

Review of research that supports the development and continuing improvement of provisions within the *Forest Practices Code*

**A Report to the Chief Forest Practices Officer,
Forest Practices Authority**

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1. Introduction

The *Forest Practices Code* has been in place since 1987, and since then there have been several revisions to the Code resulting in part from the active program of research and development (R&D) which has always been part of the forest practices system. Changes in policy and priorities have meant that the focus of relevant R&D has shifted over time as has the nature of the research provider institutions and of the funding sources which support the research. This report was commissioned to evaluate these changes in the period 1987–2007. The consultant's terms of reference for the report are given in Appendix 1.

The report provides a brief background review of the Code and the definition of relevant research areas and then outlines:

- a brief summary of the scope and focus of research of direct relevance to the operation of the *Forest Practices Code* which has been undertaken within Tasmania
- the organisations which undertake relevant research.
- the sources of funding for research (including in-house and external funding sources)
- an estimate of the amount of research capacity (expressed as FTEs or total \$ per year) over the time period against the subject areas and sources of funding.

The report concludes with a summary discussion of the status of Tasmanian R&D as it relates to the Forest Practices Authority and the *Forest Practices Code*.

2. Research and the forest practices system.

The *Forest Practices Code* is the core of the Tasmanian forest practices system. The forest practices system was established to be funded jointly by the forest industry and the Tasmanian Government and to be self-managing with independent regulation in the context of continuous improvement through an adaptive management approach.

This approach has meant that research and monitoring has a central role in the working of the overall system and indeed is prescribed in Schedule 7 of the *Forest Practices Act 1985*.

Sub sections (1) – (3) of Section 31 of the Act set out the purpose of the *Forest Practices Code*:

(1) The Forest Practices Code shall prescribe the manner in which forest practices shall be conducted so as to provide reasonable protection to the environment.

(2) Without limiting the generality of subsection (1), the Forest Practices Code shall prescribe the manner in which the following forest practices shall be conducted:

(a) the establishment and maintenance of forests including standards to be complied with in the restocking of land with trees

(b) the harvesting of timber or the clearing of trees

(c) the construction of roads and other works connected with the establishment of forests, the clearing of trees or the growing or harvesting of timber.

(3) Without limiting the generality of subsection (1), the provision of reasonable protection to the environment includes landscape management and the control of soil erosion.

And Schedule 7 of the Act sets out the 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.

Schedule 7 also states *inter alia* that there is to be

....(d) a Forest Practices Code which provides practical standards for forest management, timber harvesting and other forest operations;

(ea) an emphasis on research, review and continuing improvement....

Thus research is an integral and fundamental part of the forest practices system.

3. The scope and focus of research that has been undertaken within Tasmania of direct relevance to the operation of the *Forest Practices Code*.

3.1 Focus of This Review

In keeping with the purview of the *Forest Practices Code*, consideration here is limited to those aspects of research that relate directly to the management and protection of natural and cultural values of the environment. The review is concerned with research which has direct relevance to the *Forest Practices Code* or which supports the development and continuing improvement of its provisions. Thus research concerns that facilitate other aspects of forest management such as silviculture, wood properties, pest management, tree growth, productivity and improvements in operations and harvesting are generally outside the scope of the review. However there are inevitably some areas of overlap, for example the development of aerial spraying techniques that maximise delivery onto target species while minimising the risk of spray drift, the development of more environmentally benign insecticides, weedicides and alternative browsing control methods, or successful silvicultural and regeneration techniques.

There are other aspects of scientific research which are not considered here even though they are probably indirectly relevant to the delivery of sustainable forest practices. Taxonomic, ecological and life history research provides the underpinning for most biodiversity studies and ultimately is of relevance to forest practices. However such research was only included in this review where there was a demonstrated direct relationship, as for example where some taxonomic and ecological classifications of forest species and communities have been used to assess or re-assess management needs or conservation status and the outcomes used to update forest practices manuals. On the other hand, research was usually excluded where it focused on species or communities which had their total extent of occurrence within National Parks or which were confined to non forest habitats such as coastal dunes or alpine areas. Similarly, research undertaken on aspects of cultural heritage such as building preservation, or the development of specialist archaeological techniques, have not been included.

The scope and focus of research has shifted over the 20 year review period. It is convenient to consider the changes in five year periods. The period 1987–92 saw the initial period of *Forest Practices Code* establishment and the concomitant high profile of the Tasmanian Forest Research Council. The period 1992–1996 saw the consolidation of the *Forest Practices Code* and the establishment of the Forest and Wood Products Research and Development Corporation (FWPRDC) and the Cooperative Research Centre for Temperate Hardwood Forestry (CRC-THF). The period from 1997–2002 included the first five years of implementation of the Regional Forest Agreement (RFA) and the commencement of CRC for Sustainable Production Forestry. The current period 2002–2007 has included the second 5-year review of the RFA, the Tasmanian Community Forest Agreement and advent of the new CRC for Forestry.

3.2 Initial setting of forest practices research agendas.

In 1980, a Forest Ecology Research Fund had been established among forest industry partners and the Tasmanian Forestry Commission for the purposes of undertaking ecological research relevant to forest practices. It was funded at \$60 000 pa and the funds were made available to a range of researchers from within the University of Tasmania, CSIRO Division of Forestry, the National Parks and Wildlife Service, Inland Fisheries Commission, the Queen Victoria Museum and Art Gallery, The Tasmanian Herbarium and Tasmanian Museum and Art Gallery, private consultant ecologists and/or the Forestry Commission

In 1984–85 an Inquiry into the export woodchip industry further recognised the need for ecological research relevant to forest practices. This recognition was formalised in the *Document Concerning Research Required by Clause 21 of the Memorandum of Understanding Signed Between the Tasmanian and Commonwealth Governments on 12 June 1986*. The document specified that the funding level for this research would be set at \$350 000 pa and indexed for five years.

The MOU clause 21 document sets out priorities for research (Table 1), and adds that the direction of the research program is also relevant to provisions of Clauses 12 and 13 of the MOU, i.e. setting aside of adequate secure reserves and identifying and reserving rare and endangered species respectively.

The program was comprised of a group of (initially) four scientists employed by the Forestry Commission, an expert in each of the fields of botany, zoology, archaeology and geomorphology to undertake research. This was to be complemented by the commission of specialist work beyond the scope and expertise of the core group. The program was funded by the export woodchip companies through a Woodchip Research Fund which eventually was administered by the Tasmanian Forest Research Council (TFRC), with research priorities being set by the Ecology Sub Committee of the TFRC.

Table 1: Areas of environmental research specified in Clause 21 of the MOU

(a) processes for pre-logging identification of archaeological sites, rare or inadequately reserved species or vegetation types and other special geological or natural features
(b) fauna habitat protection requirements, including retention of habitat trees
(c) the effectiveness of the visual management system
(d) co-ordinating recreation planning of public lands with the development of forest management plans
(e) linking corridors between unlogged areas to facilitate fauna movement
(f) the use of machinery, including cable logging equipment, on steep slopes and erosion control in such areas
(g) methods of increasing utilisation of wood felled in current operations, including the use of in-forest chipping and shorter logs
(h) soil fertility maintenance
(i) genetic diversity maintenance
(j) fire management

Following the establishment of the *Forest Practices Code* in 1987, the four MOU specialists were employed as part of the Forest Practices Unit which serviced the *Forest Practices Code*, with 50 per cent of their work program on research and 50 per cent spent on other forest practices duties. The remaining funds from the export woodchip levy then became available for other research relevant to the forest environment within the meaning and priorities of the MOU.

