Division of Forest Research and Development

annual report 2010

Forestry Tasmania

stewards of the forest

Division of Forest Research and Development

Mission

To provide research, development and information services to support Forestry Tasmania and clients

Vision

To be recognised for excellence in forest research and development

Pictured above

Forestry Tasmania, Government and industry representatives visit a variable retention coupe (Styx 020A) in the Styx valley as part of an information day.

Forestry Tasmania is a REGISTERED RESEARCH AGENCY (RRA) under the Commonwealth Industry Research and Development Act 1986, for the purpose of performing contracted research and development (R&D) for eligible companies claiming the 125% R&D tax concession under Section 73B of the Income Tax Assessment Act 1936. Research is carried out in the forestry, botanical, zoological, horticultural, soil and water sciences. For more information, please refer to the Commonwealth Government Ausindustry Agency website at www.ausindustry.gov.au

Cover Photo: Forestry Tasmania's Chief Scientist Dr Steve Read with students from Huonville Primary during National Science Week 2010 activities at the Tahune AirWalk.

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overview: FORESTRY TASMANIA

Tasmania

Tasmania is an island of 68,331 square kilometres and outstanding natural beauty located 240 kilometres below the south-east corner of the Australian mainland. It is Australia's southernmost state. Tasmania has a population of around 500,000, and benefits from a temperate climate.

Tasmania is rich in natural assets, including forests and a diversity of minerals, and is the most forested state in Australia. Its relatively unspoilt beauty attracts visitors from all over the world.

Forestry Tasmania

Forestry Tasmania is a Tasmanian State Government Business Enterprise. The business manages 1.5 million hectares (ha) of State forest for multiple uses, an area that contains 39 per cent of Tasmania's forests. Just less than half of the area of state forest is available for wood production, with the remainder being set aside for other values such as conservation and recreation. Forests on other public lands, mostly national parks and other conservation reserves, are managed by separate agencies.

Forestry Tasmania manages its operations with five administrative Districts across the State, and headquarters in Hobart. As of 30 June 2010, Forestry Tasmania employed 513 personnel and 1,194 contractors.

There are some 107,000 ha of plantations on State forest, comprising:

- 52,490 ha of softwood - *Pinus radiata*
- 54,540 ha of hardwood - predominantly *Eucalyptus globulus* and *E. nitens*

A portion of this plantation estate is in joint venture with private investors or customers, including buyers of finished forest products.

Forest Tourism

Forestry Tasmania also manages world-class tourist destinations in the forest, such as the Tahune AirWalk, Tarkine Forest Adventures at Dismal Swamp, the Forest EcoCentre in Scottsdale, and the Eagles Eyrie, part of the Maydena Adventure Hub.

overview: FOREST RESEARCH & DEVELOPMENT

Forestry Tasmania manages State forest for the production of timber, water and other products, and for conservation of biodiversity. The Division of Forest Research and Development undertakes research to improve the sustainability, productivity and profitability of this management. These three goals – productivity, sustainability and profitability – and Forestry Tasmania's Sustainable Forest Management Objectives, Targets and Indicators therefore guide the Division's research planning. The Division is also committed to communicating research results and the scientific basis for forest management within Forestry Tasmania and to the wider community.

The Division has been in existence for over 30 years and is headed by the Chief Scientist. A significant investment of approximately $3.5 million per annum from Forestry Tasmania's funds is directed to in-house research and extension, out-sourced research and collaborative programs, and is augmented by competitively gained research funds and other State and Commonwealth funding.

Forestry Tasmania is a core member of the Co-operative Research Centre (CRC) for Forestry, and is also a participant in the Bushfire CRC and the Landscape Logic Commonwealth Environmental Research Facility. Forestry Tasmania also leads the long-term research at Warra in Tasmania's southern forests.

Key challenges

The Division's key challenges are to make available to Forestry Tasmania the most up-to-date knowledge in forest science; to conduct focused research for strategic and operational implementation, thereby maintaining the scientific basis for forest management; and to conduct research efficiently, making maximum benefit of in-house scientific knowledge and external collaboration.

Our strategies

Forestry Tasmania is internationally recognised as a leader in research on the management of native forests and eucalypt plantations. Our activities towards organisational and community objectives are managed across three Branches within the Division: Biology and Conservation, Native Forests, and Plantations. The Division's key strategies are to:

- undertake research into new silvicultural techniques for native forests and for improved operational performance;
- develop sustainable management techniques and improved genetic material for plantations, focusing on profitability and high-value products;
- ensure conservation of biological diversity and habitat within production forests, and sustainable management of carbon, water and other values;
- undertake health surveillance of native and plantation forests, and develop integrated protection and remediation strategies.

Many of these strategies make use of the Warra Long-Term Ecological Research site in southern Tasmania: http://www.warra.com

Forestry Tasmania's Managing Director Bob Gordon

chief scientist's report

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The past year was another in a series of transition years for the Division of Forest Research and Development, Forestry Tasmania, but reflection suggests that this is to be expected for a problem-solving, applied-science group. As we finalise incorporation into operational practice of the results from one program, another program is maturing, and yet others are moving into activity. For 2009-10, these descriptions applied respectively to variable retention for old-growth forests, to our maturing plantation silviculture program, and to the carbon and landscape research agendas. A working group that brings together operational, planning and research staff is an excellent mechanism for maintaining the real-world and commercial relevance of our work – so, as research programs changed, similarly the Variable Retention Implementation Group completed its work and the Plantation Productivity and Management Group commenced.

Serious consideration of multiple-thinning regimes began this year. Again this is logical, as Forestry Tasmania moves beyond plantation establishment, to assess the resource thereby created, and address how to maximise productivity on each of the sites planted. Sometimes this will involve a different species at second rotation, such as *Eucalyptus globulus* instead of *E. nitens*, as we learn to combine into a single decision the various assessments of differential growth rates, wood values, and pest and disease risks. Often it will involve regimes that give more solid wood earlier through a fine balance between maximal site occupancy and minimal tree competition throughout the rotation, by one or more of thinning early, thinning often, and thinning to a relatively low final stocking. We have "bought the concept" of multiple-thinning regimes, and are now settling into the long haul of trial design and assessment that will give us the best such regime for each individual site across the Forestry Tasmania plantation estate. The Plantation Productivity and Management Group will be a key forum in development of these new regimes.

Eucalyptus nitens *plantation nine months after establishment*

And the Variable Retention Implementation Group held its last meeting. Variable retention, especially in its aggregated retention form, is now established as a silvicultural approach for harvesting old-growth wet eucalypt forests, and has increasing application in various regrowth forests where the goal is development of some mature forest characteristics simultaneous with timber harvesting. Variable retention is an operational silviculture that articulates desired ecological outcomes for each coupe, incorporates these into planning, and assesses outcomes. The issue now for Forestry Tasmania is how to capture the credibility associated with this ecologically-based silviculture – for all our attention to public discourse, we often do a better job of the underlying science and its application than of explaining to others how rapidly forestry is changing.

When external pressures bring about internal change in forestry organisations, it is of course appropriate for scientists to consider the role of science in managing forests in the public gaze. Science is essentially the "art of the soluble", as British immunologist Peter Medawar wrote, with successful science thus depending on asking the right questions - whereas politics or management are the arts of the possible. Further, science does not address the great range of people's values in regards to forests, but we have learned that information produced by the scientific approach can change beliefs about consequences of actions. That is, science (and its natural corollary education) can tell about how the natural world works if we are prepared to learn its sometimes hard lessons – and, in the case of the eucalypt world and fire, these can be very hard lessons indeed. Imposing a European model on wet eucalypt forests simply will not work, yet if we are able to work within their unique disturbance ecology, where species and carbon stores are nomads in time and space, then this is the forest type in which there is perhaps the best opportunity to harvest timber sustainably by all measures.

Jagmohan Maini has described sustainable forest management as "the sociology of decision-making combined with the functioning of ecosystems", to which we could add technical stand management - and we forget at our peril the social science of forestry. There is a substantive role for social science in analysing and interpreting historical human expectations of forests, and providing a framework within which the various value-sets in society might be satisfied in a modern forest landscape. The harvest values of forests are reasonably well known, although arguments for harvesting require forest products to increase in value in proportion to the increase in value of non-extractive uses of the forest. Attributing greater value to the sustainable attributes of wood as compared to other materials ("Wood is Good") is part of this process, when accounted for in a scientifically defensible way, and part of our developing carbon research agenda addresses this issue. But, especially in Tasmania, we are going through an extended process of re-evaluating and formalising values associated with standing forest.

At a recent conference at the University of Melbourne, Rowan Reid showed how it was necessary to recognise the various values of stands of trees to farmers (whether for shelter, soil rehabilitation, or separating areas of different productivity, or for riparian protection, amenity, biodiversity or carbon) before they were willing to put trees back into their part of the agricultural landscape. This approach also removed the sole focus on harvest as providing value, and the need for precise timing of harvesting. Whether on State forest or on farms, timber values captured at harvest will remain an essential outcome from commercial management, and the major source of cash flow, but we are going through a social process of learning how to integrate within-rotation values with harvest values. At a forest estate level, this will involve moving beyond tables of landscape metrics to describing and visualising how biodiversity, carbon and other "outcome" values are captured across time and space in commercially managed forest catchments compared to in unmanaged forest catchments – the science of landscape ecology - and we are using the Southern Forests Experimental Forest Landscape to this end. This approach will involve cutting-edge science, carried out in the context of developing a narrative of management outcomes for the forest and thus for the stakeholders of the forest, wherever they might live.

Chief Scientist Dr Steve Read at the variable retention field day.

Conservation of mature-forest biodiversity in production forest landscapes

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In our forested landscapes, planning aims to reserve, maintain and develop sufficient mature forest to cater for the long-term needs of species dependent on mature forest. But how should we measure success? A major research program in the Southern Forests Experimental Forest Landscape, anchored on Warra, is investigating this deceptively simple question. The project involves doctoral students and a postdoctoral researcher at the University of Tasmania, in addition to several Forestry Tasmania staff, and has received funding support from the Australian Research Council and Forest and Wood Products Australia. Research topics under investigation include the extent to which the viability of mature forest habitat depends on the degree of modification of the surrounding landscape, whether the recolonisation of harvested areas by mature–forest specialists is made easier by proximity to mature forest, and whether there are thresholds of landscape-level modification beyond which mature-forest specialists may no longer persist.

The diversity and abundance of plants, birds and beetles is being measured in 28 patches of mature forest and 28 patches of older (>20 years old) silvicultural regeneration. These patches sample a landscape-level gradient of forest context, from near-natural areas in the west, to plantations and agriculture in the east We will use the data from these plots, in combination with GIS data and modelling tools, to explore how wildfire history and forestry combine to shape the landscape, the relationship of biodiversity to landscape context, and how to plan future management of forest landscapes.

Coarse woody debris (dead wood on the forest floor) provides habitat for many species of invertebrate and fungi. Early results from this project show that, for both mature forest and silvicultural regeneration, the current amount, size and decay state of coarse woody debris is mostly a legacy of wildfire impacts on the landscape prior to modern forestry. Our research is now testing the effects of these differences on the beetle fauna dependent on dead wood.

Grégoire Thauvin measures the diameter of a large rotting log as part of studies investigating the role of landscape context on forest biodiversity

Water quality in native forests

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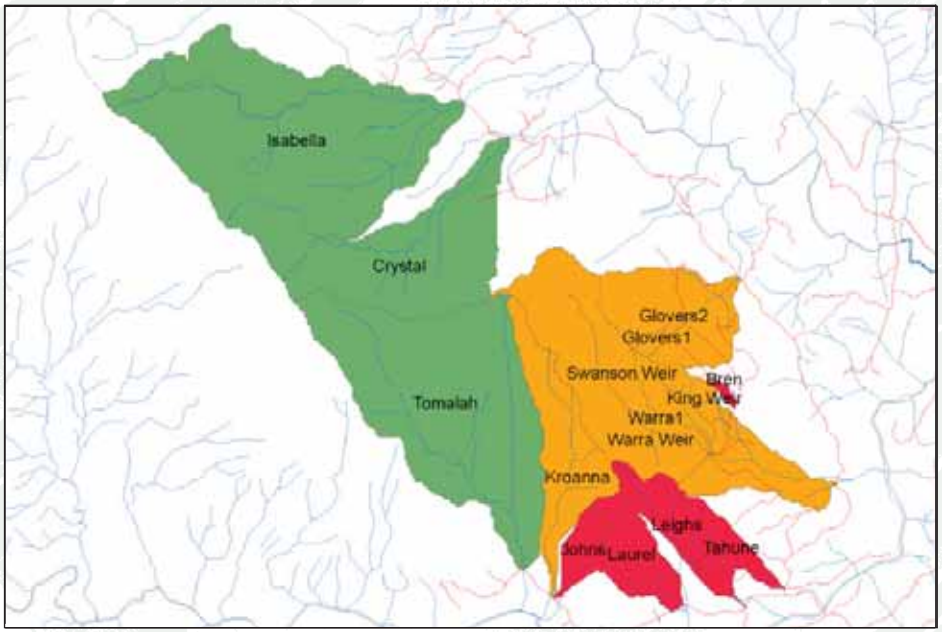
The quality of water in streams flowing through forested catchments is determined both by the natural attributes of catchments, and by their history of disturbance and management. Previously, research at the Warra Long-Term Ecological Research site had shown distinct differences in the turbidity of different creeks, possibly related to the position of their catchments in the wider landscape. We are thus working to develop a better understanding of the impacts of environmental variables on water quality, and in particular on turbidity.

