consequent checklists). These staff are responsible to the State Forest Resources Business Unit.

The present system allows CALM to maintain a high level of control over the implementation of silvicultural treatments. If further changes are implemented to contract out more of this work, such as tree-marking, training needs to be provided for the transfer of appropriate skills to the contracting workforce.

Difficulties arise with this system when individual forest officers need to trade one set of values (e.g., water yield) against another (e.g., timber yield). Generally, responsibility for these conflicts lie at the District or Regional level and there is not a clear set of priorities established for each and every forest block, nor does there seem to be a formal process for establishing those priorities. The Districts and Regions have specialist officers with responsibilities for silviculture or nature conservation, who have functional responsibilities to different directors. It is not clear on what basis conflicts are referred to this level and how such conflicts are resolved.

The division of responsibilities between the State Forest Resources Business Unit staff and the Regional Services staff is also far from clear, and seems an intermediate and incomplete step towards commercialisation of services. The State Forest Resources Business Unit does not appear to be operating as an independent profit centre and accrual accounting has yet to be introduced fully. Its primary function seems to be in providing a commercial interface with harvesting contractors, but given the dominant role of the District staff (i.e., Regional Services) in carrying out much of the work in the field (as distinct from supervisory oversight by the Business Unit), this seems more an artefact than a reality.

Given the contiguous nature of the forest area and multiple values involved, the management of public native forests needs to be closely integrated. Any subdivision of that management is likely to be dysfunctional and lead to higher costs. The expert advisory group therefore believes that the integration of all management services in the South-West Forest Region is the most critical aspect for the future management entity. The present Business Unit has the capacity to confound this integration because of the arbitrary division of responsibilities and should therefore be disbanded. The entire array of management activities for public native forests in the South-West Forest Region should be kept in the one

organisation; whether as a public service entity within CALM, or as a separate commercial entity with its own board of management, chief executive and commercial objectives.

In the latter case, the provision of management services for national parks and conservation reserves, and fire management for all public forest would then be handled by community service contracts with CALM. In addition to possible efficiencies, this latter restructuring would have the advantage of reducing the monolithic character and multiple roles of CALM which sometimes cause confusion and distrust. CALM would, of course, retain policy and overall South-West Forest Region planning responsibilities. Such an entity would also have clear incentives to pursue contracting out and other related practices.

That Government of Western Australia and CALM should ensure that the management of CALM lands in the South-West Forest Region is placed under a single integrated management entity, either as a:

- Public service entity being an integral part of CALM, or
- Separate commercial entity with its own board of management, chief executive and commercial objectives (see Recommendation 3.1).

Plantations

While the Plantations Group is not yet operating on accrual accounting and as an independent profit centre or set of centres, it will soon have the capacity to do so. The only overlapping functions with those for native forests at present are those concerning inventory, management planning and fire management, but all these plantation responsibilities are capable of clear division and delegation to this Unit. It has not been possible to examine the detailed systems and processes for field management of plantations, but they also seem well established.

Private forests

Few private forests are subject to management based on formal management plans and management could generally be best described as opportunistic. However, there is a growing awareness of the need for ecologically sustainable forest management on private land. In particular, a thorough inventory is needed, leading to a review and strategic plan for the future role and management of these forests.

Fire Management: The current system

The State Forest Resources Business Unit and the Plantations Group are responsible for fire control for CALM timber production areas (State forest, and CALM freehold land planted with plantations). They have arranged for CALMfire Branch, Regions and Districts to provide fire management over these areas. CALMfire, Regions and Districts provide the same service over CALM conservation lands.

CALMfire Branch sets fire management standards, coordinates preparation of fuel reduction and suppression plans, provides detection, communications, aircraft and other fire support services, and conducts fire training. CALMfire coordinators who are located in each Region and District coordinate fire operations work. They are Regional and District staff with links to CALMfire.

The implementation of fire management activities falls into two broad areas: wildfire suppression and the use of prescribed fire.

Wildfire suppression is a highly structured operation with a tight control structure. The Wildfire Threat Analysis (see Chapter 2) is used to determine strategies for fire management which are implemented by the nominated fire control officer.

District (i.e., Regional Services) staff undertake prescribed burning activities. All burns must have a prescription prepared in accordance with a set standard format provided by CALMfire, the fire management service branch. The prescription covers all fire behavior details, environmental concerns and safety. The prescription is checked and signed by senior officers prior to implementation. Prior to burning the weather forecast is compared to the prescriptions and burning must be approved for implementation by CALMfire officers. In the field, there is always one controller supported by a number of other officers with clearly defined roles and responsibilities.

Operational controls for fire management include the following:

- the staff hierarchy and list of duties for which each person is responsible;
- staff and contractor training and appraisal;
- compliance with Conservation and Land Management Act, Regulations, policies, manuals, and guidelines;
- compliance with management plans and other plans;
- forms, checklists, performance indicators, and reports, and
- monitoring, supervision and auditing.

Fire Management: Analysis and comment

CALM maintains a high level of preparedness for wildfires and this is a strength of both CALMfire and the Department as a whole. There are few weaknesses in fire operations and CALMfire processes for fire management are well developed and have been widely recognised and used as examples of good organisational structure.

Processes which determine the use of prescribed fire are also well understood within CALM, and are largely a matter of determining priorities among the values considered by CALMfire. For example, protection of life and property have a high priority, especially close to towns and settlements. Lower priority is given to values such as soil and carbon, and the priority for flora and fauna lies somewhere between that for life and property and that for soil and carbon. Priority setting is the key instrument for modifying how prescribed fire is implemented.

A number of stakeholders expressed strong views that the use of prescribed fire was deleterious to several values, especially flora and fauna, soil and carbon. A particular concern was that there is considerably less knowledge of the response of vegetation to repeated fires in some, mainly non-forest ecosystems in the South-West Forest Region, than there is for the more common jarrah and karri ecosystems. The expert advisory group acknowledges that CALM has workable processes for determining priorities, but draws attention to the increased importance attached to flora and fauna values, and soil and carbon values involved in the pursuit of ecologically sustainable forest management.

CALMfire should review the priority-setting process for the use of prescribed fire and change the weighting given to different values to better reflect the two over-

arching and six specific principles of ecologically sustainable forest management and the current knowledge of the response and resilience to fire of ecosystems in the South-West Forest Region (see Recommendation 3.2).

The expert advisory group has not, within the time available, evaluated the processes for the implementation of fire management activities on private land, but notes the Report of the Fire Review Panel in 1994.

The expert advisory group endorses the recommendation of the Report of the Fire Review Panel in 1994 for a higher level of integration between CALM and local government.

Nature conservation: The current system

The Director of Regional Services controls activities in national parks, conservation parks and nature reserves using advice and guidelines provided by the Director of Nature Conservation. The Director of Regional Services is responsible for four branches: Wildlife Branch; Environmental Protection Branch; Marine Conservation Branch, and the Western Australia Threatened Species and Communities Unit.

The Wildlife Branch has three sections; firstly, the Wildlife Conservation Section develops policies, provides information and advice on wildlife protection and management and maintains databases on wildlife resources and conservation status; secondly, the Wildlife Licensing Section administers wildlife licences and permits, and thirdly, the Wildlife Protection Section enforces the Wildlife Conservation Act and Regulations and ensures compliance with legislation and licence conditions.

The Environmental Protection Branch prepares guidelines and procedures for protection from weeds and feral animals, evaluates mining and development proposals, and advises on rehabilitation and environmental protection matters.

The Western Australia Threatened Species and Communities Unit draws up wildlife agreement programs and recovery plans, and assists with implementation.

Nature conservation work in the field is largely carried out by Regional and District (i.e., Regional Services) staff and employees, guided by Regional and District Nature Conservation officers, who have links to the Nature Conservation Division.

Operational controls for conservation include the following:

- staff hierarchy and list of duties for which each person is responsible;
- staff, contractor, licence holder training and appraisal;
- compliance with Conservation and Land Management Act, Regulations, policies, manuals, and guidelines;
- compliance with management plans and other plans;
- forms, checklists, performance indicators, and reports, and
- monitoring, supervision and auditing.

Nature conservation: Analysis and comment

The system currently in place to deal with nature conservation appears to cater for all levels from strategic planning to local scale implementation. However, there is a shifting onus of responsibility for implementation at the different levels from the Director of Nature Conservation to the Regional/District Manager to the Regional/District Program leader and in wood production areas to the State Forest Resources Business Unit. The responsibility shifts in accordance with the state of operations. For example, the responsibility for nature conservation within a logging coupe rests with the State Forest Resources Business Unit during logging and regeneration, but eventually passes back to the Regional/District Manager. This division of roles could lead to loss of continuity and integration and reinforces the need for integration of management (see Recommendation 3.1).

Heritage values: The current system

District staff are required to cross-check sites known to be entered on the Register of the National Estate and the CALM records of known Aboriginal sites and places prior to harvesting. There is no provision for ground surveys prior to harvesting or for post-harvesting evaluation of impacts on the cultural heritage.

Heritage values: Analysis and comment

The Director of Regional Services should ensure that heritage databases are inclusive of all known site records and are available to District staff. A sample of all CALM activities which are likely to impact heritage resources should be monitored both during and after operations.

Pests, diseases and weeds: The current system

The overarching responsibility for preparation of management guidelines for pest, disease and weed control rests within the Environmental Protection Branch of the Nature Conservation Division within CALM. Districts which undertake control on reserves and other lands not being utilised for wood production liaise directly with the Regions for implementation. For example, mapping of disease symptoms for hygiene management in harvest areas is undertaken by the State Forest Resources Business Unit, whereas the District conducts such work at recreation sites. Also business units would control weeds if they interfered with operations or tree growing, but not for environmental reasons. Control in plantations is again undertaken by the Districts, but under direction from the Plantations Group. There is no formal mechanism for protection of private forests, but it would be in CALM's interests to include these in its surveillance activities.

Pests, diseases and weeds: Analysis and comment

Emergency preparedness for existing broad scale threats such as *Phytophthora*, foxes and feral cats is very soundly based. The current system appears sound in principle. However, there appears to be opportunity for confusion about roles and priority setting for environmental protection at the District level, where there are no transparent guidelines to determine relative importance of particular pest, disease and weed problems. There is a need to implement an explicit District forest health surveillance system to provide early warning of potential pest, disease and weed problems (including private forests), other than those now catered for, to prepare an action plan for the broader categories of current minor pest, disease and weed infestations, and to undertake risk analyses for likely incursions or outbreaks.

CALM should implement a District-level forest health surveillance system (including private forests) to provide early warning of potential pest disease and weed problems, develop an associated action plan, and undertake risk analyses for likely incursions or outbreaks (see Recommendation 3.3).

Recreation and tourism: The current system

District staff generally implement recreation programs such as site development or maintenance. They are controlled by a site development plan that is prepared with the assistance of and according to standards set down by the Planning and Visitor Services Branch. Where the technical expertise does not exist within CALM, implementation of the project is contracted out. The Tree Top Walk is such an example.

Private operators generally provide commercial tourism activities on CALM managed land. Their activities are controlled through a licence that stipulates the conditions under which they operate. Park Policy and Tourism staff, assisted by Regional and District recreation officers, monitor the performance of commercial operators from time to time.

Operational controls for recreation and tourism include the following:

- staff hierarchy and list of duties for which each person is responsible;
- staff, contractor and tourism operator training and appraisal;
- compliance with Conservation and Land Management Act, Regulations, policies, manuals, and guidelines;
- compliance with management plans and other plans;
- forms, checklists, performance indicators, and reports, and
- monitoring, supervision and auditing.

