



CONSERVATION COUNCIL
OF WESTERN AUSTRALIA INC.

21 September 2008

Senate Standing Committee on Environment, Communications & the Arts
Department of the Senate
PO Box 6100
Parliament House
CANBERRA ACT 2600

Dear Secretary

RE: INQUIRY INTO THE OPERATION OF THE ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT

The Conservation Council of Western Australia (CCWA) is the State's peak body for community-based environment groups. It currently has 95 affiliated member groups covering a diverse range of environmental interests.

CCWA strongly supports the need for this inquiry and is pleased to have an opportunity to make the following comments.

The outcomes of approvals granted by the Commonwealth under the EPBC Act on threatened and migratory species, threatened communities, wetlands of international importance, national heritage and world heritage areas are essentially unknown as there appears to be no effective strategic or post-approval project-related monitoring. This is partially the result of the dependence on State Governments to monitor the status of the environment and the populations of threatened or migratory species and partly the result of the failure to set 'outcomes-based' Ministerial Conditions on projects under the provisions of the *WA Environmental Protection Act 1986*

Unfortunately because of the lack of reporting on the bio-physical outcomes of the environmental assessment process or of Commonwealth programs such as NHT many of the terms of reference cannot be adequately addressed.

A. COMMENTS ON TERMS OF REFERENCE

1. Findings of the National Audit Office Audit 38 Referrals, Assessments and Approvals under the Environment Protection and Biodiversity Conservation Act.

The National Audit Office found that the administration was reasonably efficient, robust and timely with respect to the bureaucratic processing requirements under the Act. However like CCWA it found it difficult to determine what the real world bio-physical outcomes might have been. This has been an almost universal failure of environmental administration everywhere including under WA State legislation. One of the consequences, apart from knowing whether resources have been used

effectively, is that both State and Commonwealth State of the Environment (SOE) reporting has had to rely on remote, bureaucratic and technically ridiculous surrogate indicators.

2. Lessons learnt from the first 10 years of operation of the EPBC Act in relation to the protection of critical habitats of threatened species and ecological communities, and potential for measures to improve their recovery.

CCWA is of the view that in Western Australia the EPBC Act has been ineffective in preventing the accelerated loss of threatened species habitats in the South-West Region, particularly for the Ring-tailed Possum and Carnaby's Black Cockatoo in areas that have experienced rapid urban development. It has also been ineffective in protecting one of the nation's most important refuges for threatened medium-weight range mammals on Barrow Island or the nesting habitat of Flat-backed Turtles from the same offshore gas development.

The Commonwealth Government's environmental legislation attempts to utilize its constitutional powers to exert influence over the States, which control land management, resource development and planning within their jurisdictions. The result is legislation which is drafted around foreign affairs (treaty) or corporations powers and as a result is indirect, complicated, convoluted and inefficient. Added to that, the Commonwealth is remote from the States, has little on-ground knowledge or influence and little on-ground compliance capacity. CCWA can not identify a single project environmental assessment where the EPBC Act has made a significant difference to the outcome. Some environmentally controversial projects subject to bilateral process have been rejected either by the EPA and / or by the State Minister (eg. Coral Coast, South West Yarragadee, Straits Solar), so we have no knowledge of what the Commonwealth's decision would have been. By contrast numerous housing developments in the South West of the State and the Barrow Island decision could have been overturned by the Commonwealth to protect threatened species but were not. It is worth noting that the Commonwealth remains invisible and unaccountable through bi-lateral assessments until the State Minister has made a decision.

Outside the States the EPBC Act has been relatively effective in delivering on its objectives. The recent decision to refuse new mining leases on Christmas Island because of the risk to its many threatened species is a rare example of this legislation doing its job.

An area where requirements under the EPBC Act may have had some effective influence over conservation outcomes has been through forcing the strategic environmental assessment of WA fisheries using the *Wildlife Protection (Regulation of Imports and Export)* provisions which were incorporated as Part 13A of the EPBC Act. This instrument was created from powers the Commonwealth has via the CITES Convention to control the trade (largely collecting 'specimens') of wildlife products. Powers to control the collecting of 'specimens' under the Convention have been utilized to regulate protected species bycatch and ecological issues in State managed fisheries. The relevant instruments make strange reading since they do not reflect the main purposes of the legislation but they have assisted in forcing some changes in State-managed fisheries (eg. sealion excluders in Rock Lobster pots or dolphin bycatch mitigation in the Pilbara Trawl Fishery). Unfortunately the value of driving these assessments looks like being short-lived because the Commonwealth's monitoring and verification and therefore review capacities are very weak.

The processes for issuing scientific permits under the Commonwealth legislation is very confused and poorly administered, again partly a consequence of the convoluted and illogical way the legislation is

written. This has almost certainly had a negative impact on getting necessary research on threatened species and communities underway in a timely manner.