For each 1 hectare in each of 14 Warra catchments, information on disturbance factors (including roads, harvesting and fire history), geographic and environmental factors (such as soil type, geology, vegetation, slopes, altitude, forest age, and wetness index) and stream morphology was related to water quality measurements. Geographic and environmental factors had the greatest impact on water quality, accounting for the majority of variation between catchments. Road density was the most important of the disturbance factors in regard to determining water quality.

Small, narrow catchments with talus geology, a high proportion of wet eucalypt forests, and a high wetness index, had the poorest water quality. Large catchments with high stream densities were associated with better quality water. Younger forests with high road densities were also associated with poorer quality water. Overall, water quality variation at Warra is mainly due to natural features of the landscape. Understanding the contribution of natural factors is required before any impacts of disturbance on water quality can be distinguished.



Map of the Warra LTER site showing catchments for which the relationship between water quality and environmental and disturbance factors was investigated. The three catchments coloured green have low water colour and low turbidity, the five catchments coloured red have high turbidity and some colour, while the six catchments coloured orange have high colour and some turbidity.

Use of plantation timber for fine furniture

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An innovative table constructed from plantation eucalypt timber is demonstrating how this resource might be used to its highest value into the future.

Forestry Tasmania commissioned Simon Ancher, Academic Director of the Australian School of Fine Furniture, University of Tasmania, to design and produce the piece. Simon lives and works in Launceston, Tasmania, is a member of the Design Institute of Australia, and has received numerous awards and exhibited internationally over the last decade. Simon's brief was to produce a piece from sample boards from 22-year-old *Eucalyptus nitens* (shining gum) trees typical of the large pruned plantation trees that Forestry Tasmania grows for high-value timber.

During the winter of 1984, seedlings of *E. nitens* trees raised at the Forest Nursery in Perth were used to establish a plantation at Goulds Country, 27 kilometres north of St Helens in north-east Tasmania. The plantation included a research trial to determine the optimum thinning and pruning techniques for producing eucalypt plantation sawlogs and veneer logs. Over the following two decades, the pruned and thinned trees were measured over 15 times, and data on their growth and form has helped determine the silvicultural regimes now used widely across the Forestry Tasmania eucalypt plantation estate.

It is from these Goulds Country trees that the timber used to produce the table was harvested. But Simon has produced more than a table - he has produced a "compact, flexible, multi-use piece of furniture" that highlights the best aspects of the timber.

> *"It was important for me that the table design challenge basic conceptions of what a table should look like and how it should function. The trough in the middle has an important functional and visual application. Links can be made to the traditional workbench, where a similar trough was employed to store tools ready for use but off the main work surface, leaving it free of clutter for a better work area.*
>
> *"In this case the trough accepts a sliding modesty panel that could be used for exhibition openings and presentations or simply as a playful element that changes the table's visual balance and composition depending on placement. The box too, slides within the trough and can be used for samples or brochures."*

The table and its innovative design embody the confidence of Forestry Tasmania staff that eucalypt plantations established with material from our tree improvement program can be managed to produce high-value products.

How do pests and diseases affect the choice of planting *Eucalyptus nitens* or *E. globulus*?

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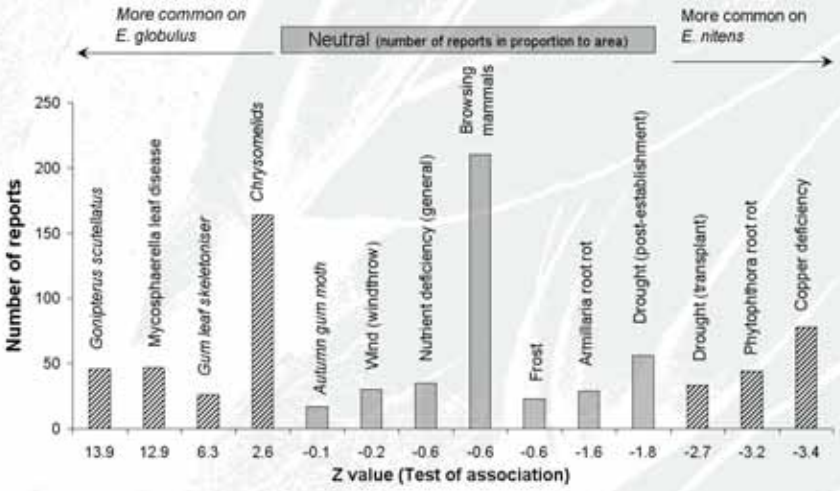
Eucalyptus globulus is superior to *E. nitens* in many wood properties important for pulp and solid wood, and these superior properties can translate to a higher value per cubic metre of log. However, more than 80% of hardwood plantations on State forest are currently *E. nitens. E. nitens* is the only suitable species for cold sites, but we have recently reviewed climatic analyses and concluded that sites with a mean minimum temperature in the coolest month of >1.8°C are suitable for *E. globulus* as well as *E. nitens*.

Sites climatically suitable for *E. globulus* represent nearly 53% of the current State forest hardwood plantation estate, but *E. globulus* is planted on less than one-third of these sites. The main reason for preferring *E. nitens* on warmer sites is the risk of severe defoliation of *E. globulus* by Mycosphaerella leaf disease, and the perception that *E. globulus* has a lower growth rate. The best choice of species to plant on warmer sites can be determined by comparing the value and quantity of wood produced after accounting for the impacts of pests and diseases.

An analysis was done to identify the most important pests and diseases likely to affect the choice of planting *E. globulus* or *E. nitens* on warmer sites. Four pests and diseases were identified as being the most important for species choice – Mycosphaerella leaf disease (MLD) and the weevil *Gonipterus scutellatus,* which were strongly associated with damage to *E. globulus,* and Phytophthora root rot (PRR) and drought death at or soon after transplanting, which were strongly associated with damage to *E. nitens.* These four pests and diseases were most prevalent in different climate regions. MLD and *G. scutellatus* tended to occur in similar climate regions, where the growth reductions they cause to *E. globulus* would require significant, but realistic, price premiums for *E. globulus* pulp and peeler logs to provide higher financial returns than *E. nitens.* PRR and drought also tended to occur in similar climate regions, with impact of PRR on the growth of *E. nitens* being a major uncertainty affecting comparative financial returns.

This is the first analysis that compares financial returns from growing *E. globulus* and *E. nitens* in areas suitable for both species, after accounting for major pest and disease risks. It highlighted critical uncertainties, and suggested values for pricing parameters that would allow *E. globulus* to be more profitable than *E. nitens.*



Strength of species association of the most common agents of damage in eucalypt plantations. Cross-hatched columns indicate damage agents significantly more commonly detected on E. globulus *(left side of graph) or* E. nitens *(right side of graph).*

Linking the leaf beetle IPM program with health surveillance

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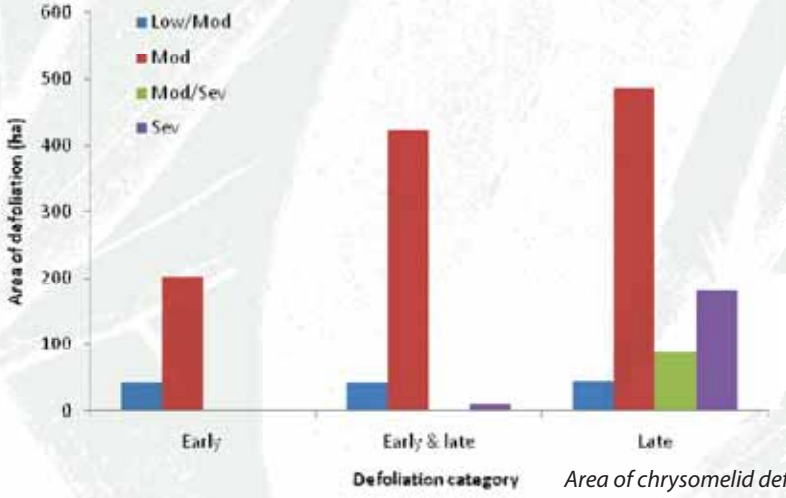
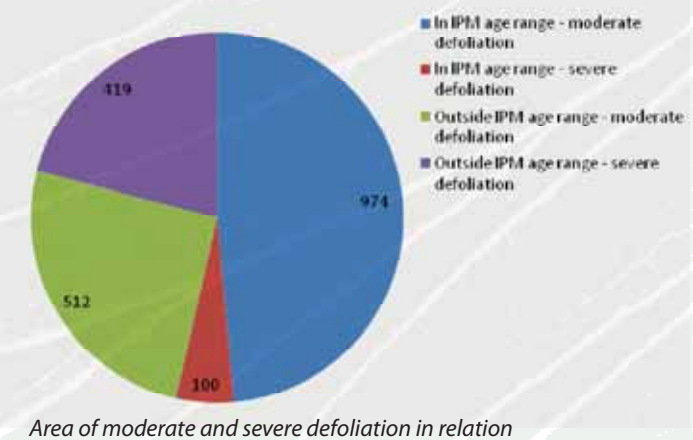
The leaf beetle IPM (Integrated Pest Management) monitoring program has been operating for the past 20 years. Over this time the eucalypt plantation estate has aged and expanded. This has highlighted the importance of a targeted program that effectively monitors those plantations most at risk. For the past 2 years we have investigated the effectiveness of our monitoring program by conducting intensive defoliation surveys. These surveys have shown that our control operations are successful at limiting moderate and severe defoliation in high population areas, indicating our IPM program is effective.



Area of chrysomelid defoliation by severity and season.

Throughout summer, leaf beetle larvae hatch, feed and grow, before pupating in the soil and emerging as adult beetles late in the season. The forest health surveys have shown us that it is this second generation of adult beetles that is responsible for most of the moderate and severe damage observed throughout the estate. Most of this leaf beetle defoliation occurs in high-elevation (>500 m) plantations. We are collaborating with the University of Tasmania to get a better understanding of why such site differences occur.

Traditionally, leaf beetle management has focussed on younger plantations 2 to 6 years old, due to the belief that this is when trees are most vulnerable, particularly in plantations managed for solid wood where leaf-beetle defoliation that coincides with crown removal during pruning could result in significant growth reduction. However, the health surveillance results showed that the majority of plantations that suffered moderate or severe defoliation were older than those normally included in the IPM monitoring program. All previous modelling of impact has focussed on young plantations, so we are developing methods to monitor older plantations, and



Area of moderate and severe defoliation in relation to age classes covered and not covered by the current IPM program.

collaborating with CSIRO and the CRC for Forestry to model defoliation impacts in older plantations so as to better focus management efforts.

Forest health surveillance needs to be linked to operational pest management to evaluate the effectiveness of the surveillance, but this is rarely done anywhere in the world. It is an approach that will give us a much clearer understanding of how to optimise management of leaf beetles.

Forest carbon export via head-water streams

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The ability of forests to fix carbon through photosynthesis is well recognized, but forests are simultaneously losing carbon via a range of processes, including respiration and fire. The loss of forest carbon through the export of dissolved organic carbon (DOC) in head-water streams may also be a significant component of the forest carbon budget. The red/brown colour of streams in many parts of Tasmania indicates that DOC is present. In collaboration with the University of Tasmania, we have recently quantified the amount of DOC exported via three small streams located in native forest in the Warra Long-Term Ecological Research site.

Quantifying carbon export in streams is difficult as the concentration of DOC varies significantly in response to variation in stream-flow as well as seasonally, and it is impractical to make continuous measurements of stream DOC. After a period of intensive monitoring of DOC concentrations, we were able to develop a model that predicts DOC concentration based on stream-flow, turbidity, temperature and electrical conductivity. This model was then used to predict total flux of DOC from the three catchments over a period in 2009.

DOC export from Warra Creek, the largest of the three streams, was estimated at 93 t C yr^{-1}, or approximately 0.2 t C ha^{-1} yr^{-1}. Average annual carbon sequestration for mature Australian forests is approximately 2.4 t C ha^{-1} yr^{-1}, suggesting that mature forests may be losing through export of stream DOC some 8% of the carbon they sequester, an amount which to date has not been included in carbon accounts.

Further studies are underway to determine the interaction between DOC and stream bacterial communities. More research is also required to understand the particular origins of DOC within the forest, as well as its fate downstream and in the ocean.