Recreation and tourism: Analysis and comment

Recreation and tourism are well catered for by CALM and it is clear that there is increased emphasis within the organisation on these activities. Policy and planning are evident in the implementation and there is an increasing trend to make recreational and tourist users of the South-West Forest Region `pay their way' as do other users of the forests, and some aspects of the implementation have been successful (e.g., the Tree Top Walk).

Some stakeholders argued that there appears to be little systematic analysis by CALM of the needs of the tourism industry and instead that decisions about both major and minor tourism developments were made centrally and on an *ad hoc* basis. There is some evidence for such an assertion, but the expert advisory group is aware that other agencies also have responsibility for implementation of tourism policy and that CALM has a program of on-going consultation with those agencies.

The expert advisory group suggests that CALM and relevant tourism agencies need to respond more effectively to local and regional concerns about operational planning of activities that could affect tourism and recreational activities. An earlier recommendation enabling public comment on operational `look ahead' plans should assist this process.

Mining: The current system

CALM manages mining on CALM land in conjunction with the Department of Minerals and Energy. Mining activities, including exploration, are carried out under conditions attached to the mining tenement involved. The Department of Minerals and Energy has the power to impose conditions and under certain circumstances the Department of Resource Development may be directly involved in setting conditions for mining. CALM has input into the conditions required for each mine. CALM and the Department of Minerals and Energy are both responsible for ensuring that specific conditions are met. Often mining on CALM land is subject to working arrangements between CALM and the mining company involved. CALM Environmental Protection Branch provides advice on management of mining.

Mining: Analysis and comment

Mining operations within the South-West Forest Region are strongly regulated, both voluntarily and by the various government departments concerned including CALM. The processes and organisational structures generally work well and there is considerable goodwill on all sides, especially in relation to the desirability of meeting environmental targets such as the maintenance of soil and water values. There are numerous *ad hoc* committees and working groups (e.g., catchment working groups) whose aims are to maintain soil and water values in which mining companies play active roles. Alternative arrangements, for example, that CALM be more closely involved in the hands-on practice of rehabilitation of mined land, would seem highly undesirable.

None of the operations of mining companies are directed towards maintenance of global carbon cycles and there are no processes in place to bring about such a change. By their nature, mining operations are likely to contribute significantly to carbon emissions from relatively small areas. Future use of lands which has been mined will determine the long-term carbon balance.

Comment has already been made (Chapters 1 and 2) about the need to better formalise and incorporate the principles of ecologically sustainable forest management in legislation and planning for mining. At the operational level, those translate into a need for detailed prescriptions for rehabilitation and for monitoring of rehabilitation in accordance with the same legislation and principles.

Minesites are generally highly prepared for emergencies (fire and flood) which might result from operations or affect operations, and the mining industry liaises closely with CALM on these matters.

Minor forest products: The current system

Most minor forest produce is now supplied by CALM contractors from integrated operations. State Forest Resources Business Unit controls the removal of some minor forest produce through a minor forest produce licence which stipulates the quantity, species and location from where the produce may be removed. Only very small quantities (under 1,000 tonnes per year) of minor forest produce such as fence posts, strainers and rails have been provided under forest produce licences, in recent years. Forest produce licences are now used mainly for craft wood and wind blown trees which cannot be easily utilised by integrated timber harvesting operations. Intermittent inspections by forest officers police the conduct of licence holders.

A similar situation operates for the collection of wildflowers on CALM land. There are few operational controls, other than for threatened species, over the collection of wildflowers or other minor forest products from private land.

Minor forest products: Analysis and comment

In general, the operations of those removing small quantities of wood are satisfactorily regulated by the present system. For some minor forest products, individuals feel constrained by the operational control exerted by CALM, but the broader community perception is that the present level of control is satisfactory.

Apiary products: The current system

Access to the CALM estate for apiarists is by apiary site permits. Applications for permits are typically made at Regional or District offices, but the permit is issued by the Leases and Licences Section of the Park Policy and Tourism Branch. The permit document has numerous conditions. Regions and Districts make some inspections to ensure that conditions are met.

Apiary products: Analysis and comment

The current system of implementation of operational controls is adequate. Some apiarists have concerns that their needs are not considered or that CALM's operation seems overly bureaucratic. Nonetheless, at the District level, most CALM staff have a sympathetic view of the apiary industry and exert control where needed.

Grazing: The current system

Access to the CALM estate for grazing is by various types of lease. Applications for leases are typically made at Regional or District offices, but the lease is issued by the Land Administration Section of the Planning and Visitor Services Branch. The lease document has numerous conditions. Regions and Districts do some inspections to ensure that conditions are met.

Grazing: Analysis and comment

There are now relatively few grazing leases in operation within the South-West Forest Region. Conditions accompanying each lease are generally observed and District staff are generally familiar with the conditions and their implementation. Particular attention needs to be given to conditions applied to grazing where the vegetation type is rare or poorly represented on other tenures, such as on the riverine alluvials.

Water management: The current system

Water catchments on CALM land are jointly managed by the water authorities and CALM. The Water Corporation has responsibility for harnessed (developed) catchments. The Water and Rivers Commission has responsibility for catchments yet to be harnessed. Both CALM and the water authorities have guidelines for activities on catchments. Both CALM and the water authorities produce management plans for catchments. CALM managers in charge of specific activities are responsible for ensuring that water catchment requirements are met. This includes CALM Regional and District staff as well as business unit staff.

Water management: Analysis and comment

The legislation, policy and planning (including ministerial conditions) for water management are appropriate given the available information. Operationally, field staff are effective in ensuring that vegetation buffers are retained and that contractors abide by the water protection regulations and guidelines. At District and Regional levels, strategic planning of forest operations ensures effective management of catchments for known risks. Despite the multi-agency responsibility for management for water yield (i.e., various water agencies and CALM, see also Chapter 4), officers from agencies other than CALM play minor or insignificant roles in most forest operations.

Water quality has been raised as a minor issue by some stakeholders. Since operational control depends on feedback from monitoring stations operated by other agencies (e.g., Water and Rivers Commission) and since some values (e.g., nutrients) are not monitored routinely for economic reasons, the expert advisory group suggests there is no mechanism for operational control for these values. On the other hand, research outcomes suggest strongly that there is no effect of forest operations on overall water quality.

CALM should, in collaboration with other agencies (e.g., Water and Rivers Commission), monitor forest operations for domestic water quality, including major nutrients.

Resourcing of implementation

- The current system
- Analysis and comment

The current system

CALM retains proceeds from contract of sale of forest products and receives appropriation funds from the government. In addition, CALM actively seeks external funds for operational work in all areas. These funds are used to support the three main programs of Nature Conservation, Recreation and Tourism, and Forest Resources. Resourcing for the major problem areas is routinely evaluated annually at the District level, but with input from the Executive on the relative importance of the various programs. Cost centres prepare budget estimates for programs of work for the annual budget process. These are considered by senior management. Strategic decisions about the allocation of resources are made by senior management.

Analysis and comment

The expert advisory group understands that the District level priority for allocation of resources is often given to seasonal harvesting-related activities at the expense of the other priorities for nature conservation and other areas.

The expert advisory group also has related concerns about the allocation of funds between the three main management programs (Nature Conservation, Recreation and Tourism, and Forest Resources) because there may be an understandable tendency for the commercial areas of each to receive priority over the non-commercial.

Mention has already been made of the need to develop a commercial structure for the management of forests in the South-West Forest Region, other than Regional policy. Such a move would also assist bringing management for nature conservation on a more business-like footing. In doing so, it would ensure that the present tendency for priority of resources to be given to the seasonal harvesting-related activities to be weighed properly against the other priorities for nature conservation and other areas, and that the funding for the three main management programs (Nature Conservation, Recreation and Tourism, and Forest Resources) is based on clear criteria and incentives to managers.

Equally, without a full commercial basis for operations, there is no process or impetus for independent external audit, although the internal audit group appears well organised and adequately funded.

The processes by which resources are allocated has largely precluded the appointment of specialist staff in some areas (e.g., soils) within the State Forest Resources Business Unit or the Plantation Group Business Unit. There are some soil and water specialists within Scientific and Information Division and within the CALM Directorate, but these people have little input into day-to-day management, and for soils, little input into policy or planning, measurement and evaluation, or review and improvement.

At the present time, CALM relies on the Water and Rivers Commission to check water quality and yield. These checks are only made at the large scale and not at

the individual coupe or forest block scale. Nevertheless, water issues remain a high priority within the organisation and receive due attention and resourcing.

Fire management is a further area which CALM as a whole adopts as a priority. Financial and human resources are directed in accordance with that high priority and the comprehensive Fire Management Plan also includes provision for estimation of the minimum requirement of human resources for each fire event.

Cultural and natural heritage appears to receive little if any resourcing by CALM.

The Director of Regional Services should have explicit responsibilities for cultural and natural heritage management (see Recommendation 3.4).

Documentation

- The current system
- Analysis and comment

The current system

In general, there is variable documentation of policies, codes, guidelines, plans and databases within CALM. There has been a continual evolutionary process of updating the map-based records of forest operations, forest inventory and silviculture. Annual reports are produced by individual units and by CALM as a whole. Nevertheless, there are some aspects of ecologically sustainable forest management that would benefit from improvement of documentation or access to that documentation.

The flora and fauna manuals, databases and data on distributions are not yet generally accessible at the District level.

Pests, diseases and weeds are recorded in the Forest Management Information System and Hardwood Integrated Planning System. In addition, there are some excellent CALM manuals, guidelines and reports dealing with dieback diseases and hygiene, feral animal control and some weed control. These are also produced for lands or responsibilities outside CALM control, for example, main roads and mining areas. However, there are no general pests and diseases plans or guidelines at the District or sub-regional level.

Soil and water values are considered only briefly at the operational level (yes/no responses to a visual analysis of `threat' from forest operations). The documents on which these responses are recorded form part of the standard records of management and practice, and are used to update silvicultural records.

Analysis and comment

Attention has already been drawn to the need for further documentation in some areas such as manuals for flora and fauna. The preparation of some documentation is inappropriate to their target audience, such as the Code of Harvesting Practice and Manual of Harvesting Specifications which have a highly legalistic tone.

CALM should revise the two existing codes of practice and accompanying manual to make them easier to understand for field operators and field staff (see Recommendation 3.5).

Existing information systems such as the Forest Management Information System and the Hardwood Integrated Planning System, etc., should be extended or established to include all reserved lands (including Commonwealth and other State reserves), and where possible private lands. These databases can be used to prepare documentation for a wide variety of subsequent uses within CALM and for public access where there are no commercial implications.

Communication and transparency

- The current system
- Analysis and comment

The current system

CALM has a good record of outgoing communication about most issues through the scientific literature, in-house publications, annual reports and seminars etc. CALM also has a vigorous and effective public education program and is moving quickly to keep up-to-date with current developments in communication (e.g., the Internet).

Generally, there appears to be good collaboration among internal and external scientists and managers. Feedback from research is often immediate and implementation and uptake of research is rapid. A number of stakeholders raised the issue of how CALM deals with suggestions for research or changes to management from outside the department.

Notwithstanding the considerable provisions made for public input at the Regional level, some stakeholders expressed dissatisfaction with the opportunities for public input in policy development. In particular, there does not appear to be any transparent process for input into policy level decisions and priority setting at the District level by the public, including the external scientific community. Furthermore, stakeholder input through the Environmental Protection Authority process is regarded by some as being unduly cumbersome and limited in scope.

Communication with Aboriginal communities is informal and indigenous peoples in the South-West Forest Region do not appear to be represented on any of the CALM advisory committees.

Analysis and comment

CALM has become highly attuned to public comment and works hard to increase accessibility to information.

A process to alleviate the perception of a 'closed shop' on pest, disease and weed management is needed. Mechanisms such as workshops or advisory committees which involve the external scientific community may provide valuable input into early warning systems for pest, disease and weed research and management needs.