In 1992 the research program was reviewed and found to have funded 24 ecological projects in full or in part, with 16 of the projects having been completed and management recommendations from at least eight of the projects having been taken up and incorporated into planning by land management agencies. Many more recommendations had been incorporated into the forest practices manuals produced by the four forest practices specialists. In the five year period, the MOU specialists had produced nearly 40 research publications, while other direct funded projects had resulted in over 17 publications and several research theses as well as the forest practices manuals.

3.3 Changes to the *Forest Practices Code* between 1987 and 2007

At its inception, the *Forest Practices Code* drew on the MOU provisions to define appropriate subject areas for research. The initial version of the *Forest Practices Code* was released in 1987, and there have been two updates since then, in 1993 and in 2000. The *Forest Practices Code* is currently again under review, indicating a currency time-frame for a Code edition of 6–8 years.

The *Forest Practices Code* provides a set of standards to protect environmental values during forest operations and each version mentions specific environmental values (Table 2):

Table 2: Environmental values to be protected under the Forest Practices Code

Value	FPC March 1987	FPC Jan 1993	FPC 2000
Soils	+	+	+
Water quality and flow	+	+	+
Site productivity	+	+	
Flora and fauna	+	+	+
Genetic resources		+	+
(visual) landscape	+	+	+
Archaeology	+	+	
Cultural heritage			+
Karst	+		
Geomorphology		+	+

These values have set the overall subject framework within which research has been conducted.

3.4 Internal Forest Practices Authority reviews of research priorities

The Forest Practices Authority (FPA) has an ongoing program of in-house research review and priority setting which determines year to year planning and implementation of research programs for specialist staff. These programs take into consideration forest practices system-related R&D being done by other research providers and may result in collaborative inter-agency research.

In addition to the in-house program reviews and the overall reviews of the *Forest Practices Code*, the FPA and its predecessors have commissioned formal reviews of particular aspects of the Code that have also led to suggestions for new research.

3.4.1 Steep Country Harvesting

A review of steep country harvesting conducted during 1991 suggested the following research priorities:

Water catchment management

- soil erosion assessment
- landslip risk

- qualitative and quantitative aspects of water.

Biological resources

- determine on a regional basis the conservation status of altitudinal/climatic gradients and to identify further areas for their conservation where this is currently not adequate
- document aquatic and terrestrial invertebrate communities associated with specific microhabitats in upland streams and their response to forestry operations and conservation needs.

Landscape

- investigate the use of cable harvesting in partial logging treatments to ameliorate high potential visual impact of steep country coupes.

Archaeology

- determine the rate and nature of Aboriginal sites in steep country.

A dissenting report by the Combined Environment Groups did not include any specific recommendations for research.

3.4.2 Soil and Water

A review of soil and water provisions conducted during 1997 suggested some key new research areas. Many of these suggestions arose from the perceived lack of a formal system for the evaluation of objectives and sampling decisions of the forest practices audit. The review recommended a number of actions in different operational areas to rectify this, most of which involved some component of research. Examples include:

- efficacy of class four stream provisions in delivering biodiversity, water and soil outcomes
- evaluation of effectiveness of road drainage provisions, town water protection provisions, contour cultivation effectiveness and wet weather provisions.

Other recommendations were made for research on the longer term to:

- identify waters of high conservation value
- determine efficacy of *Forest Practices Code* provisions for protection of karst and biodiversity
- determine long term impacts on soil physical properties, productivity and nutrients
- evaluation of risk from nitrate applied during fertilising
- evaluation of efficacy of prescriptions to minimise turbid water runoff.

Some of these recommendations have since been taken up, and some are ongoing. For example, investigations have been conducted into the geomorphology, biodiversity and ecological process within class 4 streams and the Water Division of DPIW has established a Conservation of Freshwater Ecosystem Values (CFEV) program, which has resulted in a state-wide database of relative conservation priority for rivers, water

bodies, wetlands, karst, saltmarshes, estuaries and ground water dependent ecosystems.

3.4.3 Biodiversity Review

A review of aspects of the biodiversity provisions of the *Forest Practices Code* is underway, but the review panel has yet to report.

3.5 External Changes to Research Agendas for Forest Practices

Other changes in research priorities have arisen over the years as a result of legislative and policy change. Major changes have included the enactment of the *Tasmanian Threatened Species Protection Act 1995*, the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*, the Regional Forest Agreement (1997) and its subsequent reviews (2002, 2008) and the Tasmanian Community Forest Agreement (2005).

3.5.1 Tasmanian Threatened Species Protection Act 1995 and the Australian Environment Protection and Biodiversity Conservation Act 1999

These Acts have associated lists of species and communities (EPBC only) together with their perceived levels of threat. Many of these species are forest dwelling and thus are of high priority for consideration during forestry activities. This has meant that a primary focus of research by forest practices specialists and others has been on understanding the distribution and ecology of species and communities at risk, determining levels of impact, ways of avoiding or ameliorating impacts and instituting appropriate prescriptions, databases and recovery plans.

3.5.2 Regional Forest Agreement (1997), Tasmanian Community Forest Agreement (2005) and RFA Reviews (2002, 2008)

Attachment 13 to the Regional Forest Agreement (RFA) sets out priority areas of research agreed by the Tasmanian and Australian governments (Appendix 2). The main areas of relevance to the forest practices system involve biodiversity conservation and management, carbon flows and budgets, fire, heritage conservation, soil and water conservation, and some aspects of non-wood values, pests and silviculture techniques.

For the most part the RFA priorities retained the core elements of the original MOU priorities, but included some additional areas not previously considered. Some key new areas that relate to forest practices were:

Biodiversity:

- the development of biodiversity indicators for assessing ESFM
- the effects of plantation establishment and management on biodiversity conservation.

Carbon budgets/flows

- long term analysis of carbon flows from vegetation clearance
- impacts of fire, harvesting and plantation establishment on the carbon cycle.

Soil and water conservation

- determine the major physical and chemical characteristics of forest soils in Tasmania... and develop hazard ratings
- catchment planning to protect soil and water values on all land tenures
- evaluation of effectiveness of ...currently prescribed buffer and filter strips...especially of temporary streams
- environmental water requirements: establish baseline monitoring systems for stream flow and water quality across a range of forest types evaluate impact of forest operations and refine stream protection measures accordingly.

These priorities have been reviewed as part of the first and second term reviews of the RFA in 2002 and 2007 and were added to also by the Tasmanian Community Forest Agreement in 2005. The latest set of Tasmanian priorities for forest R&D for the period 2007–2011 is given in Appendix 3. This list expands somewhat on the earlier lists, but many of the research needs given there that are relevant to forest practices remain constant, or are clarifications and refinements of particular research directions already being pursued. The newer priorities arise from shifting public attitudes, changing land use practices and an improved knowledge base and technological ability. Some key *new* areas proposed for research include:

Biodiversity Conservation

- 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
- improved systems for natural values and resource condition reporting.

Heritage conservation (natural and cultural)

- methods for in-situ management and conservation of aboriginal and cultural heritage at forest sites
- research to underpin management prescriptions for natural and cultural values under the *Forest Practices Code*, and development of means to assess the effectiveness of such prescriptions.

Silviculture techniques

- implementation of alternative silvicultural techniques for commercial harvesting and regeneration of wet old-growth eucalypt forests
- investigation of silvicultural techniques that allow persistence and regeneration of late-successional structures across the range of managed forest landscapes
- gene pool management of key native forest and plantation species.

Soil and water conservation

- determination of natural and historical flow-regimes in Tasmanian streams and rivers and associated water quality parameters
- prediction of the effect of native forest harvesting and regeneration on local water flows in Tasmanian catchments, including long-term paired-catchment studies
- prediction of the effect of plantation establishment, growth, management and harvesting on water yields, in the context of alternative land-uses and land-use changes.