Red/brown water is visual evidence of dissolved organic carbon export in head-water streams in Tasmania's temperate forests.

research branch reports:

Biology and Conservation Branch
Principal Research Scientist: Dr Tim Wardlaw
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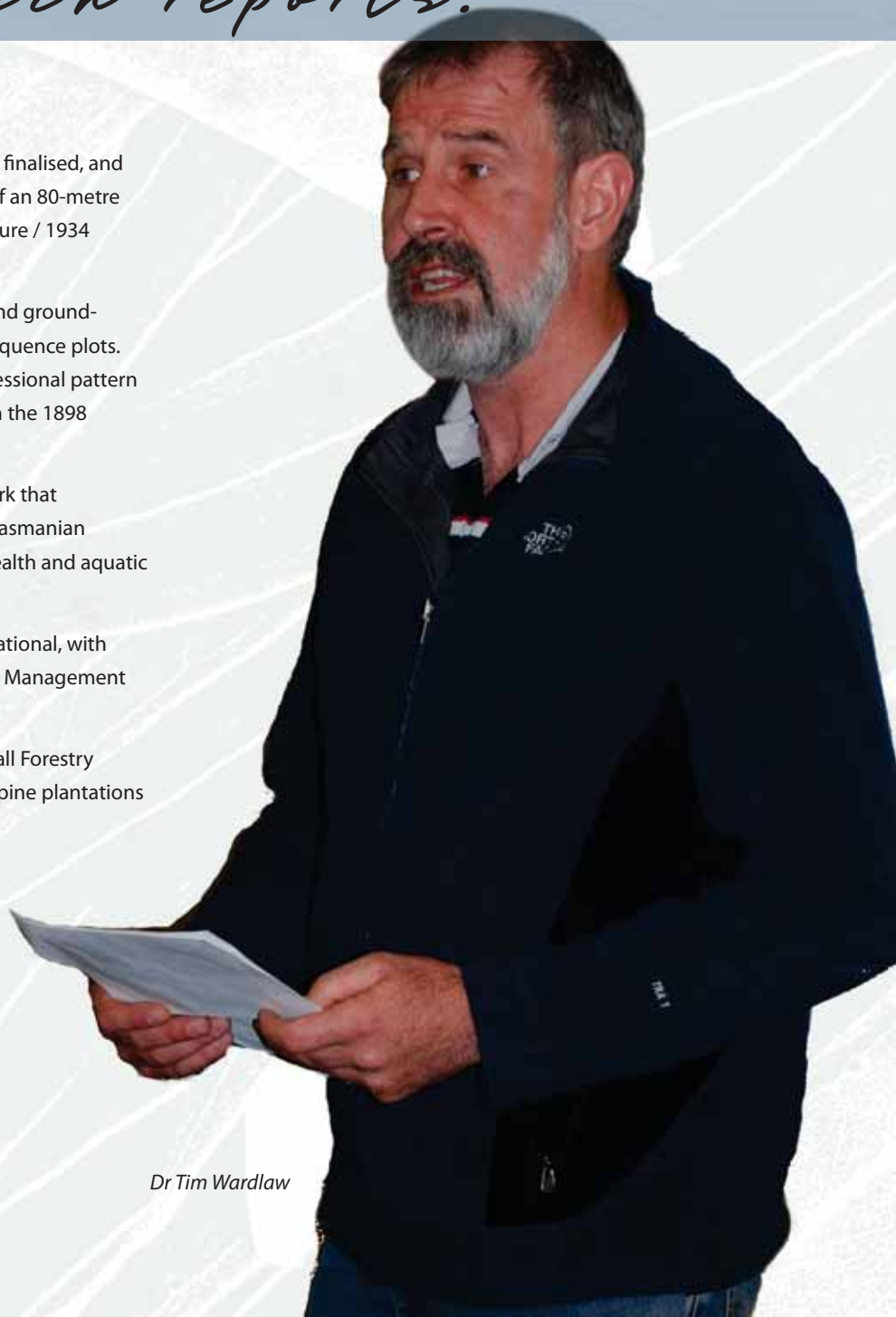
The Biology and Conservation Branch conducts research into the management of pests and diseases and the conservation of natural values. Arising from this research are management prescriptions and monitoring systems to increase forest productivity and ensure ecologically sustainable management practices. The Branch also provides Forest Health Surveillance services to Forestry Tasmania and external clients. At June 2010, the Branch has 10 staff, with a further 5 staff based within the Branch but employed by the University of Tasmania.

Main outputs for 2009-10

- The Southern Forests Experimental Forest Landscape has been established and is now supporting a significant research effort largely driven by external grants and collaborative research with University of Tasmania.
- Finalised a review of ecological objectives of Variable Retention silviculture and the development of resultant indicators to assess these objectives in aggregated retention harvest operations.
- Sue Baker commenced a 12-month World Forestry Institute Fellowship. Developed an experimental approach for conducting a meta-analysis of studies in the Pacific North- West and Canada to test evidence for and magnitude of forest influence effects. Developed hypotheses and questions for interviews with forestry companies in the Pacific Northwest and Canada on drivers for, and practices of, variable retention silviculture.
- Contract to operate the Warra Flux site finalised, and a suitable site located for installation of an 80-metre carbon flux tower at Warra LTER in mature / 1934 regrowth mixed forest.
- Completed baseline surveys of birds and ground-active beetles in the Wildfire Chronosequence plots. Bird assemblages showed a clear successional pattern with time since fire; diversity peaked in the 1898 wildfire regrowth.
- Developed a Bayesian Decision Network that related land use and management in Tasmanian catchments to indices of biotic river health and aquatic biodiversity.
- Browsing Management Tool fully operational, with data collected maintained in Browsing Management Database.
- Health surveillance was completed of all Forestry Tasmania eucalypt plantations and all pine plantations on State forest.



Dr Tim Wardlaw

Biology and Conservation - Key research and development projects

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
1. Sustaining biodiversity and habitat			
1.1 Reserve system Maintain a reserve system in State forests in accordance with the Regional Forest Agreement and Tasmanian Community Forest Agreement. Also contributes to: 1.2. (Biodiversity): Maintain a diversity of natural habitats and mixed age forests to support biodiversity across the forest estate. 1.3. (Threatened species): Maintain viable populations of all existing animal and plant species and communities found in State forests.	S Grove T Wardlaw C Airey D Bashford A Phillips S Read J Hickey M Yee R Gao **Collaborators** University of Tasmania, DSE - Vic, DPI - NSW, DEC - WA, FWPA FPA	**Effectiveness of CAR Reserves** To quantify the contribution of CAR reserves and complementary off-reserve management to the conservation of biodiversity dependent on mature forest habitats in production forest landscapes across the continuum of forest management intensity.	Refined spatial analysis of the SFEFL using SAGA® software, and classified area into five classes based on frequency of disturbance (natural or human-induced). 28 plots (7 replicates of 4 disturbance frequency classes) in each of older silvicultural regeneration and mature eucalypt forest were established. Completed floristic and CWD surveys of the 56 plots and the first of two seasons' surveys for birds and beetles (using flight intercept traps). CWD volumes and decay class in mature forest and silvicultural regeneration conform with hypothesised inputs from past disturbance events. CWD volumes provided a strong signal of landscape context reflecting past disturbance history.
1.3 Threatened species, communities and habitats Maintain viable populations of all existing animal and plant species and communities found in State forests.	S Grove **Collaborators** CRC Forestry, University of Tasmania	**Coarse woody debris** To apply prescriptions to integrated harvesting operations in wet eucalypt forests, to sustain coarse woody debris (CWD) habitat and its dependent biota.	Belinda Yaxley completing FT-funded PhD on the autecology of selected saproxylic beetles. Supported by FT, UTas MSc (Belinda Browning) documented bryophyte succession on logs after clearfelling. Bryophyte succession progressed between 8-43 years after clearfell harvest without stabilising. At 43 years after harvest, bryophyte communities in CBS were comparable with wildfire. Across the 8-43 year age sequence, time since harvest had a stronger influence on bryophyte succession than the progression of logs through decay stages. Mature forests had significantly different bryophyte communities than either 8-43 year old CBS regeneration or 43-75 year old wildfire regrowth.

Biology and Conservation - Key research and development projects (continued)

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
1. Sustaining biodiversity and habitat			
1.3 Threatened species, communities and habitats (cont.)	S Read R Gao V Tyquin **Collaborators** Forest Practices Authority	**Wedge-tailed eagle population viability modelling** To use population viability analysis for predicting future eagle populations and identifying the key factors influencing future population levels.	Undertook comparison of the distribution of current (1 000) nest sites against the smaller number of nest sites used in previous habitat modelling.
	S Grove **Collaborators** University of Tasmania	**Log Decay** To develop ecologically sustainable management practices in relation to biota dependent upon the decaying log and mature timber habitat.	Completed the sorting, identification and databasing of beetles collected from the second 3-year sampling of the log-decay project.
	S Grove T Wardlaw **Collaborators** University of Tasmania, Monash University, Scion	**Persistence of saproxylic beetles** To develop an understanding of scales and structural attributes in production forest landscapes that facilitate dispersal of saproxylic beetles thus enabling their persistence.	Christina Schmuki and Lynne Forster commenced an ARC Linkage project, that is making use of SFEFL plots. A combination of flight intercept trap and hand sampling yielded good numbers of five candidate beetle taxa, which are being prepared for DNA extraction and analysis.
	S Grove A Phillips A Hingston **Collaborators** CRC Forestry	**Silvicultural Systems Trial (SST) biodiversity** To document the biodiversity impacts from the range of silvicultural treatments available for harvesting wet eucalypt forests.	Completed annual surveys of birds and ground beetles in control plots. Completed surveys of birds and ground beetles in treatments that had reached 10 years post-harvesting. Completed long-term biodiversity monitoring plan for the SST.

Biology and Conservation - Key research and development projects (continued)

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
1. Sustain biodiversity and habitat			
1.4. Oldgrowth forests Retain oldgrowth elements including large trees, stags, understoreys and logs across the forest estate.	S Baker T Wardlaw M Neyland D McElwee **Collaborators** CRC Forestry, University of Tasmania, Oregon State University, World Forestry Institute	**VR biodiversity** To verify function of retained aggregates in operational ARN coupes providing viable habitat for late successional species.	Finalised a review of ecological objectives of VR and indicators to assess these objectives in ARN harvest operations. Assessed Indicators of ecological outcomes (ecological metrics) in 2009 and 2010 ARN coupes. Sue Baker commenced a 12-month World Forestry Institute Fellowship. Developed hypotheses and questions for interviews with forestry companies in the Pacific Northwest on drivers for, and practices of, variable retention silviculture.
	T Wardlaw S Baker A Hingston **Collaborators** University of Tasmania, Oregon State University, Washington State University	**Forest influence** To test the nature and magnitude of forest influence into harvest areas of old clearfells, and how influence effects vary dependent on the successional stage (wet sclerophyll versus mixed forest) of the adjoining retained forest.	Awarded ARC Linkage grant to examine influence effects in old clearfells with contrasting forest in the retained edges (wet sclerophyll or mixed forest) . Sue Baker is the post-doc on this project and will commence in October. Liam Hindrum and Nick Jones have both accepted PhD scholarships and will examine influence effects on vascular plants and beetles, respectively. Developed an experimental approach for conducting a meta-analysis of studies done in the Pacific Northwest to test evidence for and magnitude of forest influence effects.
2. Sustaining jobs for current and future generations			
2.3.2 Special species Ensure an ongoing supply of specialty timbers into the long-term	T Wardlaw M Jessup	**Black heart in sassafras** To determine the feasibility of accelerating the development of black heart in sassafras by artificially inoculating trees or log billets with fungi associated with natural black heart.	Attempted, unsuccessfully, to culture fungi associated with black heart from one (of nine) natural black heart samples.

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
3. Sustaining carbon stores, clean air, water and healthy forests			
3.1 Carbon and climate change Manage State forests for long term carbon storage and provide a sustainable source of products which contribute to locking up carbon and reducing emissions.	T Wardlaw K Abetz D Bashford M Moroni S Read **Collaborators** CSIRO Marine & Atmospheric Research, Monash University, University of Melbourne, University of Tasmania, CRC Forestry	**Warra carbon flux tower** To provide a focal point for intensive studies into carbon dynamics of tall, wet eucalypt forests. Key research objectives include: • To document fluxes of carbon, water and energy from mature / regrowth *E. obliqua* forest and relating fluctuations in those fluxes to climatic conditions and biotic events. • To determine the contribution of different components of the forest (soil, CWD, overstorey eucalypts, rainforest understorey) to the carbon fluxes. • To compare changes in fluxes after clearfell harvesting with changes after wildfire, and determine time after disturbance when the forests switch from carbon sources to carbon sinks.	Located a suitable site for the installation of a carbon flux tower at Warra LTER in a mature / 1934 regrowth mixed forest. Attended Ozflux training workshop on establishing and running a flux site. Installed an automatic chamber system (University of Melbourne) to measure soil CO_2 fluxes. The chamber will operate for 12 months.
Monitor emerging climate change scenarios and trends and adapt forest management practices.	T Wardlaw S Grove D Bashford **Collaborators** CSIRO Sustainable Ecosystems, University of Tasmania, DPIPWE	**Baseline altitudinal monitoring plots (BAMPS)** Early detection of large-scale influences such as climate change on forest processes. To enable the effect of any large-scale influences such as climate change to be taken into consideration when interpreting small-scale treatment effects on biodiversity.	Contributed to a CSIRO study to model the effects of climate change on pests and diseases and the consequence to net primary production in wet eucalypt forests. The study highlighted the need to resolve uncertainties surrounding the impact of fires and pests on the competitive advantage (or disadvantage) of various vegetation components in the forests, as a precursor to improved predictions on the effect of climate change on productivity in wet forests.

