BACKGROUND DOCUMENT 4

Review of Research and Monitoring Activities related to the Biodiversity Provisions of the Forest Practices System

Prepared by Mark Wapstra (Environmental Consulting Options Tasmania) and Sarah Munks (Forest Practices Authority) for the Biodiversity Expert Review Panel

29 April 2008

Trim 2011/13793

This document has been prepared by:

Mark Wapstra
ABN 83 464 107 291
Environmental Consulting Options Tasmania
28 Suncrest Avenue, Lenah Valley, TAS 7008
mark@ecotas.com.au; phone: 0407 008 685

and

Sarah Munks
Senior Zoologist (Executive Officer for BERP)
Forest Practices Authority
30 Patrick Street, Hobart, TAS 7000
sarah.munks@fpa.tas.gov.au; phone: (03) 62 33 8710

The document was commissioned by the Biodiversity Expert Review Panel (BERP), with the consultant's brief outlined as at Appendix A.

Disclaimers

The information presented is a broad overview of information considered relevant (by the authors) to the brief.

Analysis and discussion of information has been undertaken to different levels of detail.

Coverage of material related to all aspects of the brief may not be complete.

The opinions and interpretations of legislation and policy expressed in this document are made by the authors and do not necessarily reflect those of the BERP.

SUMMARY

A review of research and monitoring activities relevant to the biodiversity provisions of the *Forest Practices Code 2000* is presented.

The review addresses the historical context, administrative/policy framework, agencies involved and the relationships between agencies, and the current research and monitoring activities conducted by various agencies.

The concept of an adaptive management system is presented in relation to research and monitoring activities involving a cycle of review of information, expert input, development and implementation of planning tools, education and training, research and monitoring, and review of results for incorporation into revised management prescriptions.

Research and monitoring are often considered together in reviews of this nature, usually because supporting policy instruments include the concepts collectively in specific clauses. This document provides definitions for research and monitoring based on those found in the current literature and attempts, wherever possible, to consider the concepts separately.

Except in relation to threatened species, the concepts of research and monitoring are generic, recognised by various policies such as the *Forest Practices Act* and *Regional Forest Agreement*, but not necessarily supported by many solid policy instruments. As an example, in relation to threatened species, the "agreed procedures" require research and monitoring but the specifics of how either will be achieved is not stated, except in general terms. There is currently no policy on effectiveness monitoring for the forest practices system.

The main issue in relation to the operation of the adaptive management system is one of resource allocation and division. This is mainly in relation to a lack of real dollars for forest practices based research and monitoring activities but also in relation to appropriate resource allocation such as staff time. This lack of resource allocation causes the weakest link in the adaptive management chain at two key points: the first is as just mentioned i.e. on-ground research and monitoring; the second is in the translation of research results into modified management actions. There are potentially serious flow-on effects from the lack of a coordinated approach to forest practices research into biodiversity values, principally a gradual lack of knowledge leading to inappropriate (and outdated) management prescriptions, and a reduced credibility of the scientific rigour of the forest practices system, at several levels including individual officer level and the broader agency level.

Several agencies are involved in forest-based research and monitoring, all with differing priorities. Funding sources are limited for agencies such as the Forest Practices Authority. There is a general lack of coordination between agencies with respect to determination of research priorities, seeking funds and undertaking research leading to an *ad hoc* approach to research and monitoring of many management issues.

Several key issues are identified in this document including:

- the lack of a well defined objective of the forest practices system, and specifically the *Forest Practices Code*, in relation to biodiversity management, which means there is a lack of a framework on which to define research and monitoring objectives, actions and outcomes;

- The need for the development of a monitoring and adaptive management process that takes into account current theory and key principles (e.g. Franklin & Lindenmayer 2002);
- the need for a coordinated approach to forest practices related research and monitoring activities;
- a greater and continued commitment to resource allocation for research and monitoring activities;
- the need for an action plan supported by a budget plan in relation to the above.

Introduction

This is the fourth background document prepared to provide BERP with information relevant to the terms of reference of the review of the biodiversity provisions of the forest practices system. The first document provided information on the role of the forest practices system in the overall approach to the maintenance of biodiversity in the State, summarising the legislative and policy context. The second document delved deeper into the policy instruments and processes relating to the management of biodiversity values under the forest practices system. The third document examined in greater detail the provisions of the current *Forest Practices Code* relating to biodiversity management at both the landscape (strategic) and local (operational "in-coupe") level, specifically how the provisions facilitate implementation and how they relate to other policy instruments.

The present document relates to the research and monitoring aspects of the forest practices system, as they relate to the biodiversity provisions of the *Forest Practices Code*. This latter statement is highlighted to emphasise that it is beyond the scope of the present document to review all aspects of biodiversity research and monitoring activities that may relate in some manner to the operation of the forest practices system. However, mention is made of several related policies and reports that may have some bearing and that the BERP may wish to explore further.

This document specifically addresses items 3 and 4 of the terms of reference, which are stated as:

> 3. Review the monitoring (implementation and effectiveness) that underpins the biodiversity provisions of the Code. What are the mechanisms for delivery of adaptive management under the FP system? Is the Code sufficiently adaptive in its approach? Are there appropriate feedback mechanisms outlined in the Code?
>
> 4. Review current research relating to the distribution, ecology and impacts of forest practices on forest fauna and flora and report on future funding priorities for new information.

The present document should be read in conjunction with the first three background documents, although the relevant wording of some policy instruments is repeated in the present document such that it can be read in isolation.

The previous three background documents were:

> *Background Document 1: Legislative and Policy Context for Review of Biodiversity Provisions of Tasmania's Forest Practices System (finalised 25 May 2007).*
>
> *Background Document 2: Processes and Planning Tools to Meet Objectives and Requirements of the Biodiversity Provisions of Tasmania's Forest Practices System (finalised 29 July 2007).*
>
> *Background Document 3: Processes and Planning Tools to Meet Objectives and Requirements of the Biodiversity Provisions of Tasmania's Forest Practices System: A Review of Forest Practices Code Provisions Relating to Management of Biodiversity at Different Spatial Scales, Implementation and Relationships between Biodiversity Provisions and Other Forest Management Provisions (finalised 21 September 2007).*

In addition, the reader is referred in the text to other supporting documents, which are either included as appendices, or as stand-alone documents presented to the BERP (e.g. other background documents provided to BERP by groups such as the FPA Research Working Group).

Policy environment

For the purpose of this document, the concepts of "research" and "monitoring" will be formally defined in the following sections. First, however, the reader is provided with the policy context in relation to these concepts, via a summary of the statements made in various policy instruments. Note that only the most relevant instruments are discussed below. For more detail on the content of the listed and additional policy instruments, please refer to Background Document 1 and 2.

Note: bold emphasis below is that of the authors only.

Forest Practices Act 1985

Schedule 7 of this Act ("Objectives of the Forest Practices System of Tasmania") includes the following statement relevant to biodiversity research and monitoring activities in the context of the forest practices system:

> SCHEDULE 7 - Objective of the Forest Practices System of Tasmania
>
> The objective of the State's forest practices system is to achieve sustainable management of Crown and private forests with due care for the environment while delivering, in a way that is as far as possible self-funding –
>
> (ea) an emphasis on **research, review and continuing improvement**.

It is noted here that the Act does not define the term "research" (see discussion under the *Forest Practices Code* section for suggested implications of this). In addition, the Act does not define the concept of "sustainable management" and while the term "sustainability" is used widely, it is often poorly understood, and its relationship to the present review of the biodiversity provisions of the Code may need to be defined.

Section 37C of the Act relates to the Forest Practices Advisory Council and states two of its functions as:

> 37C. Functions of Council
>
> The Council has the following functions:
>
> (a) to advise the Authority on the review of this Act and the Forest Practices Code;
>
> (b) to advise the Authority on the quality, relevance and cost effectiveness of forest practices administration, operations and research.

The Tasmanian *Forest Practices Act 1985* also states that "the Board must…assess the implementation and effectiveness of a representative sample of Forest Practices Plans".

Forest Practices Code 2000

Section A (Introduction) of the Code states:

> "Specialists are employed by the Board to conduct **research** and provide practical management advice to Forest Practices Officers on the conservation of natural and cultural values" (p. 1)

and

> "The Act also contains compliance requirements in relation to **monitoring** and reporting upon Plans, the Code and other provisions of the Act. The Forest Practices Board conducts

> independent audits of compliance, and the results are publicly reported in the Board's Annual report to Parliament" (p. 2)

and

> "The Code contains policies and practices which have been developed as a result of **ongoing research** and practical experience. Research and innovation by landowners, contractors and the forest industry is encouraged. The Code is kept under regular review and the results of research, field experience and public input are used to make progressive improvements so that environmentally sound, socially responsible and economically acceptable production forestry can be maintained" (p. 2).

It is noted at this juncture that the above statements are the only ones in the Code that refer to the concepts of research and monitoring in any substantive context. There are some brief referrals to the concept of monitoring in other sections of the Code but mainly in relation to events such as browsing damage and eucalypt regeneration. The glossary of the Code does not contain a definition of the concepts of research and monitoring as intended by the cited examples above.

This statement highlights the need for research and monitoring, referred to in the Code, to have a context. This context would be provided if the forest practices system (either through the *Forest Practices Act* and/or the *Forest Practices Code*) had stated objectives in relation to management of biodiversity values. The Code prescribes "the manner in which forest practices are to be conducted so as to provide reasonable protection to the environment" but fails to define the terms "reasonable" or "protection", both of which are highly subjective. If these terms were defined within a broader objective for biodiversity management (e.g. similar to the stated objectives of the *Nature Conservation Act* and associated Strategy), setting priorities for research and monitoring activities would be more practical and meaningful.

The "agreed procedures" for threatened species management under the forest practices system also have some specific requirements in relation to research and monitoring, as follows:

> ***Monitoring of efficacy of prescriptions*** – The Board in association with the DPIWE will **monitor the efficacy of management prescriptions** through a coordinated approach to research.
>
> ***Research*** *– The FPB and the DPIWE will consult with landowners and other stakeholders to determine the priorities for research into the ecology and management requirements of threatened species. Both bodies will coordinate an approach to secure appropriate levels of funding from all available sources. The forest industry recognises its role in contributing to research into the effects of forest management practices on threatened species. The forest industry will consider the research needs for threatened species as part of its overall contribution to forest practices research under the terms of the forest practices research fund.*

It is noted at this point that the "agreed procedures" do not state the specific mechanisms on how the various clauses of the procedures will be satisfied by the relevant parties and to date there has been little coordination between the "FPB and the DPIWE" on this matter. In addition, it should be noted that the second paragraph that relates to "research" is out of date since there is currently no forest practices research fund.

Regional Forest Agreement 1997

The RFA includes several statements relevant to biodiversity research and monitoring activities in the context of the forest practices system. The main provisions from the main part of the RFA document are listed below (note that some non-biodiversity items have been deleted):

A. The State and the Commonwealth have agreed to establish a framework for the management and use of Tasmanian forests which seeks to implement effective conservation, forest management, forest industry practices and in particular:

- encourage the development of **forest based research**.

Research

88. The Parties agree that **continuing research** in a range of areas is vital to ensure that all aspects of forest management remain up to date with the latest information and technological developments and have outlined research priorities in Attachment 13.

89. The Parties agree to make publicly available, wherever practical, research reports relevant to the substance of this Agreement.

Attachment 10 of the RFA is titled "Improvements to Tasmania's Forest Management System" and lists several points relevant to biodiversity research and monitoring activities as follows (note that some non-biodiversity items have been deleted):

The State intends to further improve its Forest Management Systems across forest management agencies and land tenures, by:

1. Implementing the State Policy Setting New Standards for Water Quality.

2. Developing a State Policy on integrated catchment management.

3. Developing and implementing a Threatened Species Protection Strategy and recognising the role of sub-regional plans where appropriate (by 31 December 1998) and a Tasmanian Biodiversity Strategy (by 31 December 1999).

10. Continuing to adequately resource the system surrounding the Forest Practices Code (including compliance, implementation, education, training, review, **research**) and maintaining appropriate contributions by industry to ongoing management costs associated with the Code.

Attachment 13 of the RFA is titled "Priority Areas of Research" and lists several points relevant to biodiversity research and monitoring activities as follows (note that some non-biodiversity items have been deleted):

The following **research areas will be used as a guide** by the Parties when they are **examining research proposals and establishing research programs**. The Parties agree that the following areas **represent priorities for research**.

1. **Biodiversity conservation and management**

- Development of biodiversity indicators for assessing ESFM.
- Reserve management and predictive models of species, communities and successional processes for major Forest types.
- Strategic information for private landowners to protect and maintain biodiversity.
- The effects of plantation establishment and management on biodiversity conservation, both within the plantations and in adjacent natural ecosystems.
- The effects of Forest management on changes in biodiversity and other Forest values.
- Research to underpin requirements for Recovery Plans and Threat Abatement Plans and **the development of the means to assess the effectiveness of such conservation plans**.
- Taxonomy, ecology and conservation management of poorly known species.

2. Carbon budgets/flows

- Research priorities identified in the National Greenhouse Response Strategy.

- Long-term analyses of carbon flows from vegetation clearance according to broad vegetation classification.
- Estimating the impact of the following activities on the carbon cycle: fire, harvesting and plantation establishment.

3. Fire

- Environmental impacts of fire regimes and ecological management of fire.