3.6 Current FPA research agenda

The current and proposed FPA research and monitoring agenda for the period 2006–11 is given in Appendix 4 (FPA-FWG 2006). Much of the existing work is collaborative with a range of agencies as discussed below, but the thrust of the program is in three areas, the first of which is not really a research subject:

- monitoring of implementation of *Forest Practices Code* provisions
- monitoring the effectiveness of *Forest Practices Code* provisions
- research on the occurrence, conservation status and impact of forest management on natural and cultural values.

Thus the proposed research program is one that essentially continues research in established research areas.

3.7 Summary of research nature and scope

The initial focus of research in the specialist areas dealing with the conservation of cultural and natural heritage and biodiversity was very much about inventory, stocktaking and development of predictive models for the values and their distribution, followed by assessment of impacts and determining methods for protection. The main thrust of research on soil and water values and landscape protection also included some inventory work, but was focussed more on developing prescriptions for amelioration of forestry impacts such as soil erosion, compaction and chemical use near streams.

Subsequently, research has been about updating and maintaining currency of databases and predictive models, and establishing monitoring systems, as well as establishing and refining prescriptions to protect values. Most recently research has begun to consider efficacy of prescriptions i.e. determining the degree to which

existing prescriptions deliver appropriate conservation outcomes. There has also been an upsurge in interest in research into the effects of spatial scale from coupe to landscape and on temporal scale with issues surrounding putative rotation times and their implications for biodiversity conservation in particular.

The nature of the research itself can be categorized into three areas: that which assists the development of specific prescriptions for the present Code, that which assesses the effectiveness of current Code prescriptions and thirdly, the more strategic level and longer term research which may assist in the rationalisation and simplification of dealing with the multitude of issues that are currently being dealt with.

The FPA has added roles and responsibilities over the years, and this has meant that changes have been needed also in the nature and prioritisation of relevant research. However the core subject areas for research have remained relatively constant. They are biodiversity conservation – threatened species and communities and their habitats, geoconservation, soil and water, landscape and cultural heritage. Specific research in all disciplines centres on update and maintenance of inventory, including databases and GIS modelling capacity, development of prescriptions for amelioration of impacts and monitoring efficacy of those prescriptions as well as development of techniques to deal with new issues as they arise.

4. Organisations which undertake research relevant to forest practices.

An annotated list of the agencies that undertake or have undertaken research relevant to forest practices is given below. The agencies have been categorised by affiliation.

4.1 State government agencies and statutory authorities

4.1.1 Forest Practices Authority: Forest Practices Unit

The FPA has a primary role in the promotion and conducting of research into forest practices in Tasmania

4.1.2 Forestry Tasmania/Forestry Commission: Division of Forest Research and Development, Conservation Planning Branch, Fire Management Branch

Forestry Tasmania has an active program of relevant research in diverse subjects of relevance to forest practices, including biodiversity, fire, silvicultural techniques, pest and disease management, conservation planning, soils and water management at the local and landscape scales.

4.1.3 Inland Fisheries Service

Among other functions, the Inland Fisheries Service has responsibility for the management and conservation of freshwater native fish and invertebrates. It has a research function in this regard and also provides an external consultancy research service.

4.1.4 Department of Primary Industries and Water (DPIW): Resource and Conservation Management Division (including Biodiversity Conservation Branch and the Threatened Species Section), Water Division (Including Water Management and Water Assessment and Planning)

The RMC Division within DPIW has primary responsibility for the Nature *Conservation Act 2002* and the *Threatened Species Act 1995* and has had active research programs in these areas which are of direct relevance to the forest practices system, including the mapping of threatened vegetation communities.

The Water Division also has research programs and specialists expertise relevant to forest practices, including hydrologists and biologists.

4.1.5 Tourism Arts & the Environment : Aboriginal Heritage Office, Environment, Heritage Tasmania, Parks and Wildlife Service, Royal Tasmanian Botanical Gardens, Tasmanian Museum and Art Gallery (including Tasmanian Herbarium)

This agency incorporates a number of units which have some research function of relevance to the forest practices system, including research into Aboriginal and European heritage, fire management, ecology, taxonomy and biodiversity.

4.1.6 Commonwealth Government

The Commonwealth Government has Departments and Agencies, notably the Department of Environment Water Heritage and Arts, the Department of Agriculture Fisheries and Forestry, including the Bureau of Rural Sciences, which have research

capacity relevant to forest practices, but they usually work cooperatively with the states or provide funds for state or academically conducted research.

4.2 Universities

Universities are primary research agencies within Australia. The Institutions listed below are the major ones which have conducted or are conducting relevant research. The research effort has covered many aspects of forest practices, including biodiversity, soil and water conservation, geoconservation and cultural heritage studies from local to landscape scales.

4.2.1 University of Tasmania: Schools of Plant Science, Zoology, Geography and Environmental studies, Faculty of Agricultural Science, Centre for Environment.

4.2.2 University of Melbourne: School of Forestry, Environmental Studies, Botany, Geography

4.2.3 Australian National University: Centre for Archaeological Research, Fenner School of Environment and Society

4.2.4 LaTrobe University: Archaeology

4.3 CSIRO

CSIRO's activities in Tasmania have in the past been mostly at the discretion of individual divisions, but the organisation is now acting more across units (C. Beadle pers. comm.). Two of the divisions most active with respect to forest practices in the past are listed below.

4.3.1 Forest Biosciences

Formerly the CSIRO Division of Forest Research (now Forest Bioscience) had a major role in conducting of research into aspects of forest practices, including soil and nutrient studies and diseases such as myrtle wilt and diebacks caused by *Phytophthora cinnamomi*. Since 1991 CSIRO has channelled most of its research efforts in Tasmanian forests through the various CRCs; however it continues to deliver some of its activities directly through Forest Biosciences.

4.3.2 Division of Sustainable Ecosystems

This Division and its predecessors have had an active role in the past in researching aspects of forest practices, including mammal studies in Eastern Tasmania, the development of predictive modelling systems and statistical/biometric/survey methodology development.

4.4 Cooperative Research Centres:

Cooperative Research Centres are partnerships between research providers, governments and industry. Tasmania was successful in its bid to establish a Cooperative Research Centre in forestry in the first round of bids in 1991 and has maintained a CRC in the subject ever since. The individual CRCs however have

varied in the amount and nature of research undertaken that pertains directly to forest practices.

The three Cooperative Research Centres have run consecutively with a range of partner institutions from Universities, CSIRO, Government agencies and Industry. The initial CRC for Temperate Hardwood Forestry (1991–1997) was replaced by the CRC for Sustainable Production Forestry (1997–2005) and that CRC in turn by the current CRC for Forestry which commenced in July 2005 with an expectation of continuing until 2012. While each of the CRCs has had a national canvas, much of the research has been of direct relevance to Tasmanian forests and forestry, if not always to the Tasmanian *Forest Practices Code*.

4.4.1 Temperate Hardwood Forestry (1991-97)

This CRC had four major program areas: genetic improvement; soil and stand management; resource protection and education and communication of which only soil and stand management and to a lesser degree resource protection had projects relevant to the forest practices system.

Over the seven year life of the CRC there were four post-graduate ecological projects which investigated aspects of floristic regeneration after logging and/or fire, one project which examined edge effects on logged sites and one project which modelled the distribution of Tasmanian eucalypts. In genetics, there were two projects which investigated intra-specific genetic variation, and there were two projects which examined aspects of vertebrate browsing and pest control (CRC-THF 1992–1997).

4.4.2 CRC for Sustainable Production Forestry (1997-2005)

The Co-operative Research Centre for Sustainable Production Forestry (CRC-SPF) was a collaborative venture between Australian forestry companies, the Commonwealth Government, State Government enterprises and universities. The CRC-SPF had research programs focused on genetic improvement, sustainable management and resource protection. Journal publications produced in its final year of operation numbered 79, of which only six were directly relevant to the forest practices system. However during the final three years of this CRC there were a total of 14 relevant post-graduate projects in the fields of vertebrate browsing control, invertebrate and vascular plant conservation, forestry impacts, genetics and silviculture.