3. The cumulative impacts of the EPBC Act approvals on threatened species and ecological communities

The consequences of cumulative habitat loss on threatened species populations in the south-west of the State have not been monitored or quantified but it is likely that as the result of numerous small decisions under the EPBC Act many species have become more threatened. The offsets applied to some of these projects are unlikely to have any material impact on the populations of threatened species. Some measures such as the translocation program for Ring-tailed Possums are now known to have failed.

4. The effectiveness of responses to key threats identified within the EPBC Act, including land-clearing, climate change and invasive species, and potential for future measures to build environmental resilience and facilitate adaptation within a changing climate.

At this stage CCWA cannot identify any specific examples of the EPBC Act having changed the risk profile for threatening process such as land-clearing (which is probably accelerating in WA), invasive species or climate change in this State.

5. The effectiveness of Regional Forest Agreements in delivering ecologically sustainable forest management where the EPBC Act does not directly apply.

The Regional Forest Agreement for the South-West Forest Region of Western Australia (WA RFA) was signed on 4th May 1999. It states that it:

B (b) provides for the ecologically sustainable management and use of forests in the Region (Purpose of the Agreement).

“Ecologically Sustainable Forest Management” or “ESFM” is defined in the RFA as:

Forest management and use in accordance with the specific objectives and policies for ecologically sustainable development as detailed in the National Forest Policy Statement.

The NFPS has as its first goal:

To maintain an extensive and permanent native forest estate in Australia and to manage that estate in an ecologically sustainable manner so as to conserve the full suite of values that forests can provide for current and future generations. These values include biological diversity and heritage, Aboriginal and other cultural values.

The RFA required a Forest Management Plan (FMP) for the Region to be prepared by 30th June 2004 to implement the commitments of the RFA (Clause 43, p. 13). In fact the FMP (2004-2013) came into operation on 1st January 2004.

The FMP recognises that pursuant to section 38 (1), Part 3 of the EPBC Act (Requirements for environmental approvals) does not apply to that part of the plan area covered by the RFA:

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* also contains provisions relating to the protection of nationally-listed threatened species and ecological communities. In that part of the plan area covered by the RFA, the Commonwealth and State Governments have agreed that the CAR reserve system, and the forest management system, meet the requirements of that Act for the protection of threatened flora and fauna and ecological communities (RFA clause 56). Therefore, the provisions of that Act for environmental assessment are not triggered for forestry operations. (FMP, p. 13)

The FMP has failed to deliver ecologically sustainable forest management

5.1 Failure of the FMP to maintain a permanent forest estate

The FMP allows logging in forest blocks across the whole of State forest, including jarrah forest where the rainfall is as low as 600 mm/yr and karri forest where the rainfall is 1000 mm/yr, the minimum precipitation required to sustain these species.

In 1991, CALM scientists produced a report called “The greenhouse effect and Western Australian forests.” The prognosis for the forests was so bad that CALM suppressed it, and it has never been published.

The report states that:

It is reasonable, therefore, to suggest that there would be a contraction of the major production forest types commensurate with any decline in rainfall. Arnold (1988) has mapped the likely distribution of the jarrah forest in the year 2040 solely on the basis of a 20% decrease in winter rainfall (Fig. 6). This shows a westward contraction of the eastern (dry) boundary and a southern expansion into the area presently dominated by karri, presumably reflecting a contraction of that forest type. However, the real impact of the rainfall changes will be more complex at least because of the ameliorating effect of the increment in summer rainfall (cf. Churchill 1968). Furthermore, the forest boundaries are unlikely to alter at the rate implied by the figure - typical migration rates for forest boundaries are of the order of 50-2000m p.a. (Huntley and Birks 1983; Huntley and Webb 1989; Roberts 1989). As rainfall declines, the trees on the dry margins will be subjected to increasing water stress. Productivity will decline and mortality will increase, thus the forests will become more open (woodlands) and less tall. Plants may be more vulnerable to the attacks by insect pests and pathogens during the period of stress and transition to a new structure. (Report, p. 16)

The map showing likely distribution of jarrah forest is attached (Attachment 1).

If jarrah in the eastern jarrah forest is logged, as permitted by the FMP, it is unlikely to regrow and therefore the forest estate would not be maintained, in breach of the definition of ESFM.

Also, the likely increase in winter temperatures and summer rainfall will, as the report states, “increase the period of activity of *P. cinnamomi* and may well also increase its geographic range of virulence.” This will impact adversely on the productivity and biodiversity values of the jarrah forest.

The range of karri forest is likely to contract, so some karri forest if logged now is unlikely to regrow and therefore the forest estate would not be maintained, in breach of the definition of ESFM.