Similarly, some stakeholders expressed concern about the apparently limited opportunities to have input to development of policy related to fire management and its impacts on flora and fauna.

A number of policy and planning documents are released for public comment and others are routinely available. As noted earlier, others, for example the timber harvesting plan, are not easily understood by field operators and field staff (see Recommendations 3.7 and 3.5).

CALM should develop processes to facilitate consultation with and involve communities in heritage conservation.

CALM should release draft Policy Statements related to ecologically sustainable forest management for public comment prior to finalisation (see Recommendation 3.7).

CALM should develop appropriate processes to facilitate consultation with and involvement of Aboriginal communities in the development of policies and procedures for heritage conservation (see Recommendation 3.8).

Knowledge, skills and training

- The current system
- Analysis and comment

The current system

CALM and other management agencies, including the private sector, have a high level of awareness of most forest values among staff. Field staff receive basic training about many of the underlying specialist areas including flora and fauna. Contractors, who must be registered as timber workers, also receive basic training through the Forest Industries Training Services. Occupational Health and Safety issues are managed at a District level with an oversight maintained by the Executive.

A considerable proportion of the staff of CALM has strong backgrounds in soil, water, nature conservation and recreation disciplines from their training as professional foresters (four year degree) or through other tertiary education and training. In addition, newly appointed field officers may undergo up to ten weeks of further skills based training. CALM also has a strong internal program for training staff (registered provider of 38 nationally recognised training programs), and strongly encourages staff to undertake advanced studies and training outside the organisation (e.g., through local and interstate universities). Nevertheless, gaps exist in expertise and CALM has a Policy Statement (No. 6) which states that these needs will be identified and corrected. The expert advisory group believes that this may warrant closer attention in human resource management.

Analysis and comment

Generally CALM has an admirable training and education system which works to the benefit of individuals as well as the organisation. Some staff still have less knowledge of particular areas than is desirable and would benefit from a staff development program to rectify major deficiencies.

Guidelines and training programs for indigenous or cultural heritage values do not appear to exist. No operational manuals which refer to archaeological, geoconservation, landscape or cultural landscapes are available (in CALM). No-one with formal qualifications in these fields and responsibilities for heritage resource management is employed by CALM (see Recommendations 3.6 and 4.4).

CALM should give increased attention to skill requirements, staff training, and the contracting of external services to ensure timely access to the range of expertise needed to implement ecologically sustainable forest management (see Recommendation 3.6).

Chapter 4: Monitoring and compliance

Monitoring

Information about forest values is fundamental to resource planning for ecologically sustainable forest management. The expert advisory group has not had sufficient time to pursue all forest values in detail and the following discussion therefore focuses on the main areas of activity in nature conservation, natural and indigenous heritage, recreation and tourism, and timber production. Except where otherwise indicated, much of this assessment is related to the activities of CALM, which is the largest and most important forest manager in the South-West Forest Region, and the lead agency with policy responsibilities for oversight of activities on private forests. Activities on private land appear more opportunistic than planned, and monitoring and compliance issues are met largely through the provisions of the codes of harvesting practice and guidelines for the protection of remnant vegetation on private land.

Two of CALM's controlling bodies have monitoring responsibilities as listed below.

- Section 19(1)(e) of the *Conservation and Land Management Act 1984* requires the Lands and Forest Commission to monitor the carrying out of management plans by the Department in respect of land vested in it (mainly State forest).
- Section 22(1)(e) of the Conservation and Land Management Act requires the National Parks and Nature Conservation Authority to monitor the carrying out of management plans by the Department in respect of land vested in it (national parks, conservation parks and nature reserves).

Members of the public belong to both controlling bodies. Meetings are held regularly and minutes are available under the freedom of information process. Both bodies produce annual reports which are available to the public. These reports do not cover all provisions within relevant management plans. The controlling bodies are included in CALM's audit process.

The Lands and Forest Commission and the National Parks and Nature Conservation Authority should jointly report on compliance with all provisions of relevant management plans, including periodic reporting of progress with the structural goals prescribed within the `Forest Management Plan 1994-2003' (see Recommendation 4.1).

Policy Statement No. 28 sets out a strong approach to monitoring forest composition and impacts of management on biodiversity, soil and water and other environmental values. Its objectives are to:

- study and record management decisions and their effects on CALM lands, and to incorporate the information gained in subsequent development of policy and management plans;
- maintain up-to-date records of distribution and status of the State's biota, the management decisions that are made about that biota and about departmental lands (and waters) and the consequences of those decisions;
- provide a mechanism for systematically reviewing management policy and programs in the light of new information, and
- provide an ongoing record system which will document changes in community species composition through natural ecological changes as well as management.

This Policy Statement provides for an ecosystem monitoring section within CALM and development of manuals and pilot programs in each region. The policy addresses ecosystems and ecosystem management generally but does not specifically identify the principles of ecologically sustainable forest management.

Policy Statement No. 28 has not been fully implemented and is under revision. To achieve an environmental management system with high integrity with respect to sustainability of biodiversity, an implemented policy much like Policy No. 28 is needed and should be adequately resourced and implemented.

The research efforts into long term effects of forest management in Western Australia are a strength of the system, but research should be seen as a tool for developing better future management rather than a substitute for monitoring of the outcomes of present systems.

CALM should complete the revision of Policy Statement No. 28 to include the current objectives and a commitment to develop and regularly monitor a set of indicators of ecological sustainability in relation to all of the principles of ecologically sustainable forest management. The revised policy should be implemented as soon as possible (see Recommendation 4.2).

Conservation of biological diversity

The current system

The current approach to collection and maintenance of forest information for biodiversity includes maintaining databases on locations of flora and fauna, and mapping of forest types (including structural measurements).

Important components of the system with respect to biodiversity are internal audit of compliance with specifications of the Code of Harvesting Practice and Manual of Harvesting Specifications, and reporting on indicators set in species recovery plans.

Primary data sets on flora and fauna are held at the herbarium and the museum respectively. Whilst much of the flora data comes from environmentally stratified surveys, there have been comparatively few stratified fauna surveys.

Current maps of forest types come from a substantial project completed in the 1960s. The study utilised aerial photography, typically at around the scale of 1:15,840 (20 chains = 1 inch) and covered most of the Crown land and private property in the forest zone. The mapping estimated density, species, structure, height class and fire damage.

Further work has been undertaken to more accurately define species composition not comprehensively mapped in the original project, notably for karri and wandoo. There has been mapping of regrowth and old growth in the karri forest zone. There has also been recent mapping by CALM of forest associations as part of the Regional Forest Agreement and this is to be published shortly.

Analysis and comment

The extent and quality of information databases for ecologically sustainable forest management have been assessed in a separate project. There appear to be movements towards development of centralised databases that can be made available to Regional and District staff to support planning and decision-making.

The expert advisory group suggests that the completion of information databases and networks to provide access at Regional and District levels should be given a high priority.

The collection of more systematic rare flora and fauna data are needed to provide a scientifically sound basis for predicting and mapping the distribution of key species of flora and fauna in the forests. Discussions with agency staff and stakeholders and an inspection of the literature indicate that the vast majority of data are collected for purposes other than modelling distributions. The expert advisory group has heard opinions that this lack of distributional data hinders planning for fire management and timber harvesting.

Although assessing the significance of this problem is beyond the scope of the group's brief, the lack of a process to clearly and transparently assess the need, or lack thereof, for survey information should be addresses by CALM.

CALM is moving towards development of a set of indicators of ecologically sustainable forest management consistent with the Montreal Process criteria and indicators. Development of indicators of sustainability of biodiversity is a vital requirement for monitoring of Principle 1 and this is addressed by Recommendation 4.2.

Maintenance of productive capacity of forest ecosystems

The current system

Monitoring of systems related to wood production involves the following:

- measurement of standing gross bole timber volume using photo plots, a sample of these measured on ground;
- derivation of product volumes from gross bole volumes adjusted by field sampling data;
- estimation of forest growth based on old research and inventory data (typically pre-1982 for jarrah) used in growth models;
- setting of sustainable yield by the Minister based on data provided by CALM;
- contracts of sale issued up to the volumes permitted by ministerial determination;
- re-measurement of permanent (timber inventory) growth plots;
- monitoring of actual product volumes removed per hectare and residues left in the forest;
- regeneration success assessed at coupe level;
- application of silvicultural prescriptions, and
- monitoring of harvest compared to contracts of sale and ministerial determination of sustainable yield, at local level and also at departmental level reported in CALM annual report.

Systems for recording operations due and carried out include various databases described below.

- The Silviculture Records System is a geographic information system employed to store and present information (e.g., maps and area data) on silvicultural operations performed and requiring completion. It maintains a spatial, vector image of the treated stands in addition to works programming details for each operation.
- CALM Integrated Management Control Information System is a manual map-based system for planning, control and recording of operations on CALM lands, excluding plantations. It has maps displaying information such as dieback, apiary sites, research plots, mining, hydrology, rare flora and fauna, recreation, historic sites, timber harvesting and regeneration for forest blocks, or parts of blocks. This system has now been replaced by the Silviculture Records System for all new harvesting and regeneration.
- Records for planning, control and recording of operations on CALM plantations are held in the Plantations Operations Control System. The system has maps displaying information such as research plots, mining, hydrology, establishment, tending and thinning operations. The system is used to produce plantation establishment and tending data presented in the CALM annual report.
- The Forest Operational Control Information System was developed as an information system to satisfy the operational and financial management requirements of share farming properties, CALM estate plantations and even-aged regeneration in native forests.
- Forest Management Information System is a computer-based system which uses map overlays to enable area land resource information to be determined for various combinations of forest type, management activities and constraints. The system is based on grid cells with basic data being recorded for each separate

overlay or attribute. The smallest unit of data recording was approximately two hectares, but new data are now based on 0.5 hectare units.

- The Hardwood Integrated Planning System is an integrated geographic information system and ORACLE database forest stand selection system which is used as a hardwood harvesting planning tool. The system, which is still being developed, provides forest stands which can be used to form coupes and volume estimates. Data are drawn from other systems, including forest inventory data, growth data, Forest Management Information System, Silviculture Record System, fire system and the ORACLE financial system.

The jarrah inventory methodology was subject to independent review by the Australian National University, School of Forestry for the Barnett Inquiry in 1992. Harvested quantities (volumes, weights and numbers) are monitored against estimated quantities (inventory estimates) and against contracted quantities and the Minister's determination. Areas cut over are mapped from aerial photography, recorded in the Silvicultural Records System and monitored against planned areas and boundaries such as stream reserves and national park boundaries. Some summaries of timber removals are presented in CALM annual reports. The jarrah inventory assesses gross bole volume. Data from harvested coupes is used to derive estimates of proportions by log products.

Matters relating to the need for an external audit are discussed in Chapter 4, harvesting operations on CALM land are carried out by contractors. The contractors operate under conditions specified in the contract and related schedules. The contracts require that the contractor provide supervision at each site. CALM's Manual of Harvesting Specifications and Code of Harvesting Practice are both included as schedules to these contracts. CALM forest officers-in-charge at each site are responsible for ensuring compliance with all requirements of the manual and code. Checklists in the manuals are used to record the results of inspections and action required. At the completion of a formal inspection, a form CLM 105 hardwood harvesting inspection and action sheet, is completed. There are sections on this form for comments on demarcation of dieback coupe boundaries, dieback hygiene practices, soil damage level, erosion control measures, landing and track rehabilitation.

Sections of the Timber Harvesting Manual which are relevant to the maintenance of productive capacity are listed below.