5. Non-wood values of Forests

- Valuing non-wood uses (e.g. biodiversity, soil and water, recreation, and natural and cultural heritage).
- Possible ecological impacts of beekeeping in natural areas.

6. Pests

- Cost effective detection, evaluation of impacts, identification and control of pests and diseases in Native Forests and plantations.
- Development of integrated management systems for weeds, browsing mammals, and insect pests to reduce or eliminate chemical use.

9. Soil and water conservation

- Catchment planning to protect soil and water values on all land tenures.
- Environmental water requirements: establish baseline monitoring systems for stream flow and water quality across a range of forest types, evaluate the impact of forest operations and refine stream protection measures accordingly.

Supplement to the Regional Forest Agreement (Community Forest Agreement)

This policy identifies some key areas for research but these are in relation to three main areas: (1) tasmanian devil facial tumour disease; (2) alternatives to 1080 use; and (3) alternatives to clearfelling silviculture in oldgrowth forests. None of these items relate directly to the biodiversity provisions of the Code and are not discussed further (their importance is not commented on but they are recognised as peripheral to the operation of the forest practices system).

Sustainability Indicators for Tasmanian Forests 2001 – 2006

This formed part of the 10-year review of the *Regional Forest Agreement* and contains some important information in relation to research and monitoring activities relevant to the biodiversity provisions of the forest practices system. A full copy of this report is provided to the panel for its consideration.

The following summary statement is taken from the report:

> A scientific understanding of the characteristics and functions of Australian forest ecosystems is needed to underpin their management. In 2005-06 there were 147 personnel engaged in forest-related research at a cost of $12.4 million. This research expenditure is spread across government agencies, the forest industry and academia. Much of the current research is conducted through the CRC for Forestry based in Hobart. There were 537 research publications produced during the last five years. The majority of the research reports (508 in all, or 95 per cent) are in four of the nine Priority Areas of Research (Biodiversity Conservation and Management, Pests, Silviculture Techniques, and Soil and Water Conservation).

Implementation of the Tasmanian Regional Forest Agreement 2002 – 2007

This formed part of the 10-year review of the *Regional Forest Agreement* and contains some important information in relation to research and monitoring activities

relevant to the biodiversity provisions of the forest practices system. A full copy of this report is provided to the panel for its consideration, and should be read in conjunction with this background report (especially Appendix 1 which provides a list of relevant research reports).

The following summary statement is taken from the report:

> **Research**
>
> Priority areas for research have been reviewed. A total of 55 priority areas were identified. A list of 537 forest research publications prepared and published since 2002 has been compiled. TCFA funds have supported additional research on alternatives to clearfelling of public old growth forests, alternatives to the use of 1080 on private land, Tasmanian Devil Facial Tumour Disease and the impact of chemical usage on water catchments.

The report also reported on the implementation of recommendations from the 2002 five year review of the *Regional Forest Agreement*. The most pertinent recommendations and commentary are included below but the full report should be referred to for additional details such as full research publications lists.

> PART 2 REPORT ON IMPLEMENTATION OF RECOMMENDATIONS FROM THE 2002 FIVE YEAR REVIEW
>
> In 2002 the Tasmanian Resource Planning and Development Commission (RPDC) conducted the first five-year review of progress with implementation of the Tasmanian RFA. The RPDC provided the Governments with a Final Recommendations Report – see http://www.rpdc.tas.gov.au/public_land_use/plu_docs/plu_reg_forest_agree.htm. This Report contained a series of recommendations to the Governments.
>
> In May 2005 the Premier of the State of Tasmania and the Prime Minister of the Commonwealth of Australia signed a Supplementary Agreement to the Tasmanian RFA, referred to as the Tasmanian Community Forest Agreement (TCFA). As part of the TCFA (clause 3) the Governments agreed to implement the RPDC recommendations, except recommendation 4.5. They also agreed (clause 4) that the TCFA represents a full and final response to the RPDC Report.
>
> The following details the actions that have been taken by both governments to implement the RPDC recommendations
>
> *Ecologically Sustainable Forest Management*
>
> *Recommendation 4.1: That the State improves the accountability of the Forest Practices System. Issues to consider include:*
>
> *• improving transparency and communications, in particular, public access to information on Forest Practices Plans, through a central access point designed to improve industry consultation with neighbours and local communities;*
>
> *• improving on ground implementation of Forest Practices Plans by introducing minimum standards of training, education and accreditation of forest operatives, and introducing systems to convey the detail of the Forest Practices Code and Forest Practices Plans in a form readily available and understandable to forest operatives;*
>
> *• improving public understanding of the Forest Practices System including the Forest Practices Code, the role of the Forest Practices Board and, in particular, the public and legal policy framework in which the Forest Practices Board operates;*
>
> *• providing for a specific position on the Forest Practices Board for a person with ecological and/or conservation expertise;*
>
> *• reviewing the efficacy of the self regulatory aspects of the Forest Practices System in the next five year review of the Forest Practices System; and*
>
> ***• ensuring provision of additional funding, including from industry, to support the communication and research functions of the Forest Practices System**.*

Implementation of this recommendation is ongoing, with substantial measures to address the recommendation implemented by the Tasmanian Government since 2002. The Tasmanian Government undertook a major review of the Forest Practices System in 2004.

In September 2004, the then Minister for Infrastructure, Energy and Resources, the Hon. Bryan Green, announced a comprehensive package of major changes to the forest practices system, which included:

• The **provision of additional resources** for training, education, **monitoring** and enforcement of the Code.

The Tasmanian Parliament passed legislation in 2004 and the new Act and Regulations took effect on 1 July 2005 and 1 August 2005 respectively. Details of the changes are provided below.

(f) Continuing improvement

The Forest Practices Act 1985 now formally provides that the FPA will, at least once every five years, review the operation of the forest practices system, including the provisions and operation of the Code, and provide a report to the Minister on the outcome of that review. This does not mean that the Code will be reissued every five years. Rather, it highlights that the forest practices system must undertake research and review and maintain a program of continuing improvement.

(g) Amendment of the Forest Practices Regulations 1997

The Government has provided the Authority with resources to employ additional staff to inspect and audit operations for compliance with the requirements of the Forest Practices Code.

Additional funding has been provided to the Authority to develop and implement in cooperation with industry, minimum levels of training on the environmental care and the Forest Practices Code to all forest operatives. Upgrading of training requirements for all Forest Practices Officers has commenced.

Recommendation 4.10: That the Parties prepare a list of relevant research reports at future five yearly reviews

This recommendation has been implemented.

Attachment 13 to the RFA contained a list of Priority Areas of Research designed to be used to guide State and Commonwealth governments when examining research proposals and establishing research programs. Recommendation 4.10 of the RFA requires preparation a list of research reports relevant to these Priority Areas that have been published over review periods. A list of relevant research reports published during the period 2002-2006 is provided in Appendix 1 of this report, to inform the 2007 Review of the Tasmanian RFA.

This list has been compiled using information provided directly by a number of forest research agencies and extracted from their Annual Reports. Informing agencies were:

• Forestry Tasmania

• the Department of Primary Industries and Water

• Forest Practices Authority, Tasmania

• the Hobart node of ensis (joint venture of CSIRO and Scion)

• the Cooperative Research Centre for Forestry and its predecessor the Cooperative Research Centre for Sustainable Production Forestry

• Schools of Architecture, Geography and Environmental Studies, Plant Science, and Zoology, University of Tasmania.

Research reports have been selected if they contained research relevant to Tasmanian forestry issues. Confidential reports, conference papers and presentations, higher degree theses, and reports covering basic science applicable more broadly than Tasmania, are not included. No attempt has been made to collect relevant research reports from interstate or international research organisations since it would be difficult to make such a collection other than partial.

Research reports have been allocated to one of the nine forestry and forest science Priority Areas enumerated in the Tasmanian RFA in 1997. For each Priority Area, reports are then divided into refereed journal publications, books and book chapters, and technical reports.

A total of 537 research reports are listed, comprising 351 journal publications, 19 books and book chapters, and 167 technical reports (see Table 12). The majority of these (508 or 95 per cent) are in four of the nine Priority Areas (Biodiversity Conservation and Management, Pests, Silviculture Techniques, and Soil and Water Conservation) - these are topics that are both directly applicable to forest managers and of interest to the scientific and wider communities. The other five Priority Areas (Carbon Budgets/Flows, Fire, Heritage Conservation (Natural and Cultural), Non-Wood Values of Forests, and Social and Economic Research) are, in comparison, minor topics of research. This lack of reported activity may however partly be because these areas may be subject mostly to basic research performed outside Tasmania and/or not necessarily specific to Tasmania (Carbon Budgets/Flows, Fire), or because the research may be done mostly in combination with other research topics under which the reports are listed (Fire), or because the research may in part be carried out by organisations other than those polled here (Heritage Conservation (Natural and Cultural), Social and Economic Research).

Recommendation 4.11: That the list of priority research areas in Attachment 13 should be reviewed by the Parties, in consultation with relevant stakeholders, at future five yearly reviews to determine if priorities have changed.

This recommendation has been implemented.

In accord with Attachment 13 of the RFA, the list of research priorities relevant to the RFA and the period 2007-2011 was produced in 2006. The priorities were collated with input from CSIRO Forest and Forest Products / ensis, the Department of Primary Industries and Water, Forestry Tasmania, the Cooperative Research Centre for Forestry, and others, including the Research Priorities Coordinating Committee that reports to the Primary Industries Ministerial Council's Forestry and Forest Products Committee.

A total of 55 research priorities were identified. These have been organised in the list below under the same nine broad research areas identified in the RFA. These priority research areas can be used as a guide by the Parties when examining research proposals and establishing research programs.

Only the research priorities directly related to biodiversity management are cited below i.e. the report's category of "biodiversity conservation and management".

1. Biodiversity conservation and management

• Landscape-level requirements for persistence of forest-dependent species, including predictive biological models for species and communities in different landscape mosaics, and population viability analyses of individual species.

• Long-term ecological research on natural processes, the effects of forest management and climate change, and long-term monitoring at established sites.

• Contribution of regrowth forests to landscape-level measures of biodiversity, including comparison of forests regrowing after logging and wildfire disturbance, the effect of thinning or fuel reduction, and the development of late-successional structures.

• Contribution of plantation blocks to landscape-level measures of biodiversity, and the role of remnant native vegetation in plantation estates.

• Impact of alternative silvicultural techniques on biodiversity, with special reference to mature forest habitat features.

• Impact of forest management on flora and fauna of high conservation significance and their habitats, including value and management of retained habitat.

• Development of a coordinated approach, tools and protocols for vegetation mapping, vegetation extent and vegetation condition assessment.

• Improved systems for natural values and resource condition reporting.

• Taxonomy, ecology, population monitoring and conservation management of poorly known species, whether common or rare.

• Research to underpin Recovery Plans and Threat Abatement Plans, and development of means to assess the effectiveness of such conservation plans.

> • Research to underpin management prescriptions for Threatened Species under the Forest Practices Code, and development of means to assess the effectiveness of such prescriptions.

The review continued with several other research priorities. These were examined and not included here because of lack of direct relevance to the present review process.

National Forest Policy Statement

Research and development is listed as a key "national goal":

> **Research and development**. The goals are to increase Australia's national forest research and development effort and to ensure that it is well coordinated, efficiently undertaken and effectively applied. This research will expand and integrate knowledge about the many aspects of native forests, plantations, forest management, conservation, and forest product development.

It is noted that the term "research" is not defined in the NFPS.

The NFPS also includes the following statements in regard to the concept of "ecologically sustainable forest management and codes of practice":

> **Ecologically sustainable forest management and codes of practice**
>
> Ecologically sustainable forest management will be given effect through the continued development of integrated planning processes, through codes of practice and environmental prescriptions, and through management plans that, among other things, incorporate sustainable-yield harvesting practices. The management plans will provide a set of operational requirements for wood harvesting and other commercial and non-commercial uses of forest areas, including conservation reserves and leased Crown land.
>
> To ensure that nature conservation objectives are met in forests, the management of public native forests outside the reserve system will complement the objectives of nature conservation reserve management. Forest management agencies will continue to assess forest areas for the purpose of developing strategic management plans and, where necessary, operational harvesting plans. As a consequence of these forest assessments, areas that have important biological, cultural, archaeological, geological, recreational and landscape values will continue to be set aside and protected from harvesting operations or managed during operations so as to safeguard those values.
>
> • Accordingly, and in keeping with the 'precautionary principle', the State Governments will undertake **continuing research and long-term monitoring** so that adverse impacts that may arise can be detected and redressed through revised codes of practice and management plans.
>
> The Governments agree that the AFC's set of national principles of forest practices related to wood production in native forests (see Attachment A) should be applied to all public and private native forests in Australia.
>
> • The State Governments will ensure that, for public native forests, existing or new codes of practice are developed so as to conform with the AFC's national principles. In structure, these codes of practice may take different forms in different States, but they will be effective and either legislatively based or legally enforceable through contractual agreements. They will also reflect 'best available practices'. The codes are to apply to all commercial and high-impact non-commercial uses of public forests. They will be supported by effective prescriptions for non-commercial uses in these forests. They will also apply to conservation reserves in forests and unallocated or leased Crown lands that are forested, with the aim of ensuring that activities in these areas do not adversely affect the forests' ecological basis. The State Governments will regularly review and revise the codes of practice in light of improved knowledge of ecologically sustainable management and with appropriate industry and community consultation.