5.2 Failure of the FMP to protect biodiversity values (forest species and forest habitats)

The FMP requires the establishment of Fauna Habitat Zones (FHZs) for the protection of fauna in loggable forest. Appendix 4 sets out the interim guidelines for the selection of FHZs and Appendix 3 sets out the interim guidelines for their management.

Criteria for FHZs include a minimum area of 200 ha and a total area of between 50,000 and 55,000 ha. However, DEC has interpreted this hecterage as the gross, not the net, area of loggable forest and to date, the size of FHZs has averaged 179 ha. Further, while according to Appendix 3 FHZs are supposed to be excluded from regeneration burns, in fact they are regularly subjected to such burns. This defeats the whole purpose of FHZs, which is described as follows:

The principal purpose of fauna habitat zones is to provide a strategy to meet the plan's objective of ensuring that biodiversity recovers between one rotation and the next. The zones fulfil this purpose by providing a sufficiently extensive network of areas excluded from timber harvesting in the mid-term within State forest and timber reserves. The design of the network of zones therefore applies at the landscape scale, with implementation then occurring at the forest block and coupe scales. The zones are intended to maintain both fauna populations within themselves, and to provide a source for the recolonisation of nearby areas after timber harvesting. (FMP, p. 95)

Action 7.2.2 requires DEC to prepare Guidelines for the Selection of FHZs with public consultation, submit them to the Conservation Commission for advice and have them approved by the Minister for the Environment by 31st December 2004, when they were to take effect and supersede Appendix 4. By September 2008, more than three years after the specified date, DEC has not released a draft document for public consultation.

A similar timeline for finalisation by 31st December 2004 was set for the management of FHZs (FMP 7.2.2) while the Guidelines for Soil and Water Conservation were required to be finalised by 31st December 2005 (FMP 20.1.2). For both documents, by September 2008 DEC has only reached the public consultation phase.

Thus important provisions for the protection of forest species and forest habitats have been ignored. This means that the RFA through the FMP has failed to protect the biodiversity values of the forests and that reliance of the RFA on the FMP for this purpose is misplaced.

5.3 Failure of the FMP to protect biodiversity values (threatened species)

The FMP (p. 30) has KPIs relevant to the protection of threatened flora and fauna:

| | |
|------------------------------|--|
| Key performance indicator 2 | The status of (critically endangered, endangered, vulnerable, conservation dependent) forest-dwelling species and ecological communities as determined by listing. |
| Performance measure | List of species and ecological communities and their status that tracks movements of species between protection categories. |
| Performance target(s) | No species or ecological community will move to a higher category of threat as a result of management activities. |
| Reporting | Annually with the review of the lists. |
| Response to target shortfall | The Department to investigate the cause of a change to a more threatened category and report to the Conservation Commission and to the Minister for the Environment. The Conservation Commission to evaluate the need for revision of management practices, in the context of its assessment and auditing function, in consultation with the Department. |

On 12th December 2006, the WA Environment Minister listed the Brush-tailed Phascogale (*Phascogale tapoatafa*) as vulnerable under Schedule 1 of the State *Wildlife Conservation Act 1950*. In compliance with the FMP, DEC is required to investigate the cause(s) and report to the Conservation Commission and the Minister for the Environment. By September 2008, only a draft report has been prepared for the Commission, and no action has been recommended in relation to revision of management practices. On the contrary, the draft Phascogale report confirms that the removal of Temporary Exclusion Areas (TEAs) between clearfelled gaps 15 to 20 years after the gaps are clearfelled must proceed in order for the sustainable yield set under the FMP to be achieved. This is despite the fact that the Director, Science, in DEC, Dr Neil Burrows, has stated publicly that if the TEAs are removed as planned, the arboreal mammals will become locally extinct.

On 22nd January 2008 the WA Environment Minister re-listed the woylie (*Bettongia penicillata*) as endangered under Schedule 1 of the State *Wildlife Conservation Act 1950*.

Thus since implementation of the FMP began in January 2004, two forest fauna species have moved to a more threatened category. It is therefore clear that the FMP cannot protect threatened species of fauna and that the reliance of the RFA on the FMP for this purpose is misplaced.

5.4 Failure of the FMP to protect productive values (sustainable cut of sawlogs)

The FMP sets the allowable cut based on what is calculated to be a sustainable yield for WA's timber species. However, the data and modelling used by the Department of Conservation and Land Management (CALM), now the Department of Environment and Conservation (DEC), appear to be inadequate for that purpose. What data the Conservation Council was able to obtain were deficient in that except for jarrah, the numbers of growth plots were too small to provide adequate information, and the growth plots were rarely measured at the required frequency. Summaries of the jarrah, karri and marri growth plots that the Conservation Council obtained are attached. (Attachment 2). Attempts by the Conservation Council to obtain the modelling failed, and the Department has made not remedied this situation even though it is required by Action 35.2.1 of the FMP:

The Department will develop and implement programs that seek to provide the community with educational opportunities and information on ecologically sustainable forest management, in particular information relating to the sustained yield statistics and models.