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
3. Sustaining carbon stores, clean air, water and healthy forests			
3.1 Carbon and climate change (cont.)	T Wardlaw S Grove A Hingston **Collaborators** University of Tasmania, Bushfire CRC, DPIPWE, University of Melbourne	**Wildfire chronosequence** To establish a set of long-term monitoring sites to provide natural disturbance benchmarks against which biodiversity and structural changes in the Warra SST can be assessed. The sites will fulfil the scientific criteria of an extended "space-for-time" design.	Completed baseline surveys of birds and ground-active beetles in the Wildfire Chronosequence plots. Bird assemblages showed a clear successional pattern with time since fire; diversity peaked in the 1898 wildfire regrowth. Analysed floristic and vertical structure data. Initiated collaborative study with University of Melbourne PhD student (Benedikt Fest) to measure soil fluxes of methane and nitrous oxide in chronosequence plots, as part of a wider study examining the effects of forest disturbances on soil fluxes of non-CO_2 greenhouse gases. Installed manual respiration chambers in chronosequence plots and undertook spring sampling.
3.2 Ensure availability of clean water from State forests	S Read T Wardlaw **Collaborators** University of Tasmania	**Landscape logic** To link land-use change, and resulting chemical and physical changes in water quality and riverine habitats, to river health.	Developed a Bayesian Decision Network that related land use and management in Tasmanian catchments to indices of biotic river health and aquatic biodiversity. Grazing, dairy and cropping land uses had negative effects on biotic river health, mitigated at local scales by riparian vegetation. By comparison, protection, forestry and plantation land uses had smaller or minimal effects.
3.4 Weeds, pests and diseases Control weeds, pests and diseases to protect State forests.	L Clark T Wardlaw L Jordan	**Browsing monitoring and extension** Develop systems to support the adoption of a reactive approach to browsing management.	Browsing Management Tool fully operational, and data maintained in Browsing Management Database. Standard report formats developed to allow districts to review the current status of browsing operations.
	L Clark T Wardlaw D Williams **Collaborators** University of Tasmania, CRC Forestry	**Browsing IPM** Develop cost-effective management of browsing that seeks to capture maximum benefit from low-cost non-lethal options through integration with operational monitoring and culling.	Completed an analysis of the conduct of browsing management in eucalypt plantations planted in 2008, to examine how the introduction of seedling stockings affected operations and outcomes. Presented results to Australian Wildlife Management Conference and DPIPWE Alternatives to 1080 Workshop. Collaborated with University of Tasmania to screen foliage of *E. nitens* seedlots using near infrared spectroscopy and relate spectra to sideroxylonal levels.

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
3. Maintain Ecosystem Health and Vitality in State forest			
3.4 Weeds, pests and diseases (cont.)	J Elek T Wardlaw **Collaborators** University of Tasmania, CRC Forestry, Bayer Crop Science	**Lethal trap trees** To develop a novel delivery method for systemic insecticides as an alternative to aerial spraying, which offers the potential for better targeting defoliators and in particular adult beetles that are difficult to manage with current methods.	Six two-year-old plantations with blocks of *E. regnans* or *E. delegatensis* trap trees were treated with systemic insecticide. Insect populations, insect mortality (due to lethal trap trees), leaf chemical assays and defoliation were assessed on three occasions (early and late summer, and autumn).
	L Jordan T Wardlaw J Elek **Collaborators** University of Melbourne, CSIRO Sustainable Ecosystems, CRC Forestry	**Leaf beetle management** To develop an IPM system that is efficient at preventing economic damage by leaf beetles in plantations.	Linked FHS surveys, specifically targeting defoliation in young to mid-rotation plantations, with leaf beetle IPM records to determine the effectiveness of the IPM and defoliation risks in older plantations. Co-ordinated the monitoring of 25,690 ha of eucalypt plantations for leaf beetles. Collated the results of the 2009 - 10 leaf beetle management season for inclusion in the annual Stewardship Report. Developed a project proposal for using Cabala Health to predict the impact of defoliation on growth at different stages of the rotation. This project would review the appropriateness of the currently targeted plantation age-classes and regions for leaf beetle management. Commenced evaluating options for monitoring leaf beetle populations in older plantations. Developed proposal for industry-wide co-ordination of leaf beetle management and circulated to Districts and industry partners. Discussions with Bass District resulted in a proposal for a pilot co-ordinated program in 2010-11.

Biology and Conservation - Key research and development projects (continued)

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
3. Sustaining carbon stores, clean air, water and healthy forests			
3.4 Weeds, pests and diseases (cont.)	K Wotherspoon S Jennings N Ramsden L Jordan T Wardlaw	**Health surveillance of plantations (FT & external)** To maximise the health and productivity of plantations by ensuring health problems are detected and managed before significant impacts occur.	Completed health surveillance of all Forestry Tasmania eucalypt plantations and all pine plantations on State forest. A total of 86 notification reports were sent to clients. Undertook a contract with Pöyry to validate previous health surveys of state-owned plantations in Queensland.
	S Jennings K Wotherspoon N Ramsden L Jordan K Swanepoel	**FHS: District liaison and quality standards** To provide pro-active responses to the management of detected health problems through effective liaison between FHS staff (and specialists) and District staff. To increase awareness among field staff of the common health problems in pine and eucalypt plantations.	Held meetings in all Districts to review the outcomes of actions in response to notifications made in 2007 - 08 and agree to actions in response to notifications made in 2008 - 09. Developed a proposal for issuing Corrective Action Reports to track actions in response to significant detections made during FHS.
	K Wotherspoon N Ramsden T Wardlaw D Bashford K Swanepoel R Gao	**FHS - policy** To ensure the flow of information from FHS to inform policy and corporate reporting.	Completed an analysis of the health risks affecting the species choice decision (*E. globulus* or *E. nitens)*. Provided tabular data and narrative on pest and disease status and pest management for the Stewardship Report. Prepared annual pest and disease status report for Tasmania for inclusion in the RWG 7 national pest and disease status report.
	D Bashford N Ramsden **Collaborators** National *Sirex* Coordination Committee	***Sirex* wood wasp** To prevent significant losses from outbreaks of *Sirex* wood wasp in *P. radiata* plantations.	Established and maintained static traps in five plantations and introduced nematodes into two plantations. Chaired National *Sirex* Coordination Committee. Involved in the preparation of a successful ARC Linkage project on *Ips* – *Sirex* interactions and improved methods for managing *Sirex*. Appointed post-doctoral researcher and PhD student (both based at Charles Sturt University.

Biology and Conservation - Key research and development projects (continued)

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
3. Maintain Ecosystem Health and Vitality in State forest			
3.4 Weeds, pests and diseases (cont.)	T Wardlaw S Jennings N Ramsden **Collaborators** Forest Practices Authority, DPIPWE, NRM South	***Phytophthora cinnamomi*** To ensure that susceptible plant species and communities of high conservation value are protected as far as possible from the adverse effects of *P. cinnamomi*.	Developed a project proposal to evaluate the risk of growth losses from chronic sub-lethal infection of *E. nitens* by *P. cinnamomi* under current and future climate scenarios. Undertook quarry inspections for *P. cinnamomi* certification. Provided advice to Districts on formulating Forest Practices Plan prescriptions for operations in Phytophthora Management Areas. Provided advice on management systems and operational approaches for inclusion in a draft Hygiene Manual being developed by NRM South. Provided input into a project proposal for implementation of universal hygiene for soil and water-borne pathogens prepared by NRM South (funded under Caring for our Country).
	T Wardlaw **Collaborators** University of Tasmania, CSIRO Sustainable Ecosystems	**Bark stripping of pines** To ensure that susceptible plant species and communities of high conservation value are protected as far as possible from the adverse effects of *P. cinnamomi*.	Completed quarterly assessment to measure seasonal changes in browsing and food quality (starch, sugar, protein, C:N) of understorey plants in plots with high and low levels of bark stripping.
	D Bashford N Ramsden **Collaborators** DPIPWE, OCPPO	**Port surveillance** To detect the early introduction of exotic forest pests and diseases.	Provided training on static trapping surveys in South Australia and sorted / identified static trap catches. Completed static trap surveys for selected established exotic insect pests in Tasmania. Screened trap catches from Tasmanian hazard sites.
	J Elek E Trainer	**CERAS (Chemical environmental risk assessment scheme)** To develop and implement an improved system for rating and reporting on the environmental risk of pesticide operations.	Completed and circulated for comment a draft review of methods for evaluating the environmental risk of pesticides.

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
3. Sustaining carbon stores, clean air, water and healthy forests			
3.4 Weeds, pests and diseases (cont.)	D Bashford S Jennings N Ramsden T Wardlaw	**Pathology diagnosis and advice** To provide and maintain specialist forest pathology diagnostic support for Forestry Tasmania.	Determined Armillaria (suspect *A. luteobubalina*) as the cause of patch mortality of blackwood in a pre-commercial thinning trial of a fenced intensive blackwood coupe at Togari. Determined Armillaria to be the cause of mortality in myrtle and celery-top pine at the AirWalk. Culturing from shoot lesions in a young *E. nitens* plantation (at Camden) with extensive shoot dieback yielded a fungus putatively identified as *Coniothyrum*. Suspect frost damage was primary cause. Attempted (so far unsuccessfully) to reisolate fungi associated with black heart in sassafras. Determined water-logging (following record spring rainfall) as the probable cause of extensive mortality in young *E. nitens* plantations (owned by Gunns) on the east coast. Determined an outbreak of the native looper caterpillar, *Clenias*, as the cause of widespread and severe defoliation of *P. radiata* at Pittwater.
	T Wardlaw **Collaborators** University of Tasmania, QDEEDI, DPI (NSW)	**Forest biosecurity audit** To review and document current plant biosecurity arrangements in each jurisdiction, evaluate how those arrangements capture sector-specific issues for forestry; identify gaps and propose actions to improve forest biosecurity.	Secured funding from Forests & Wood Products Australia. Developed stakeholder list for each jurisdiction. Advised Plant Health Committee of project and sought their co-operation. Developed questions to guide interviews with stakeholders in each jurisdiction.
	T Wardlaw D Bashford K Wotherspoon N Ramsden **Collaborators** ACIAR, Queensland DEEDI	**Forest health surveillance research and development** To refine methods for the detection of forest pests.	Participated in two project visits to Fiji and one to Vanuatu. Held end-of-project workshop with project participants. Analysed and documented results from study examining the relationship between borer populations and plantation damage along a rainfall gradient. Conducted study to examine the within-stand intensity of static trapping required to adequately detect damaging populations of wood-borers. Completed the monitoring of the progression of borer attack and mortality following drought events in an *E. nitens* plantation (Blackwood Creek).

Biology and Conservation - Key research and development projects (continued)

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
5. Sustaining science-based stewardship			
5.3 Maintain a viable research program Use science to inform continuous improvement in forest policy and management.	S Grove D Bashford **Collaborators** Australian National Insect Collection, University of Tasmania, University of Guelph, CRC Forestry, Numerous taxonomists	**Tasmanian Forest Insect Collection (TFIC)** To develop a comprehensive, highly valued and widely used reference collection and database of Tasmanian forest insects.	Continued to acquire photographic images of specimens in the TFIC. To date, 220 species have been photographed. Progressed the development of a TFIC web site that provides images, distribution maps and ecological information of specimens contained in the TFIC.
	D Bashford A Phillips J Lesek	**Laboratory management** Maintain a functional laboratory facility to support research.	Routine maintenance and calibration of equipment. New water distillation unit purchased.
	All research staff	**Communications** Maintain strong linkage between research and science-based forest management. Maintain a high profile for credible research within the scientific community.	Staff from the branch were involved in presentations at 25 workshops and conferences, produced 16 technical reports and had 11 papers published or accepted for publication in peer-reviewed journals or book chapters.

Biology and Conservation - Key research and development projects (continued)

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
5. Sustaining science-based stewardship			
5.3 Maintain a viable research program Use science to inform continuous improvement in forest policy and management.	S Grove S Read P Hopson **Collaborators** University of Tasmania, CRC Forestry, Australian National University, Bureau of Rural Studies, Australian LTER network, Taiwan Ecological Research Network, US LTER network	**Warra development** Maintain a high public and scientific profile of the Warra Long-Term Ecological Research (LTER) site. Develop a long-term research strategy based on the Warra Ecological Model. Promote collaborative research at the Warra LTER site.	Attended US LTER All-Scientists Meeting Four small project grants were granted during year: 1. Funds to purchase a bat call recorder (Lisa Cawthorn, University of Tasmania) 2. Acquisition of photographic images of specimens in the Tasmanian Forest Insect Collection (Lynne Forster) 3. Bat activity within the SST (completion of project that commenced in 2008, NSW DPI) 4. Effect of forest disturbance on non-CO_2 greenhouse gas soil fluxes (Benedikt Fest, University of Melbourne) Provided honours scholarship to Ian Riley (University of Tasmania – CRC for Forestry) to undertake a study of export of carbon in streams. Hosted visits to Warra LTER during Science Week.