- *Specification 1.1 Harvesting and regeneration plans, including Pre-harvesting checklist (CLM form 109)* requires that harvesting and regeneration plans, including pre-harvesting checklists, be prepared by the planner and authorised by the Business Unit cell manager.
- *Pre-harvesting checklists* are prepared for each compartment or coupe in the harvesting plan showing which items have been checked, by whom, action required and when completed. The checklist is signed by the planner, regional manager, business unit cell manager and forest officer-in-charge of the coupe.
- *Specification 2* - Roading requires the approval of the Business Unit cell managers for most aspects of road works, including new alignments, widths, hygiene and gravel sources. The work is contracted out and the contract is supervised by Business Unit staff. There is no formal report on the contract outcomes unless a major problem occurs.
- *Specification 4.1* states that coupe demarcation is the responsibility of the harvesting contractor. Due to the sensitivity of establishing the coupe location accurately with respect to formal reserves, informal reserves and the location of threatened flora, the forest officer-in-charge of each coupe is usually intimately

involved. If the boundary is particularly sensitive a global positioning system will be used to ensure accuracy. Cell managers check standards periodically.

- *Specification 4.5* specifics that CALM's harvesting contractor supervisors are responsible for periodically checking standards. Forest officers-in-charge from CALM check at least twenty per cent of fellers' blocks. CLM 105 forms are filled in periodically by the forest officer-in-charge. The form has sections covering coupe preparation, felling, extraction, environmental controls, log measurement, loading, haulage and safety. Completion of felling and snigging is certified in CLM 104, by the contractor's foreman. This system is audited by CALM Management Audit Branch at least once every three years.
- *Specification 5.2* sets limits for winter soil damage which must not be exceeded or harvesting operations must cease. Field assessment of soil damage sheets (CLM 108) are required to be filled out by the forest officer-in-charge when soil damage appears to be reaching the limits, which are ten per cent in selectively cut forest and twenty per cent in clear felling. Soil erosion control barriers must be installed on snig tracks of greater than two degree slope. This is the responsibility of the contractor, with standards checked by forest officer-in-charge and occasional spot checks by the cell manager.
- *Specification 5.6* requires that harvesting contractors have specified fire fighting equipment and a proportion of their personnel trained, as specified in the Timber Harvesting Code of Practice. The forest officer-in-charge is responsible for ensuring that the requirements are met at coupe level and the cell manager is responsible at cell level.

The Timber Harvesting Manual (incorporating the superseded Code of Harvesting Practice) is a public document, available for sale to the public. CALM's manuals, including the Code of Harvesting Practice and the Manual of Harvesting Specifications are not formally subject to public consultation, although the public can comment on harvesting operations and manuals during consultation for a management plan.

Assessment of regeneration success is required at specified times after regeneration treatment in native forest, in accordance with Silviculture Specification 1/90 (karri) and 3/90 (jarrah). Records are maintained and summaries of performance are compared to specific performance indicators in the annual report of the Business Unit.

The Code of Harvesting Practice requires harvesting contractors to make good any damage. If the contractor fails to do so, as required by the forest officer-in-charge then any necessary work may be at the contractor's expense and the money expended recouped by CALM. Monetary penalties are mentioned in section 1.8 of the Code. Contractors are paid fortnightly and the forest officer-in-charge has the power to withhold all or part of a contractor's payment for non-compliance with contract provisions. This is rarely applied as most disputes are dealt with by negotiation.

The Forest Management Regulations 1993 cover aspects such as registration of timber workers (sections 4-18), felling of trees (sections 19-23) and dieback hygiene requirements (sections 104-125). Penalties for breaches are prescribed in the regulation. The forest officer-in-charge of each coupe is required to ensure that all logs carted meet the log quality standards defined in the Timber Harvesting Manual. Frequent inspections are necessary to achieve this. Some details of the system used are in the Timber Harvesting Manual section 7.8. There is little or no documentation involved unless logs are rejected on the customer's landing and a credit note is issued. Log production (intake) and sawn output statistics are compiled by CALM and presented in CALM annual reports. The

annual reports also provide information on land tenure, areas regenerated, plantations established, areas burnt, and a comparison between the ministerial determination of sustainable yield and actual harvest.

Statistics on wildflower production from Crown land are available through the picking return required to be submitted by all licenced pickers, however, the quality of the data submitted is dependent on the knowledge and interest of the picker. CALM believes that the quality of returns has improved significantly over the last five years due to an education campaign and is at the minimum level useful for showing trends in species production.

The State Forest Resources Business Unit has a monitoring and training unit which checks on compliance with requirements, for example, the activities of timber harvesting contractors. Forest Resources Services has a timber utilisation and inspection service, which inspects, for a fee, timber products for compliance with specifications, for example, the export railway sleepers and utility poles.

Forest Resources Services has a Forest Offence Investigation Team which enforces the CALM Act and Forest Management Regulations.

The Environmental Protection Authority has the responsibility of monitoring the implementation of ministerial conditions attached to approvals to implement a proposal. They accomplish this through desk audits of proponents annual reporting on compliance. For the 1992 draft `Management Strategies for the South-West Forests of Western Australia', one condition required a major report after five years of operation. The Environmental Protection Authority has established an advisory body to assist with the analysis of CALM's report on compliance for those five years.

Analysis and comment

CALM has an appropriate procedure for the formal monitoring and reporting of regeneration results in karri forests and in those jarrah forests which have been treated for the establishment of regeneration. The results are published in the internal annual report of the State Forest Resources Business Unit. Monitoring and reporting are not systematically undertaken in those jarrah forests which have been treated for the release of advance growth or crop trees. The basis for the assessment of the adequacy of stocking in these stands is not documented in a publicly available form, and reports on the adequacy of stocking levels are not included in the annual report of the State Forest Resources Business Unit. Improved transparency of this process is necessary, given the importance of the comparison between the area of forest harvested for regeneration and the area of forest actually regenerated as a performance indicator in CALM annual reports.

There is no periodic reporting of compliance with the structural goals which are prescribed in the Forest Management Plan for the karri and jarrah forests.

Systematic assessment of early growth rates following the successful establishment of regeneration after logging or mining activities is not undertaken. Routine inventory does not commence until about age twenty to twenty five years. As a result, there is no procedure for the assessment of early growth which would enable an early determination of whether site productivity has been maintained. The Forest Management Branch recognises this shortcoming, but believes that it has no standard productivity or species composition benchmarks to compare any such measurements with in order to make meaningful conclusions. Similarly, there is no procedure for the monitoring of changes in

species composition and dominance on sites which contain a mixture of species. This may be a particularly important criterion of forest productivity on sites where the initial stocking of species during the regeneration phase is significantly different to the natural, mature stage composition.

CALM has an appropriate procedure for monitoring and reporting, through CALM annual reports, the wood harvested in comparison to the sustained yields determined in the Forest Management Plan.

CALM should monitor and report on the adequacy of stocking in jarrah forests which have been treated for the release of advance growth or crop trees, and the early growth and composition (commencing at age five to ten years) of trees species on sites after harvesting or mining activities.

Maintenance of forest ecosystem health and vitality

- The current system
- Analysis and comment

The current system

Mapping and on-ground surveys are carried out in a set program to monitor the extent of spread and success of control measures for a range of pests, diseases and weeds, including jarrah leaf miner and leaf skeletoniser, blackberries, and fungal diseases, as well *Phytophthora cinnamomi,* foxes and feral cats. Detection of most other noxious outbreaks relies on *ad hoc* problem recognition by District staff or by chance discovery by specialists. The system in place is subject to audit by the Management Audit Branch. In addition, there has been a recent ministerial review of dieback management which resulted in a number of recommendations.

Analysis and comment

The monitoring programs for the range of pests, diseases and weeds presently in place appear thorough and serve to deliver appropriate outcomes. The recommendations of the dieback review report should be implemented.

The current system of *ad hoc* inspection of forested lands at the District level for other new forest health problems needs to become more formalised, through a routine forest inspection and reporting system.

Conservation and maintenance of soil and water resources and of global carbon cycles

- The current system
- Analysis and comment

The current system

There are means by which implementation of policy and planning with respect to soil, water and carbon values is examined. CALM's internal audit department as well as outside agencies, including the Water and Rivers Commission and the Environmental Protection Authority, conduct checks from time-to-time. The Water and Rivers Commission closely monitors water yield and quality, and conducts regular and routine checks of its own methods and processes, but the expert advisory group has not been able to ascertain if those checks are internal or external.

Environmental Protection Authority investigations are initiated by a diverse range of individuals and organisations and for an equally wide variety of reasons. Consequently, there appears little systematic analysis by the Environmental Protection Authority, with most investigations being *ad hoc*.

The Water and Rivers Commission maintains a database of water yield and quality based on a wide-ranging network of sampling stations. CALM staff work collaboratively with the Commission and have access to that data, mainly in electronic format.

There is no systematic monitoring of soil and carbon values. The available data and information are largely those from site-specific research studies or from non-specific soil surveys. A carbon inventory, excluding soil, is about to be established for Western Australian forests.

At the day-to-day level, further data on soil, carbon and water values are made available through implementation of plans for harvesting and silviculture. For example, if soil damage approaches ten per cent of the area concerned then harvesting stops and remedial actions are taken. The level of damage is recorded and becomes part of the harvesting and silvicultural records.

Analysis and comment

The process whereby data on water yield and quality are collected and held by the Water and Rivers Commission and made available for use by specialists (managers, researchers) is satisfactory for that use. The process is less satisfactory from a public transparency point of view. Previously, these data were also published in hard copy but that practice ceased due to economic reasons. The data remain accessible to those with legitimate needs. Data on water yield and quality are collected on the basis of whole catchments and are generally not useful for extrapolation to assess forest operations at the level of individual coupes, but are useful for assessing operations over larger scales.

Data on soil (including nutrients) and carbon values are widely scattered among researchers and managers both within and outside CALM. There is an argument for their collation and addition to, say, vegetation databases. The noted lack of

data on the effects of fuel-reduction fire on some of these aspects (e.g., carbon budgets) should be addressed.

CALM should collate and maintain a database on forest soils (including soil nutrients) and carbon, using data from researchers within and outside CALM (see Recommendation 4.3).

Auditing of compliance with policy and planning statements on the maintenance of soil (including nutrients), water and carbon values is fragmented. The reliance on the Water and Rivers Commission for water yield and quality data includes reliance on their auditing of processes and procedures used for data collection. Internal CALM expertise in this area partially offsets that need. Data are checked continually for reliability and accuracy.

Nonetheless, public concerns about water values are not easily addressed due to the complex nature of data recording and presentation. Resumption of the past practice of publication of water yield and quality and auditing of that data by the Water and Rivers Commission, would help allay those concerns.

The Environmental Protection Authority has been the primary means of auditing of soil values but its investigations are often superficial due to an absence of funding and the lack of a clear and systematic approach. These investigations typically concentrate on `examples' of both good and bad practice and are not true `audits'. The difficulties of auditing for soil and carbon values partially stem from a lack of comprehensive data sets. This issue is further addressed in Chapter 5.

Protection of natural and cultural heritage values

- The current system
- Analysis and comment

The current system

Current inventory practice for the most part ignores cultural and natural heritage values unless concern is raised by community organisations. Pre-harvesting ground-truthing surveys and post-harvesting evaluations of impacts are not undertaken. It appears as if the officers undertaking monitoring activities have no training in Aboriginal site recognition.

A paper-based record of Aboriginal sites may be retained at the District level and there is an awareness by CALM officers of the maintenance of historical site records by the Western Australia Heritage Council. There are plans to place the records of the Register of Heritage Places on the Hardwood Integrated Planning System. Processes have not been initiated which would lead to the transfer of data from the Aboriginal sites records held by the Aboriginal Affairs Department to the CALM database.