This represents a further breach of the FMP.

A copy of a report prepared for the Conservation Council of mathematical ecologist, Dr Paul Davis, in 2003 is attached (Attachment 3). In the opinion of Dr Davis,

the CALM model is probably a reasonable short-term logging scheduler, which is what I understand it to have been designed for. It is not, in my opinion, a reasonable long-term sustainability predictor. As I understand it, that is not what it was designed for, but that is what it seems to be being used for. I believe that therein lies a major problem for the Government, industry, the WA community and the forests.

For 1st and 2nd grade jarrah sawlogs the allowable cut set in the FMP is 131,000 m³ a year. However, last year it was admitted in the WA State Parliament that the sustainable cut for 1st and 2nd grade jarrah sawlogs is only 90,000 m³, which means that since 2004 the jarrah cut has been 50% higher than what is now estimated to be sustainable.

This demonstrates that the WA RFA through the FMP has failed to maintain the productive values of WA's forests in breach of the definition of ESFM and should no longer be allowed to oust the application of the EPBC Act in WA.

6. The impacts of other environmental programmes

CCWA is a centrally-based peak body and has relatively little meaningful contact with regionally-based NRM Councils. Our general impression as observers rather than participants in the various NRM schemes is that their approach to identifying so-called investment targets is somewhat unsystematic and generally controlled by the agencies or large research consortia rather than by those on the ground. The planning process would appear to lack technical rigor with little attention given to assessing the bio-physical outcomes of the expenditure against project or landscape objectives. Many CCWA affiliates have indicated a growing aggravation about the agencies delivering these programs and repeatedly vent a concern that too little is making its way down to ground level. We are also finding, as a consequence of these perceptions, that the volunteer base that underpins these programs is in steep decline.

CCWA is of the view that the NRM approach is fundamentally sound but needs to become a legislated part of state planning, supported with appropriate legislation.

7. The impact of programme changes and cuts in funding on the decline or extinction of flora and fauna

In the absence of specific reports based on the monitoring of threatened species of flora and fauna in Western Australia we have no way of making an informed comment

B. GREENHOUSE EMISSIONS

With the change in government policy on signing Kyoto the Commonwealth must now ensure adherence to targets set under international conventions. Major projects and land-use activities potentially exceeding pre-determined thresholds should now become Matters of National Significance triggering the EPBC Act or its replacement legislation.

Carbon and Forest Management in Australia

A recent study conducted by scientists at the Australian National University found that the natural forests of Tasmania, Victoria and New South Wales store very large amounts of carbon, much larger than is generally recognised, and that this carbon is released into the atmosphere when the forests are logged and burnt. They recommended that because the remaining intact natural forests constitute a significant standing stock of carbon they should be protected from carbon emitting land-use activities. Further, there is substantial potential for carbon sequestration in forest areas that have been logged if they are allowed to re-grow undisturbed by further intensive human land-use activities.

In summary, forest protection is an essential component of a comprehensive approach to mitigating the climate change problem for a number of key reasons. These include:

- For every hectare of natural forest that is logged or degraded, there is a net loss of carbon from the terrestrial carbon reservoir and a net increase of carbon in the atmospheric carbon reservoir. The resulting increase in atmospheric carbon dioxide exacerbates climate change.

- Given the long time that grey carbon will remain in the atmosphere–biosphere–hydrosphere system, maintaining the natural processes that regulate atmosphere–biosphere fluxes will be critical for moderating carbon levels in the atmosphere in the short to medium term. If natural forests are able to expand then the increased buffering capacity will act as a negative feedback on the accumulation of greenhouse gases.

The carbon dynamics of natural forests are significantly different to those of industrialized forests, especially monoculture plantations. The carbon in natural forests has a longer residence time, the system is more resilient to environmental perturbations and natural processes enable ecological systems and their component species to respond to changing conditions.

Mackey, Brendan G., Keith, Heather, Berry, Sandra L. and Lindenmayer, David B. (2008) *Green carbon: the role of natural forests in carbon storage. Part 1, A green carbon account of Australia's south-eastern Eucalypt forest, and policy implications.* © ANU E Press

We believe that similar studies of WA's forests would produce similar results. Because of the large amounts of carbon stored in natural forest vegetation and organic material in forest soils, logging and burning of natural forests should cease and the forests should be retained and, if already logged, allowed to regrow without further interference. The EPBC Act should be amended to provide for this as an effective response to climate change.