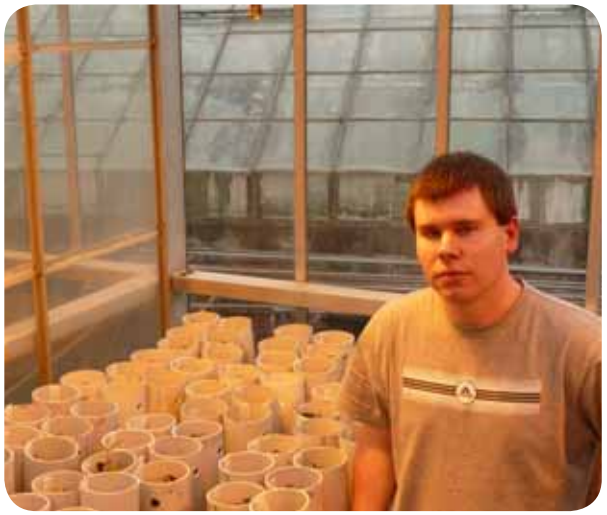
Biology and Conservation Branch

Reg Magierowski and Tim Cole sorting aquatic invertebrates.

Simon Grove establishing plots for landscape biodiversity study.

Jane Elek preparing insecticide solution to be injected into trap trees.

French student interns Gregoire Thauvin and Elsa Libis doing coarse woody debris surveys.



Summer student Liam Hindrum examining the effect of soil compaction in seedling growth.

ARC post doctoral researcher Christina Schmuki and PhD student Lynne Forster getting excited about a beetle.

research branch reports:

Native Forests Branch
Principal Research Scientist: Dr Mark Neyland
Mark.Neyland@forestrytas.com.au

Native Forests Branch conducts research on the silviculture of native forests to increase productivity and support continuous improvement for sustainable forest management. Major projects include:

- Researching alternatives to clearfelling in oldgrowth wet eucalypt forests.
- Developing stand management regimes for native forest regrowth.
- Developing stand management regimes for blackwood in native forests.
- Improving practices for harvesting in Special Timbers Zones.
- Assessing and reporting on carbon stores in State forests.
- Managing and improving the quality standards system for native forests.
- Providing silvicultural support and training to field staff.
- Maintaining an up-to-date and accurate set of technical bulletins as a key reference tool for field staff.

At June 2010, the Branch had 5 full-time and 3 part-time staff.

Main outputs for 2009-10

- Maintenance, monitoring and reporting of the Warra silvicultural systems trial.
- Silvicultural support for and monitoring of operational aggregated retention coupes established throughout the State.
- Calculated distribution of carbon in trees across forest classes in Tasmanian State forest.
- Completion and reporting of the annual Quality Standards review.
- Provision of data and reports on native forests regeneration outcomes (site preparation, seed provenance and regeneration success by forest type) to the Sustainable Forest Management report.

Dr Mark Neyland presenting at the variable retention field day

Forestry Tasmania

Native Forests - Key research and development projects

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
1. Sustaining biodiversity and habitat			
1.4 Oldgrowth forests Forestry Tasmania will maintain a minimum of 250,000 hectares of oldgrowth in reserves in State forests (25% of Tasmania's reserved oldgrowth forests), for conservation values. Forestry Tasmania will retain oldgrowth elements including large trees, stags, understoreys and logs across the forest estate.	M Neyland L Edwards D McElwee R Scott	**Alternatives to clearfelling lowland wet eucalypt forest** To establish a replicated silvicultural systems trial (SST) in wet eucalypt forests at Warra and compare the standard clearfell, burn and sow system with potential alternatives.	Monitored single tree plots at ages 3, 6 and 10 years. Monitored vegetation at ages 3, 6 and 10 years.
	J Jarman M Neyland **Collaborators** Tasmanian Herbarium (G Kantvilas), University of Southern Illinois (P Minchin)	**Impacts of harvesting and regeneration operations on lichens and bryophytes in wet eucalypt forests** To assess the impact of various logging and regeneration treatments on the lichen and bryophyte floras of wet eucalypt forest.	Sampled plots in the aggregates within two coupes and completed species identifications. Made substantial progress with the draft manuscript on assessing the impacts of the treatments, commenced a paper on succession after harvesting and burning, commenced a paper describing the general ecology of the bryophytes and lichens at Warra, and prepared draft establishment report for the project.
	M Neyland R Scott L Edwards	**Reporting** To report on aspects of the Warra SST.	Paper on safety and productivity of the trial published in *Tasforests.*

Native Forests - Key research and development projects (continued)

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
1. Protect and maintain environmental values in State forest			
1.4 Oldgrowth forests (cont.)	L Edwards D McElwee M Neyland	**Warra LTER support** To support and promote research at the Warra LTER site. To inform visitors to the Warra LTER site of the costs and benefits of various silvicultural treatments applied to wet eucalypt forests designated for wood production.	Provided assistance to external researchers. Safety coordination with Huon District. Provided guides for 17 Site tours (415 participants). Research tracks established and maintained for long-term studies.
	R Scott D McElwee L Edwards M Neyland	**Operational development and evaluation of aggregated retention (ARN) in tall oldgrowth forests** To develop ARN as a reliable and cost effective silvicultural system. To monitor outcomes in all aggregated retention coupes until 2010 and a subset of coupes thereafter.	Database maintained on all ARN coupes and comparable Clearfell Burn and Sow (CBS) coupes. Monitored all ARN coupes in 2009-10 and a set of comparable CBS coupes. A similar subset of ARN coupes will be monitored in 2010-11. Final Variable Retention Implementation Group meeting (May 2010). Advice provided to Districts on planned aggregated retention coupes.
	T Blanks R Scott M Neyland	**Regeneration burning of aggregated retention coupes** To assist the Districts to undertake successful regeneration burns in aggregated retention coupes. To identify approaches to regeneration burning in ARN coupes that can assist future burning.	To date, Native Forests Branch has monitored burning conditions and outcomes in all VR coupes and a set of CBS coupes for comparison. A subset of coupes will be monitored in 2010-11. 13 of 20 planned regeneration burns completed in ARN coupes.
	R Scott D McElwee L Edwards M Neyland	**Reporting** To communicate the results of the VR silviculture program and report on progress.	Annual progress reports on VR monitoring program completed. Outline for journal paper on VR burning completed. Full reporting plan to be developed this year.

Native Forests - Key research and development projects (continued)

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
2. Sustaining jobs for current and future generations			
2.3.1 Eucalypt forests	L Edwards M Neyland D McElwee	**Measurement and maintenance of established trials** To maintain established trials in an efficient manner.	No measurements required in 2009-10.
	M Neyland L Clark D Mannes R Musk M Stone	**Rationalisation, measurement and maintenance of established thinning trials** To rationalise the existing thinning trials, to commence data analysis using existing data sets, and to determine the most efficient program of monitoring for the next few years.	First meeting of group (DFRD and Resources) held, existing data sets identified. Progressed bringing existing native forests data sets into corporate data bases. Gaps in existing knowledge and some inventory needs identified. Project on hold pending completion of LiDAR data capture, and identification of most efficient approach for future work.
	M Neyland L Clark	**High altitude eucalypt forests** To provide silvicultural advice and to promote good silvicultural practice in high altitude forests.	The Uneven Aged Treatment (UAT) procedure has become widely accepted as a useful tool for planning and monitoring the harvesting of high / dry *E. delegatensis* forest. Pre-logging assessments have declined recently due to a lack of staff. Progressive harvesting assessments continue to be useful. In 2004 - 05, 4410 ha..... ….96% met the standard. In 2005 - 06, 3445 ha..... ….98% met the standard. In 2006 - 07, 1969 ha..... ….94% met the standard. In 2007 - 08, 3078 ha..... ….93% met the standard. In 2008 - 09, 3531 ha..... ….92% met the standard.
	M Neyland	**Dry eucalypt forests** To develop and improve silvicultural treatments being applied to dry eucalypt forests, particularly in Bass, Derwent and Mersey Districts.	Provided advice as required. Field trip to Mersey District to review seed tree and shelterwood coupes and likely future operations in these coupes.

Native Forests - Key research and development projects (continued)

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
2. Sustaining jobs for current and future generations			
2.3.1 Eucalypt forests (cont.)	L Clark L Edwards M Neyland	**Quality standards monitoring** To ensure 'best practice' standards are developed and met in native forest silviculture.	Provided support to Districts with inputting data into FOD. Formal Quality Standards visit held in each District. Statewide review held in September. Reported to General Management Team in October. Key issues were browsing management and seed supply. Districts urged to start browsing control earlier in the cycle. 2010 Quality Standards Manual published. Considerable re-education process with the introduction of FOD 2.
	L Clark L Edwards	**Native forest coordinators group** To provide Districts with a forum to exchange ideas on native forest management and to identify and update SEMS documents.	Maintained and improved regeneration survey database. Maintained mammal browsing database and browsing monitoring tool.
	L Clark	**Review of strategic seed reserves** To estimate the amount of seed required to fulfil 3 year plan requirements and compare that with present seed centre stocks. This will provide seed coordinators with priority species by zones for seed collection.	Provided on-going analysis of seed stock shortfalls and surpluses on an as-needs basis. FOD improvements allow for the seed management system to calculate seed balances automatically.
	L Clark	**Support for seed allocation program** To ensure that optimum seed mixes are used in all FT sowing.	Developed germination testing database as part of the seed management system. Supported seed allocation process for 2010 sowing. Provided technical advice and support to seed centre staff on germination testing procedures.

Native Forests - Key research and development projects (continued)

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
2. Sustaining jobs for current and future generations			
2.3.1 Eucalypt forests (cont.)	M Neyland L Clark L Edwards **Collaborators** University of Melbourne (Peter Ades, Paul Nevill), University of Tasmania (Brad Potts, Dot Steane)	**Genetics of *E. regnans* and *E. obliqua*** To use DNA studies to: • examine variability and similarity in and between populations; • identify what environmental factors map with genetic variation; • better understand mating systems.	Promoted the use of seed from as many well distributed parents as practical when compiling seed lots while recognising 100% on-site seed is not necessarily good if the source material is from too few tree seed sources. Introduction of additional 'distance measurement' on seed collection labels to better inform seed coordinators about the spacing (and therefore relatedness) of trees from which seed has been collected.

Native Forests - Key research and development projects (continued)

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
2. Sustaining jobs for current and future generations			
2.3.2 Special timbers	S Jennings D McElwee M Neyland	**Remedial treatments in swamp-blackwood forests** To regenerate a failed swamp blackwood coupe.	CH042B is a failed swamp blackwood coupe. A field day was held that reviewed this coupe amongst others. The coupe was subsequently rough heaped, burnt in autumn 2009 and re-fenced. It was sown with eucalypt seed (*E. brookeriana/obliqua*) and was the site of an experimental teatree seed sowing. The coupe will be closely watched over the next couple of years. Regeneration surveys will be carried out for all species.
	S Jennings D McElwee M Neyland	**Regeneration strategies for swamp blackwood myrtle forests** To investigate the effectiveness of partial harvesting and fencing in achieving successful regeneration in swamp blackwood myrtle forests.	CH41D and CH41E are a swamp blackwood myrtle forest. The FPA in recent years has recommended that partial harvesting options should be explored in these later-successional stage forests. This coupe was selectively harvested for blackwood and other commercial special timbers, then patchily burnt and fenced. Control of the browsing mammal population and early regeneration establishment is looking promising at 1 year after harvest.
	S Jennings D McElwee M Neyland	**Stand management of fenced-intensive-blackwood** To develop prescriptions for management of blackwood rich regeneration particularly in the far northwest.	Remeasured TG005A and completed progress report. Established another replicate in TG021B, a 20-year-old fenced-intensive-blackwood coupe to further test blackwood and eucalypt response to removal of varying levels of eucalypt basal area. This is the last of a series of thinning trials established to inform development of a stand management regime for such coupes.
	L Edwards M Neyland	**Silvicultural systems for harvesting special timbers from tall oldgrowth forest** To assist Huon District to develop and implement a safe, practical and economic silvicultural system for the sustainable production of low volumes of special timbers from eucalypt forests rich in special timbers.	A second series of patches at WR017B was harvested in 2007, and burnt in 2010. Feedback from the design group and the District is that the patches harvested in the second round are too small. Openings of at least two tree height width are required to enable good fuel preparation (without excessive soil disturbance) which facilitates burning and to provide sufficient light for regeneration to prosper. Small patches are too shady; once wet in autumn they do not dry out.