Australian Forestry Standard

The applicability of the AFS in the management of biodiversity under the forest practices system has been discussed in previous background documents. However, it is noted that the AFS makes several mentions of the concept of forest-based research but mainly in the context of other policies such as the *National Forest Policy Statement* and the *Regional Forest Agreement* i.e. it recognises existing process.

Tasmania's Nature Conservation Strategy

This strategy includes the following key "priority recommendation":

> 13 **Target well recognised gaps in scientific research**. Priorities include biological surveys and habitat mapping of marine systems, systematic surveys and research on invertebrates and non-vascular plants including their taxonomy and ecology, habitat requirements and life history of freshwater species, descriptive inventories and process research on major representative classes of Tasmanian landforms, soil systems and bedrock geology. (Action 1).

It is noted that this Strategy attempts to qualify the concept of research by use of the term "scientific", although it to fails to define research.

The strategy provides a little more guidance to these "well recognised gaps" in scientific research, identifying the following areas:

- biological surveys and habitat mapping of marine systems;
- systematic surveys and research on invertebrates and non-vascular plants, including their taxonomy and ecology;
- habitat requirements and life history of freshwater species especially fish;
- descriptive inventories and process research on major representative classes of Tasmanian land forms, soil systems and bedrock geology.

In identifying these so-called gaps in research, the Strategy goes someway to attempting to further qualify its concept of research, which incudes "biological surveys and habitat mapping" and "descriptive inventories", two areas of scientific activity traditionally thought of as "survey" rather than "scientific research".

Tasmanian Government Policy for Maintaining a Permanent Native Forest Estate November 2005 (PNFE)

The key terms of the most recent version of this policy are stated below, with the clauses related to reporting and monitoring highlighted below (essentially the entirety of clause 5 of the policy statement).

> 5. Implementation and Reporting
>
> 5.1 This Policy will be implemented through the forest practices system under the *Forest Practices Act 1985*.
>
> 5.2 Forest Practices Plans submitted for certification and Conservation Covenants and Vegetation Management Agreements submitted for approval will identify and provide details on the type and area of forest communities present.
>
> 5.3 Forest Practices Plans, and relevant Conservation Covenants and Vegetation Management Agreements will prescribe the stocking Page 5 14/11/05 standard to be achieved for forests that are to be maintained as part of the Permanent Native Forest Estate.
>
> 5.4 The Forest Practices Authority will continue to ensure that Forest Practices Plans are certified and Conservation Covenants and Vegetation Management Agreements are approved in accordance with the provisions of this policy.

> 5.5 Information with respect to the maintenance of forest communities and the achievement of reforestation standards, including composition and the maintenance of forest communities, will be reported for all operations on public and private land by way of the certificates of compliance required under s.25A of the *Forest Practices Act*.
>
> 5.6 The Forest Practices Authority will continue to independently audit a sample of Forest Practices Plans.
>
> 5.7 The Annual Report to Parliament of the Forest Practices Authority will continue to monitor and report on progress with the maintenance of the Permanent Native Forest Estate and reforestation success.
>
> 5.8 The Forest Practices Authority will take action under s.19 and other sections of the *Forest Practices Act* to ensure compliance with this policy.
>
> 5.9 The Forest Practices Authority will monitor the progressive total of all areas of native forest approved for conversion under Forest Practices Plans, Conservation Covenants and Vegetation Management Agreements and will take appropriate action to ensure that the levels defined within this policy are not exceeded, as follows-
>
> 5.9.1 The Forest Practices Authority will make decisions based upon the data for net areas converted within its Forest Practices Plan database, except as provided for under 5.9.2 below;
>
> 5.9.2 The Forest Practices Authority may make decisions where more accurate information is available on the basis of revised mapping or assessments.
>
> 5.10 A plan for the implementation of this Policy will be developed in consultation with stakeholders by 30 June 2006. This Plan will clarify issues of definition and flexible implementation required to achieve the objectives of this Policy.
>
> 6. Review of the Policy
>
> 6.1 The implementation of this policy will be reviewed as part of the successive five year reviews of the Regional Forest Agreement. The policy itself will next be reviewed by the Tasmanian Government in conjunction with the 2012 five year review of the Regional Forest Agreement.
>
> 6.2 The Tasmanian Government will progressively update and revise the mapping of native vegetation to provide a long term basis for monitoring changes in the extent and nature of the native forest estate.

Tasmanian *Threatened Species Protection Act 1995* (TSPA)

Schedule 1 (Part 1) of the TSPA states the objectives of the Act, specifically the objectives of the Resource Management and Planning System of Tasmania, as stated in the NCA.

Schedule 1 (Part 2) of the TSPA states the further objectives of the Act, specifically the objectives of the Threatened Species Protection System.

It is interesting to note that neither of these schedules (not their original versions ion the original context) use the terms “research” and “monitoring”.

Forestry Act 1920

One of the listed “functions of the corporation” is to:

> Functions of corporation
>
> (1) The corporation has the following functions:
>
> (g) to **conduct research in relation to the management of forests**.

The Act also has some research functions in relation to reserve management, as follows:

SCHEDULE 3 - Objectives for management of forest reserves

1. The objectives for the management of forest reserves are as follows:

(f) to **encourage research**, particularly that which furthers the purpose of reservation.

Research providers and administration

General comments

Several agencies undertake forest-based research. The emphasis of the research is often quite different because of the agency priorities and responsibilities.

Irrespective of the priorities of other agencies, the priority for research and monitoring by the Forest Practices Authority is in relation to the values affected by activities carried out under the *Forest Practices Act 1985* i.e. effectively the *Forest Practices Code*. However, other research and monitoring projects often have direct bearing on the forest practices system, and especially biodiversity values (e.g. research into dieback effects, monitoring of root-rot pathogen, coarse woody debris research, etc.) so it is relevant to summarise some of the current research and monitoring projects of other agencies.

Historically, the research and monitoring program of the Forest Practices Authority was (directly linked to) Forestry Tasmania's program because of the administrative and legal structure of the entities. From 1999, when the Authority became independent, there was a rapid divergence in research and monitoring projects between the agencies, with less links between them. There has been an attempt to recreate those links with the involvement of the FPA in the CRC for Forestry. However, this has had mixed success because of the CRC for Forestry's strong emphasis on research that contributes to the productivity of native forests and plantations on State forest.

Agencies involved

The following agencies are actively involved in research and monitoring relevant to the biodiversity provisions of the *Forest Practices Code*:

- Forest Practices Authority
- Forestry Tasmania (mainly the Division of Forest Research and Development)
- University of Tasmania
- DPIW (mainly Threatened Species Section but also other divisions)
- CRC for Forestry
- Independent consultants such as Freshwater Systems and ECO*tas* (with or without links to university or other agencies).

The coordination of forest-based research and monitoring is complex. The Forest Practices Authority has dedicated staff time (0.1 day a week) to a position of Research Coordinator, whose role it is to facilitate the development of research priorities by the FPA Research Working Group within the Authority but also to link to external agencies (e.g. the nationally based Research Working Group, the CRC for Forestry and Forestry Tasmania) through various mechanisms.

Relevant research and monitoring – current activities

Two key topics are covered in this background document -

- Review current research relating to the distribution, ecology and impacts of forest practices on forest fauna and flora.
- Report on future funding priorities for new information.

As mentioned above, each agency has their own priorities and focus for research and monitoring. We have attempted to summarise these in the information below. The most complete information, and probably the most relevant, relates to the activities of the FPA, CRC for Forestry and Forestry Tasmania.

Forest Practices Authority

The Forest Practices Board has responsibilities for administering the forest practices system under the *Forest Practices Act*. The Mission of the Board is to advance the objective of the State's forest practices system and to foster a co-operative approach towards policy development and management

A 2005 Science and Technology audit estimated that the Forest Practices Board spends approximately $370,000 per annum ($173,365 in salaries and $199841 in research costs) on research and monitoring (across all specialist areas). The Board's Research and Advisory Program employs specialists with expertise in forest practices, the development and implementation of codes of practice, cultural heritage, botany, geomorphology, soil science, visual landscape and zoology. These specialists provide advice to foresters on how to integrate and manage a range of values in the forests. They also undertake monitoring and research programs that contribute to scientific knowledge that underpins the *Forest Practices Code* and associated specialist manuals.

The Forest Practices Authority Research Working Group (FPA RWG) was first convened in 2003. This group comprises senior scientific staff of the Forest Practices Authority. It was set up to facilitate discussion on issues relating to research and monitoring and to provide FPAC with advice on research priorities. The group also administers the forest practices student research fund.

Research priorities are driven by the *Regional Forest Agreement* and the *Forest Practices Code*, which are both reviewed every five years. Annual updates are made to the Code based on specialist reviews and priorities are influenced – though not determined – by a national research advisory group that sets national priorities for forestry research.

Research is ongoing, with a number of small and larger projects underway at any one time. Staff specialists usually work in collaboration with research staff and students from the Schools of Zoology, Plant Science and Geography & Environmental Studies at the University of Tasmania, and with scientists from Forestry Tasmania and the Nature Conservation Branch in the Department of Primary Industries, Water and the Environment. Other partners are sourced for relevant projects as they arise. The economic and commercial benefits of forestry research are not of significant interest to the Board, given that the development, interpretation of, adherence to, and effectiveness of the *Forest Practices Code*, or required revisions to the Code constitute the primary focus.

The FPA's research and monitoring priorities and research projects current in 2006 are documented in the report by the FPA's Research Working Group attached at

Appendix B (*FPA Research and Monitoring Program 2006 – 2011: A Funding Request to Bureau of Rural Sciences*).

We have reviewed this document and can confirm that it is still the most up-to-date document that summarises FPA's research and monitoring activities and can be referred to by the BERP. It incorporates FPA priorities identified by the Research Working Group in 2006 and previous recommendations in relation to research and monitoring identified in other research reviews (see reference list in the document included at Appendix B). In suggesting that this document can be referred to by the BERP, we also recommend that it forms the basis for BERP to make recommendations for biodiversity research priority setting as part of the present review process.

We have also attached at Appendix C the latest research priorities (2007) identified by the FPA RWG. The current FPA projects are detailed in the FPA Annual Report (2007).

FPA has developed a draft research policy statement, used by the Research Working Group to guide decision-making processes (attached at Appendix D).

Forestry Tasmania

Forestry Tasmania currently allocates 3 million to research and monitoring activities (see web page). Forestry Tasmania's division of forest research and development (DFRD) undertakes research that contributes to the sustainability and productivity of native forests and plantations on State forest. This includes research into forest health and surveillance. The work of this division is summarised on an annual basis in the DFRD Annual Report (see 2006/07 Annual Report). The present document does not separate the cost of the biodiversity component of Forestry Tasmania's research and monitoring activities because this information is not readily available to the authors.

CRC for Forestry

There are two key projects being undertaken by the CRC for Forestry within the Trees in Landscape Programme 4 that have some relevance to the biodiversity provisions of the forest practices system. Relevant details of the project outlines are provided below (further information can be obtained from the CRC web page).

> 4.1 Water
>
> Project leader: Dr. Pat Lane
>
> Commencement and completion date: Commencement 1 July 2005; Completion 30 June 2012
>
> Project objectives:
>
> *Provide data for prediction of the impact of forest harvesting and other operations on stream ecosystems:* Data will be collected and collated from existing research catchments to support the development and application of models to predict the impact of forest harvesting, re-establishment and other operations on water yields, water quality and aquatic biota (e.g. macro-invertebrates).
>
> Provide soundly based prescriptions and recommendations for management of riparian zone stream buffers for maintenance of water quality and stream health. The role of buffer zones in plantations and native forests and options for their design and management during forest operations will be assessed as a basis for

recommending management procedures for optimal productivity and water outcomes.

Provide a catchment processes model suitable for the development of integrated agricultural - tree cropping systems with water benefits: Hydrological and productivity data will be measured and applied to model the environmental and water benefits of integrated tree cropping and agricultural systems in the 400-750 mm rainfall areas in southern Australia.

Strategy

Research will focus on two long-term hydrological study sites (Croppers Creek in Victoria, Warra in Tasmania) and a recently established experimental farm in the medium to low rainfall zone of WA owned by FPC. Research will be conducted under five sub-projects.

4.1.1. Integrating forestry and agriculture for productivity and environmental benefits in medium to low rainfall zones.

Leader: Dr John McGrath and/or Dr Richard Harper, WA FPC

This Western Australian project will apply existing knowledge to design integrated combinations of trees and agricultural systems for reversal of hydrologic imbalance as a cause of salinisation; will collect data to quantify their benefits in terms of tree and pasture water use; and will work with the model developers of subprogram 1.3 to improve capacity to model the effects of tree growing strategies at catchment scale.

4.1.2. Impacts of forest harvesting and re-establishment on stream yield and water quality.

Leader: Dr Sandra Roberts, Forestry Tasmania

This project will draw together observations of stream conditions pre and post harvesting in research catchments in Tasmania (harvesting of FT *E. obliqua* native forest at Warra) and other states (harvesting of HVP *Pinus radiata* in the Croppers Creek catchment in Victoria). Data from previous studies will be included as well as new observations, and the reasons for differing responses in the scale and timing of catchment responses sought from comparisons of climate, terrain and stand conditions.