C. SUGGESTED IMPROVEMENTS TO THE EPBC ACT AND / OR ITS ADMINISTRATION

Review of Bilateral Arrangements

Western Australia is currently reviewing its EP Act to introduce a transparent upfront risk-based approach, reduce the number of levels of assessment, review policies and introduce more scientifically defensible, auditable and enforceable Ministerial Conditions.

The Commonwealth should negotiate new bi-lateral assessment arrangements with the States that:

- Require Commonwealth and community engagement in a pre-scoping risk assessment process to properly identify matters of national significance.
- Ensure that the scope of environmental investigations into 'Matters of National Significance' are clearly outlined in the referral documents (to Commonwealth and State).
- Ensure proposed investigations will provide the data for the development of monitoring programs capable of supporting outcome-based objectives and Ministerial Conditions for 'Matters of National Significance'.
- Provide Commonwealth guidelines to the State EPA and Appeals Convenor on how the 'Matters of National Environmental Significance' should be assessed at State level.

It cannot be assumed that there is sufficient information in official information systems to identify interactions with matters of 'national environmental significance' at the project level. **The opportunity for third party referrals should be introduced to the EPBC Act.**

Advice from the Commonwealth's environment agency to its Minister is not available to the public until after the decision has been made. This reduces the political accountability of the Commonwealth

Minister compared to his State counterpart. **The agency's advice should be public for a period prior to the Minister's decision to ensure appropriate transparency.**

Forest Management

- The EPBC Act should make provision for an end to logging and burning of natural forests so that the large amounts of carbon stored in natural forest vegetation and the organic material in forest soils can be retained as an effective response to climate change.
- Because the WA RFA has not established ecologically sustainable forest management, it should not be allowed to displace the operations of the EPBC Act for areas it covers for 20 years (until 2019) and therefore the sections of the EPBC Act that exclude the Act for areas with a Regional Forest Agreement should be repealed.

Greenhouse Emissions

The greenhouse emissions of projects exceeding prescribed thresholds should become matters of national significance under the EPBC Act.

The Council appreciates this opportunity to comment on the inquiry.

Yours sincerely



Piers Verstegen
DIRECTOR

Attachment 1

Likely distribution of the jarrah forest as estimated in 1991.

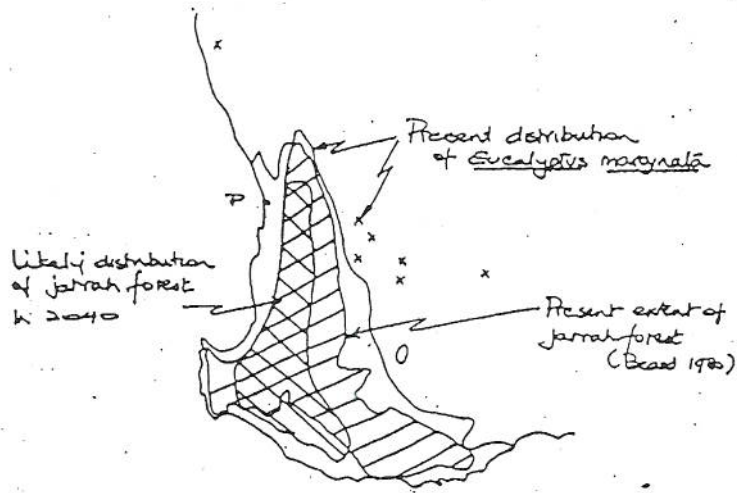


Fig 6

Permanent Sample Plots Measurement Summary*

Forest type: Jarrah dominant
Conservation Council of WA - July 2003

Number of times measured and percentage of total

| Zero | Once | Twice | Three times | Four times | Five times | Six times | Total number |
|------------|--------------|--------------|--------------|-------------|-------------|-----------|--------------|
| 27 (5%) | 179 (35%) | 174 (34%) | 79% (15%) | 47 (10%) | 2 (0.5%) | 0 | 508 |

Decade of first measurement

| "New" - not measured | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | Total number |
|----------------------|-------|-------|-------|-------|-------|-------|--------------|
| 27 | 39 | 125 | 269 | 37 | 3 | 8 | 508 |

Decade of last measurement

| "New" - not measured | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | Total number |
|----------------------|-------|-------|--------------|-------------|-------------|-------------|--------------|
| 27 (5%) | 0 | 0 | 236 (46%) | 81 (16%) | 71 (14%) | 93 (18%) | 508 |

*Information supplied in response to a Freedom of Information application by the Conservation Council for summary tables for all data sets that are being used, or will be used, to estimate growth rates for the species for which an allowable cut will be set in the new forest management plan (jarrah, karri, marri and wandoo), dated 26th April 2001.

Jarrah growth plots are supposed to be measured once every ten years. Few, if any, of the plots have been measured at this frequency.