The CRC-SPF had a total in-kind contribution of funds from participating partners of \$55 949 000 over eight years, with a cash input for the same period of \$1 846 000. The latter figure was combined with the CRC Grant of \$16 389 000 and other cash to give a total cash outlay of \$21 130 000 for the life of the CRC.

4.4.3 CRC for Forestry (2005-current)

The stated goals of the current CRC for Forestry are to foster research to:

1. maintain and improve security of access to land and resources for the forest industry by:
 - developing strategies that consolidate the industry's social license to operate

- increasing investment confidence in the establishment of new forestry ventures
 - identifying pathways for the industry to contribute positively to pressing environmental and social issues (including carbon sequestration, wildfire and water resource management)
2. increase yields and reduce the costs of production through improvements in site selection, resource monitoring and management
 3. increase the value of wood products through more targeted breeding and silviculture
 4. reduce the cost of delivered wood through development and communication of safer, more efficient harvesting, handling and transport.

In order to achieve these goals, the CRC partners are contributing \$10.5 million in cash, and \$46.7 million of in-kind resources together with \$26.6 million of CRC program funds and \$2.6 million of other cash for a total in excess of \$86 million over the seven years from 2005- 2012 . The research of the CRC for Forestry is organised into four programs: Managing and Monitoring for Growth and Health, High-Value Wood Resources, Harvesting and Operations, and Trees in the Landscape. Except possibly for the High Value Wood Resources Program, all of the programs have some relevance to the present discussion, although none of the programs has their objectives aligned solely toward this end. The 2006–07 annual report (CRC-F 2007) lists 80 journal publications, of which 15 are related directly to forest practices system concerns. The CRC has 23 PhD and three MSc students as well as another 34 PhD and five Honours students affiliated with it. The current web page lists 40 CRC students of whom 21 are dealing subjects of relevance to forest practices, and seven of these have projects directly relevant to existing Forest Practices Code prescriptions.

4.4.4 Other relevant CRCs

There have also been a number of CRCs in other subject areas which have conducted research of relevance to forest practices.

4.4.4.1 Bushfire (current)

The Bushfire CRC has one major project in Tasmania of relevance to forest practices. This is the establishment and inventorying of a wildfire chronosequence in an experimental forest landscape in the Southern Forests. This project will monitor biodiversity and other forest attributes over time at a range of sites subject to different fire/logging histories.

4.4.4.2 Greenhouse Accounting 1999–2006

Part the research program of this CRC involved development of methods for estimating change in forest biomass and carbon storage and cycling. Some of this work was done in Tasmania, giving estimates of longevity of standing dead wood and downed logs, which provide habitat for biota, as well as being important components for estimating and ameliorating global change.

4.4.4.3 Catchment Hydrology 1992–2005

The CRC for catchment hydrology conducted some research directly within Tasmania as well as much based in mainland Australia that is also of relevance to forest

practices more generally. For example O'Shaughnessy (1995) carried out a *Survey into User Perceptions of Codes of Forest Practice*, which included Tasmania, and the CRC was a partner in the hydrological research into granite soils in north-eastern Tasmania which are included elsewhere here as part of Forestry Tasmania's research effort. The CRC also undertook other studies of relevance to Tasmanian forest practices eg *A Critical Review of Paired Catchment Studies* (2004) by Best *et al.*

4.5 Other institutions and private consultants

4.5.1 Queen Victoria Museum and Art Gallery

The Queen Victoria Museum and Art Gallery has had an active role in research in the area of forest practices since before the establishment of the *Forest Practices Code*. Its main study areas have been in Aboriginal and historic heritage and in the ecology, biogeography and taxonomy of invertebrates, vertebrates and vascular plants.

4.5.2 Tasmanian Aboriginal Land and Sea Council

The TALSC have had an active interest in forest related research into aspects of Aboriginal heritage.

4.5.3 Private sector consultancy firms and individual contractors.

There are a number of private firms and individuals engaging in research into aspects of forest practices on behalf of their clients, who may include government agencies, industry and/or private landowners..

4.5.4 Forest industry bodies

Some of the Tasmanian forest industry bodies eg North Forest Products and ANM, have in the past maintained active forestry-related research programs, but these have not usually been directed in the area of forest practices *per se*. Rather, the forest industry has contributed to this aspect of research by outsourcing.

4.6 Voluntary bodies

There are some private individuals and groups such as caving groups and field naturalists who have contributed research effort in the areas of relevance to forest practices. These have been mostly in the areas of biodiversity and geoheritage conservation.

5. Sources of funding for research (including in-house and external funding sources).

Many of the agencies discussed above have dual roles in that they fund research as well as providing research services. This funding may go totally towards internal research programs as in the case of the universities whereas some of the government agencies in particular also fund outsourced research.

A list of bodies which fund or have funded relevant research is given in Table 3

Table 3: Bodies which fund or have funded FPS-relevant research

<p><i>Academic</i></p> <ul style="list-style-type: none">Australian Research CouncilAustralian Post-Graduate Awards SchemeUniversity funded honours and post-graduate scholarshipsIndustry and other funded post-graduate scholarships <p><i>State Government Agencies and Statutory Authorities</i></p> <ul style="list-style-type: none">Forestry Commission/Forestry TasmaniaDepartment of Primary Industry and Water and predecessor bodiesForest Practices Authority/Forest Practices UnitInland Fisheries Commission/ServiceParks and Wildlife Service <p><i>Industry bodies</i></p> <ul style="list-style-type: none">Industry directForest Industries Association of TasmaniaTasmanian Forest Research Council <p><i>Research and Development Corporations</i></p> <ul style="list-style-type: none">Forest and Wood Products AustraliaRural Industries RDCLand and Water Australia <p><i>Commonwealth Government Agencies</i></p> <ul style="list-style-type: none">Department of Agriculture Fisheries and Forestry including the Bureau of Rural Sciences and predecessorsDepartment of Environment Water Heritage and Arts and predecessors

Private Benevolent Trusts etc

WWF Australia
Tasmanian Conservation Trust
M. A. Ingram Trust
Holsworth Wildlife Research Grants
Plomley Foundation
Winifred Violet Scott Trust

Commonwealth and/or Tasmanian Government Initiatives.

National Rainforest Conservation Program
National Soil Conservation Program
Comprehensive Regional Assessment and Regional Forest Agreement
Forests and Forest Industry Council
Tasmanian Community Forest Agreement
National Water Initiative
Helsham Committee of Inquiry into Lemnathyme and Southern Forests
Resource Assessment Commission Inquiry into Forests and Forestry
State Water Plan (CFEV)
Natural Heritage Trust/Natural Resource Management

It is beyond the scope of this report to go into detail on every one of these. Details of funding levels for the various forestry CRCs have been provided above and attributes of some of the key research funding and/or providing agencies are discussed below.

5.1 Government agencies

5.1.1 Forest Practices Authority

Funding for research within forest practices came initially from the MOU allocation discussed above (3.2). The specialists were also successful in attracting ancillary funding from the TFRC and elsewhere for other research projects. After the demise of the TFRC, from about 1999, FIAT and Forestry Tasmania established a FIAT/FT Research fund of c.\$40 000 p.a. to fund jointly agreed prioritised research over and above internal FPA allocations. This funding continued until August 2005, when FPA became an independent, government-funded authority.

The number of full time equivalent positions (FTEs) by year within the FPA by year has been estimated in Table 4 from the FPA's annual reports (FPA 1987–2007) and from personal communications about proportion of time allocated to research by temporary and continuing FPA staff.