Native Forests - Key research and development projects (continued)

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
2. Sustaining jobs for current and future generations			
2.3.2 Special timbers	S Jennings L Clark M Neyland	**Harvesting damage assessment in rainforest coupes** To train harvesting supervisors to monitor and report on harvesting damage in rainforest coupes.	Supervisors were trained in the two rainforest coupes that were harvested this year on the west coast.
	S Jennings M Neyland	**Regeneration of celery-top pine** To prepare a paper of the results of a series of rainforest trials, looking at the regeneration strategies of celery-top pine.	Paper submitted to *Tasforests*.
	M Neyland L Clark J Rendell L Edwards S Jennings D McElwee **Collaborators** University of Tasmania (Jim Reid, Bryn Daniels)	**Sumac rainforest logging trial** To remeasure the Sumac rainforest logging and regeneration trial.	Remeasured the floristics across the trial. Remeasured a subset of the original regeneration plots.
	M Neyland L Clark S Jennings R Scott L Edwards	**Technical bulletins (TB)** To maintain a comprehensive set of technical bulletins for native forest silviculture.	Technical Bulletins 1, 2, 3, 7 and 8 revised. Technical Bulletins 5, 6 and 12 are in review.
	M Neyland L Clark R Scott L Edwards S Jennings	**Silvicultural training** To communicate recommended management practices and research results to staff and Technical Forester trainees through training programs, field days and seminars.	Provided training to Forest Practices Officers and Supervisors Courses. Provided on-ground training for field staff based on needs identified at annual Quality Standards Reviews. Provided input to review of the FPO training package.

Native Forests - Key research and development projects (continued)

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009 - 10 Progress
3. Sustain carbon stores, ocean air, water and healthy forests			
3.1 Carbon and climate change	M Moroni T Kelley M McLarin	**Preliminary report on carbon stocks on State forest** To review inventory assessment of carbon stocks in Tasmania. Compare and contrast with published work discussing Carbon Carrying Capacity.	Prepared manuscript examining forest carbon stocks in State forest and the concept of Carbon Carrying Capacity.
	M Moroni T Kelley M McLarin	**Evaluation of carbon accounting tools** To evaluate FullCam and CBM-CFS3 for use in Tasmanian forests.	Acquired and commenced evaluation of the most recent version of FullCam and CBM-CFS3 in collaboration with model developers.
	M Moroni M Neyland S Read	**Review the role of forests in the greenhouse gas mitigation debate** To review and discuss concepts being discussed, which include; • Landscape carbon stores, including Carbon Carrying Capacity, • Wood Product Carbon stores, • Emission reductions through substitutions.	Instigated through CRC Forestry an FWPA-funded review of the role of forests in the greenhouse gas mitigation debate.
	M Moroni	**Increase confidence in forest carbon data** To collate existing data that can be used to, and to provide an, estimate component of total forest carbon stocks. To collect data to address data gaps.	Submitted a project proposal to CRC Forestry.

Native Forests Branch

The publication of a Tasforests *paper delighted authors John Hickey, Mark Neyland and Leigh Edwards.*

Kristen Dransfield is amazed by the size of an old-growth tree in the LiDAR assessment plot in the Styx Valley.

Research technician Dave McElwee records more information in a ten-year-old regenerating coupe at Warra.

Ten years of rapid understorey growth makes finding plot markers at Warra a challenge for Leigh Edwards.

Trainee forester Jordan Rendell collects seed and litter samples at Warra.

Global Positioning technology allows Lachie Clark to accurately locate the plot corners of a thinning trial.

research branch reports:

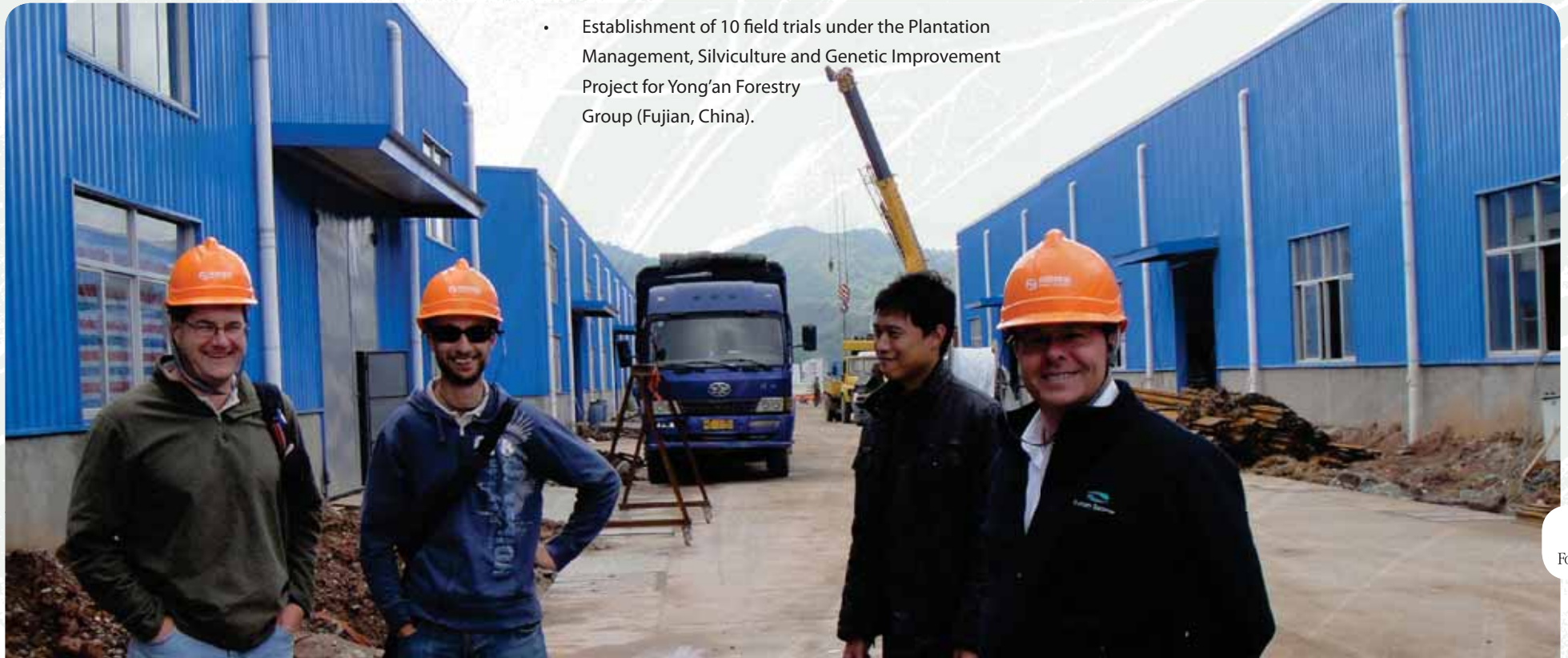
Plantations Branch
Principal Research Scientist: Dr Paul Adams
Paul.Adams@forestrytas.com.au

The Plantations Branch undertakes research and development on Forestry Tasmania's plantation estate, provides operational advice on management of Forestry Tasmania plantations, reports on quality standards and provides consulting services to external clients. Collaborative research is undertaken with a number of public and private sector organisations in Australia and elsewhere. At June 2010, the Branch had 7 full-time and 4 part-time staff and 1 trainee.

Dean Williams, Dion McKenzie and Paul Adams Inspecting development of a Medium Density Fibreboard plant by Yong'An Forestry Group in Yong'An, Fujian, China

Main outputs for 2009-10

- Stocked the new grafted clonal *E. nitens* seed orchard in Mersey district.
- Modelled alternative silviculture regimes that reduce tree-tree competition.
- Completed coupe analysis and development of coupe management plans in Derwent district.
- Harvested and peeled logs from approximately 600 trees in an FWPA-funded research partnership with University of Tasmania to study the genetic parameters that affect quality of *E. nitens* rotary peeled veneer.
- Establishment of 10 field trials under the Plantation Management, Silviculture and Genetic Improvement Project for Yong'an Forestry Group (Fujian, China).
- Completed a major trial of processing requirements and wood quality outcomes for plantation-grown *E. nitens,* which demonstrated that alternative sawing strategies, in combination with appropriate reconditioning, effectively eliminate surface and internal checking.
- Showed that water quality variation between adjacent forested catchments can be largely explained by natural features of the catchment rather than impacts of land use and disturbance.



PLANTATIONS

Plantations - Key research and development projects

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
2. Sustaining jobs for current and future generations			
2.4.1 Establish and manage plantations to maintain timber supply levels to industry Maximising the production of high quality sawlogs, and associated products, from plantations through genetic improvement, pruning, thinning and fertilising to improve growth and wood quality.	D Williams P Moore D Robertson D McKenzie C Cox **Collaborators** University of Tasmania, SeedEnergy, STBA, Plantplan Genetics, CRC Forestry, CSIRO, Ta Ann, Gunns Ltd, Private Forests Tasmania	**Tree improvement and seedling supply** To provide genetic material for plantations to maximise profitability and product quality. To provide research and advice to improve the quality and efficiency of seed and seedling production.	Stocked the new grafted clonal *E. nitens* seed orchard. Completion of a joint *E. nitens* genetic analysis project with Gunns Ltd has helped to identify trees within FT's own trials with higher genetic worth than those previously selected. This also provides an opportunity for exchange of *E. nitens* genetic material in the future. Harvested and peeled logs from approximately 600, trees to study the genetic parameters that affect *E. nitens* rotary peeled veneer quality (FWPA-funded research partnership with University of Tasmania). Established 3 new genetics trials (2 *E. nitens* progeny trials and 1 *E. nitens* demonstration of genetic gains trial). Completion of the CSIRO "Hottest 100" *E. nitens* molecular genetics project which identified about 20 genetic markers of growth and pulp yield. Use of these markers would increase the efficiency of *E. nitens* breeding, through reducing the breeding cycle. Finalised a study on leaf defensive chemistry of seed orchard trees and their offspring. Genetic improvement of growth and wood quality has not affected levels of leaf defensive chemicals. Provided information on seed sources of plantations in the George River catchment to the George River Water Quality Panel. Established trials of different eucalypt species to test their suitability for lowland cold and dry environments in Tasmania.

Plantations - Key research and development projects (continued)

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
2. Sustaining jobs for current and future generations			
2.4.1 Establish and manage plantations to maintain timber supply levels to industry	M Wood D McKenzie **Collaborators** CRC Forestry, Timberlands Pacific, University of British Columbia	**Eucalypt plantation silviculture** To conduct research to investigate the effects of silvicultural management on growth. To communicate research outcomes to district and / or operational staff. To optimise silvicultural management, limit associated risks and ensure maximum financial returns.	Modelled alternative silviculture regimes. A second major trial investigating the processing requirements and wood quality outcomes for plantation grown *E. nitens* demonstrated that alternative sawing strategies, in combination with appropriate reconditioning, can effectively eliminate surface and internal checking. Completed Derwent project (coupe analysis and development of coupe management plans).
	P Adams M Syme D McKenzie **Collaborators** CRC Forestry, University of Sydney, Forest Industry Herbicde Research Consortium, BASF, Serve-Ag	**Nutrition and productivity** To develop and implement plantation nutrient management systems. To evaluate nutrient limitations to plantation growth and the long-term implications of nitrogen and phosphorus status in eucalypt plantations. To evaluate and predict productivity for plantation sites.	Work on starter fertiliser trials with Basacote slow release fertiliser products. Modelled the impacts of secondary fertilisation on the current hardwood plantations.

Plantations - Key research and development projects (continued)

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
2. Sustaining jobs for current and future generations			
2.4.1 Establish and manage plantations to maintain timber supply levels to industry	M Syme D McKenzie P Adams P Smith	**Quality standards monitoring and extension** To ensure growth targets and silvicultural objectives are met through the implementation of quality standards monitoring. To work with District staff to continue and refine quality standards monitoring of operations, and performance indicators. To implement correct management systems and have in place a system to keep field operators abreast of issues in quality management of eucalypt plantations. To communicate recommended management practices and research results to staff through training programs, field days and seminars. To review Standard Operating Procedures and Quality Standards covering the areas of plantation establishment, silviculture and management.	Completed the 2009 Annual Quality Standards report for plantations and reported against revised Plantation Performance Indicators for 2009. Conducted field visits, advice sessions and a successful field day on site prep, second rotation issues, pruning, insect control and thinning issues. Conducted Aerial Application Supervisors Course. Undertook Pruning Assessment Tool (PAT) audits and training in districts. Provided input into Forest Practices Code Review negotiations with FPA. Coordinated secondary fertiliser program and related contracts, advice and training. Reviewed additional forestry chemicals with Serve-Ag and undertook District Quality Assurance use audits. Successful field day on site preparation, second rotation issues, pruning, insect control and thinning issues. Ongoing evaluation of machinery and equipment. Progressed development of Thinning Assessment Tool (TAT).