Analysis and comment

There is an urgent need for a state-wide strategy to assign responsibility for maintaining various heritage databases and entering into partnerships with land management agencies such that the appropriate data are available for planning and monitoring purposes. It is essential that databases are comprehensive and accessible at all planning and operational levels, as well as needing to reflect the local, catchment, regional and state-wide significance of the heritage resources.

CALM should employ Aboriginal heritage officers to maintain the indigenous places database, as well as communicate with Aboriginal communities on the protocols for data entry and retrieval (see Recommendation 4.4).

The lack of procedural instructions, staff training programs and databases renders operational and post operational monitoring and compliance ineffectual. The heritage information retained by CALM is insufficiently integrated to allow assessment of conservation needs for heritage values throughout the South-West Forests. Reliance is placed upon processes initiated by the Australian Heritage Commission, but these processes are designed to document significant places at the national level. Places of local significance, unless recorded on the municipal inventories, are not regularly incorporated into land management database. Information on the protection of heritage resources during timber harvesting needs to be integrated with data acquired during the monitoring process. It appears that no government agency maintains a geoconservation databases. It is worth noting that a comprehensive map of soils and landforms has now been completed for the Regional Forest Agreement. The map and its partly completed predecessors, are also the primary basis for the mapping of vegetation complexes, which were the means of selection of the representative areas for inclusion in the reserve system proposed in the `Forest Management Plan 1994-2003'.

It is necessary to come to grips with the nature of Aboriginal use of the forest landscape through 40,000 years of occupation of the Region. To some extent the pattern of occupation will be contingent on the changing nature of the landscape

and its vegetation throughout that long period of land use. It is more than likely that the folk memory of Aboriginal occupation may not correspond with that evidenced throughout all prehistoric periods of utilisation by indigenous peoples.

State forests and conservation reserves often contain sites relating to the timber industry while lands adjacent to the forests will evidence historical places pertaining to grazing or other forms of land utilisation.

The Code of Harvesting Practice requires that heritage values be signed off by the forest officer-in-charge of the timber harvesting process. Post-harvest survey of coupes and other land impacting activities such as roading should be conducted by trained CALM staff, preferable with the participation of indigenous officers who have both the confidence of the local community and the necessary technical skills. It is commonly believed that the prehistoric population of the south-west camped in the immediate vicinity of water sources and thus by reserving stream buffer zones sites will be protected. This assumption needs to be tested.

CALM should:

• Link its heritage databases to geographic information systems and to those of other agencies;

• Employ Aboriginal heritage officers in the field monitoring of CALM activities;

• Commission experts to explore the feasibility of developing sensitivity indicators which might be applied to the location of prehistoric Aboriginal sites, and

• Sponsor research on the ability of prescribed buffer zones to conserve a representative sample of cultural heritage values (see Recommendation 4.4).

Maintenance and enhancement of long/term multiple socio-economic benefits to meet the needs of societies

- The current system
- Analysis and comment

The current system

CALM maintains fairly comprehensive monitoring of standard statistics on socio-economic benefits, including those on timber production from private land, although it has no legislative requirement to do this. These statistics are published in CALM's annual report.

Recreation sites are monitored, visitor surveys are undertaken, and management plans recommend modification or relocation of facilities as circumstances change and visitor demand increases.

Analysis and comment

In a narrow sense, CALM fulfills the requirements of monitoring for this principle and sometimes goes beyond those requirements. However, those reports are of little value without interpretation, analysis and supplementary data collection to examine the issues and trade-offs. As is true of most Australian forest agencies, the latter functions have been scant, at least in terms of those made available publicly. As a policy agency, it would be appropriate for CALM to do more in commissioning and undertaking analytical reviews of issues, especially those relating to trade-offs.

Visual resources and their links to eco-tourism are a concern of local communities. Forest management practices such as prescribed burning, location of recreational facilities and amenities, non-disposal of timber refuse and the retention of valued old growth forests within the community catchment are expressed concerns. The after-shock of timber harvesting and the visual degradation resulting from prescribed burning are contentious issues which require careful monitoring of community concerns and mechanisms need to be implemented for gauging and addressing these needs.

Modifications are made to recreational facilities in order to meet with the express needs for a higher level of amenity, seclusion of camp sites and comfortable access to key recreational places. Where there are signs of severe deterioration, activities are restricted and facilities are relocated.

Compliance

- The current system and analysis

The current system and analysis

The activities of the Management Audit Unit are a strength with respect to monitoring the implementation of plans and compliance with specifications in the Code of Harvesting Practice and Manual of Harvesting Practice, and taking corrective action through consultation and negotiation with District managers and business units. The system should be strengthened with respect to maintaining biodiversity by checking whether prescriptions for wildlife and environmental values on coupes remain effective throughout the harvesting cycle.

However, this system does not fulfill the need for an independent audit of compliance for several reasons. Firstly, the Unit operates wholly within CALM, which can give the perception of lack of independence. Secondly, there is no public reporting of the results of the Unit's activities (see Recommendation 4.5). A periodic external audit is needed, together with publication of the results.

The audit process has a strong emphasis on consultation, negotiation, review and improvement. Audit reports and recommendations from the Management Audit Unit are provided to managers for response. The recommendations of the Unit and the response from the managers are subsequently submitted to the Audit Committee for further action. The audit reports are not published or contained within the annual reports of CALM.

Legal enforcement of the *Conservation and Land Management Act 1984* and Regulations is carried out by a Forest Offence Investigation Team within CALM's Forest Resources Services. The Wildlife Protection Section has wildlife officers which enforce the *Wildlife Conservation Act 1950*. The primary mechanism for the legal enforcement of operational practices is through the contractual obligations between CALM and contractors. These obligations include requirements for compliance with the harvesting code and manual. Breaches of the contract are generally dealt with by negotiation or (rarely) by financial penalty.

An internal audit of operational and financial systems within CALM is carried out by the Management Audit Branch. The Branch comprises six full-time staff: a manager, three operational auditors, and two financial auditors. The audit process is based upon six clear objectives which deal with: corporate goals; compliance with legislation, policies and procedures; security of assets and data; efficiency of control mechanisms; efficiency of operational practices, and the use and adequacy of data. The program for the Management Audit Unit is reviewed and approved by an Audit Committee, which consists of representatives of the CALM Executive, the manager of the Management Audit Unit and a representative of the Auditor-General. The Management Audit Unit responds directly to the Executive Director.

The CALM Management Audit Branch should continue to operate as an internal audit of CALM planning and implementation priorities. In addition, there should be an external, independent audit of a sample of operational practices on an annual basis. Performance criteria and the results of the external audit should be published in the annual report of CALM (see Recommendation 4.5).

The apparent absence of auditing for natural and cultural heritage values is a definite weakness in the CALM land management system.

Chapter 5: Review and improvement

Review and continual improvement of the management system, including research and development to meet key requirements for knowledge, represent important elements in refining and advancing ecologically sustainable forest management. As review and improvement have many facets at various levels in management systems, the expert advisory group has discussed only the major processes and identified the most significant areas for improvement in the Western Australian system. With respect to assessment of research and development, the group focused on the processes by which research priorities are determined and how research results are implemented in forest management. However, a detailed assessment of this research is beyond the scope of this report.

Chapter 5 starts with general assessments of review, continual improvement of the management system, and research and development. Thereafter, the expert advisory group considers specific issues relating to the six principles of ecologically sustainable forest management.

Review and continual improvement of the management system

Review and continual improvement of the management system

The current system

Although there is no formal CALM policy for continuous improvement, improvements are achieved by informal processes and are documented in CALM annual reports. Major reviews of management systems of CALM and other agencies occur at irregular and often long intervals, often during restructuring exercises. Minor reviews occur much more frequently. Some sections of CALM, including the CALM Corporate Executive, have annual seminars, which are an opportunity to consider performance and discuss possible changes.

Circular 11/95 (which superseded Circular 2/91) and Policy Statement No. 48, `Freedom of Information in CALM', require that CALM maintain a central register of manuals and guidelines. The Management Audit Branch has responsibility for keeping this register up to date. Circular 11/95 requires that managers ensure all technical manuals and operational guidelines are kept up-to-date and this is assessed as part of internal audits. There are no formal overarching policies or guidelines relating to the frequency or mechanisms for review of manuals and guidelines, although some documents include guidelines for their own review.

Analysis and comment

The charter of the Management Audit Branch of CALM is sufficiently broad to provide a formal process for internal review and continual improvement of the management system in Western Australia. This charter allows auditing of any processes or practices within CALM, subject to approval of priorities by the Audit Committee and the Executive Director of CALM. Within this framework the Audit Committee manages the efficiency and direction of the Branch. The auditing processes adopted by this Branch include presentation of recommendations to managers and follow up assessment of adoption of those recommendations. The Audit reports often recommend development of indicators of continuous improvement, but the responses to these recommendations have been varied.

However, there is a need for any large land management agency to seek review of its management systems by appropriately qualified people external to the day-to-day operation of the systems. The Regional Forest Agreement process is currently fulfilling this role and subsequent reviews of the Regional Forest Agreement will provide ongoing input to review and continual improvement.

However, the expert advisory group recommends development of a formal policy for regular external review of the environmental management system in Western Australia and associated mechanisms for assessing and implementing recommended improvements (see Recommendation 1.5).

Because the Code of Harvesting Practice and Timber Harvesting Manual play a central role in the environmental management system in State forests, it is important that these documents are formally reviewed by both internal and external processes. At present informal review of these documents occurs about

each eighteen months, and review of the silvicultural specifications that come from the Timber Harvesting Manual is ongoing as needed. It is unclear what practices operate with respect to external review.

CALM should implement frequent (about one to two yearly) internal review and periodic (about five yearly) external review of the Code of Harvesting Practice and Timber Harvesting Manual (see Recommendation 5.1).

Research and Development

- The current system
- Analysis and comment

The current system

CALM

CALM's Science and Information Division researches a broad range of issues related to the principles of ecologically sustainable forest management. The extent to which individual principles are addressed in the activities of the Science and Information Division is discussed in the following sections. This Division has a stated commitment to `providing up-to-date and scientifically sound information to uphold effective conservation and land management in Western Australia'. The strategic plan for the Science and Information Division (1995-1999) provides further details on its mission, objectives, strategies, structure and responsibilities.

The Science and Information Division consists of four groups: Bio-resources; Bio-conservation; Sustainable Resources, and Science Services.

Current and recent research projects are documented in the Division's Triennial Report 1992/95 for each group and section.

CALM management plans provide an opportunity for public consultation on research requirements for the area covered by the management plan involved. Research results are published after each project has been finalised. Preliminary research data are typically unsuitable for public access, but available under freedom of information requirements. Research highlights are presented in CALM's annual reports. Review and improvement are based on a combination of formal research and adjustments to management after monitoring performance in the field.

The four groups within the Science and Information Division interact among themselves and also network with other CALM staff. Direct interaction with staff in Regional and District offices is encouraged, and in future will be formalised with respect to priority setting and implementation of research results (see below). There is also considerable interaction with scientists in CSIRO, universities, and other government departments and authorities, inside and outside Australia. A formal system of advisory committees, concentrating on major research and development themes, and including external scientists as a majority, has been proposed as a mechanism to further improve interaction with external scientists.

The process for setting of research priorities has been modified since the last annual report of the Science and Information Division. Initial priorities are set within the Science and Information Division by management teams, which consist of the Head of the Science Group and section managers in that group. Scientists can bid for funding from any group by submitting a detailed science project plan.

Once the annual allocation to Science and Information Division is known, the management teams rate the priority of science project plans using the following criteria.

• Is the project relevant? If not, reject.

• Rate the characteristics relating to benefits, such as effectiveness, demand for results, usefulness, benefit, integration with research outside CALM.