Table 4: Number of FTEs by year in specialist areas at FPA

Year	Biodiversity	Earth sciences	Cultural heritage	Visual management
1987	1	0.5	0.5	0.5
1988	1	0.5	0.5	0.5
1989	2	1	1	0.5
1990	3	1	1.5	0.5
1991	3	1.5	1.5	0.5
1992	3	2	1.5	0.5
1993	3	2	1.5	0.5
1994	3	2	1	0.5
1995	3	2.5	1.5	0.5
1996	3	3	3	0.5
1997	2.5	2	1.5	0.5
1998	1.5	2	1.7	0.15
1999	3.5	2.5	1.2	0.15
2000	3.5	3	1.2	0.15
2001	3.5	3	1.2	0.15
2002	3	3	1.2	0.15
2003	3	2	1.2	0.15
2004	4.5	1.5	1.2	0.15
2005	6.5	2.1	1.2	0.15
2006	6.2	1.5	1.7	0.15
2007	7	1.8	1.2	0.15

These figures have been corrected for the time actually allocated to research by the primary forest practices specialists. For the first few years of the forest practices research program, the individual researchers were spending about 50 per cent equivalent time on research. This figure has reduced over the years to the stage that in 1998, the FPA Strategic Plan (FPA 1998) estimated research time for individual researchers at levels of between 10 to 20 per cent of their time (Table 5).

Table 5: Percentage of FPA staff time to be spent on research 1998–2001 (from Strategic Plan for the Forest Practices Board 1998–2001)

Archaeology: 15% research (+ time on database maintenance and site surveys,

Botany: 15% research (+ site surveys, data bases)

Geomorphology: 10% research (+ databases, site surveys)

Landscape: 15% research and development (mostly development)

Soil and Water: 20% research (+data bases, site surveys)

Zoology: 20% research (+ data bases, field surveys)

The most recent estimate of costs of research by the FPA (S&T 2005), was \$350 000, in the following subject areas:

Archaeology: excavation of two Chinese tin miners' camps in the north-east for Forestry Tasmania.

Botany: the investigation and monitoring of tree ferns response to logging disturbance; the recovery of vegetation associated with headwater streams in the north east highlands; and research into the regeneration of threatened flora species in response to forestry practices.

Geomorphology: comparative study of the composition of sinkholes in plantation and native forest settings in the Florentine Valley.

Soil and Water: effects on Class 4 streams of forestry operations and known erosion hazards; catchment issues in the Koonya State Forest; the effect of fire on soil properties; the management of soils in granite; aeolian deposits; and improving soil and water information availability.

Visual landscape: study of current international landscape review methods and practices and the update of visual planning data held by Forestry Tasmania has been undertaken to enable better visual planning and representation.

Zoology: zoological studies focus on the management of forest fauna, including the impact of forestry on stag beetle populations and juvenile freshwater lobsters.

5.1.2 Forestry Tasmania

Research into areas related to the forest practices system at Forestry Tasmania occurs within the Division of Forest Research and Development and the Conservation Planning Branch, with some limited research in the past having been conducted by the Fire Management Branch.

Research contributions in areas related to forest practices are detailed in Table 6. The FTEs include contract personnel working on particular projects in the respective fields and contributions from Fire Management Branch. In addition to these FTEs, the

Conservation Planning Branch has contributed one FTE p.a. to landscape level conservation planning research since 1997.

Table 6: Research FTEs in Forestry Tasmania/Forestry Commission 1988–2007

Year	Silviculture	Soils and water	Flora/fauna	Archaeology	Geomorphology	Other
1988	2	2.5	3.4	0.2	0.2	0.7
1989	2.6	3.3	3.8	3.2	0.8	1.2
1990	2.6	2.2	6.6	4.4	2	1.2
1991	2.6	5.4	6.7	2.2	1.5	1.2
1992	2.6	5.4	8	4.4	2.5	3.7
1993	2.6	5	8.1	4.2	2.8	2.7
1994	2.6	6	7.2	3.7	3	2.7
1995	2.3	5.6	4.1	2.3	4.1	2
1996	1.3	4.5	5.1	2.3	3.1	3
1997	4	0.9	5.1	2.5	0	3
1998	2	2.8	5.9	1	0	3
1999	3	3.3	9	0	0	3
2000	3	3.3	12.9	0	0	3
2001	3	3.3	9	0	0	3
2002	3	3.3	11.7	0	0	3
2003	3	4	10.8	0	0	3
2004	3	3.5	11.7	0	0	3
2005	3	3.5	6.9	0	0	3
2006	3	3.5	10.6	0	0	3
2007	3	4.2	12.7	0	0	3

5.1.3 DPIW

The Resource Management and Conservation Division of DPIW employs researchers in a number of different areas of relevance to Forest Practices. The numbers of staff by Branch is given in Table 7. This table does not include staff in the fox task force.

Table 7: Staff Numbers in Branches of the RMC Division of DPIW

Wildlife Management Branch	35
Biodiversity Conservation Branch	39.5
Land Conservation Branch	35
Conservation Policy and Planning	22

Most of these staff are engaged in activities which are unrelated to forest practices, but the areas with most relevance would be in the Threatened Species, Flora and Wildlife and Marine, Sections of the Biodiversity Conservation Branch, and in the Earth Sciences and Land Management Sections of the Land Conservation Branch.

There are relevant researchers also in the Water Division, but for DPIW as a whole, there was no available overall breakdown of individual FTEs by research subject at the time of writing. However their FTEs were included in the combined figures for all forest research reported in the Sustainability Indicators document (SI 2007) and some comment about these figures is made in that section.

5.2 Tasmanian Forest Research Council (TFRC)

The TFRC was established in April 1987 with 13 foundation members comprising:

- six industry bodies and associations (including FIAT, TFGA Forestry Committee, APPM, Forest Resources, ANM, APM)
- five Government and semi government agencies (Forestry Commission, DPI, DLPW, Private Forestry Council, Australian Forest Development Institute)
- three research providers (CSIRO, and the University of Tasmania and Tasmanian State Institute of Technology (the latter 2 bodies were amalgamated during the period of the TFRC).

The TFRC had five expressed objectives which related to the promotion, encouragement and coordination of research related to Tasmanian forests. It was comprised of a Board and Executive group, with three Sub-Committees established to oversee research prioritisation and allocation of funds in accordance with TFRC objectives. The three sub-committees dealt with R&D in the areas of Ecology, Wood Production, and Harvesting and Processing.

The TFRC was fully functional from 1987 until 1994, but with the advent of the FWPRDC, funding for ecological research was terminated, except for a unilateral grant from North Forest Products for two years 1994–96. The TFRC was finally wound up in 1998–99 financial year, and coordination of R&D funding for Tasmanian forestry was passed to FIAT.

Funding (Table 8) was sourced in a number of ways, including direct from industry and government in the case of the Wood Production and Harvesting & Processing themes. Funding for ecological research came from a levy placed on export woodchips by the Australian Government. The Ecology Sub-committee also assisted in prioritising the research of specialists in the Forest Practices Unit whose work programs included a 50 per cent research component.

Table 8: TFRC funding for R&D projects 1987-1999 (TFRC 1988-99)

Financial Year	Ecology Sub-committee funding (\$)	Harvesting & Processing Sub-committee funding (\$)	Wood Production Sub-committee funding (\$)
1987–88	135 001	Part of 185 192	Part of 185 192
1988–89	181 025	Part of 251 298	Part of 251 298
1989–90	289 895	22 800	66 050
1990–91	488 305	69 717	137 066
1991–92	501 150	0	127 965
1992–93	399 141	0	118 140
1993–94	226 404	17 500	32 800
1994–95	99 204	30 224	65 482
1995–96	201 059	36 674	77 941
1996–97	85 299	11 284	61 539
1997–98	59 150	1 500	46 972
1998–99	49 500	0	29 013

The amounts allocated to research by the Ecology Sub-committee have been converted to FTEs in figure 1. This chart shows an exponential rise and decay in TFRC produced FTEs over the period, with the ‘halcyon’ years being in 1991 and 1992, prior to the reduction and redirection of woodchip export levies to the FWPRDC.