Plantations - Key research and development projects (continued)

Sustainable Forest Management Objective	FT Staff and Collaborators	Project name and aims	2009-10 Progress
3. Sustaining carbon stores, clean air, water and healthy forests			
3.3.1 Ensure availability of clean water from State Forests	S Roberts E Trainer R Barton-Johnson C Marunda K Abetz **Collaborators:** CRC Forestry, Forest & Wood Products Australia	**Hydrology research** To maintain water quality above accepted standards. To conduct research into water quality and quantity to provide greater understanding of the effects of forest operations and to provide management solutions.	Intensive sampling for pesticides by in coupes in the NE and NW showed zero detections of herbicide in water sampling despite very wet conditions, and resulted in development of a new monitoring approach. Prototype rising stage sampler for pesticide sampling developed and testing initiated. Hydrology research showed that water quality variation can be largely explained by natural features of the catchment, and that understanding the impacts of natural features on water quality is at least as important as understanding the impacts of land use and disturbance. The plantation water-use project at the Florentine study site shows a clear relationship between plantation basal area and plantation water use; this relationship will be tested at other sites in the coming year. Recommendation to reduce amount and frequency of environmental monitoring at an industry site due to significant evidence that a mill has not been impacting the surrounding aquatic environment.

Plantations Branch

Dean Williams discusses trial planting, Yong'An, Fujian, China.

Richard Lindley and Justin Bailey laying out a genetics trial.

Peter Sheldon inspects a stream-height data-logger at Ben Nevis.

Dion McKenzie measuring an E. dunnii *plantation, Yong'An, Fujian, China.*

Peter Sheldon conducting leaf sampling in a tall eucalypt plantation.

Richard Lindley monitoring E. nitens *logs being processed at Ta Ann rotary veneer mill.*

Warra Long-Term Ecological Research (LTER) site
Dr Simon Grove
Forestry Tasmania Warra Research Co-ordinator
Simon.Grove@forestrytas.com.au

The Warra LTER site of 15,900 ha was designated in 1995 to encourage long-term ecological research and monitoring in wet forests in Tasmania. The site is supported by eight LTER site partners from Tasmanian and national research agencies. Continuing projects are listed at www.warra.com

DFRD provided Warra small-project grants to 4 researchers during 2009-10.

Major activities for 2009-10

- A suitable site for the installation of a carbon flux tower at Warra LTER has been found in mature / 1934 regrowth mixed forest.
- Initiated collaborative study with University of Melbourne PhD student Benedikt Fest to measure soil fluxes of methane and nitrous oxide in Wildfire Chronosequence plots as part of a wider study examining the effects of forest disturbances on soil fluxes of non-CO_2 greenhouse gases. Installed manual respiration chambers in chronosequence plots, undertook spring sampling, and installed an automatic chamber system to measure soil CO_2 fluxes.
- Completed baseline surveys of birds and ground-active beetles in the Wildfire Chronosequence plots. Bird assemblages showed a clear successional pattern with time since fire; species richness peaked in the 1898 wildfire regrowth.
- Three year project on landscape-scale biodiversity advanced to the fieldwork stage, involving establishing 56 study plots and beginning the survey/sampling of birds, beetles and vascular plants in these.
- Analysed floristic and vertical structure data in the Wildfire Chronosequence plots.
- Completed bat activity project within the Warra Silvicultural Systems Trial with Brad Law (NSW Primary Industries).
- Conducted project on biogeochemistry and ecosystem processes of headwater streams conducted (Ian Riley).
- Attended US LTER All-Scientists' Meeting.

Projects commenced 2009-10 at the Warra LTER site

- Effect of forest disturbance on CO_2 greenhouse gas soil fluxes (Benedikt Fest, University of Melbourne).
- Acquisition of photographic images of specimens in the Tasmanian Forest Insect Collection (L Forster).

Landscape ecology researchers searching for saproxylic beetles in a rotting stump.

what is a flux tower?

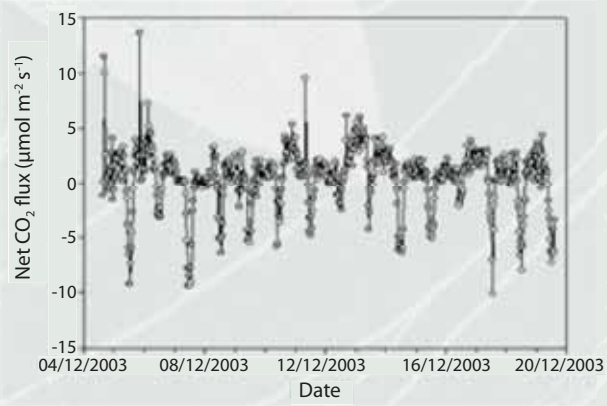
A flux tower is a platform for equipment measuring exchanges of carbon, water and energy between the land surface and the atmosphere. Towers extend above the canopy of the vegetation of interest. In the case of the 50-60 m tall forest at Warra, the tower will need to be at least 80 m tall.

The great benefit of measuring carbon and water fluxes by micro-meteorology is that changes can be measured over both short (sub-hour) and long (annual to multi-decadal) time intervals. Because the measurements are dynamic, they show fluxes from forests fluctuating between the forest being a sink (absorbing carbon) to a source (losing carbon) at different time scales.

Knowing how these fluctuations are linked with climatic conditions and factors such as defoliation (e.g. outbreaks of defoliating insects) improves our capacity to predict how forests will behave under different climates. This knowledge is critical if we are to plan strategies to adapt to climate change both in managed landscapes and protected areas.

25-m flux tower at Wombat State forest (Victoria) above the canopy of a dry *E. obliqua* woodland.

Critical instruments on the flux tower are the sonic anemometer and the open path gas-analyser. They provide 10 readings per second of the vertical and horizontal velocity of the air and the CO_2 and H_2O concentrations in that air, to enable calculations of fluxes.



An example of 30-minute average CO_2 fluxes measured from a flux tower. Negative values mean vegetation is accumulating carbon, positive values mean vegetation is losing carbon. (Centre for Terrestrial Carbon Dynamics, Sheffield, U.K.)

library and information services

Library
library@forestrytas.com.au

Forestry Tasmania's Library is located in the head office at 79 Melville Street, Hobart. It contains an extensive collection of core technical information and resources that supports the diverse needs of Forestry Tasmania, including books, print images and slides, and serials. The Library also serves as a repository and archive for published technical reports and organisational materials from Forestry Tasmania and other forestry organisations nationally and internationally.

The existing collection of books, journals, videos and photographic images is augmented by on-line access to current journals.

The Forestry Tasmania Library also makes information available to students, other libraries and members of the public who have specific requirements not able to be satisfied from other sources, and thus makes a valuable contribution to community involvement by Forestry Tasmania.

A Library review commenced in late 2009 and is due for completion in late 2010. The review will rationalise the collection to ensure that all holdings are appropriate and catalogued, and that material most relevant to Forestry Tasmania's information needs is available. Some material not needed is being transferred to other libraries in Tasmania, including the State Library, or to other specialist forestry libraries interstate.

Library opening hours are 9 am - 5 pm Monday - Wednesday, by appointment only.

Phone 03 6235 8160 or email library@forestrytas.com.au

http://www.forestrytas.com.au/science/forestry-library

Library Project officers Fiona McFarlane and Emilia Ward

divisional services to external clients

Research Services
Business & Communications Manager: Peter Hopson
Peter.Hopson@forestrytas.com.au

Staff from the Division of Forest Research and Development work with external clients, such as other forestry companies and land managers, in a number of ways, including research contracts and technical service consultancies.

The Division has significant experience in delivering contract research and consultancies to industry and other organisations both in Tasmania and abroad. A substantial body of know-how and other intellectual property has been gained by the Division through long experience of native forest management, and specialist skills have been developed in growing plantation pines and eucalypts for solid timber products.

Divisional staff provide training and operational advice to internal and external clients in harvesting, regeneration, thinning and pruning procedures. Specialist manuals, standard operating procedures, and quality assessment protocols for these operations have also been developed.

The Division works with clients in a number of ways such as collaborative research, research services contracts, and technical services consultancies on specific projects undertaken on a fee-for-service basis.

Key advantages for clients who use Research Branch Services are:

- Working with a service provider that has a long history of forestry research and development, and provision of technical solutions for a large native forest and plantation estate.
- Working with a team that specialises not only in high-quality science but also in converting project outcomes into operational realities in the forest.
- Buying knowledge and expertise at the leading edge in development of specialist hardwood silvicultural regimes for maximising solid wood production.

Specialist technical services are offered in:

- Native forest harvesting and regeneration, seedbed preparation, sowing and remedial treatments.
- Native forest silviculture, including pre-commercial and commercial thinning operations.
- Plantation silviculture including thinning and pruning regimes to produce clearwood in sawlogs from eucalypt plantations.
- Soil surveys to assess sites for plantation establishment.
- Health surveillance and audits of eucalypt and pine plantations, diagnosis of forest health problems (pests, diseases and abiotic issues), advice on the significance of their impacts, and advice on management options.
- Integrated management of major insect pests in eucalypt plantations, and use of environmentally friendly insecticides to control major insect pests of eucalypt plantations.
- Forest monitoring and assessment protocols for biodiversity, analysis and interpretation of biodiversity data, and development of appropriate management prescriptions for biodiversity.

Forestry Tasmania has signed a commercial agreement with China's Yong'an Forestry Group (YFG). Under the agreement, Forestry Tasmania's business arm, Forest Technical Services, is working with YFG to improve the way trees are grown in eucalypt plantations in Fujian Province in south-eastern China. Forestry Tasmania is providing services to develop tree breeding and silviculture, and also helping develop sustainable management of plantations, which is becoming an increasingly high priority in China.

To obtain a DFRD Capability Statement contact :

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http://www.forestrytas.com.au/science/research

tasmanian forest insect collection

Tasmanian Forest Insect Collection (TFIC)
Dick Bashford
Dick.Bashford@forestrytas.com.au

Insects are one of the most diverse groups living in our forests. Some are pests that cause damage to trees, and some are natural enemies of the pest insects. All insects contribute to the biodiversity of forests and are essential for the function of healthy forest ecosystems. We need to understand our insects to enable us to look after our trees, our forests and our biodiversity.

The Tasmanian Forest Insect Collection (TFIC) commenced in 1974 under the headship of Dr Humphrey Elliott, the Chief Scientist of DFRD at that time and now a member of the Forestry Tasmania Board. The collection began with an initial focus on forest pests and their predators and parasitoids, and more recently on wood borers.

More recently, Dr Simon Grove has overseen a major focus on beetle biodiversity, particularly saproxylic (log-dwelling) and ground beetles. The insects collected during many studies done by university students, particularly those at Warra, are also added to the TFIC. The TFIC is one of only three State forestry-specific collections (Qld and NSW hold the others), is registered as a satellite collection of the Tasmanian Museum & Art Gallery, and is a member collection of the Council of Heads of Australian Entomological Collections.

The main value of the TFIC is in providing a reference that links insect specimens either with an accepted name, or, if un-named, with a consistent "morphospecies" (group of insects with the same physical characteristics). This is particularly important for long-term studies (seven long-term studies currently contribute to the TFIC), where it is critical to maintain the correct identity of insects collected at different times.

As the TFIC was becoming established, most specimens were sent to the Australian National Insect Collection (Canberra) for identification. Now, however, many insect identifications are done in-house or in collaboration with overseas entomologists who specialise in particular groups. In the future we may rely more on DNA techniques to identify insect specimens.

During the last few years there has been major reorganisation of the TFIC, including the development of the TFIC Database. All new specimens added to the TFIC are captured in the database and, progressively, many specimens already in the collection have been added to the database as well. The TFIC currently contains approximately 320,000 specimens in 24 ten-drawer cabinets, 40% of which are databased. The collection contains 1,944 species of beetles.

The TFIC has thus become a valuable resource for research on the link between forest management and biodiversity, and in supporting operational programs such as health surveillance and quarantine. As the TFIC continues to grow, it provides new opportunities for scientists to discover patterns across space and time - a critical aspect of forest management. A web-site for the TFIC is currently in development.

laboratory services

Laboratory
Laboratory Manager: Dick Bashford
Dick.Bashford@forestrytas.com.au

Forestry Tasmania's main laboratory is located at Forestry Tasmania's head office at 79 Melville Street, Hobart.

Activities undertaken for Forestry Tasmania, and services that can be supplied to external clients, include:

1. **Pathology**

- Soil testing for *Phytophthora cinnamomi* (using standard lupin bait test).
- Diagnosis of diseased trees - isolation and identification of pathogenic fungi.

2. **Entomology**

- Identification of forest insect pests.
- Insecticide bioassays.

3. **Soil and foliage testing**

- Preparation of soil and foliage samples for chemical analysis by external labs.
- Assessment of soils for physical characteristics using wet sieve analysis.

4. **Wood density for wood quality assessment**

- Processing wood samples including discs and cores to assess basic density.
- Cellulose content assessment.

5. **Water Quality Sampling**

- Initial sample preparation.
- Turbidity, pH testing and electrical conductivity.

The laboratory works in conjunction with other laboratories to obtain specialist analyses.