4.1.3. Impacts of forest management on stream yield, water quality and hydrological processes in the riparian zone.

Leader: Dr Patrick Lane, University of Melbourne

This project will research the water quality and quantity impacts of forest management including fuel reduction burning and thinning in native forests, Best Management Practices in water quality protection and stream health maintenance from fertilisation and harvesting in plantations, and the physical processes on the hillslope and within the riparian zone that act to modulate runoff and nutrient generation and transport. Existing and historic catchment studies will be used where possible to build on and extend previous research, with the aim providing predictive tools and management guidelines for forest management.

4.1.4. Impacts of forest harvesting and management on stream health

Leaders: Dr Leon Barmuta, Utas, Dr Peter Davies, Utas and Dr Sarah Munks, Tasmanian FPA

This project will investigate the degree to which forestry operations in upper catchment areas have downstream effects on stream biota and channel/sediments. It will develop a conceptual model of the responses of stream systems to forest management practices, and integrating data from other subprojects (4.1.2 and 4.1.5).

4.1.5. Commercial forestry in the riparian zones of farms

Leader: Dr Phil Smethurst, CSIRO

This project is aimed at developing guidelines for establishing streamside forest plantations for protecting stream water quality and producing wood in catchments that will remain predominantly agricultural. Institutional and economic obstacles to riparian farm plantations will be examined, acceptable methods for their management developed, and impacts on water yield and quality and other stream characteristics quantified.

4.2 Biodiversity

Project leaders: Brad Potts / Giles Hardy. Project commenced 1 July 2005, project completion 30 June 2012.

Project objectives

Evidence of sustainable forest practices are becoming increasingly important for the Australian forest industry to enable it to receive broad community support as well as capturing the commercial and regulative incentives that flow from forest certification. This project aims to provide research to:

(i) Develop strategies, prescriptions and tools to sustain or enhance biodiversity values of production forest landscapes, including procedures for the cost-effective monitoring of biodiversity values

(ii) Prescriptions to enable key pests and pathogens to be managed in a sustainable manner using the principles of integrated pest management and in ways that reduce reliance on the use of chemicals.

Themes and subprojects

Research will be conducted under ten interacting subprojects grouped into three themes:

(i) Monitoring and managing biodiversity in forestry landscapes

(ii) Gene pool management

(iii) Sustainable management of key pests.

Potential outcomes of Project 4.2

Strategies and indicators for monitoring and managing biodiversity in production landscapes including:

- Genetic and biological indicators for monitoring sustainability criteria
- Strategies to maintain the long-term biodiversity values of production landscapes and manage the biotic interchange between plantations and adjacent native communities
- Sustainable strategies for managing populations of pests, weeds and pathogens of tree crops which reduce reliance on chemicals

Project milestones (numbers in brackets indicate sub-projects contributing towards this milestone)

- Milestone 4.2.1 Review of biodiversity values of silvicultural regimes in native forest and forest components such as coarse woody debris. Dec 2007 [4.2.1, 4.2.3]
- Milestone 4.2.2 Identification of cost-effective options for non-lethal control of marsupial damage in plantations and native forests. Dec 2008 [4.2.8]

- Milestone 4.2.3 Strategies for assessing and managing the risk of gene flow between plantations and native eucalypt populations. Dec 2009 [4.2.6]
- Milestone 4.2.4 Sustainable strategies for managing key pests and pathogens, including revised, more socially acceptable means of controlling vertebrate browsing. Dec 2010 [4.2.8-11]
- Milestone 4.2.5 Synthesise knowledge of impacts of operations in native forests and plantations on biodiversity values Dec 2010 [4.2.1-7]
- Milestone 4.2.6 Strategies for the management of keystone, dominant and listed threatened taxa in production landscapes, including improved seed zone classifications of key commercial eucalypt species. June 2011 [4.2.5, 4.2.7]
- Milestone 4.2.7 Development of strategies for assessing and managing the biodiversity values of remnant forest in production landscapes Dec 2011 [4.2.2-4.2.7]

Project deliverables (numbers in brackets indicate sub-projects contributing towards this deliverable)

- Revised prescriptions for native forest silviculture and management of coarse woody debris Dec 2008 Dec 2011 [4.2.1, 4.2.3]
- Prescriptions for non-lethal strategies for controlling marsupial browsing integrated into pest management strategies. June 2009 [4.2.8]
- Decision support system for assessing the risk of gene flow from plantations into native forest gene pools and strategies to manage this risk. June 2010 [4.2.6]
- Prescriptions for managing key pests and pathogens, including more socially acceptable, revised strategies for controlling marsupial browsing. June 2011 [4.2.8-11]
- Prescriptions for the integrated management of threatened, keystone and dominant taxa in production landscapes, including genetically based adaptive model for eucalypt seed sourcing. Dec 2011 [4.2.5, 4.2.7]
- Strategies for assessing and managing the biodiversity values of remnant forest in production landscapes adopted by industry. June 2012 [4.2.2-4.2.7]

Threatened Species Section

Research and monitoring undertaken by staff of the threatened species section has relied for the most part on external funding. Research priorities are driven by Recovery Plan actions. Current activities relating to forest practices focus on threatened hollow-using birds, the wedge-tailed eagle and the giant freshwater crayfish.

The TSS also undertake and participate in other research and monitoring activities that may have some peripheral bearing on the operation of the biodiversity provisions of the Code. For example, recent activities include involvement in surveys of rare orchids (as part of an FPA/ECO*tas*/forest industry project), extension surveys for threatened plants, some of which are forest-dependent and directly affect forest operations (an NRM funded project) and DNA analyses of threatened plants with disjunct distributions, which may affect the threat status of certain species (TSS funded).

University of Tasmania

Various schools at UTas undertake forest-based research relevant to the biodiversity provisions of the Code. Staff of the FPA have often co-supervised undergraduate and postgraduate student research projects where such projects coincide with FPA's research and monitoring priorities.

It is noted here that there has never been a well coordinated approach to FPA's involvement in UTas research projects and much of the support provided has been opportunistic. It is noted that FPA's web page now supplies some details of potential student projects and support in the form of a Student Research Grant. However, uptake has been slow and more effort is needed to make UTas schools aware of FPA's research and monitoring priorities.

Monitoring – current activities

Monitoring is divided into three key sections: (1) ecological, (2) effectiveness monitoring, and (3) implementation monitoring.

Ecological monitoring

Ecological monitoring comprises projects such as long-term ecological monitoring of a particular value but not necessarily in response to any event. This is the classic "baseline monitoring" that provides critical data in the event of some major disturbance (e.g. past monitoring of Tasmanian devil numbers, gathered through spotlighting and roadkill data, has enabled the effect of the DFTD to be examined).

The Forest Practices Authority no longer undertakes this type of baseline ecological monitoring. Historically, the longest term baseline monitoring project was the recording of physical and biological variables in Little Trimmer Cave, a project that had its impetus because of proposed forestry activities but continued when the operations did not proceed.

There are other agencies conducting ecological monitoring, and the Authority has some peripheral involvement in these types of projects. For example, DPIW traditionally conducted annual monitoring of the ptunarra brown butterfly but this has now been effectively abandoned by DPIW and is conducted only by Gunns Limited as part of their northwest grassland management strategy. DPIW also monitors the success rate of breeding raptors (independent of tenure) and the forest industry (coordinated by the Authority) has direct input of data to this project.

Effectiveness monitoring

Effectiveness monitoring is used to determine whether the management specified has achieved its objective and whether the outcome observed is a consequence of management. In making this statement, the link between effectiveness monitoring and baseline ecological monitoring is highlighted. The value of long-term ecological monitoring in allowing a determination to be made of why certain events may have been observed during the course of effectiveness monitoring is emphasised (e.g. did numbers of a species drop because of a forestry activity or was a 5-year natural dip in the population coincidentally observed?).

In relation to the biodiversity provisions of the Code, efficacy monitoring is only a formal requirement in relation to threatened species management. The "agreed procedures" state:

> *Monitoring of efficacy of prescriptions* – The Board in association with the DPIWE will monitor the efficacy of management prescriptions through a coordinated approach to research.

Efficacy monitoring comprises projects such as long-term monitoring of the response of a species, community or feature (e.g. hollow-bearing trees) in relation to the specific implementation of a provision of the Code (e.g. streamside reserve width, wildlife habitat clump location, value of wildlife habitat strips).

Historically, most of the current ecological monitoring projects have arisen due to an operational imperative such as a proposed harvesting operation in key habitat for a threatened species. These types of monitoring projects are akin to efficacy monitoring projects in that they do gather information on the efficacy of the implementation of a particular Code provision (e.g. effect of streamside reserve width in the case of rare burrowing crayfish).

Some examples of current efficacy monitoring programs being undertaken by the FPA are included at Appendix B. Some example projects include the long-term effectiveness of reserves established to protect wedge-tailed eagle nests, the longevity of retained wildlife habitat clumps, response of simsons stag beetle to different silvicultural regimes, and the response of rare burrowing crayfish to catchment disturbance.

Several miscellaneous efficacy type monitoring projects have also occurred, often in response to operational stimuli. For example, staff of Murchison District revisited several coupes supporting the rare grass *Ehrharta juncea* when management prescriptions continued to be recommended for new coupes, despite peer-reviewed evidence suggesting such prescriptions were unwarranted. The information gathered indicated that the species tolerates forestry disturbance and the species has been recommended for delisting. These types of projects highlight the importance of efficacy monitoring but also emphasise the relationship of such projects to implementation monitoring (see below).

Implementation monitoring

The Forest Practices Authority is required under the *Forest Practices Act 1985* to report to parliament on an annual basis the activities of the forest practices system. Annually the Authority conducts an "audit" of a random sample of Forest Practices Plans examining a multitude of variables, including the planning and implementation of the biodiversity provisions of the Code. Note that the Act does not specify the exact number of plans that must be audited each year.

The areas examined in the annual audit are summarised below by reference to the actual questions asked by the auditor when an FPP is assessed:

FLORA

98. FPP evaluation been correctly completed for plant communities?

99. Has the evaluation been correctly completed for priority plant species?

100. Has the evaluation been completed for sites of potential significance for flora?

101. FPP evaluation completed for effects on reserves and SMZs?

102. Have flora values been referred to FPB botanist as required?

103. Have important flora values been taken into account in FPP?

104. Have the botanical requirements of the FPP been followed?

FAUNA

105. Was all the required information supplied in the evaluation?

106. Were known localities and habitat for threatened species identified?

107. Was FPB advice sought on threatened species, if required?

108. Were prescriptions for threatened species included in FPP?

109. If present, were WHS identified and WHS prescriptions implemented?

110. If present, were faunal SMZs identified and prescriptions included?

111. Was the requirements for WHCs correctly assessed?

112. Gave FPP threatened fauna prescriptions been implemented?

113. Have WHS prescriptions in the FPP been implemented?

114. Were the SMZ prescriptions in the FPP implemented?

115. Were the WHC prescriptions in the FPP implemented?

The questions asked in the audit have evolved over several years, with significant input from FPA specialists. However, it is quite clear by comparing the flora and fauna questions that there is differential emphasis placed on different issues by different specialists. For example, the fauna questions focus strongly on threatened fauna management (probably because the planning tools, i.e. the *Threatened Fauna Manual* and the *Threatened Fauna Adviser*, are well developed) whereas the flora questions ask much simpler questions in relation to threatened flora. In addition, the flora questions include a single question on implementation of all values, whereas the fauna questions include questions on each major provision.

In addition to the annual audit conducted by the Authority, thematic monitoring of the implementation of the biodiversity provisions of the Code has been undertaken by specialists within the FPA. These include the major monitoring project undertaken by the Zoology Program examining a large set of FPPs for two widely separated years (data yet to be analysed), an informal monitoring of the implementation (and where opportunity arose, effectiveness) of threatened flora management prescriptions in FPPs (early reporting, draft only, project in hiatus), and monitoring of the implementation and longevity of retained Wildlife Habitat Clumps (Duhig *et al*. 1999).

At present, the authors are unwilling to comment further on the adequacy of the specific questions posed by the fauna and flora components of the Board audit because the current projects cited above may provide substantial information on this matter. The main monitoring program described (i.e. the comparison between years of the implementation of fauna provisions included in a large number of forest practices plans) is in effect a “monitoring of the monitoring” and will likely highlight areas where the current Board audit is adequate and where further detail is needed.

Implementation monitoring is considered a core legislative and administrative requirement and is funded by parliament and the forest industry. The detail of the monitoring is reviewed by independent and in-house parties, and includes consultation with specialists. Compliance monitoring has direct links to certain biodiversity provisions of the Code, most notably the "agreed procedures" for threatened species management, which state:

> 5 *Monitoring of compliance* – Compliance with the provisions of the Forest Practices Plan, including provisions that relate to threatened species, will be assessed by a Forest Practices Officer and a report on compliance will be lodged with the FPB within 30 days of the expiry of the plan, as required under s.25A of the *Forest Practices Act*. The Board will publish information on compliance in its Annual Report.
>
> 6 *Independent audit and enforcement*– The Board will audit the standard of planning and the degree of compliance with the implementation of the provisions of the Code and Forest Practices Plan, including those that relate to threatened species as part of its annual audit. Results will be published in the Board's Annual Report, as required under s.4 of the *Forest Practices Act*. Appropriate action will be taken with respect to instances of poor planning, or failure to comply with the provisions of a plan, in accordance with the provisions of the *Forest Practices Act*. Potential breaches of the *Threatened Species Protection Act* will be reported to DPIWE as soon as practicable.