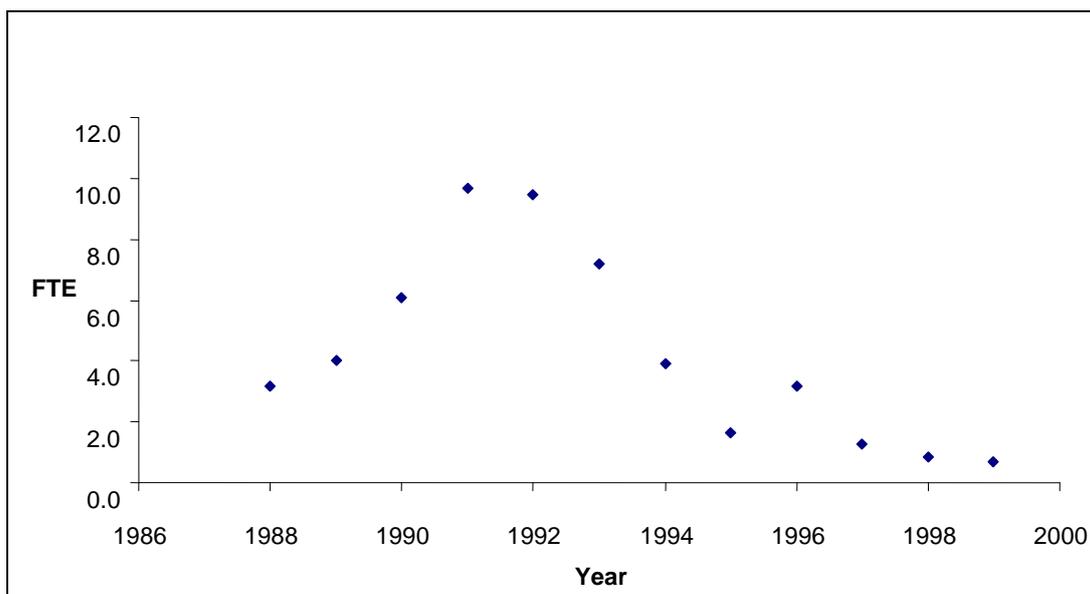


Figure 1: FTE by year from Ecology Sub-committee, TFRC

5.3 Research and Development Corporations (RDCs)

There are a number of RDCs which have contributed funds towards forest practices-related research, including Land and Water Australia and the Rural Industries RDC. These two RDCs are largely publicly funded and funding they have provided in the forestry arena have mostly assisted research into forestry impacts on soil and water.

A major player in forest research has been Forest and Wood Products Australia which is funded via industry sector levies together with a Government contribution. An analysis of their direct role in research of relevance to Tasmanian forest practices is presented below.

5.3.1 Forest and Wood Products Australia, FWPA, (formerly the Forest and wood Products Research and Development Corporation, FWPRDC)

The FWPRDC was established in 1994 to broker and promote R&D in the forest and wood products sectors using funds provided through levies raised on Industry sectors and matched dollar for dollar by the Australian Government. It was replaced by a new body, the Forest and Wood Products Australia (FWPA) in 2007. Their website (FWPA 2008) lists some 286 funded projects of which 94 are active and 192 are completed. The R&D has been undertaken in four program areas, with the Sustainable Forest Management Program being potentially of the most interest to the Tasmanian forest practices system. The website lists 37 published reports in this program, of which only six appear at all relevant to the present discussion (Table 9). However, in addition to this direct funding of research, FWPA also contributes to research relevant to Tasmanian as a partner in the CRC for Forestry.

Table 9: FWPRDC projects potentially having some relevance to the Tasmanian Forests Practices Code

Project No.	Title	Comment
PN06.4016	The use of chemical pesticides by the Australian plantation forest industry	Review document
PN06. 4012	Guidelines for communicating performance against standards in forest management	
PN04.4010	Regional scale, spatially explicit quantification of plantation forest water use	
PN04.4005	Plantations and water use; a review	Review document
PN002.96	Excavator based logging in native eucalypt forest	
PN 003.95	Snig track management	Primary purpose is increased extraction efficiency, with ancillary environmental benefits.

The FWPRDC commissioned a report which analysed the impact of its funded research from 1995–2000 (Agtrans Research 2001). This report examined 35 projects selected from the 79 projects completed to that date and which were funded at over \$30 000. These 79 projects included 93 per cent of all research funds allocated at that time. Only three of the 35 sampled projects were of any relevance to the forest practices system. Two of them were reviews of sustainability indicators, and the third was the above-mentioned project PN 003.95 on snig track management which had only peripheral relevance to the forest practices system, being primarily aimed at increasing efficiency of harvesting and extraction.

The current Five-Year Plan (FWPRDC 2003) specifies that approximately 15 per cent of total FWP investment would be in the area of sustainable forest management. Presumably some of this investment will be of relevance to *Forest Practices Code*, including some component of the funds invested by FWPA into the CRC for Forestry.

6. An estimate of the amount of research capacity (expressed as FTEs or total \$ per year) over the time period against the subject areas and sources of funding.

The *State of the Forest Report 2006* (FPA 2007), states that in 2005–06 there were 147 FTEs engaged in forest-related research in Tasmania, involving an estimated expenditure of \$12 353 000. However most of this research capacity is unrelated to forest practices *per se*. It has not been possible to provide an unequivocal breakdown of research capacity over the whole period 1987–2007 broken down by subject areas and funding. The advent of the administratively complex CRCs and pooling of funds by other agencies makes it difficult without the expenditure of considerably more time to disentangle just who contributed what funds to which component of often large and multi-faceted research programs. However it is clear from the information presented above in the section dealing with the CRCs, that there has been a steadily increasing component of forest practices related research over the life of the three CRCs, both in terms of numbers of post graduate students undertaking research and number of research publications.

In order to make some evaluation of research effort over the twenty year time-frame, it has also been necessary to find a common basis for comparison. This has been done by placing research effort/expenditure on a common footing of number of FTEs standardised by salary component over time. Figure 2 shows the relationship between salary and time based on a Level 2 Government scientist. This equation was used to calculate an estimated gross annual salary for any one year, and then multiplied by 1.5 to obtain a cost of an individual FTE research effort, based on the proportional cost of gross salary to running/on costs for a researcher at FPA. This figure has then been divided into research funding to assess relative number of FTEs.