• Rate the features of feasibility, such as impact on departmental operations, budget, time frame, teamwork.

A new five-step process proposed by the Science and Information Division of CALM formally provides improved opportunities for setting research priorities in consultation with a range of stakeholders and users of research results.

Following the internal review and prioritisation described above Regional and District managers and staff, and branch and business unit managers comment on the relative importance of the research proposed, the likely changes in priorities in the future and any gaps. At this stage, not only are requirements for research in Regions and Districts identified, but mechanisms for implementation of research results are agreed.

Further review is being provided by the Forest Monitoring and Research Committee, which was established as a ministerial condition following a recommendation by the Environmental Protection Authority. This committee has a membership that includes a range of stakeholders. Recently, a working group of CALM and external scientists was set up under this committee to provide scientific advice. In theory, the Forest Monitoring and Research Committee makes the final decisions about what research gets funded, but lack of allocation of funding from government has curtailed the activity of the committee since its establishment in 1992.

Western Australian Museum

The Western Australian Museum is a key agency collecting and storing data on fauna in the South-West Forest Region. Its research is primarily focused on distribution and taxonomy of fauna. There is no formal process for determining research priorities at an organisational level. Individual curators determine their own priorities in relation to opportunities for external funding and requirements for taxonomic revisions.

CSIRO

Research priorities within CSIRO are set at a number of levels. The organisation consists of divisions that perform as self-contained business units determining many of their research priorities internally, usually with input from advisory committees consisting of a range of external stakeholders. All divisions are expected to obtain a significant proportion of their salary funding externally, as a mechanism to enhance relevance of research and application of results.

Cutting across the divisional structure is a number of sectors aligned with client bases. Each division allocates its research efforts across one or more sectors. Each sector has an advisory committee consisting of stakeholders from industry and government, and these advisory committees assist in identifying research priorities for sectors.

By this process, criteria for establishing research priorities for some divisions include the ecologically sustainable forest management principles along with a

range of other criteria. The Division of Forestry and Forest Products, the Division of Land and Water, and the Division of Wildlife and Ecology have significant research interests in the South-West Forest Region, including collaborative projects with CALM.

Universities and other research agencies

Research priorities within universities are determined by individual staff and are highly influenced by availability of funding from a range of external sources. There is a strong tradition of collaboration between universities and CALM in the South-West Forest Region. Other institutions, such as Kings Park, and Agriculture Western Australia, conduct research in line with their corporate objectives, some of which are relevant to the South-West Forest Region.

Mining companies

The major mining companies in the South-West Forest Region carry out a range of research to identify environmental and heritage values of mine sites and associated works and to investigate ways to retain or replace these values. ALCOA, for example, commits itself in its environmental management plan for the Huntly Mine (1997), to `… sponsor and conduct research and development, including the application of emerging technologies, to improve our ability to predict, assess, measure, reduce and manage the environmental, health and safety impacts of our operations and products'.

At least the larger mining companies spend substantial sums of money on research into impacts of mining on the environment (e.g., ALCOA spends approximately $1.8 million annually on the site of the Wagerup Alumina Refinery). The extent to which research and development by the mining companies address the ecologically sustainable forest management principles varies with the requirements for restoring ecological function.

Analysis and comment

The existence of a detailed strategic plan for the Science and Information Division is a major strength of the research and development effort in CALM. The most important requirements for research and development to contribute to achieving ecologically sustainable forest management are that resources are applied to the most pressing research questions, and that results are implemented in a timely fashion. The strategic plan for the Science and Information Division addresses these issues by espousing the principal of involving Regional, District and other staff in the development of research proposals and implementation of research results. The five-step process for determining research priorities (not detailed in the 1995-1999 strategic plan) proposes mechanisms for involving potential users and external scientists in the prioritisation and approval of research projects.

In interviews with CALM staff and stakeholders, the expert advisory group heard examples of where these policies are applied, but also heard cases of research issues that are seen by District staff or stakeholders as being important yet not being given a high priority by the Science and Information Division. The new processes for formal consultation of Regional and District staff should largely remove the inadequacies of past processes, but have not been in place for long enough to prove themselves.

The involvement of the Regions and their interest in outcomes would be improved if their role included the contractual purchase of research using funds under their

control. It is also important that strategic research on issues related to ecologically sustainable forest management continues to be funded. This is achieved at present by funding of research from the Forest Resources, Nature Conservation, and Tourism and Recreation Programs.

CALM should encourage the implementation of the new processes for formal involvement of Regional and District staff in setting priorities for research and development, and planning implementation of research results in management. Strategic research should continue to be funded from the Programs but regions also should purchase research using funds under their control. CALM should periodically assess whether the processes are meeting the research needs of the Regions and Districts (see Recommendation 5.2).

CALM should pay particular attention to identifying research priorities in relation to broad-scale prescribed burning and to incorporating the results of this research into management. Several stakeholders expressed concern about this issue.

The Forest Research and Monitoring Committee provides an important opportunity for input to research priorities from a broad range of stakeholders. This group includes broad representation from community groups, government agencies and research institutions with potentially widely differing technical expertise and views on where research and development should focus. This could make reaching agreement difficult at times, or could lead to conflicts of interest where final decisions are made regarding funding of research within CALM.

The Forest Research and Monitoring Committee should be retained as a peak committee for advising on research priorities within CALM, but it should not have authority or responsibility for funding or the detail of the research program. CALM should ensure that the Forest Research and Monitoring Committee represents a wide range of stakeholder interests relevant to ecologically sustainable forest management (see Recommendation 5.3).

The external scientific stakeholders interviewed all spoke favourably of their interactions with CALM, but overwhelmingly expressed a desire to see better mechanisms for discussion of research priorities with CALM staff.

Formal mechanisms for involving external scientists in the process of strategic planning of research would allow CALM to take maximum advantage of research underway in other organisations and institutions.

The establishment of advisory committees that include external scientists (as currently proposed within the Science and Information Division) would provide a better mechanism for input of both external expertise and information on research activities outside CALM.

CALM should establish scientific advisory committees to facilitate input of external advice to research projects and to aid integration of CALM's strategic research planning with research priorities of other organisations, agencies and institutions (see Recommendation 5.4).

The expert advisory group notes that a process exists for registering all research sites in forests with CALM, but that compliance is variable sometimes leading to inadvertent disturbance of sites. This register is an important process for integrating research on ecologically sustainable forest management issues in the South-West Forest Region, and should be reviewed by CALM with a view to

achieving high compliance. Within CALM, responsibility should be allocated for collating and disseminating information on research sites

As in other States, the need for external funding of a proportion of research projects brings with it the risk that priorities will be set by the funding agencies, which might have different criteria from CALM. This possibility is minimised by the strong process of strategic planning for research within CALM, and the inclusion of a broad range of stakeholders in the review of research priorities. It is important that key funding agencies are represented on stakeholder and other advisory committees to facilitate agreement on priorities for funding.

Despite CALM's responsibility for the South-West Forest Region, it is also faced with consideration of priorities across the entire State. Limitations on resources and the magnitude of environmental issues elsewhere have led several commentators within and outside CALM to argue that for many environmental values the highest priorities are outside the South-West Forest Region.

This is a factor potentially working against achievement of ecologically sustainable forest management in the South-West Forest Region, but there is a legitimate need to prioritise research and development on a state-wide scale.

Whereas CALM is the principal repository of data on locations and distribution of plant species and species assemblages in the South-West Forest Region, the Western Australian Museum and CALM are the principal repositories of data on fauna. To facilitate development of decision support systems for fauna comparable with these existing for flora within CALM, there is a need for formal processes for jointly determining priorities for data collection and for sharing databases or developing joint databases. A consolidated fauna database for the South-West Forest Region is being developed as part of the Regional Forest Agreement and should be maintained.

The Western Australian Museum, CALM and other relevant institutions should develop formal processes for jointly determining priorities for collection of fauna data and for maintaining a consolidated database (see Recommendation 5.8).

The processes for determining research and development priorities in at least the large mining companies seem effective at targeting research to allow the companies to meet their legislative and other obligations and commitments. For this research to be an effective input to ecologically sustainable forest management, it will be important that requirements placed on the mining companies for restoration after mining take account of the full range of environmental and cultural values of the forests. For example, although there currently are requirements on mining companies to restore biodiversity and landscape values of mined sites, the expert advisory group has drawn attention elsewhere in this report to the lack of requirements to maintain productive capacity.

To guide research and development by the mining industry, the relevant land management agencies should ensure that the requirements for restoration of former mine sites take account of the full range of values related to ecologically sustainable forest management (see Recommendation 5.9).

There appears to be no coordinated mechanism for fostering the research and development of new harvesting techniques, or for facilitating the transfer of technology from overseas, interstate and within the State.

CALM and harvesting operators should develop mechanisms for fostering research and development and transferring new technology in harvesting operations (see Recommendation 5.5).

Conservation of biological diversity

- The current system
- Analysis and comment

The current system

Research and development

Research and development relating to biodiversity in CALM are carried out by the Bio-resources, Bio-conservation and Sustainable Resources groups within the Science and Information Division. Responsibilities of these groups include the following:

• inventory of systematic, biological and ecological information on the biota;

• documentation of the landscape characteristics and ecological communities of the State;

• identification of bio-resources of the State which are being diminished or degraded and of the processes responsible;

• investigation of how these processes can be managed effectively and the resources best conserved, and

• research on management and utilisation of species from which natural products are derived, including plantations.

Scientists from the Science and Information Division, as well as external scientists, are included on the teams that develop recovery plans for rare and threatened species. Among their other activities, these recovery teams identify priorities for research on the taxa on which they focus.

Review and continual improvement of the management system

Fauna and flora guidelines, which are part of silvicultural specifications, are reviewed regularly as knowledge in these areas changes quickly. There is no formal policy relating to the regularity of these reviews.

There is evidence of numerous improvements to the management system with respect to maintenance of biodiversity. This evidence is found in recent annual reports. Some recent initiatives or improvements reported in the 1995-1996 CALM annual report included:

• western shield feral animal control program;

• revision of the priority flora list (includes declared rare flora);

• establishment of a seed store for taxa threatened by dieback and other critically endangered or poorly known taxa;

• development of techniques for use of the dieback-inhibiting chemical, phosphonate;

• amendments to the gazetted list of specially protected fauna;

• preparation of interim recovery plans of taxa classified as critically endangered;

• preparation of Regional or District threatened flora management plans, and

• revision of CALM Policy Statements, for example, No. 29.

An example of the capacity for the management system in CALM to initiate major reviews where necessary is the review of roads, rivers and streams that arose from the 1987 management plan for the Southern Forest Region. The aim of the review was to improve the efficiency of the zoning system without reducing the overall area, and to provide for amenity, wildlife habitat and stream protection.

A review of management experience and research results suggested that a redistribution of zones and more flexibility in the allocation of buffer zones would improve conservation, amenity and hydrologic values of the forest. CALM published the review in March 1988. Changes recommended include retaining zones of reduced width:

• 200 m total width on all rivers (fifth and greater order streams);

• 100 m total width on third and second order streams;

• retaining zones of reduced width, and

• 400 m total width on level one roads, most level two roads and designated essential fire buffers.

A degree of flexibility was also recommended.

A seminar sponsored by the Lands and Forest Commission was held at Manjimup on 9 July 1991. The proceedings of the seminar list seventy one participants, including members of the public. The 1992 draft `Management Strategies for the South-West Forests of Western Australia' included proposals for road, river and stream zones and diverse ecotypes, for public comment. As a result, the `Forest Management Plan 1994-2003' instituted a new system of fixed travel route zones in the southern forests, with level one travel routes to have a zone of 200 m either side and level two travel routes a zone of 100 m either side. The plan also included guidelines for river and stream (riparian) zones of approximate width 30 m either side for first, second and third order streams; 75 m either side for fourth order, and 200 m either side for fifth order upwards. Diverse ecotypes (heath, sedge, herb vegetation, rock outcrops, lakes and wetlands) were also protected.