Permanent Sample Plots Measurement Summary*

Forest type: Karri dominant
Conservation Council of WA - July 2003

Number of times measured and percentage of total

| Zero | Once | Twice | Three times | Four times | Five times | Six times | Total number |
|------------|------------|-------------|-------------|--------------|-------------|------------|--------------|
| 14 (5%) | 12 (4%) | 32 (12%) | 65 (23%) | 107 (39%) | 37 (13%) | 10 (4%) | 277 |

Decade of first measurement

| "New" - not measured | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | Total number |
|----------------------|-------|-------|-------|-------|-------|-------|--------------|
| 14 | 3 | 35 | 11 | 195 | 15 | 1 | 277? |

Decade of last measurement

| "New" - not measured | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | Total number |
|----------------------|-------|-------|-------|-------|-------|-------|--------------|
| 14 | 0 | 0 | 24 | 29 | 128 | 82 | 277 |

*Information supplied in response to a Freedom of Information application by the Conservation Council, dated 26th April 2001, for summary tables for all data sets that are being used, or will be used, to estimate growth rates for the species for which an allowable cut will be set in the new forest management plan (jarrah, karri, marri and wandoo).

Permanent Sample Plots Measurement Summary*

Forest type: Marri dominant
Conservation Council of WA - July 2003

Number of times measured and percentage of total

| "New" - not measured Null value | Once | Twice | Three times | Four times | Five times | Six times | Total number |
|------------------------------------|-------------|-------------|-------------|-------------|------------|-----------|--------------|
| 14 (22%) | 13 (20%) | 11 (17%) | 14 (22%) | 11 (17%) | 2 (3%) | 0 (0%) | 65 |

Decade of first measurement

| "New" - not measured | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | Total number |
|----------------------|-------|-------|-------|-------|-------|-------|--------------|
| | | | | | | | |

Decade of last measurement

| "New" - not measured | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | Total number |
|----------------------|-------|-------|-------|-------|-------|-------|--------------|
| | | | | | | | |

*Information supplied in response to a Freedom of Information application by the Conservation Council, dated 26th April 2001, for summary tables for all data sets that are being used, or will be used, to estimate growth rates for the species for which an allowable cut will be set in the new forest management plan (jarrah, karri, marri and wandoo).

Attachment 3

Attempts to evaluate CALM's process of predicting a non-declining yield in jarrah forest Report to the Conservation Council of WA

Paul Davis BSc (Hons), PhD; Director, Configurable Software Solutions
August 2003

Disclaimer: CALM has not seen a copy of this report, and therefore it has not been reviewed or approved by CALM. I offered to send a draft to CALM for comment, but that offer was declined.

Preamble

Several years ago, I attended an information session presented by CALM, which explained in general terms the basis of the models CALM uses to ascertain growth and increment rates, sustained (or sustainable) yield, and the allowable cut of logs from Western Australia's State forests. Since then, I have kept abreast of all the available reports, reviews and plans that have involved or used results from the models.

In the past two years, I have been tangentially involved in various FOI applications by the Conservation Council, which tried and failed to access sufficient information to evaluate the process whereby the modelling process predicts a sustained yield.

Recently, the Conservation Council and CALM agreed that if CALM made some time available to inform me in an adequately detailed fashion of the workings of the models, I would then be in a position to evaluate the concerns about the sustained yield calculation process.

The meetings

The agreement between CALM and the Conservation Council resulted in three meetings between CALM and me. All meetings were cordial and interesting, if not always as informative as I would have hoped. First CALM presented a general overview of the entire process, and recommended some reading material to refresh my knowledge. The importance of silvicultural practices, and how these are incorporated in the modelling process, was then explained to me. After this, it was agreed that JARSIM was the component of the model where most of my concerns about predictions of sustainability were centred, and that I would therefore be given detailed information about this

The last session was, I understood, meant to be an in-depth exposition on JARSIM at a technical level, so that I, as a software designer and a mathematical ecologist, could appreciate the detail, or at least taste the flavour of the detail, of the model. This meeting was not as informative as I had hoped and expected.

My concerns about CALM's process of predicting yield in jarrah forest

General concerns

Fact:

CALM did not show me a single line of computer code, nor a single actual equation. Nor did it permit me to take away with me some graphs which were printed out which showed relationships used by the model. The reasons given for this were that the work was unpublished and therefore couldn't be made public until it was published; and information could be taken and re-presented elsewhere out of context and therefore erroneously.

The Ferguson Panel recommended publication, stating that: "*The [Ferguson] Panel urges that new resources be found to support public education and dissemination (including peer-reviewed publication) programmes.*"¹

My comment:

I find it difficult to accept or trust CALM's modelling process because I have not been given sufficient information to assess whether the modelling process is appropriate.