It is beyond the scope of the present document to review the adequacy of the current biodiversity component of the Authority's compliance auditing program.

Time and funding

Traditionally, specialists within the Forest Practices Authority (originally the Forest Practices Unit and then the Forest Practices Board) aimed to spend about 50% of their time dedicated to research and 50% of their time dedicated to providing advice, education services and some monitoring activities. In the early days of the FPU, this level of research was regularly achieved, to differing degrees, by different specialists, and the "gang of four" (the first appointed scientific staff at FPU) undertook a range of research projects. By mid 1995, all the specialists were actively lamenting the loss of research funds and time and most of the annual "biodiversity/silviculture reviews" was spent discussing this state of affairs.

During the late 1980s and into the early to mid 1990s, there were several State and Commonwealth funding opportunities such as the State-based Tasmanian Forest Research Council (TFRC) and the Commonwealth-based National Estate Grants Program (NEGP). As the 1990s progressed, funding sources "dried up" (although there was a brief flush of funds for specific projects during the Comprehensive Regional Assessment that preceded and formed part of the *Regional Forest Agreement* period), and specialists continued to indicate their concern at the loss of research funds and time.

The concept of research was always seen as fundamental to the credibility of the forest practices system and the scientists employed within the system. It is interesting to note that the peer-reviewed scientific output of some FPU scientists in the 1990s consisted almost wholly of non-forest industry related research findings (i.e. output from externally funded projects, academic based collaborations or activities pursued outside work time).

During the latter part of the 1990s and into the early 2000s, FPA scientists starting seeking alternative funding sources for forest-based research. This part of the history of research is addressed in the document included at Appendix B.

Adaptive management

The key questions are:

- What are the mechanisms for delivery of adaptive management under the forest practices system?
- Is the Code sufficiently adaptive in its approach?
- Are there appropriate feedback mechanisms outlined in the Code?

The Code itself is a seemingly fairly static document. The first version of the Code was released in 1987, the second in 1993 and the current version in 2000. The present BERP review forms part of a broader intended review of the Code, so it can be seen that the Code is on a 5-8 year review and release cycle.

However, Section A2 of the Code states:

> The Code is supported by other manuals and technical instructions that are endorsed from time to time by the Forest Practices Board after consultation with the Forest Practices Advisory Council. Forest Practices Officers will use these documents and follow instructions issued by the Board.

This statement is, in essence, an excellent example of the concept of adaptive management. The statement, especially when read in conjunction with Schedule 7 of the *Forest Practices Act* (objectives of the forest practices system), recognises the inherent need for the Code to be able to adapt to change (i.e. an "emphasis on research, review and continuing improvement"). This clause of the Code can be delivered because of Section 19 of the Act, which states:

> 19. Authority to certify or refuse to certify forest practices plan
>
> (1) Where an application for the certification of a forest practices plan is made in accordance with section 18, the Authority may -
>
> (a) certify the plan; or
>
> (b) refuse to certify the plan; or
>
> (c) amend the plan in such manner as it considers necessary and certify the plan as so amended.

So while the Code itself does not change within the cycle period, some provisions can. This point is best explained by way of some examples.

The Code has a Basic Approach statement in regard to protecting susceptible vegetation from infection by root-rot fungus and refers to some generic hygiene measures. When the current version of the Code was released, root-rot fungus was not formally listed as a threatening process on the EPBC. Post-Code release, this status was recognised and the State and Commonwealth governments worked actively to develop policy. It is through an FPAC endorsed technical note, formally issued by the Authority, that FPOs can address this Code provision in detail, thus also meeting Commonwealth/State policy requirements.

Another example comes from threatened fauna management. The Code clearly requires FPOs to use the *Threatened Fauna Manual* and *Threatened Fauna Adviser* under the "agreed procedures", However, because of the gap between Code versions and *Threatened Fauna Adviser* versions, new species are added to the schedules of the *Threatened Species Protection Act 1995*. The "agreed procedures" are sufficiently flexible to allow the Authority to add such species to the manual and provide advice to FPOs through a consultative mechanism between government agencies. The

procedures specifically state that major changes to the *Threatened Fauna Adviser* require consultation between various parties and formal endorsement by FPAC and the Scientific Advisory Committee. This is a key component of the agreed procedures that has been ignored by some involved in the provision of advice in relation to threatened fauna leading to confusion within the forest industry as to who gives advice, what sort of advice will be delivered and how the advice will be delivered (and sometimes when).

At a broader level, there are several mechanisms for achieving an adaptive management outcome under the forest practices system. Above have been explained some of the "coal face" type of mechanisms, which include the following types of planning tools:

- technical notes such as the flora and fauna technical note series;
- modifications to special values evaluation sheets;
- release of documents such as interim guidelines (viz. class 4 guidelines);
- provision of information to meet specific Code provisions (e.g. threatened vegetation community information sheets);

It should be noted that there has been some concern expressed over the mechanisms described above by FPOs and industry management because items such as technical notes, at least in their earlier incarnations, were seen as "additions to the Code" and ways of changing the "goal posts" without consultation. The use of the FPAC to endorse such interim management tools has allayed such fears (at least from a forest industry perspective) such that these types of tools now appear to have wide acceptance as a practical means of explaining the Code provisions and achieving good outcomes. It is noted that it is the role of FPAC to advise the Board so it is important that FPAC is well balanced in its composition to ensure a non-biased consideration of biodiversity matters (such that conservation and socio-economic values receive equal attention).

At a broader level, the entire forest practices system can be viewed as an adaptive management system. As can be seen from the cited sections of the Code and Act, there is a strong emphasis on research, monitoring and continued improvement.

The forest practices adaptive management process, in relation to many biodiversity values, can be summarised as follows:

a. The most up-to-date information is gathered from published and non-published sources to determine the 'expert opinion' with respect to the value in question and its likely response to various forms of forest management;

b. The science and expert opinion is used to develop management actions for the value. This may be done through a technical working group (e.g. fauna/flora strategic planning groups, hollows working group) set up for the particular value;

c. Comment is sought from the stakeholders, particularly the practitioners, on the proposed management actions and any associated implementation tools (e.g. policies, DSS, technical notes, etc.);

d. Endorsement for the management actions is sought from the relevant committees as required by policy or legislation, such as TSSAC (for threatened species) and FPAC (for forest practices);

e. The final decision on adoption or amendment of the management actions and any associated implementation tools is made by the Forest Practices Authority;

f. Training, education and awareness programs are conducted on a regular basis for forest practices officers, other planning and supervisory staff employed throughout the forest industry and landowners;

g. The management actions are implemented through effective and efficient planning tools and procedures;

h. Research is conducted to improve understanding of the value in question and its response to different impacts;

i. Monitoring is carried out by specialists to assess the efficacy of management prescriptions;

j. The management prescriptions are reviewed and revised on a regular basis to incorporate the findings of new research, results from monitoring and operational experience.

The weak point of this adaptive management process is the lack of resources (i.e. funding and time allocation). The gathering of relevant information (part a) is a continual process undertaken by FPA specialists but also by external agencies (e.g. the FPA is advised by expert opinion on the management of eucalypt hybridisation by University specialists), management prescriptions are continually being developed by FPA staff (part b) and then implemented through planning tools (e.g. production of technical notes, information sheets, etc.). Training (part f) is undertaken regularly and is probably not a critically weak link in the adaptive management chain (this issue is already being considered by the BERP).

While the issue of resource allocation is highlighted as an issue at all levels of the adaptive management process, it is at the research (part h) and monitoring (part i) parts of the adaptive management chain that the link is weakest. While the will to undertake research and monitoring is present, the lack of funding sources to effectively implement a coordinated research and monitoring program means that these activities are either undertaken at a much lower level of detail (e.g. less study sites, less information collected), delayed (e.g. much of the desired research program is simply awaiting funds) or never undertaken. This means that the review of management prescriptions (part j) may not happen or be delayed. Another critical area that lacks funding and time is the translation of research and monitoring results into management prescriptions.

A real world example is the *Threatened Fauna Adviser*. This planning tool now forms an integral part of the Code and satisfies many State and Commonwealth policies in relation to threatened fauna. Through routine work duties of FPA staff, parts a-g of the adaptive management chain have been undertaken since the release of the *Adviser*. However, a formal review of the Adviser has been long delayed because of various administrative and funding issues. In addition, many areas of research on particular species included in the *Adviser* have not been undertaken such that any review of the *Adviser* is unlikely to recommend significant changes for some species. Almost all species included in the *Adviser* have not received formal monitoring of the efficacy of prescriptions delivered for their management. This means that any review of the *Adviser* (part j of the adaptive management chain) will only be partial and somewhat superficial in relation to many species. For some other species, where the research and monitoring has been undertaken (by FPA and/or other agencies), the review may be detailed and in depth but this will depend on the manner in which the

research results are supplied. An example of this is the swan galaxiid hydrological modelling undertake by Forestry Tasmania in response to a particular operational issue. Despite the detailed modelling, the results of the work have not resulted in either advice being provided to the District or a modification to the manner in which the species is considered.

Another example is the PVA modelling undertaken by University of Melbourne researchers. Their work reported on possible extinction of the wedge-tailed eagle because of forestry activities but due to lack of resources, their work was not reviewed and incorporated into any management planning and implementation (for the record, it took an adversarial federal court case to cause a review of the work, and to date, there remain no formally recognised changes to the *Threatened Fauna Adviser*, or the manner in which wedge-tailed eagles are managed). These sorts of examples highlight the critical area of interagency communication and need for a coordinated approach to research activities, with a mechanism for feedback into the system.

The question of whether the Code has sufficient feedback mechanisms for the delivery of an adaptive management system is perhaps better addressed at a higher level (because the Code has an inbuilt mechanism for adapting between versions as described above). It is perhaps more important that the forest practices system is sufficiently adaptable to bring in new information and to ensure that this new information is gathered in a timely manner i.e. making sure that the best approach is being used at all times. The Code is able to deliver "coal face" adaptive management but can the broader system deliver "strategic" adaptive management? The intent is certainly encapsulated in the *Forest Practices Act* (and various other forest policy and nature conservation policy instruments) but the detail of the mechanism (e.g. surety of funding for research and monitoring and subsequent review, adoption of results and development of planning tools) is less clear.

One of the difficulties in attempting to answer this question is the lack of clearly stated objectives for biodiversity management under the forest practices system, and the relationship of these objectives to other nature conservation policies, industry needs and community expectations.

Key issues and recommendations

The following key issues and recommendations are made by the authors and do not necessarily reflect the view of the BERP, the Forest Practices Authority or other agencies. They are presented, however, to stimulate discussion and be a source of information to assist the BERP on consideration of the role of research and monitoring in the management of biodiversity via the forest practices system.

REVIEW AND COORDINATION GROUPS

We have identified three main "groups" currently involved in decisions regarding research and monitoring priorities relevant to the biodiversity provisions of the forest practices system: FPA's Research Working Group (this group comprises senior scientific staff of the Forest Practices Authority and provides FPAC with advice on research priorities – see Appendix D), the national Research Working Group 4 and the CRC for Forestry. To a certain extent, overall research and monitoring priorities are decided under a broad policy framework (e.g. the *Regional Forest Agreement*) but many projects arise on an *ad hoc* basis, often in response to a particular

operational issue, the sudden availability of opportunistic funds or a particular interest of a student/research group.

The position of a Research and Monitoring Coordinator within the Forest Practices Authority should be formally recognised and a clear set of directions, especially in relation to coordinating priorities between agencies, provided. This is important to ensure that any forest-based biodiversity research relevant to the machinations of the forest practices system is known to the FPA and input can be provided. It would also help to ensure that any outcomes from such research are used to inform the development of actions in an adaptive management manner. It has already been noted that different agencies have different priorities for research and monitoring objectives and projects so incorporation of FPA's "needs" into other agency programs may be difficult.

ACTION PLAN / RESEARCH POLICY

An FPA-based action plan is needed in relation to research and monitoring activities. This would highlight the importance of research and monitoring activities, ensure that research activities fit into a broader framework of priorities, ensure dedication of in-house resources and increase understanding of the relative contribution of research and monitoring to each section within FPA.

This action plan would incorporate recognition of existing research groups, such as those mentioned above, and a budget plan (see below).

This action plan would also identify the role of each agency in undertaking research and monitoring activities relevant to the forest practices system to avoid issues that have arisen in the past (e.g. is TSS or FPA responsible for efficacy monitoring of eagle nest management under the "agreed procedures", and if both as is suggested by the agreed procedures, which is the lead agency, why is that the lead agency, and where does the funding come from, etc.).

BUDGET PLAN

A budget plan needs to accompany the action plan, which identifies know sources of funding and potential sources of funding (and dedicates resources to actively seeking funds for research and monitoring activities).

FOREST PRACTICES BIODIVERSITY RESEARCH AND MONITORING FUND

A dedicated fund for undertaking research and monitoring activities should be established to allow specialists to continue existing projects, resurrect old projects (i.e. the numerous "grey literature" data sets held by FPA), support University postgraduate projects on a regular basis (e.g. 1-2 Honours projects a year, etc.), participate in presentation of research findings (i.e. conference attendance, etc.), and organise and participate in thematic symposia (e.g. class 4 research, hollows research, coarse woody debris research, etc.).