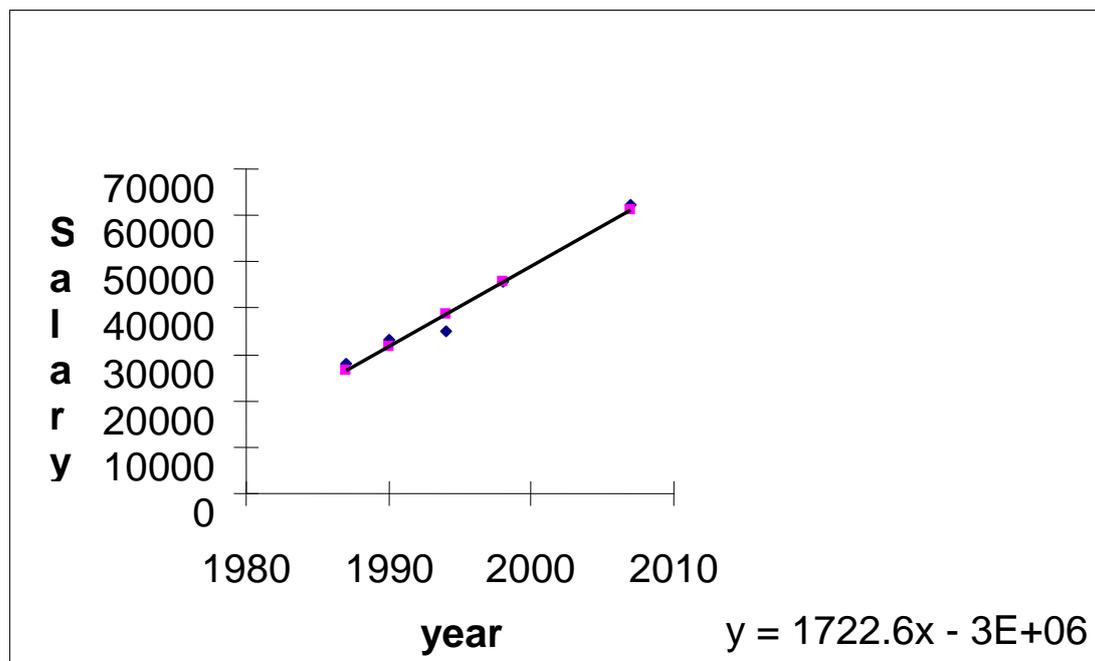


Figure 2: Salary of a Level 2 Government scientist (\$) by year

An indication of the numbers of FTEs engaged directly in relevant research over the period can be gained from Table 10. This table allows for the changing research time allocations of the primary FPA researchers over the period, and does not include them under FT's allocation in the period from 1987 until 1994, when the FT replaced the Forestry Commission. The table demonstrates the decline in TFRC and FIAT/FT funded research but nevertheless shows an overall gradual increase in numbers engaged in forest practices-related research over the 20 years. There is an aberration in the 5-year period to 1997 resulting largely from the work being undertaken as part of the Comprehensive Regional Assessment prior to the RFA and also due to the establishment of the Warra LTER site and intensification of soils and hydrology work as part of the plantation development program by FT.

Table 10: Numbers of FTEs engaged in relevant research in FPA, FT and TFRC/FIAT in four 5-year periods 1987–2007

Year	TFRC & FT/FIAT	FPA	FT	Total
1992	32.4	26.5	69.1	128
1997	17.2	37.0	97.8	152
2002	4.3	35.8	99.5	139.6
2007	1.4	43.4	106.4	151.2

The status of R&D in overall forest management and delivery of goods and services over the period 2003–2007 is summarised in Indicator 7.1 e of the Sustainability Indicators report (SI 2007). This report includes the most recently available data, for the period 2002–2006 and provides a status report for 2005–2006. The Indicator uses the number of personnel, expenditure and number of research publications to measure capacity, but it includes many aspects of research which are not directly related to forest practices. The summary data from that report are reproduced here in Table 11

Table 11: Magnitude of Tasmanian forest and forestry research effort (2005–06)

	Government agencies	Private companies	Academia		Total
			staff	students	
Personnel engaged on forest-related R&D (number of FTE)	69.0	10.4	38.4	36.3	154.1
Expenditure on forest-related R&D (\$)	\$5 586 000	\$851 000	\$6 767 000		\$13 204 000
Research publications in last 5 years (number)	204	12	306		522

The report states that

Staff and students in Academia comprise approximately half the total number of personnel engaged in forest-related research and development in Tasmania, and account for approximately half the total expenditure.

This report lists 522 publications which cover many aspects of forest research, including many relevant to the FPC. A breakdown of these publications by research area of direct relevance to the FPC is given in Table 12.

Table 12: Research publications in the period 2002–2006 relevant to the forest practices system. Numbers in brackets are the total number of publications reported by SI 2007

Subject	Number of publications
Biodiversity conservation	107 (139)
Carbon	0 (0)
Fire	2 (2)
Cultural Heritage	1 (3)
Other non-wood values	2 (2)
Pests and diseases	6 (123)
Silviculture	19 (198)
Social and economic	0 (20)
Soil and water	21 (35)
TOTAL	158 (522)

The report tabulates the research subject areas and numbers of full time equivalent research personnel (FTEs) working in each area for 2005-06. Table 13 reproduces the data from that report. A number of the research categories recognised therein are not relevant to forest practices and much of the research effort in categories such as silviculture and the genetics components of plantations are also not directly relevant. The base data from which the compilation was made would need to be examined to make a more apposite evaluation.

Table 13: Full-time personnel engaged in forest-related research and development in 2005–06 (FTE)

	Plantations	Native forest	Total
Fauna ecology (including genetics)	16.5	23.5	40.0
Flora ecology (including genetics)	5.7	32.9	38.6
Silviculture	21.0	3.6	24.6
Tree breeding	13.5	0	13.5
Timber use	9.4	0.4	9.8
Forest pathology	6.5	2	8.5
Forest hydrology	3.8	4.4	8.2
Statistical analysis	1.2	1.2	2.4
Climate change	1.1	0.7	1.8
Forest entomology	0.1	1.6	1.7
Fire ecology	0	1.1	1.1
Fire behaviour	1.0	0	1.0
Non-timber forest products	0	0.4	0.4
Agroforestry	0	0	0
Other	1.5	0.9	2.4
Total	81.4	72.7	154.0

The SI (2007) report also does not consider theses, so an attempt has been made here to quantify research theses over the period. The numbers of research theses in forest practices-related subjects produced by the schools of Plant Science, Zoology and Geography & Environmental Studies have been tallied by research area in Table 14, and the total relevant research output across all schools and subjects for each 5 year period of the 20 year period is shown in figure 3. These data do not include a number of highly relevant theses which have been done in other parts of the university and elsewhere in Australia, eg several PhD biodiversity studies on invertebrates in litter, logs and old growth and regrowth trees and on decay fungi. However even without those theses being included, figure 3 shows that there has been a steady increase in research output as measured by this indicator over the period.

Whilst there has been an increase in research effort relating to forest practices in general, much of this effort has been at the strategic level, and research has not kept pace with the demands for forest practices advice on current prescription issues. This is particularly the case since the advent of the Threatened Species Protection Act (1995). For example a preliminary analysis shows that of the 91 threatened vascular plant species for which notifications for advice have been received by specialists, only 22 have had any research undertaken on them. (N. Roberts pers. comm.). Figure 4 shows that there has been a great increase in the number of formal notifications for advice while the total numbers of Forest Practices Plans have remained more or less constant over the past ten years.