I understand that CALM has refused to provide me the information I sought because that information has not been published. If that information remains unpublished and CALM continues to refuse to provide the information, I, and everyone else outside CALM, will continue to lack the information needed to assess the modelling process.

Fact:

CALM stated that silvicultural practices in their own right guarantee sustainability, and the modelling process simply gives an estimate of a reasonable yield that the available area can provide in any one year, and if it's too high this 10-year period, it can be changed in the next. The 'sustainability' is really because the reserve system ensures that an appreciable area is not logged at all, and even with an area that is to be logged, the silvicultural practices ensure that some areas of it are in fact not logged, for ecological, environmental and social reasons.

CALM told me that all the model does (or attempts to do) is determine how much timber the area to be logged might yield.

My comment:

From what I was shown, I believe that CALM's modelling does not amount to a valid computer or mathematical model predicting a non-declining yield. In my opinion, at the very best it is a modelling process predicting a yield, which may be sustained if the practices are indeed sustainable. My concern here is that the apparent science of a 'computer model' may lend undue credibility to the concept of sustainability possibly derived from a set of practices, and then those practices are used to justify the 'sustainable' prediction of the model! In my view, the practices (sustainable or not) and the model's predictions (sustainable or not) need to be viewed separately so they do not let each apparently justify the other in a circular argument. In my view, the results of the CALM modelling process cannot justify any comment on whether or not the practices as documented are sustainable (which a more ecological model could do), nor can it incorporate the adequacy of the enforcement of those documented practices (which the model apparently assumes to be perfect).

Fact:

CALM's 'validation' of the modelling process relies on the results being deemed 'reasonable' by those using the model, or of some comparison of the output of the model compared with that observed for a trial plot.

My comment:

In my opinion this is problematic because if the parameters or structures of the modelling process are simply modified to remove predictions deemed 'unreasonable', then the basis of the assumption of reasonability will become critical. A forester, an ecologist, an environmentalist and a logger, for instance, might all have very different definitions of 'reasonable', and the legal definition – the opinion of the ordinary person on the Clapham omnibus – is hardly pertinent here. In my view, the process as it has been explained to me may well simply result in a prediction which the designers or operators deem 'reasonable'. This seems to me to be an entirely subjective opinion, albeit a well-informed subjective opinion, apparently (but only apparently) supported by the trappings and mystique of a computer modelling process.

Fact:

I have been told by CALM that frequently the data from trial plots are used to estimate parameters for the model, and then the model output is compared with those very same data. However, it is common scientific practice to compare the output of a model with data that were NOT used in the development of the model.

My comment:

In my opinion, to compare a model's output with the data used to estimate its parameters may confirm that the process is a competent numeric mimic, but in no way validates the model's assumptions, nor its predictions.

Fact:

The literature is rife with inconsistent results from different trial plots and different experimenters.

My comment:

Whilst some inconsistencies can be explained away by untested but 'reasonable' assumptions, the possibility that there are major influences not included in the observation and modelling processes cannot be discounted.

Fact:

A significant component of the modelling process (see Appendix A) consists of the Area/Objective Allocation, whereby the outputs of SILVIA and JARSIM are input into FORSCHED. I was told by CALM that this module of the process is not a computer program or system, but a subjective evaluation by a group of knowledgeable individuals.

My comment:

Having been given no insight into this process whatsoever, I cannot comment on it other than I find it difficult to see how it can be anything other than subjective, no matter how experienced, well meaning, well qualified or well informed those individuals are. It seems to me that this is an Achilles heel in any claim of 'proof' of sustainability based on a computer modelling process.

Based on the limited information CALM provided me, in my opinion each individual sub-component of the modelling process can both be justified (usually on a best guess basis), and be challenged (usually on a "this is untested" or "this is not based on ecological or biological theory" basis), but that the overall complex mass (morass?) of the modelling process is both unjustifiable and unchallengeable. It is unjustifiable in a theoretical sense because the myriad of assumptions are not externally explicit, some are clearly untrue (even if claimed to be conservative), and any interactions between them are unknown and possibly unknowable; and unchallengeable in a practical sense for pretty much the same reasons. I don't believe I could accurately say "the model is over-predicting because of x and y". All I can say is "I do not believe the model's ability to predict is reliable in a scientific sense because much of the 'model' contains untested compromises and unanalysed best guesses massaged by subjective opinion."

Fact:

The average annual sustained yield for 10 years as stated in the proposed Forest Management Plan (pp. 30-31) is:

Jarrah 1st and 2nd grade sawlogs: 131,000 cubic metres
Jarrah bole logs other than 1st and 2nd grade sawlogs:

534,000 cubic metres

Total jarrah logs: 665,000 cubic metres

My comment:

In my opinion, the precautionary principle requires the setting of the cut at the lowest possible socially acceptable level until the most important recommendation of the Ferguson report, "*The Panel recommends that alternative approaches be developed to determine the sustainable yields of a range of forest values while maintaining critical elements of ecosystem function*", is implemented.¹

Technical

Fact:

The entire modelling process (see Appendix A) is formulated as a series of at least six independent processes: five are computer based, four are written in a version of Fortran, three use an Oracle database, and at least two (I think more) are running on the VMS operating system.