A well managed research fund is seen as not only critical in achieving the broader higher priority research and monitoring projects (e.g. as outlined in Appendix B) but also for providing for short-term "emergency" types funding for smaller projects. Several recent examples of these small projects come from the flora section of the FPA's Biodiversity Program and include monitoring of the implementation of

management prescriptions for "oldgrowth" *Acacia pataczekii*, establishment of long-term monitoring plots for *Pterostylis atriola* in a State forest coupe near Railton, and participation in a joint government-industry-private research project on *Prasophyllum stellatum*. Individually these projects add small amounts of information to the base knowledge about threatened flora in the State but collectively are highly important for developing "better" management prescriptions for not only threatened flora but various other values requiring management at the in-coupe level. Such projects are not resource hungry in the first instance but become more labour intensive if such projects are presented to a wider audience (e.g. conference posters, short articles in newsletters, etc.).

This fund should be administered by an advisory panel (made up of industry and research specialists) that can advise the Board on the distribution of funds in accordance with priorities agreed to by the Board (e.g. as advised by the FPA's Research Working Group or FPAC or by the recommended Action Plan).

RESEARCH SITES

There is no clear indication of 'active' research and monitoring sites in the current forest management database system (except Forestry Tasmania's self-managed MDC system) to alert forest planners to the presence of such sites. There is a mechanism for inclusion of such sites into planning systems via the online Threatened Fauna Manual. For example, this manual includes the long-term monitoring sites for simsons stag beetle and swift parrot. With the proposed demise of this database (to be replaced by DPIW's *Natural Values Atlas*), there is a potential for loss of this critical planning 'flag'.

MANAGEMENT OF DATABASES

Effective management of databases is critical to effective management of biodiversity values in production forests. It requires a coordinated approach between agencies and independent researchers. A case example of the importance of keeping databases up to date for planners comes from the recent federal court case. A University researcher made claims regarding the potential suitability of certain forest types for a threatened species, basing this information on collected specimens. Setting aside the fact that the research itself that led to this locality was not undertaken in consultation with the land manager, the fact that this information was not provided to any agency (even though required by law under permit conditions) meant that there was no practical way in which (a) the site could be managed on the ground and (b) that the information could be reviewed and incorporated into the decision-making process.

The shift from FPA's *Threatened Fauna Manual* to DPIW's *Natural Values Atlas* is both advantageous and concerning. If coordination of databases is seen as important, then this shift of management responsibility is critical. However, if accurate management of information is seen as important, then this shift is potentially concerning. DPIW has a long history of poor database management. There are many problems with the *Natural Values Atlas* system that need to be dealt with before the system should be adopted by the FP system.

PROFESSIONAL CREDIBILITY

A high output of peer-reviewed research is critical to the professional credibility of the research scientists involved in the forest practices system and the credibility of the system itself.

It is important that research results are disseminated to a wide audience through an appropriate forum. Many Tasmanian agencies are '"sitting" on unpublished research and monitoring data or data is held in the "grey literature" (internal reports). It is important that this backlog of information is published but this will require a shift in the commitment of resources.

Publication of research finding in high ranking journals (and presentation at international conferences) is critical to the credibility of a system that currently recognises the key role of research in the adaptive management framework. Publication to this standard is a resource-hungry process. The recent Old Forests New Management Conference highlighted the time involved in preparing and presenting information at an international level and the critical importance of this interactive process.

Linked to this issue of credibility of the individuals involved and the system itself, is the concept of professional morale and motivation. Research scientists require the input of peers to allow for effective design and implementation of research projects. The researchers within a small agency such as the FPA have the potential to become insular in their thinking and implementation of research projects. Dedication of resources to national and international collaborations should be provided to allow for exchange of ideas (eg. conference attendance, working group membership, study tours, etc.).

ADAPTIVE MANAGEMENT AND RESOURCE ALLOCATION

The concept of adaptive management, and its key components, needs to be formally recognised in the *Forest Practices Act* and *Forest Practices Code*, with clear links to a policy environment that actually allocates appropriate resources to the funding of all aspects of the adaptive management chain i.e. review, education, development of tools, endorsement/adoption process, research and monitoring, review, and so on.

At present, the lack of resource and political commitment is highlighted as a critical issue resulting in an insufficient amount of research and monitoring and the translation of results of such activities into on-ground actions.

One of the main issues is the lack of a clear agreed process and resources for the endorsement and adoption phase of the process.

Appendix A. Consultant Brief

Project

Review of processes for conservation of biodiversity under the Forest Practices Code (2000)

Tasks

- To review information relevant to the Terms of Reference (TOR) 3 and 4 (see below) and prepare Background document (4), in collaboration with the BERP executive officer, for consideration by the Biodiversity Expert Review Panel.
- To attend the Biodiversity Review Panel meeting on the 27th September to present the information contained within the draft Background document 4 for TOR 3 and 4.

Timeframe

- September 24th - Provide first draft Background document 4 to executive officer for comment and input.
- September 26 th – Provide second draft of Background document 4 to executive officer for circulation to BERP.
- September 27 th – Attend BERP meeting 7 to present summary of information contained in Background document 7.
- October 8 th - Revise Background document 4 as required.

Terms of Reference

1. Review the role of the Forest Practices System in the overall approach to the maintenance of Biodiversity in the State.
2. Review the relevance and scope of the Forest Practices System in relation to biodiversity conservation and evaluate the ability of existing provisions to meet conservation objectives at the local, catchment and regional scales. In particular consider:
   a) Processes and planning tools to meet objectives and requirements of the RFA, Tasmanian Nature Conservation Strategy, Threatened Species Strategy, Threatened Species Recovery Plans, Tasmanian *Threatened Species Protection Act, 1995* and other relevant National and State legislation and policies.
   b) Processes and planning tools to address current forest practices at both the landscape and stand level. Provisions to address plantation design and planning are a priority. Provisions for stream fauna are also a priority. In particular, consider the research undertaken to address issues raised in the last review of the Code, relating to the management of stream fauna, and translate outcomes into recommended actions.
   c) Processes and planning tools for facilitating legislative responsibilities amongst agencies (e.g. interagency agreed procedures).
   d) Processes and planning tools to facilitate implementation - practicability of current planning processes and provisions (strategic and operational).
   e) Relationships between biodiversity provisions and other forest management provisions covered in the Code (eg. provisions for other natural and cultural values, roading, burning etc.).
3. Review the monitoring (implementation and effectiveness) that underpins the biodiversity provisions of the Code. What are the mechanisms for delivery of adaptive management under the FP system? Is the Code sufficiently adaptive in its approach? Are there appropriate feedback mechanisms outlined in the Code?
4. Review current research relating to the distribution, ecology and impacts of forest practices on forest fauna and flora and report on future funding priorities for new information.

Appendix B. ***FPA Research and Monitoring Program 2006 – 2001:A Funding Request to Bureau of Rural Sciences***

[copied with only minor formatting changes from original document]

FPA Research and Monitoring Program 2006 –2011

Funding Request

Forest Practices Authority Research Working Group

A Funding Request to Bureau of Rural Sciences

Summary

The Forest Practices Authority (FPA) has responsibilities for administering the forest practices system under the *Forest Practices Act*.

The Authority's Research and Monitoring Program employs specialists with expertise in forest practices, the development and implementation of codes of practice, cultural heritage, botany, geomorphology, soil and water science, visual landscape and zoology. They carry out monitoring and research to ensure that forest practices are environmentally and culturally sustainable, thereby providing the scientific knowledge essential for underpinning and improving the *Forest Practices Code* and its supporting specialist publications.

Overall research priorities are determined by the Regional Forests Agreement and the *Forest Practices Code*, which are both reviewed every five years. Detailed priorities (at the project level) are determined by annual research reviews within the Forest Practices Authority and are influenced – though not determined – by a national research advisory group that sets national priorities for forestry research.

Although specialist staff time spent on research and monitoring is funded by industry, the operational budget, previously provided out of Forestry Tasmania/Forest Industries Association of Tasmania funds, has been cut to almost zero. Consequently the FPA Research and Monitoring activities are currently largely unfunded.

This document provides information on the aims and objectives of the FPA Research and Monitoring program, tabulates the research priorities, and requests funding to support essential research necessary to underpin the sustainable forest industry in Tasmania.

The FPA seeks $100 000 a year for the next five years to support its research and monitoring program.

Background

Research and monitoring activity required for successful functioning of the Forest Practices Authority

Adaptive management programs adopted by government and private organisations, including forest managers, facilitate the continued development and improvement of conservation strategies (Walters and Holling 1990; Davies *et al* 2001; Lindenmayer and Franklin 2002). Management decisions need to be based on good information and their effectiveness needs to be monitored and researched. There are two types of monitoring programs (Lindenmayer and Franklin 2002):

- Implementation monitoring (or monitoring of compliance) – used to determine whether prescribed management is actually conducted.
- Effectiveness monitoring - used to determine whether the management specified has achieved its objective and whether the outcome was actually a consequence of management.

Both are extremely important for determining whether conservation management strategies are working. Implementation monitoring (monitoring of compliance) is considered to be a core legislative requirement that is most appropriately funded from industry and State sources and is not considered further in this application.

In addition, research is required so that FPA scientists can keep abreast of issues in a rapidly changing industry. For example, the greater emphasis on plantation area means that the effectiveness of wildlife habitat clumps as refuges is increasingly important – but do they work?; how are headwater streams modified morphologically and biologically by conversion of their catchments from native forest to plantations?

The Tasmanian Forest Practices system follows an adaptive management framework. The *Forest Practices Code* (Forest Practices Board, 2000) contains policies and practices for protecting natural and cultural values. These have been developed from a mixture of expert judgement, practical experience and the outcomes of research and monitoring. It is widely recognised that ongoing research and monitoring is important for the scientific credibility of the Code's provisions applied in forest management plans, including Forest Practices Plans and more strategic plans (Commonwealth of Australia and State of Tasmania 1997; Davies *et al* 1999; Wilkinson 1999). There is also a legislative requirement for monitoring the effectiveness of Code provisions applied in Forest Practices Plans (FPPs). The Tasmanian *Forest Practices Act 1985* states that, "the Board must…assess the implementation and effectiveness of a representative sample of Forest Practices Plans". With the increasing public scrutiny of forest practices in Tasmania, the scientific basis for particular management actions needs to be clear.

Threats to essential research and monitoring

Traditionally the Forest Practices Authority has had a strong research emphasis and a good publication record. Publications for the last 5 years (2001-2005) are listed at www.fpa.tas.gov.au. This good record of research and publications is threatened for two reasons.

(1) In the last ten years the intensification of forestry operations in production forests, following Tasmania's Regional Forest Agreement (Commonwealth of Australia and State of Tasmania 1997; Munks and McArthur 2001; Lindenmayer and Franklin 2002) and more recently the Community Forest Agreement (Commonwealth of Australia and State of Tasmania, 2004), has increased demands on the advisory and education component of the FPA Research and Advisory programs. These include the Geoscience, Soil and Water, Cultural Heritage, Landscape and Biodiversity programs. The work of these programs during this period has focussed primarily on the development of procedures and planning tools to ensure the requirements of legislation, such as the Tasmanian *Threatened Species Protection Act 1995* are met during forestry activities (e.g. Munks and Taylor, 2000). This has reduced the amount of time and resources available for research and monitoring over the past ten years.

(2) The demise of some principal seed funding mechanisms, such as the Tasmanian Forest Ecology Research Fund, administered by the TFRC in 1996 and the Forestry Tasmania/Forest Industries Association of Tasmania fund in 2005, previously available to forest practices scientists, has contributed to the decline in research output.

The future

The FPA needs more emphasis on research and monitoring goals over the next five years (2006-2011). A more integrated approach to new projects is required to ensure that existing opportunities are capitalized upon to the maximum extent, wherever possible. Collaborative studies, across disciplines, such as recent stream catchment work in the Ben Nevis area which resulted in six publications (Appendix 1)

need to be encouraged. The studies carried out at the Ben Nevis sites assessed the impact of pre-Code clearfell, burn and sow practices on flora, fauna and geomorphology and involved personnel from the Soil and Water and Biodiversity FPA research and advisory programs as well as university researchers and private consultants. There is an urgent need for resources to conduct similar collaborative work to address current priorities. If this is achieved the links between research, monitoring and management, that exist within the Tasmanian Forest Practices system but which are increasingly difficult to maintain, will result in continued translation of results into best practice.

This document outlines the proposed FPA program of research and monitoring, relating to natural and cultural value issues, to be carried out over the next 5 years. This document also outlines the five-year objectives of the program, the FPA research priorities, and the resources required to implement them.

Aims and objectives of the FPA Research and Monitoring Program

Research and monitoring by the FPA research and monitoring (R&M) programs has an emphasis on the provision of advice on practical management guidelines for the protection of environmental and cultural values in wood production forests. The FPA's R&M program includes areas related to archaeology, botany and zoology (biodiversity), geomorphology (including fluvial morphology), soil science and the visual landscape.

The overall aim of the FPA's R&M program is to conduct research and monitoring to support continual improvement of the Forest Practices Code's natural and cultural value provisions, and to evaluate the effectiveness of Forest Practices Code provisions.