Some of these initiatives arose from routine implementation of policies with respect to flora or fauna, while others have been initiated by individuals or groups within CALM in response to a perceived need. Thus, it is clear that the various responsibilities for managing the forests for nature conservation objectives carry with them an implicit responsibility to continually assess the need for improvements to the management system. However, the expert advisory group was unable to identify any formal policies and processes for regular internal or periodic external review of the management system with respect to maintenance of biodiversity.

Analysis and comment

The apparently minor formal involvement of external scientists in setting research priorities in CALM is of particular concern with respect to biodiversity as the breadth of skills and experience to address biodiversity issues cannot be held within one agency. There are many examples of CALM initiating external collaboration to fill skill gaps, but this does not take the place of external involvement in the challenging process of determining what research is most needed to achieve sustainable management of biodiversity.

Maintenance of biodiversity is one area in which a balance of input from the Science and Information Division and District staff in setting priorities is important.

District and Regional staff are likely to identify local issues missed by Science and Information Division scientists, but many issues relating to sustainability of biodiversity are apparent at broad scales that might not be apparent to District and Regional staff. This is one reason that the expert advisory group recommended (above) only a partial move towards purchase of research by Regions.

Maintenance of productive capacity of forest ecosystems

The current system

Research and development

CALM's Sustainable Resources Group within the Science and Information Division is undertaking research to improve wood yields and identify cost-effective harvesting, establishment and regeneration procedures and profitability of native forests and plantations.

Summaries of current research projects are well documented in the reports of the CALM Science and Information Division.

Review and continual improvement of the management system

Reviews have also been carried out in fields such as inventory, fire management, and the river and stream zones (described under Principle 1 above). The harvesting codes and manual are subject to internal processes of regular review and revision. Supporting documents, such as the `Silviculture Guidelines' are based on continuing research, monitoring and internal review.

Analysis and comment

The expert advisory group recognises the strengths of the process used by CALM for the determination of research priorities. The review of these priorities by the group is not within the terms of reference for the current study. However, some stakeholders identified a number of key areas in which research activity appears to be limited, suggesting a potential deficiency in either the determination or documentation of research priorities. Such a deficiency would be minimised by greater opportunities for the involvement of stakeholders and external scientists in the research review process. Particular concern was raised in relation to the co-ordination of research within subjects areas which are subject to overlapping responsibilities. For example, the group was not able to identify a clear mechanism between CALM and the mining industry for the review and determination of research priorities for long-term studies such as the vigour of regeneration and longer term wood productivity on ex-mining sites.

The expert advisory group recognises the importance of the external reviews which have been completed for various components of CALM's management system. The group also notes that much of the science which underpins the management system is published in externally refereed journals. However, many of the prescriptive components of the management system, such as the harvesting codes and manual, and supporting documents such as the `Silviculture Guidelines', have not been directly subjected to external review. The group believes that a formal process should be introduced to ensure that regular external reviews are conducted for all components of the management system (see Recommendations 1.5 and 5.1).

Maintenance of forest ecosystem health and vitality

- The current system
- Analysis and comment

The current system

Research and development

CALM has a well developed research and development capacity, which does not draw optimally on external scientific resources. There appears to be effective liaison within CALM between and within researchers and operational managers to get the results of research implemented on the ground. A good example is the research on the use of phosphonate on threatened species susceptible to *Phytophthora*.

Review and continual improvement of the management system

Review of the research and management programs of relevance within the Science and Information Division, Environmental Protection Branch, and at the District level are carried out periodically. An external review of management for *Phytophthora* has recently been carried out. Other than this the reviews are mostly internal.

Analysis and comment

Internal review and improvement with respect to research and management on pests, diseases and weeds in CALM appears sound, but more use could be made of possibly valuable external input. Whilst CALM has put in place a well developed system for research, review and continuous improvement in public forests, much of the private forest estate is not covered by any formal system.

Conservation and maintenance of soil and water resources and maintenance of global carbon cycles

- The current system
- Analysis and comment

The current system

Research and development

The Water and Rivers Commission is relied upon for the assessment of water yield and quality. A number of catchments, especially those in jarrah forests, have been monitored over long periods of time and results suggest there is little effect of forest operations on long-term hydrological balance. These studies have included some analysis of water quality, but concentrated on salinity and potential movement of particulate matter. There has been limited analysis of major nutrients and deficiencies in methodology reduce the reliability and usefulness of that data.

Many streams and rivers which drain the forests then pass through agricultural land. Some of the better early studies showed clearly that the effects of forest operations were minor compared to the effects of agriculture, especially on water quality. Systematic assessment of water values for managed catchments is relatively poor for the karri forests (compared to the jarrah forests) despite a substantial network of gauging and sampling stations.

Early CSIRO studies focused on quantifying the major pools of nutrients in karri and jarrah forests and while these are reasonably large, there are few data on the effects of burning or logging. The mining industry has continued to research these areas, but little is being done in the remainder of the native forest estate.

There seems to be no systematic evaluation of assessing the effects of forest operations (e.g., harvesting or burning) on soil properties other than the visual assessment of the area of `damaged' soil in logging coupes. There has been no research aimed directly at the maintenance of carbon cycles though new studies in this area are proposed.

This background of research in soil, water and carbon has been produced by a centralised system of determining strategic research priorities. For example, when early studies suggested that there were few effects of logging on water quality, the priority for further research in that area diminished.

Review and continual improvement of the management system

Like most organisations, CALM undertakes an informal process of continual review and improvement. The Science and Information Division plays a major role here though almost all of its soil and water research is directed towards new tree crops. CALM's internal audit group has the capacity to review and assess the field performance in maintaining soil, water and carbon values. Outside organisations (CSIRO, universities) conduct site-specific studies of soil and water properties. The Bureau of Resource Science is about to contract a review of carbon storage in Western Australian forests and woodlands.

From time-to-time, a range of outside bodies including the Environmental Protection Authority, the Legislative Council Standing Committee for Ecologically Sustainable Development, and the Minister for the Environment conduct their own reviews for a variety of reasons and prompted by the general public or other interested parties. Those external reviews have made comment in the past on soil, water and carbon values and on the lack of data.

Analysis and comment

In the areas of soil, water and carbon, early research, mainly in jarrah forests, suggested that forest operations did not adversely affect soil and water values other than those related to dieback. Dieback research produced marked changes in forest management. It is worth noting that most of the data on water yield and quality or nutrient budgets are ten or even twenty years old. In that same period, some forests have been burnt three, or possibly even four more times, the importance of processes such as global carbon cycles and nutrient cycles has increased dramatically and technology has improved, greatly increasing our capacity to measure change.

These factors argue that there is a need to redress the lack of soil and carbon research in native forests and one might argue that the process of determining research priorities within CALM has not managed to incorporate these factors.

Part of the reason why the research process has not incorporated these issues is the lack of routine monitoring to detect trends. One approach might be to establish a simple but comprehensive network of permanent sampling points to monitor soil (including the litter layer) and soil-water properties including carbon storage and cycling. Clearly, these sample points would be best located in close proximity to CALM's permanent sample points for forest inventory or floristics or both. The network should clearly include for each forest type or ecosystem:

- long unburnt and unlogged forests;
- long unlogged forests which are regularly burnt (at a frequency suitable to the Region), and
- forests which are part of CALM's burning and logging schedule.

Soil and litter sampling should be conducted on an annual basis while water sampling could be restricted to the present network of sampling sites maintained by the Water and Rivers Commission, and detailed short-term (one to two years) analysis of soil-water at replicated selected burnt, logged or logged and burnt (as well as control) forests.

With such a network, it should be possible to determine if further nutrient and carbon budget studies are needed, especially for the lower productivity systems where a large proportion of the carbon and nutrient capital of the ecosystems resides in the biomass. The effects of logging and burning cannot be estimated without those data, and consideration should be given to this in the setting of research priorities.

Protection of natural and cultural heritage values

The current system

Research and development

CALM does not devote research resources to cultural heritage management studies other than the projects which are being undertaken as part of the forest assessment and Regional Forest Agreement processes.

Review and continual improvement of the management system

There appears to be no coherent system for reviewing performance of natural and cultural heritage management systems or for community input. Heritage values are incorporated into the provisions of the Forest Practices Code. There is no evaluation of the effectiveness of the Timber Harvesting Code such that any reliance can be placed upon the identification and conservation of heritage resources.

Analysis and comment

The absence of a heritage component to the research and development effort in CALM is significant gap with respect to achieving ecologically sustainable forest management. Survey information needs to be integrated into a single coherent document, evaluated and research priorities established.

CALM should initiate a cross-agency cultural and natural heritage research program (see Recommendation 5.6).

Timber harvesting practices present real challenges with respect to heritage management. In addition to identification, measurement and monitoring, it is essential that links be forged with communities to assess the intangible values of heritage places and landscapes. Given that CALM has no heritage management expertise assigned to the South-West Forest Region, and that research funds are limited, it is essential that it initiates collaborative research ventures until such time as it is able to internalise essential cultural and natural heritage skills. Provision for the training of CALM officers in heritage management skills must be given a priority, as should the need to develop a credible database to support its planning and operations.

Maintenance and enhancement of long/term multiple socio/economic benefits to meet the needs of societies

The current system

CALM monitors sites and entry gate counts as well as undertaking visitor surveys. The data are integrated into Vistat, a visitor statistic system. The data are compared on a year-to-year basis and examined for trends. Summaries of the information are presented in CALM annual reports.

The visitor management system is monitored at least once every three years by CALM Management Audit Branch and improvements when appropriate are implemented through the management planning process.

Analysis and comment

Dramatically increasing concern with land management practices by commercial interests and social groups which rely upon natural and cultural forest heritage resources will necessitate a comprehensive state-wide approach. Activity in this area consists of jointly-funded Commonwealth and State surveys of natural and cultural heritage. However, there is no indication of how the information from the surveys will be integrated into planning and operational structures in the absence of integrated-agency expertise in heritage management.

Areas in need of evaluation are forest-based tourism and recreation, which require resource security within the community catchment. This is perceived by some commercial operators as being reliant upon access to old growth forests. Regular workshops should be held with local community groups in order to gauge their interests and needs with respect to recreation and tourism opportunities. Small-scale commercial operators should be provided the opportunity to participate in these workshops. Community expressions of interest should be incorporated into CALM policy initiatives.

CALM has supported research on aspects of forest economics in the past but there appears to be little, if any, social research under way except that being undertaken as part of the Regional Forest Agreement process.

CALM should develop further its social and economic research program (see Recommendation 5.7).