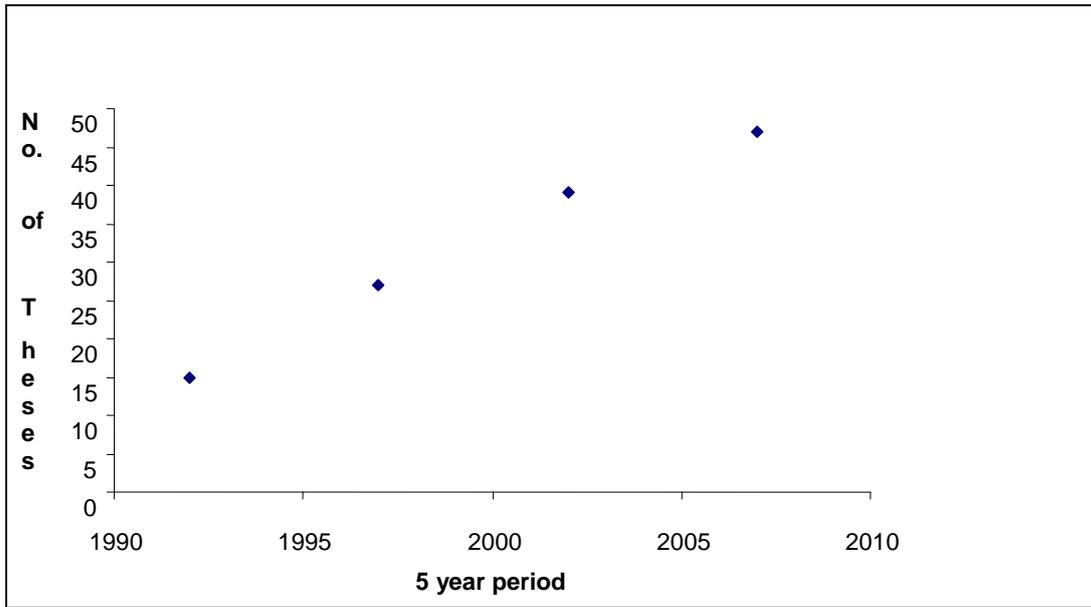


Figure 3: Number of theses by 5 year period 1998–2007

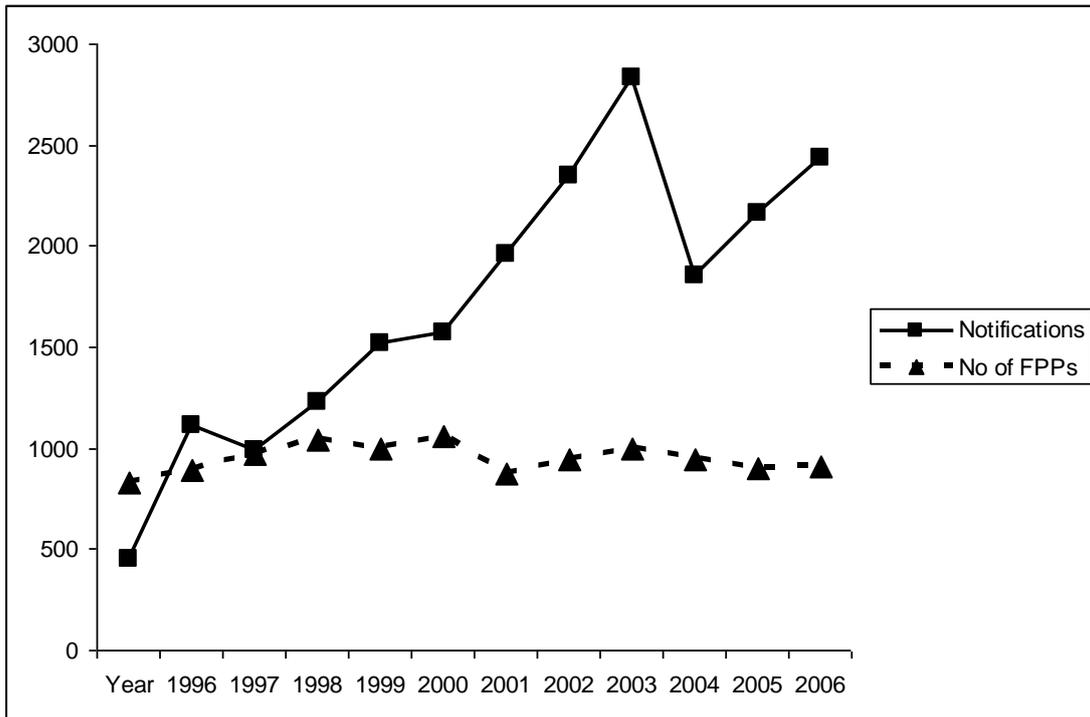


Figure 4: Numbers of notifications to forest practices specialists and numbers of Forest Practices Plans 1995-2006

Table 14: Numbers of theses on forest practices-related research from University of Tasmania Schools of Geography & Environmental Studies, Plant Science and Zoology by subject and year

Year	Policy	Vegetation ecology & fire	Earth sciences	Freshwater	Mapping/RS	Plant species	Fauna species	Fauna habitat	Cultural heritage	Genetics	Silviculture	Total number
1987		2	1		1			1				5
1988		1										1
1989			1			2		1				4
1990		1			1							2
1991	1		1					1	2			5
1992		2						1				3
1993			1	1		1		1				4
1994		3			2	1						6
1995				1			2					3
1996	2	4				1						7
1997		2				1	3		1			7
1998	1	2		1			3					7
1999		3					3		1			7
2000	1	1		1			3	1				7
2001	1	1		2		1	4	1	1			11
2002		1		2	1	1		2				7
2003	1	4	1			1	4	2		1		14
2004		3		2		1		4		1		11
2005			1	1		1	1					4
2006	1	1	1		1	1	1	3				9
2007	1	3	1			1		2			1	9
TOTAL	9	34	8	11	6	13	24	20	5	2	1	133

7. Discussion:

There has been an increasing body of relevant research being conducted in the period given:

- the increasing research FTEs of the major forest-practices-related bodies
- the increase in the amount of forest practice –related research in the successive CRCs
- the increase in numbers of relevant research theses produced by three major schools at the University of Tasmania.

Much of this research has been of a strategic nature, and the amount of research relating to the immediate requirements of existing forest practices provisions and their effectiveness has not kept pace with the demand for information from field practitioners. The original model of joint funding for research directly to the FPA to assist the development of adaptive management does not appear to be the model preferred by industry.

The nature of the role or influence that the FPA has been able to exert on agenda-setting for such research is unclear. It appears that the directions and priority for much of the relevant research has been generated largely by policy decisions external to the FPA, leading to a lack of research funding/resourcing for immediate concerns of FPA specialists. The FPA appears to be addressing this issue by becoming more involved in cooperative inter-agency programs such as the Warra LTER site, threatened species conservation planning and landscape planning for visual management, cultural heritage and biodiversity and by participating in the CRC for Forestry.

In particular, landscape level planning for conservation and environmental management is being conducted by FT, but there is a need to address the issue across tenures. It is not apparent that this is being done, nor should the costs or responsibility for relevant research to be borne by FT alone. It is a whole of industry issue and should be funded accordingly. The CRC for Forestry has some programs which are relevant to this concern, but the FPA is an appropriate body to be a major player/champion on the operational research side of this work.

The above information demonstrates that research has maintained an active and essential role in the delivery of the forest practices system in the past 20 years. The model under which the forest practices system was established was one of joint funding by the forest industry and government to arrive at outcomes in the context of continuous improvement through an adaptive management approach. This model was initially supported by the forest industry, but the passing years have seen a diminishing contribution from the industry to direct funding of research by the Forest Practices Authority. Despite this reduction in funding, the amount of research has steadily increased over the period, whether measured by FTEs, publications or research theses. The relationship between research which has relevancy and that which has immediacy needs more examination than has been given here. However it is clear that the demand for immediate research to service the existing Code provisions and their effectiveness is not being met.

8. Summary and Conclusions

The Tasmanian Forest Practices Code provides for environmental protection during forest operations and is underpinned by research. This research can assist strategic level planning, the development of tools and techniques at a range of scales, the development and application of new operational prescriptions and the monitoring and effectiveness testing of existing prescriptions.

This analysis has shown that the need for research has remained high over the period from 1987 to 2007, the subject areas for research needed to service the forest practices system have remained fairly constant, but there have been changes in the particulars of research topics within the broad scientific disciplines pursued to protect environmental values.

The total amount of research over the period has increased as measured by a number of different indicators, but there is insufficient research being undertaken to service immediate demands for operational advice and to test the effectiveness of existing prescriptions.

The research funding has come from a variety of sources and its delivery has come from a range of providers.

There is a key role to be played by the FPA in promoting and facilitating research which is relevant to its particular charter. While this charter does not always coincide with the perceptions and needs of other organisations in the same research marketplace, the FPA has the imprimatur to take a lead role in consolidating existing research take up, and advocating future research in the area.

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