The five main objectives for the next five-years are:

1) To publish results from completed projects and ensure new information is used to support the continual improvement of natural and cultural value provisions of the *Forest Practices Code*.
2) To support and undertake applied research to document the occurrence of natural and cultural values in the forest estate and to investigate the impacts of forest practices on such values. Such studies are required to develop conservation objectives and management prescriptions.
3) To monitor the effectiveness of natural and cultural value provisions. Do they meet conservation objectives (short-term and long-term and at different spatial scales and across a range of silvicultural activities)?
4) To construct a database of FPA, research and monitoring projects. To assist in the monitoring of project progress, reporting, and identifying further research priorities.
5) To continue to develop collaborative links with other research providers and to provide opportunities for postgraduate students.

The FPA has a continuous program of small and larger projects. Staff specialists usually work in collaboration with research staff and students from the Schools of Zoology and Environmental Science at the University of Tasmania, scientists from Forestry Tasmania, scientists from the Department of Primary Industries and Water, and private consultants. Other partners are sourced for relevant projects as they arise.

The economic and commercial benefits of forestry research are not of significant interest to the Board, given that the development, interpretation of, adherence to, and effectiveness of the *Forest Practices Code*, or required revisions to the Code constitute the FPA's primary focus.

Research Priorities

A recent review by the FPA Research Working Group identified three broad research areas (A, B and C below) and identified priority topics within these areas (Table 1). Results from projects undertaken within these areas are required to improve forestry practices and planning strategies. Details of the current investment in these areas are provided in Table 2. Current projects that fall within these research topics are listed in Table 3.

The research and monitoring priorities identified in Taylor (1999), the Forest Practices Code, Soil and Water Review (Davies *et al*, 1999), review of the Tasmanian Regional Forest Agreement (1997) and national research priorities identified for the National Forest Research Priorities Coordination Committee (Anon, 2006) were used to identify some of these priorities. Important issues identified from discussions with stakeholders (Industry planners, TSU, DPIWE etc.) were also taken into account.

A) Monitoring the implementation of Forest Practices Code provisions

As mentioned above, implemention monitoring (monitoring of compliance) is considered to be a core legislative requirement that is most appropriately funded from industry and state sources and is not considered further in this application.

B) Monitoring the effectiveness of Forest Practices Code provisions

Problem

Under the Tasmanian *Forest Practices Act 1985*, "the Board must…assess the implementation and **effectiveness** of a representative sample of Forest Practices Plans". There have been some studies in the past that have provided justification for current Forest Practices Code natural and cultural value provisions and forest management strategies. Many of the natural and cultural value provisions of the Code, however, are based on limited knowledge and are relatively untested. For example, in a review of gaps in ecological monitoring projects in Tasmanian forests, Taylor (1999) identified a number of issues that the Forest Practices Board needed to address before it could demonstrate that faunal diversity was being sustainably managed, and Soil and Water Review (Davies et al. 1999) made similar recommendations relating to headwater streams.

Required response

Monitoring of the effectiveness of current Code provisions. Incorporation of findings into the Code provisions.

See Tables 1 and 2 and 3 for specific topics and current projects and funding needed in this area.

C) Research on the occurrence, conservation status and impact of forest management on natural and cultural values.

Problem

Currently forest managers are required to protect or manage natural and cultural values that have a high significance under legislation and various policy documents, including the Tasmanian *Regional Forest Agreement* (1997). This has driven the need for the R&M section of the FPA to deliver information to planners on the occurrence

of natural and cultural values of high conservation significance and on situations where there is urgency for conservation action due to continuing threats. Research on the occurrence of natural and cultural values of high conservation significance and the impacts of forestry operations is required to support the development of an effective forest management strategy.

Required response

Studies, of the distribution and conservation status of natural and cultural values, in production forests.

Studies, of the impacts of forest management practices on natural and cultural values, to inform the development of conservation actions.

Incorporation of the results of such studies into strategic planning.

See Tables 1, 2 and 3 for specific topics and current projects and funding needed in this area.

Reporting and Review of projects

Research results are published via scientific publications (see Appendix 1), conferences, technical notes for practitioners and newsletters distributed to land and environment management stakeholders and conservation groups. In addition decision support tools for forest planners are published online (www.fpa.tas.gov.au) and Code reviews and recovery plans for threatened species are released at least annually. There are no restrictions on the public release of research outputs because the Board's goal is to provide advice to practitioners, not commercialise or retain information for its own use.

Ongoing projects are reviewed annually as part of the FPA R&M programs annual review. Steering or advisory committees may be established for large research programs. Funding bodies receive project progress reports as required.

Incorporation of project outputs into the Forest Practices System

Project outputs relevant to forest management practices are used in reviews of *Forest Practices Code* provisions and management guidelines via existing processes (e.g. threatened fauna agreed procedures, thematic reviews of the Code, new guidelines, Technical Notes, training courses, etc.).

Funding Required

Decline of Existing Resources

Approximately 18% of the FPA's current operating budget ($360 000 out of $2 million) is currently allocated to research and monitoring. This investment only covers specialists' time allocated to research and monitoring and some travel costs. There are no additional internal funds to cover operational costs of research and monitoring (e.g. travel, equipment, analyses, GIS support, consultant surveys, statistical consultancy, technical assistance and projects officers).

Industry 'in-kind' support has been provided in the past, and is likely to continue, in the form of scientific collaboration and secure study sites (coupes/catchments). However, the industry FT/FIAT fund (seed funding for implementation of RFA research and monitoring priorities) is no longer available.

The FPA is a supporting partner of the CRC Forestry, providing 'in-kind' support. However, FPA projects that come under the CRC banner receive no CRC (federal) funding.

Specialists have had mixed success in applying for funds from external funding bodies. Most funding bodies expect this research and monitoring to be funded by Government or Industry.

Resources required

$100,000 per year is being sought to enable the FPA R&M section to address the research and monitoring priorities identified in this document. This funding is sought from the Bureau of Rural Sciences.

Resources will be used to appoint a full time permanent Scientific Officer to provide scientific support for priority research projects initiated by FPA specialists and to provide funding to cover operational research costs.

This funding will be managed by the FPA Research Working Group which will distribute support to the five areas of FPA research (Cultural Heritage, Geoscience, Soil and Water, Biodiversity, Landscape) according to priorities.

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Table 1 Priority FPA research and monitoring topics with priority level by 'special values' area. *[1] Botany, Zoology and Ecology, *[2] Cultural Heritage and Visual landscape programs, *[3] Soils and Water, and Geosciences programs.

Research Topic and (Area)	Priority by FPA program		
	Biodiversity*[1]	**Landscape and Cultural Heritage*[2]**	**Earth Sciences*[3]**
Monitoring the **implementation o**f Forest Practices Code fauna and flora provisions **(A)**	High	High	High
Distribution, ecology and impacts of forestry practices on **flora and fauna species of high conservation significance** (threatened and RFA priority species), and their habitats. **(B/C)**	High	N/A	Medium (cave fauna)
Value of **headwater streams** and impacts (intensity, duration and extent) of forestry practices on stream values. **(B/C)**	High	Medium	High
Special values and management of mature forest habitat, in particular issues relating to retention of **hollow resource for hollow users** (RFA priority fauna). **(B/C)**	High	N/A	N/A
Managing special values risks associated with extensive **plantations** at the local catchments and landscape levels **(B/C)**	High	High	High
Values and management of **retained habitat** (remnants, wildlife habitat strips, habitat clumps, streamside reserves, cultural heritage reserves, karst reserves)) **(B/C)**	High	High	High
Rehabilitation of riparian areas for the maintenance of 'special' values including aboriginal heritage values. **(B)**	Low	High	High
Sustainable management of **tree ferns (*Dicksonia antarctica*)** and their role in forest ecosystems. **(B/C)**	High	N/A	N/A
Public perceptions of existing forest visual landscape practices **(A)**	Low	High	Low
Assessing the present **land stability** and ecological communities in the forest estate in relation to recent and ancient human impacts. **(C)**	Medium	High	High
Integration of **cultural landscape management and visual landscape management (B)**	N/A	High	N/A

Table 2 Current investment in priority topics. * details of current FPA projects listed in Table 3.

Research Topic	Current FPA projects*	Areas still needing funding
Distribution, ecology and impacts of forestry practices on **flora and fauna species of high conservation significance** (threatened and RFA priority species), and their habitats.	Z1.Z2,Z3,Z4,Z8,Z9, Z10, B1,B2,B6,B7.	This important area is still largely unfunded and external funds are not readily available.
Value of **headwater streams** and impacts (intensity, duration and extent) of forestry practices on stream values.	Z6, S1, S2.	Post-harvest surveys are not funded. Further funding is still required to address downstream impacts and effectiveness of class 4 stream guidelines.
Special values and management of mature forest habitat, in particular issues relating to retention of **hollow resource for hollow users** (RFA priority fauna).	Z4.	Still largely unfunded
Managing special values risks associated with extensive **plantations** at the local catchment and landscape levels	-	Still largely unfunded for most special values areas; measurement of hydrological effects is unfunded
Values and management of **retained habitat** (remnants, wildlife habitat strips, habitat clumps, streamside reserves, cultural heritage reserves, karst reserves))	Z5,B4,B5	Funding is still required to continue work on the values and management of wildlife habitat clumps, streamside reserves, cultural heritage reserves and karst reserves.
Rehabilitation of riparian areas for the maintenance of 'special' values including aboriginal heritage values.	-	In-kind support from companies is available; specialist surveys and analyses (e.g. of chemical movement) requires funding.
Sustainable management of **tree ferns (*Dicksonia antarctica*)** and their role in forest ecosystems.	B8,B9.	This topic is currently adequately funded?
Designing strategies for **industry engagement with local**	FPA involvement in CRC 4.3.3	This topic is currently adequately funded.

communities		
Community attitudes to commercial forestry – gaining a better understanding of perceptions of existing practice	FPA involvement in CRC 4.3.2	This topic is currently adequately funded.
Public perceptions of existing forest visual landscape practices – effectiveness of visual management provisions of FPC**.**	-	Project of use in the development of improved forest practices guidelines.
Landscape Character Assessment as a basis for planning visually sustainable landscapes – elucidating community perceptions across diverse scenic areas.	-	Project to inventory landscape values as guide for strategic forestry development...
Assessing the present **land stability** and ecological communities in the forest estate in relation to recent and ancient human impacts.	S3, S4 , S5 and S6	Funding required for soil analyses and ^{14}C and thermoluminescence dating of erosion events in the forest estate Funding required to integrate FPA landslide database and Mineral Resources Tasmania landslide database.
Integration of **cultural landscape management and visual landscape management**	-	Specific projects of use in the development of forest practices guidelines still need funding.

Table 3 Summary of current FPA R and M projects (May 06)

Project Number	Project Title	Key Researchers	Funding	Aims	Progress and Expected Outcomes
Z1	***Systematics and habitat preferences of threatened hydrobiid snails (Hydrobiidae: Beddomeia) in Tasmania***	Karen Richards (PhD), Sarah Munks, Alastair Richardson, FPB/Utas Winston Ponder, Nat Museum, Sydney.	TSU, DPIWE, FPB and TCT	To determine if sufficient genetic differentiation exists to warrant the current speciation based on morphological characteristics. To increase knowledge of characteristics of habitat where the species' occur. To obtained info on the impact of forestry operations on populations of the species.	Four seasons of field data collection have been completed in the Groom River catchment and Castra Rivulet catchment, 5 in Castra. 3 seasons of samples sorted and identified. Refinement of Threatened Fauna Adviser Program management recommendations for the genus and headwater stream habitats.
Z2	The downstream effects of forestry disturbance in upper catchment areas on macroinvertebrate fauna (including *A. gouldi*, *Hydrobiid* snails).	Peter Davies, Laurie Cook, Freshwater Systems/ Utas, Sarah Munks, Karen Richards, FPB Bradley Smith (honours student), Utas	FT, FPB, Utas and Freshwater systems	To investigate whether forestry operations in upper catchment areas have a downstream effect on macroinvertebrate structure and abundance.	Fieldwork completed in 2004/05. This is a preliminary study that will be continued in 2005/06.
Z3	Monitoring the effects of regrowth thinning, CBS, and conversion to plantation of wet eucalypt forest on populations of *Hoplogonus simsoni* and terrestrial snails	Sarah Munks, Karen Richards, Mark Wapstra FPB, Jeff Meggs, FT, Kevin Bonham.	FPB, FT ('in-kind')	To monitor the effects of silvicultural practices on local populations of *H. simsoni* (and land snails) to provide information to assess the effectiveness of the current management plan for the species.	Before impact data collected for CBS and regrowth thinning sites. Three years post harvest. Sites sampled each summer since 1998. Preliminary analysis of results began in 2004.
Z4	The abundance of hollows in *E. obliqua* wet and dry forest, and use by fauna.	Amy Koch, Jamie Kirkpatrick, Utas, Sarah Munks, Chris Spencer, FPB	FPB, FT, Utas, WV Scott	To assess the abundance, distribution and use of tree hollows in *E.obliqua* dominated forest.	The results will increase the understanding of the hollow resource in Tasmania. They will be used to inform the development of current Code provisions for the retention of this resource.
Z5	Implementation and survival of wildlife habitat clumps.	Sarah Munks, Chris Spencer, Mark Wapstra, Nathan Duhig, FPB	FT, FPB	To re-sample sites established in 1999 to investigate whether widlife habitat clumps are implemented adequately and	The outcomes will help to further develop and refine current actions prescribed for hollow dependent fauna. Proposal developed in 2004/05. Field work