My comment:

I do not believe that in 2003 these are appropriate tools to implement an ecological computer model for the following reasons:

Fact:

VMS is a very aged operating system.

My opinion:

If not yet generally unsupported, then it will be generally unsupported soon.

Fact:

Fortran has an on-going value in supplying well tested mathematical and statistical sub-routines, but these sub-routines can also be called from much more sophisticated, more easily maintained and hugely more functional computer languages. My post doctoral fellowship research in the 1980's involved re-casting a Fortran based bog-growth model into a more modern simulation language.

My opinion:

To find Fortran the language of choice some 25 years later was very surprising to me.

Fact:

Oracle is a well-established Relational Data Base Management System often used in commerce in the past decade. Structured Query Language is a language developed, as the name implies, for querying data, not implementing models. There are several newer, arguably more cost-effective and in my opinion in many respects more functional RDBMSs available – indeed, I am currently replacing Oracle for a client with a different RDBMS for commercial, performance and functionality reasons.

My opinion:

I find it very difficult to think that anyone would choose to develop a scientific model in Oracle/SQL unless they had absolutely no other option.

The unconnected modules and complex nature of the process cause what I believe to be the following problems:

- there can be no two-way interaction between the modules;
- many assumptions are implicit, not explicit;
- there may be inconsistent, even contradictory, assumptions in different modules;
- any pathological interaction between module assumptions or formulation would be very difficult to detect;
- testing, sensitivity analysis and optimisation activities can only be carried out on a piecemeal basis;
- an attempt to repeatedly run the modelling process with all possible input variables combined in all possible ways would simply be impossible. But this is precisely what I would like to do to investigate and verify the model's behaviour!

Ecological

Fact:

The models within the process rely almost completely on estimating relationships between observed variables based on some form of statistical regression analysis, using selected data. I have seen no evidence of a single genuine biological, ecological or physiological assumption implemented in the computer modelling. (I was told by CALM that such concepts are all subsumed in the belief that predictions based on past observations are valid into the future.)

My comment:

I am concerned about the predictions of the model because, in my opinion, the approach described above is questionable when considered in light of the following facts:

- The original choice of trial plots was not randomised.
- The maintenance (or not) of trial plots is also not randomised.
- The acceptance or rejection of data is based on the 'reasonableness' of the data. Again, as with the output of the model, true but challenging data could be rejected as part of the process.
- Trial plots have been 'cut over' at the most twice, many only once, some not at all. The exact situation is not available to me. But the modelling process is predicting sustainability out for 200 years, that is several more cuts, making the implicit but untested (and to my thinking unlikely) assumption that cutting and re-cutting do not affect yield.
- Factors such as Greenhouse effect (decreased total rainfall, increased summer rainfall, increased temperature, increased carbon dioxide, etc) will have impacts on the jarrah trees and on the jarrah ecosystem - some possibly affecting growth rates positively, some possibly not - but none of these can be allowed for in a model based on past data and minimal biology.

- The model accounts for only the two commercial species, jarrah and marri, and takes absolutely no account of any other component of the ecosystem. The implicit assumption that yield is completely independent of the ecosystem of the jarrah forest may make the modelling simpler, but it is hardly persuasive when presenting a model predicting 200-year sustainability.

Conclusion

In my opinion the CALM model is probably a reasonable short-term logging scheduler, which is what I understand it to have been designed for. It is not, in my opinion, a reasonable long-term sustainability predictor. As I understand it, that is not what it was designed for, but that is what it seems to be being used for. I believe that therein lies a major problem for the Government, industry, the WA community and the forests.

¹Ferguson, I.F., Adams, M., Bradshaw, J., Davies, S., McCormack, R., Young, J. (2003). "Calculating Sustained Yield for the Forest Management Plan (2004-2013)." Stage 3 Report. Report for the Conservation Commission of Western Australia by the Independent Panel.

Appendix A: Modelling process overview (necessarily brief and incomplete)

| | | | |
|----|---------------------------|---------------------------------|----------------|
| 1 | Area | FMIS (also MAPInfo and ArcInfo) | Fortran |
| 2 | Standing Volume | IRIS | Fortran/Oracle |
| 3a | Available Volume | SILVIA | Fortran/Oracle |
| 3b | Available Volume | JARSIM | Fortran |
| 4 | Area/Objective Allocation | People | |
| 5 | Wood Form | FORSCHED | SQL/Oracle |