Total websites: 163
Hyperlink #1
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Hyperlink #14
Hyperlink display text: Chapter 4
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Hyperlink #15
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Hyperlink #16
Hyperlink display text: Chapter 5
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Hyperlink #17
Hyperlink display text: rfa@affa.gov.au
mailto:rfa@affa.gov.au
Hyperlink #18
Hyperlink display text: The Expert Advisory Group
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Hyperlink #19
Hyperlink display text: The Project Management Group
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02591
Hyperlink #20
Hyperlink display text: The commitment and the policy framework
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Hyperlink #21
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Hyperlink display text: Implementation
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Hyperlink #23
Hyperlink display text: Monitoring and compliance
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Hyperlink #24
Hyperlink display text: Review and improvement
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02593
Hyperlink #25
Hyperlink display text: Concluding remarks
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02593
Hyperlink #26
Hyperlink display text: 1. The commitment and the policy framework
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02594
Hyperlink #27
Hyperlink display text: 2. Planning
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Hyperlink #28
Hyperlink display text: 3. Implementation
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02594
Hyperlink #29
Hyperlink display text: 4. Monitoring and compliance

http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02594
Hyperlink #30
Hyperlink display text: 5. Review and improvement
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Hyperlink #31
Hyperlink display text: Background
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Hyperlink #32
Hyperlink display text: The Conceptual Approach
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Hyperlink #33
Hyperlink display text: Assessment Criteria: Discussion of Principles
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Hyperlink #35
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Hyperlink #36
Hyperlink display text: Principle 3 Maintenance of forest ecosystem health and vitality
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02595
Hyperlink #37
Hyperlink display text: Principle 4 Conservation and maintenance of soil and water resources
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02595
Hyperlink #38
Hyperlink display text: Principle 5 Maintenance of global carbon cycles
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02595
Hyperlink #39
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http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02595
Hyperlink #40
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Hyperlink display text: Method of Assessment
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Hyperlink #42
Hyperlink display text: Preparation of the Assessment

http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02595
Hyperlink #43
Hyperlink display text: Public Comment and Consultation
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Hyperlink display text: Conservation of biological diversity
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Hyperlink #47
Hyperlink display text: Maintenance of productive capacity of forest ecosystems
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02598
Hyperlink #48
Hyperlink display text: Maintenance of forest ecosystem health and vitality
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02599
Hyperlink #49
Hyperlink display text: Conservation and maintenance of soil and water resources and maintenance of global carbon cycles
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02600
Hyperlink #50
Hyperlink display text: Protection of natural and cultural heritage values
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02601
Hyperlink #51
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Hyperlink #52
Hyperlink display text: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02597
Hyperlink #53
Hyperlink display text: Analysis and comment
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02597
Hyperlink #54
Hyperlink display text: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02598
Hyperlink #55
Hyperlink display text: Analysis and comment
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Hyperlink #61
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Hyperlink #62
Hyperlink display text: The current system
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Hyperlink #63
Hyperlink display text: Analysis and comment
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http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02605
Hyperlink #66
Hyperlink display text: Maintenance of forest ecosystem health and vitality
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02606
Hyperlink #67
Hyperlink display text: Conservation and maintenance of soil and water resources and maintenance of global carbon cycles
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02607
Hyperlink #68
Hyperlink display text: Protection of natural and cultural heritage
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02608
Hyperlink #69
Hyperlink display text: Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02609

Hyperlink #70
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Hyperlink #71
Hyperlink display text: Analysis and comment
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Hyperlink #73
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Hyperlink #82
Hyperlink display text: Accountabilities and responsibilities
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Hyperlink #83
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Hyperlink #84

Hyperlink display text: Resourcing of implementation
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Hyperlink #85
Hyperlink display text: Documentation
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Hyperlink #86
Hyperlink display text: Communication and transparency
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Hyperlink #87
Hyperlink display text: Knowledge, skills and training
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Hyperlink #88
Hyperlink display text: The current system
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Hyperlink #89
Hyperlink display text: Analysis and comment
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02611
Hyperlink #90
Hyperlink display text: Timber production: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #91
Hyperlink display text: Timber production and overall operation: Analysis and comment
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #92
Hyperlink display text: Fire Management: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #93
Hyperlink display text: Fire Management: Analysis and comment
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #94
Hyperlink display text: Nature conservation: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #95
Hyperlink display text: Nature conservation: Analysis and comment
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #96
Hyperlink display text: Heritage values: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #97
Hyperlink display text: Heritage values: Analysis and comment
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #98

Hyperlink display text: Pests, diseases and weeds: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #99
Hyperlink display text: Pests, diseases and weeds: Analysis and comment
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #100
Hyperlink display text: Recreation and tourism: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #101
Hyperlink display text: Recreation and tourism: Analysis and comment
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #102
Hyperlink display text: Mining: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #103
Hyperlink display text: Mining: Analysis and comment
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #104
Hyperlink display text: Minor forest products: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #105
Hyperlink display text: Minor forest products: Analysis and comment
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #106
Hyperlink display text: Apiary products: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #107
Hyperlink display text: Apiary products: Analysis and comment
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #108
Hyperlink display text: Grazing: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #109
Hyperlink display text: Grazing: Analysis and comment
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #110
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http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #111
Hyperlink display text: Water management: Analysis and comment
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #112
Hyperlink display text: The current system

http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02613
Hyperlink #113
Hyperlink display text: Analysis and comment
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Hyperlink #114
Hyperlink display text: The current system
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Hyperlink #115
Hyperlink display text: Analysis and comment
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Hyperlink #116
Hyperlink display text: The current system
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Hyperlink #117
Hyperlink display text: Analysis and comment
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Hyperlink display text: The current system
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Hyperlink display text: Analysis and comment
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Hyperlink #122
Hyperlink display text: Conservation of biological diversity
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02618
Hyperlink #123
Hyperlink display text: Maintenance of productive capacity of forest ecosystems
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02619
Hyperlink #124
Hyperlink display text: Maintenance of forest ecosystem health and vitality
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02620
Hyperlink #125
Hyperlink display text: Conservation and maintenance of soil and water resources and of global carbon cycles
http://www.daff.gov.au/content/output.cfm?ObjectID=2015727E-1258-4831-92203A60E35E22B0
Hyperlink #126
Hyperlink display text: Protection of natural and cultural heritage values

http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02622
Hyperlink #127
Hyperlink display text: Maintenance and enhancement of long/term multiple socio-economic benefits to meet the needs of societies
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02623
Hyperlink #128
Hyperlink display text: Compliance
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02624
Hyperlink #129
Hyperlink display text: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02618
Hyperlink #130
Hyperlink display text: Analysis and comment
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Hyperlink display text: The current system
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Hyperlink #138
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Hyperlink #18
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http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02606
Hyperlink #19
Hyperlink display text: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02608

Hyperlink #20
Hyperlink display text:
http://www.daff.gov.au/content/output.cfm?ObjectID=3E48F86-AA1A-11A1-B6300060B0AA00008&contType=outputs
Hyperlink #21
Hyperlink display text: Resourcing of implementation
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02613
Hyperlink #22
Hyperlink display text: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02611
Hyperlink #23
Hyperlink display text: Fire Management: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #24
Hyperlink display text: Heritage values: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #25
Hyperlink display text: Recreation and tourism: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #26
Hyperlink display text: Minor forest products: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #27
Hyperlink display text: Grazing: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #28
Hyperlink display text: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02613
Hyperlink #29
Hyperlink display text: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02616
Hyperlink #30
Hyperlink display text:
http://www.daff.gov.au/content/output.cfm?ObjectID=3E48F86-AA1A-11A1-B6300060B0AA00008&contType=outputs
Hyperlink #31
Hyperlink display text: Maintenance of forest ecosystem health and vitality
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02620
Hyperlink #32
Hyperlink display text: Compliance
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02624
Hyperlink #33
Hyperlink display text: Analysis and comment
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02619
Hyperlink #34

Hyperlink display text: Analysis and comment
http://www.daff.gov.au/content/output.cfm?ObjectID=2015727E-1258-4831-92203A60E35E22B0
Hyperlink #35
Hyperlink display text: Analysis and comment
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02622
Hyperlink #36
Hyperlink display text:
http://www.daff.gov.au/content/output.cfm?ObjectID=3E48F86-AA1A-11A1-B6300060B0AA00008&contType=outputs
Hyperlink #37
Hyperlink display text: Conservation of biological diversity
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02628
Hyperlink #38
Hyperlink display text: Protection of natural and cultural heritage values
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02632
Hyperlink #39
Hyperlink display text: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02627
Hyperlink #40
Hyperlink display text: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02629
Hyperlink #41
Hyperlink display text: Analysis and comment
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02630

Total websites: 20
Hyperlink #1
Hyperlink display text: Chapter 1
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02596&contType=outputs
Hyperlink #2
Hyperlink display text: Chapter 5
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02625&contType=outputs
Hyperlink #3
Hyperlink display text: Review and improvement
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02593
Hyperlink #4
Hyperlink display text: The Conceptual Approach
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02595
Hyperlink #5
Hyperlink display text: Principle 6b Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02595
Hyperlink #6
Hyperlink display text: Maintenance of forest ecosystem health and vitality

http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02599
Hyperlink #7
Hyperlink display text: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02599
Hyperlink #8
Hyperlink display text:
http://www.daff.gov.au/content/output.cfm?ObjectID=3E48F86-AA1A-11A1-B6300060B0AA00008&contType=outputs
Hyperlink #9
Hyperlink display text: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02606
Hyperlink #10
Hyperlink display text:
http://www.daff.gov.au/content/output.cfm?ObjectID=3E48F86-AA1A-11A1-B6300060B0AA00008&contType=outputs
Hyperlink #11
Hyperlink display text: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02611
Hyperlink #12
Hyperlink display text: Heritage values: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #13
Hyperlink display text: Minor forest products: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #14
Hyperlink display text: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02613
Hyperlink #15
Hyperlink display text:
http://www.daff.gov.au/content/output.cfm?ObjectID=3E48F86-AA1A-11A1-B6300060B0AA00008&contType=outputs
Hyperlink #16
Hyperlink display text: Compliance
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02624
Hyperlink #17
Hyperlink display text: Analysis and comment
http://www.daff.gov.au/content/output.cfm?ObjectID=2015727E-1258-4831-92203A60E35E22B0
Hyperlink #18
Hyperlink display text:
http://www.daff.gov.au/content/output.cfm?ObjectID=3E48F86-AA1A-11A1-B6300060B0AA00008&contType=outputs
Hyperlink #19
Hyperlink display text: Protection of natural and cultural heritage values
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02632
Hyperlink #20
Hyperlink display text: The current system

http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02629

Total websites: 10
Hyperlink #1
Hyperlink display text: Chapter 5
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02625&contType=outputs
Hyperlink #2
Hyperlink display text: The Conceptual Approach
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02595
Hyperlink #3
Hyperlink display text: Maintenance of forest ecosystem health and vitality
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02599
Hyperlink #4
Hyperlink display text:
http://www.daff.gov.au/content/output.cfm?ObjectID=3E48F86-AA1A-11A1-B6300060B0AA00008&contType=outputs
Hyperlink #5
Hyperlink display text:
http://www.daff.gov.au/content/output.cfm?ObjectID=3E48F86-AA1A-11A1-B6300060B0AA00008&contType=outputs
Hyperlink #6
Hyperlink display text: Heritage values: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #7
Hyperlink display text: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02613
Hyperlink #8
Hyperlink display text: Compliance
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02624
Hyperlink #9
Hyperlink display text:
http://www.daff.gov.au/content/output.cfm?ObjectID=3E48F86-AA1A-11A1-B6300060B0AA00008&contType=outputs
Hyperlink #10
Hyperlink display text: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02629

Total websites: 5
Hyperlink #1
Hyperlink display text: The Conceptual Approach
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02595
Hyperlink #2
Hyperlink display text:
http://www.daff.gov.au/content/output.cfm?ObjectID=3E48F86-AA1A-11A1-B6300060B0AA00008&contType=outputs
Hyperlink #3
Hyperlink display text: Heritage values: The current system

http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02612
Hyperlink #4
Hyperlink display text: Compliance
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02624
Hyperlink #5
Hyperlink display text: The current system
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02629

Total websites: 2
Hyperlink #1
Hyperlink display text:
http://www.daff.gov.au/content/output.cfm?ObjectID=3E48F86-AA1A-11A1-B6300060B0AA00008&contType=outputs
Hyperlink #2
Hyperlink display text: Compliance
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02624

Total websites: 1
Hyperlink #1
Hyperlink display text: Compliance
http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A02624

Total websites: 0