				whether habitat trees retained persist for the time necessary for them to be effective.	commenced in 2005/06.
Z6	Recovery of Headwater Streams after current Code Logging. Two PhD studies: 'Community structure and habitat responses to forest practices in headwater streams' and, 'Responses of ecosystem processes to forest practices in headwater streams'.	John Gooderham, (PhD) Utas Joanne Clapcott, (PhD) Utas Peter McIntosh, FPB Peter Davies, FS and Utas Leon Barmuta, Utas Sarah Munks, FPB Laurie Cook, FS	ARC Linkage Grant and FT/FIAT Research Fund. FPB, Freshwater Systems, Uni of New England and Utas. 'in –kind'.	To address the question "do forestry activities which comply with the current Code provisions have a long-term effect on the biodiversity and physical properties of small streams?". One PhD sub-project will assess the impact of forestry activities on headwater stream ecosystem processes and the other will look at the impact of forestry activities on ecosystem structure.	Will provide an indication of the potential for downstream impact of forestry activities as well as the local impact. Will establish sites that can be monitored by the FPB to assess long-term recovery.
Z7	Assessing the implementation of fauna provisions of the Tasmanian Forest Practices Code: Before and after improvements to process and prescriptions.	Sarah Munks, Mark Wapstra, Karen. Richards, FPB	FPB ('in-kind')	To assess the standard of implementation of FPC fauna provisions and the effectiveness of improvements to planning processes and prescription delivery.	Before data collection (1997/98 THP's) complete. After data collection current (2001/02 FPPs)
Z8	Foraging habitat requirements of the grey goshawk, *Accipter novaehollandiae* in Tasmania.	Sarah Munks, FPB Nick Mooney,DPIWE Simon Plowright, Wildspot Suzette Weeding, Gunns	DPAC, FT, FPB	To obtain information on the characteristics of foraging habitat for breeding grey goshawks. To collect information to couple with existing information on the nesting habitat to refine existing prescriptions and to inform strategic planning.	Results being analysed, paper drafted: Munk, S., Plowright, S., Mooney, N., and Weeding S. (in prep) Utilisation of habitat by the Grey Goshawk, *Accipter novaehollandiae* in north-west Tasmania.
Z9	Distribution, habitat characteristics and conservation requirements of *E. granulatus*	Sarah Munks, Karen Richards and Chris Spencer, FPB. Alastair Richardson and Suki Hopgood (honou student), Utas	FPB, TSU, Utas ('in-kind')	To determine the distribution, reservation status and characteristics of habitat of *E. granulatus*.	Information on distribution and range and *E. granulatus* of use in FPP planning process.
Z10	Development and ground-truthing of habitat suitability	Peter Davies, Freshwater Systems, Sarah Munks, Nathan Duhig, FPB, Peter Von	FT	To continue development of a GIS model to predict the	Distribution and habitat information of use

	model for *A. gouldi*	Minden, FT.		occurrence of habitat for *A. gouldi*	in FPP process.
Z11	How effective are the current management actions in protecting wedge-tailed eagle nest sites in production forests?	Sarah Munks, Karen Richards, Mark Wapstra, FPB Nick Mooney, Bill Brown, DPIWE Ray Brereton, Cindy Hull, Hydro Tasmania	FPB, TSU ('in-kind') Hydro	To assess the effectiveness of current Threatened Fauna Adviser management prescriptions in maintaining usage of nest sites by wedge-tailed eagles. Recovery Action 6.2 in Eagle Recovery Plan.	Project proposal developed. Information to inform revision of wedge-tailed eagle recovery actions.
Z12	Long-term monitoring project: Scottsdale burrowing crayfish *Engaeus spinicaudatus*, Mt Arthur B. C. *E. orramukunna* and the Burnie B. C. *E. yabbimunna*.	Sarah Munks, Karen Richards, Mark Wapstra, FPB Niall Doran, DPIWE Jeff Meggs, FT	FPB, TSU ('in-kind)	To monitor densities of burrows for 3 species of threatened species of burrowing crayfish in stream catchments subject to forestry activities.	Ongoing

B1	Distribution, habitat characteristics and conservation status of the lesser guineaflower *Hibbertia calycina*	Mark Wapstra, Fred Duncan, FPB Allison Woolley, (ex FT, now DPIWE) Katriona Hopkins (ex FPB)	FPB and FT in-kind	An FT funded project in 1995 produced an internal report. This current work builds on that original report and aims to develop management prescriptions for the species in the context of the most recent information.	Final data analysis and map production needed; paper expected for submission late 2005; field day for forest industry staff; modifications to MDC layers.
B2	Distribution, habitat characteristics and conservation status of the Australian dusty miller *Spyridium parvifolium*	Brian French, Mark Wapstra, FPB Grant Scurr, Greg Jordan, Utas (Plant Science)	FPB and FT in-kind	To assess the distribution, habitat characteristics and conservation status of the Australian dusty miller *Spyridium parvifolium.*	Final data analysis and map production needed; paper expected for submission late 2005.
B3	Population dynamics of slender tree fern *Cyathea cunninghamii*	Fred Duncan, Mark Wapstra, Simon Davies, Anne Chuter (FPB)	FPB	Resurvey some larger populations of this threatened forest species, and use previously collected population data to establish survival and regeneration trends.	Information to inform management actions and reassess threat status on TSPA. Potential for paper.

B4	Structure, composition and biodiversity of logged wet eucalypt forests, wildlife habitat strips and unlogged reference areas (Wayatinah study)	Fred Duncan, Anne Chuter (FPB) Simon Grove, Mick Brown (FT and associates)	FPB and FT	To assess changes in vegetation structure, composition and biodiversity of logged *E. delegatensis* wet forests, wildlife habitat strips and unlogged reference areas (Wayatinah study), using permanent plots established as part of a major FPB/FT study in 1992/3. The study will also allow relationships between changes in fauna parameters to be compared with veg trends	Field sampling completed and preliminary data analysis undertaken. Paper expected for submission early 2006.
B5	Structure, composition and biodiversity of logged dry eucalypt forests, wildlife habitat strips and unlogged reference areas (Pioneer study)	Fred Duncan, Anne Chuter (FPB) Simon Grove, Mick Brown, Allison Woolley (FT and associates)	FPB and FT	To assess changes in vegetation structure, composition and biodiversity of logged (predominantly) dry sclerophyll forests, wildlife habitat strips and unlogged reference areas (Pioneer study), using permanent plots established as part of a major FPB/FT study in 1992/3. The study may allow relationships between changes in fauna parameters to be compared with vegetation trends.	Field sampling almost completed. Data analysis will be conducted late 2005 – preparation of paper in 2005/2006 probably not realistic.
B6	Taxonomy, distribution, habitat and conservation status of *Cyathodes platystoma* in SE Tasmania.	Adam Pennington (Uni of Tas)	FPB and FT	Investigate taxonomy, extent and habitat of this species, and its ability to cope with native forest logging and plantation establishment (using silvicultural research sites on the Forestier Peninsula).	Project undertaken as Honours project – thesis submitted and separate report prepared for FT. Information to inform management actions, and potential for listing on TSPA..

B7	Ecology and response to forestry operations of *Odixia achlaena* in SE Tasmania.	Tim Leaman (Uni of Tas)	FPB	Investigate ecology of this species (field and glasshouse research), and its ability to cope with native forest logging (using logged and unlogged sites in Wielangta – Mt Morrison area).	Project undertaken as Honours project – thesis submitted. Information to inform management actions, and potential for re-evaluation as a species listed on TSPA.
B8	Recovery and regeneration of tree fern (*Dicksonia antarctica*) in old-growth forest and different regrowth age-classes in the Florentine Valley.	Anne Chuter , Brian French, Mark Wapstra (FPB)	FPB	Investigate recovery and regeneration of tree fern (*Dicksonia antarctica*) in old-growth forest and different regrowth age-classes in the Florentine Valley.	Follow-up sampling from Honours thesis (2003) completed; paper on germination of *Dicksonia* submitted; paper on regeneration in preparation.
B9	Survival and salvage of *Dicksonia antarctica* in wet forest following clearfalling and regeneration to native forest	Simon Davies, Anne Chuter, Fred Duncan (FPB)	FPB	Investigate recovery and regeneration of tree fern (*D. antarctica*) in a range of wet forest coupes after cable and ground-based logging, followed by regeneration to native forest; and to examine the potential for sustainable management of this resource.	30 permanent plots established in Florentine Valley coupe; initial assessments done prior to sampling in Ben Nevis coupe; other coupes in Derwent, Bass and Huon Districts assessed for suitability for experimental treatment. Major experiment – several outcomes expected: initial outcome is presentation at IUFRO conference (2005).
B10	Re-establishment of native grassland on *Pinus radiata* plantation site.	Fred Duncan, Anne Chuter (FPB), Brooke Craven (ex-FPB, now DPIWE)	FPB, possibly external	Investigate the re-establishment of montane grassland following removal of *P. radiata* plantation in NW Tasmania (Surrey Hills), using permanent transects established in plantation prior to removal (2000).	Information on restoration processes; potential for paper on management of threatened community, under an unusual scenario.

S1	Impact of cable harvesting on stream morphology and erosion in steepland plantation catchments	Peter McIntosh (FPA), Karen Richards (FPA), Chris Ringk (Rayonier) and Chris Spencer (private technical consultant)	FPA and Rayonier	To determine whether current guidelines for stream protection are adequate	Pre-harvest surveys completed. Post-harvest surveys to begin in September 2006.
S2	Impact of native forest harvesting on stream morphology and erosion in native harvest coupes	Peter McIntosh (FPA), Karen Richards (FPA), and Chris Spencer (private technical consultant)	FPA and Forestry Tasmania	To determine whether current guidelines for stream protection are adequate	Pre-harvest surveys completed. Post-harvest surveys to begin in December 2006.
S3	Review of landslide threshold angles for forest harvest on steeplands and integration of landslide database with database of Mineral Resources Tasmania	Peter McIntosh (FPA) and Colin Mazengarb (MRT)	FPA ; external funds applied for	To better predict areas of land instability in the forestry estate	To begin July 2006
S4	Assessing the present land stability and ecological communities in the forest estate in relation to recent and ancient human impacts. (1) erosion rates	Peter McIntosh (FPA)	FPA; RFA funds	To define natural rates of erosion so that risks can be better predicted and acceptable forest practices better defined	June 2005; data collection phase in progress
S5	Assessing the present land stability and ecological communities in the forest estate in relation to recent and ancient human impacts. (1) effects of fire on soil development and forest ecology	Peter McIntosh (FPA) and Mike Laffan (FT)	FPA, FT	To describe the effects of fires on soil development over the last 30 000 years and how this is likely to have affected forest ecology	June 2003; major paper published; research is continuing; links to project S6
S6	Improving knowledge of soil erodibility and soil properties for sustainable forests	Peter McIntosh (FPA), Mike Laffan (FT) and industry foresters	FPA, FT, Gunns	To improve knowledge of soils so that soil management can be improved, especially in regard to erosion and selection of areas for intensive production	2000; an ongoing project that requires regular soil description and analyses as new issues are discovered; soil knowledge is also used in S5

Appendix C. *FPA's Nov 2007 research and monitoring priorities identified by the FPA RWG*

Research Topic and (Area)	Priority by FPA program		
	Biodiversity*[1]	**Landscape and Cultural Heritage*[2]**	**Earth Sciences*[3]**
Monitoring the **implementation o**f Forest Practices Code fauna and flora provisions **(A)**	High	High	High
Distribution, ecology and impacts of forestry practices on **flora and fauna species of high conservation significance** (threatened and RFA priority species), and their habitats. **(B/C)**	High	N/A	Medium (cave fauna)
Value of **headwater streams** and impacts (intensity, duration and extent) of forestry practices on stream values. **(B/C)**	High	Medium	High
Special values and management of mature forest habitat, in particular issues relating to retention of **hollow resource for hollow users** (RFA priority fauna). **(B/C)**	High	N/A	N/A
Managing special values risks associated with extensive **plantations** at the local catchments and landscape levels **(B/C)**	High	High	High
Values and management of **retained habitat** (remnants, wildlife habitat strips, habitat clumps, streamside reserves, cultural heritage reserves, karst reserves)) **(B/C)**	High	High	High
Rehabilitation of riparian areas for the maintenance of 'special' values including aboriginal heritage values. **(B)**	Low	High	High
Review distribution of forest and non-forest vegetation with a priority for conservation – Remapping of vegetation communities	High	Low	Low
Sustainable management of **tree ferns (*Dicksonia antarctica*)** and their role in forest ecosystems. **(B/C)**	High	N/A	N/A
Public perceptions of existing forest visual landscape practices **(A)**	Low	High	Low
Assessing the present **land stability** and ecological communities in the forest estate in relation to recent and ancient human impacts. **(C)**	Medium	High	High

Appendix D. Research Working Group's Research Policy Statement

FPA Research Policy

Activities
The FPA will conduct applied research and monitoring to underpin continual improvement of the Forest Practices Code and sustainable forestry, and lead to outputs that can be used to improve operational guidelines and prescriptions and measure their effectiveness.

Administration
The Forest Practices Advisory Council (FPAC) will define priorities and allocate and administer funds.
The FPARWG will advise FPAC on priorities.

Reviews
Annual research reviews will occur after FPA program activity reviews.
The FPA RWG will meet six-monthly for internal review/updating.

Communication

Information seminars – Annual 'Whats New' for those involved in FP system
Research newsletters – Summaries of research outcomes in FP News
CRC communications
Membership on national RWGs