Laboratory Manager Dick Bashford with Forest Health Officer Nita Ramsden (left) and Plantations Laboratory Technician Jacinta Lesek (right)

collaboration & linkages

The Division leverages more research than it can fund directly, through gaining grant funds and through working closely with other research providers.

Australian National Insect Collection

- Dr Simon Grove and Dick Bashford collaborate with the ANIC in the identification of insect specimens from the Tasmanian Forest Insect Collection.

Bayer Crop Science

- Dr Jane Elek is involved in evaluating the efficacy of stem-injected imidacloprid for protecting the foliage of plantation eucalypts from chrysomelid leaf beetles.

Charles Sturt University

- Dick Bashford is co-supervisor with Professor Geoff Gurr and Dr Angus Carnegie (NSW DPI) of a PhD student.

Canadian Forest Service

- Martin Moroni is leading CRC Forestry project 1.6.1 'Carbon model assessment' which will collate and collect forest C data to evaluate CBM-CFS3 and FullCam, in collaboration with Robert Waterworth, Department of Climate Change, and Canadian Forest Service.
- Martin Moroni is involved in the Newfoundland Boreal Ecosystem Latitudinal Transect examining the impact of climate change on forest systems.

CRC for Forestry

- Dr Steve Read is Chair of Program 4 (Trees in the Landscape) Co-ordinating Committee.
- Dr Tim Wardlaw is Chair of Project Steering Committee for Project 4.2 (Biodiversity) and

  Project 1.2.2 (Measuring and managing forest health).
- DFRD researchers are involved in most of the research projects of this CRC:

  Program 1 Managing and monitoring for growth and health (Dr Paul Adams, Dr Tim Wardlaw, Karl Wotherspoon and Dr martin Moroni);

  Program 2 High value wood resources (Dr Matt Wood, Dr Dean Williams);

  Program 3 Harvesting and operations (Dr Mark Neyland, Dr Tim Wardlaw);

  Project 4.1 Water quantity and quality (Dr Sandra Roberts, Dr Crispen Marunda);

  Project 4.2 Biodiversity (Dr Tim Wardlaw, Dr Simon Grove, Dr Jane Elek, Dr Dean Williams, Dr Mark Neyland, Robyn Scott, Dr Sue Baker) .
- Several postgraduate students from the CRC for Forestry use the Warra Silvicultural Systems Trial for their research.

CSIRO Division of Sustainable Ecosystems

- Various researchers collaborate with Dr Chris Beadle on pruning and thinning, blackwood plantation silviculture, nutrient management and genetics in relation to wood quality.

CSIRO Division of Plant Sciences

- Various researchers collaborate with Dr Simon Southerton to identify genes that significantly affect wood quality in *E. nitens*.

CSIRO Division of Land and Water

- Provided input to Dr Rai Kookana on modification of the Pesticide Impact Rating Index (PIRI), to utilise Soil Dryness Index, as part of the Tasmanian River Catchment Water Quality Initiative Project.

CSIRO Marine and Atmospheric Research

- Dr Tim Wardlaw and Karl Abetz are collaborating with Dr Ray Leuning in the establishment and operation of the Warra Flux site as part of the TERN-funded Ozflux network.

Commonwealth Department of Climate Change

- Martin Moroni is collaborating with Robert Waterworth, Department of Climate Change, as well as the Canadian Forest Service and CRC for Forestry on carbon model assessment.

Commonwealth Department of Environment, Water, Heritage and the Arts

- DEWHA funds the CERF Research Hub Landscape Logic at University of Tasmania, of which Forestry Tasmania is a member. DFRD hosts Landscape Logic post-doctoral researcher Dr Regina Magierowski.
- Christine Scheveijer and Dr Alan Thomas (DEWHA) sit on the Management Committee of the Tasmanian River Catchment Water Quality Initiative Project.

collaboration & linkages

Forest Practices Authority, Tasmania

- Dr Sue Baker is collaborating with Dr Sarah Munks and Dr Amy Koch on habitat trees retained in aggregates of aggregated retention coupes.

Forest and Wood Products Australia

- Many Forestry Tasmania staff are involved in a number of collaborative projects funded by the FWPA, including on the effect of thinning on wood quality in regrowth forests, incorporating plantation water use parameters into routine forest inventory, the interaction between the CAR reserve system and forest management by prescription, and the role of forestry in the greenhouse gas mitigation debate.

Memorial University of Newfoundland

- Dr Martin Moroni is an adjunct professor with the Memorial University of Newfoundland.

Menzies Research Institute (Hobart)

- Dr Martin Moroni is collaborating with statistician Petr Otahal to evaluate the carbon budget model of the Canadian Forest Service in eastern Canada.

Monash University

- Dr Simon Grove and Dr Tim Wardlaw collaborated with Dr Paul Sunnucks on an ARC Linkage project using molecular genetics approaches to examine landscape factors affecting the movement of log-dwelling beetles in the Southern Forests Experimental Forest Landscape.

National *Sirex* Co-ordination Committee

- Dick Bashford is Chair and Treasurer of the NSCC, a national body responsible for the development of the biological control program for *Sirex*.

Nova Scotia Department of Natural Resources

- Dr Martin Moroni is collaborating with Peter Neily to regionally evaluate the carbon budget of the Canadian Forest Service in hardwood forests of Nova Scotia.

Oregon State University

- Dr Tim Wardlaw is collaborating with Dr Thomas Spies on an ARC Linkage project examining the effect of forest influence on recolonisation of harvested areas.

Private Forests Tasmania

- Dr Dean Williams and Dr Paul Adams are undertaking collaborative research into selecting eucalypt species suitable for deployment on cold and dry sites in the Tasmanian Midlands.

New South Wales Department of Primary industries

- Dr Sue Baker collaborated with Dr Brad Law in a study of the responses in the bat fauna to treatments in the Silvicultural Systems Trial.

Research Priorities Coordinating Committee

- RPCC Membership - Dr Steve Read.
- Research Working Group 1 (Genetic Resources): Membership - Dr Dean Williams.
- Research Working Group 3 (Water): Membership - Dr Sandra Roberts.
- Research Working Group 4 (Native Forest Management): Membership - Dr Mark Neyland, Dr Simon Grove.
- Research Working Group 5 (Plantation Management): Membership - Dr Paul Adams, Dr Matt Wood.
- Research Working Group 7 (Forest Health): Membership - Dr Tim Wardlaw, Dick Bashford.

Scion (New Zealand)

- Dr Tim Wardlaw collaborated with Mark Miller and Lindsay Bulman on a project comparing needle cast assessment methods for screening *P. radiata* genetics trials.

seedEnergy Pty Ltd

- seedEnergy provides contract services for training in Mass Supplementary Pollination of *E. globulus*.
- seedEnergy supplies genetically improved *E. dunnii* seed to support the Genetic Improvement and Silviculture Program in China.

Southern Tree Breeding Association Inc.

- *E. globulus* operational tree breeding and genetic improvement research is done through the STBA, and STBA is undertaking a TreePlan® analysis of FT *E. nitens* breeding populations under contract with PlantPlan Genetics.
- Dr Dean Williams is an elected member of the STBA Technical Advisory Committee.
- David Pilbeam (STBA) provides assistance and information for the Forestry Tasmania eucalypt breeding program.

collaboration & linkages

St Francis Xavier University

- Dr Martin Moroni is collaborating with David Risk and Lisa Kellman on the use of isotopes to separate heterotrophic and autotrophic soil respiration.

Tasmanian Department of Primary Industries, Parks, Water and Environment

- Dick Bashford is a member of the Biosecurity Technical Committee and Dr Tim Wardlaw is on the Stakeholder Reference Group of the Tasmanian Biosecurity Committee.
- Dick Bashford is collaborating with Dr Megan Szczerbanik in conducting quarantine surveillance programs in Tasmania to detect exotic forestry insects as part of a national program funded by the Office of the Chief Plant Protection Officer (OCPPO).
- Dr Simon Grove, Dr Tim Wardlaw and Dick Bashford are collaborating with Michael Driessen to plan the second decadal monitoring of the basal altitudinal monitoring plots at Warra.
- DPIPWE Water Management Branch staff communicate regularly with Dr Sandra Roberts and provide advice to research and operational programs.
- Dr Sandra Roberts provided advice to DPIPWE during the development of the Water Availability and Forest Landuse Planning Tool.

Tasmanian Herbarium

- Dr Jean Jarman is collaborating with Dr Gintaras Kantvilas on surveys of bryophytes and lichens in the Warra Silvicultural Systems Trial.

Technical University of Dresden

- Dr Martin Moroni is collaborating with Professor Franz Makeschin investigating the forest carbon cycle in eastern Canada and evaluating of the carbon budget model of the Canadian forest sector.

Tourism Tasmania

- Mr Rowan Sproule was part of the steering committee for the project entitled "Social acceptability of forest management options; Landscape level analysis". This project is being conducted by the University of Melbourne with funding from the Australian Research Council, Forestry Tasmania and the Forest Practices Authority.

University of British Columbia

- Dr Steve Mitchell (University of British Columbia) is co-supervising Robyn Scott's PhD with Dr Mark Neyland and Associate Professor Mark Hovenden (University of Tasmania).

University of Guelph

- Dr Tim Wardlaw and Dr Simon Grove are collaborating with University of Guelph to undertake DNA fingerprinting of a selection of saproxylic beetle taxa from the TFIC (as part of the ARC Linkage project on forest influence).

University of Hawaii

- Dr Martin Moroni is collaborating with David Beilman to carbon-date buried wood samples.

University of Melbourne

- Dr Leon Bren provides advice on the Warra Hydrology project.
- John Hickey is collaborating with Dr Kath Williams, Professor Ian Bishop, Dr Rebecca Ford and Eric Smith to determine the social acceptability of alternatives to clearfelling.
- Drs Tom Baker, Yue Wang and David Forrester collaborate in CRC Forestry Program 2 (High Value Wood Resources), particularly in the area of growth and yield modelling in eucalypt plantations.
- Dr Steve Read is involved in a range of collaborations with the School of Botany, School of Zoology and School of Forest and Ecosystem Sciences and is an Honorary Associate Professor in Forest and Ecosystem Sciences.
- Professor Ian Rae undertook an audit of historical water monitoring data supplied for the Tasmanian River Catchment Water Quality Initiative Project.

University of Southern Illinois

- Dr Jean Jarman and Dr Gintaras Kantvilas are collaborating with Dr Peter Minchin on assessing the impacts of harvesting and regeneration operations on lichens and bryophytes in wet eucalypt forests.

University of the Sunshine Coast

- Mark Hunt is collaborating with Dr Martin Moroni on the role of forestry in the greenhouse gas mitigation debate.

collaboration & linkages

University of Sydney

- Dr Charles Warren has been collaborating on work aimed at understanding the importance of organic nitrogen and improving soil nitrogen indicators, funded by an ARC Linkage Grant.

University of Tasmania

- Dr Simon Grove and Dr Tim Wardlaw are partner investigators on an ARC Linkage project with Dr Caroline Mohammed and Dr Christina Schmucki using molecular genetics to examine landscape factors affecting the movement of log-dwelling beetles in the Southern Forests Experimental Forest Landscape.
- Dr Tim Wardlaw is collaborating with Dr Greg Jordan, Dr Chris Burridge and Dr Sue Baker on an ARC Linkage project examining the effect of forest influence on recolonisation of harvested areas.
- Dr Simon Grove is co-supervisor of PhD studies by Belinda Yaxley on the autecology of saproxytic insects in the southern forests, and by Lynne Forster on population structures of saproxylic beetles in the Southern Forests Experimental Forest Landscape.
- Dr Tim Wardlaw is collaborating with Dr Greg Jordan in an honours study examining forest influence effect on the recolonisation by bryophytes into an old clearfell.
- Dr Tim Wardlaw is collaborating with Dr Caroline Mohammed in an FWPA-funded project auditing forest biosecurity arrangements and preparedness in Australia.
- DFRD is a partner in an ARC Linkage project led by Dr Julianne O'Reilly-Wapstra to examine genetic interactions of browsing animals and eucalypts.
- DFRD is collaborating with Professor Brad Potts and Associate Professor Rene Vaillancourt to examine genetic and phenotypic segregation in F2 families of *E. globulus.*
- Robyn Scott is enrolled at the School of Plant Science at the University of Tasmania as a part-time PhD student. Her topic is 'Effects of variable retention harvesting on productivity and growth in wet eucalypt forests'. Robyn is supervised by Associate Professor Mark Hovenden (University of Tasmania), Dr Steve Mitchell (University of British Columbia) and Dr Mark Neyland.
- Dr Mark Neyland assisted Bryn Daniels, forestry masters student at the University of Tasmania. Bryn is examining the floristic changes after 32 years at the Sumac rainforest logging and regeneration trial.

Washington State University

- Dr Tim Wardlaw is collaborating with Professor (Emeritus) Jerry Franklin on an ARC Linkage project examining the effect of forest influence on recolonisation of harvested areas.

variable retention field day

The biodiversity benefits of variable retention (VR) harvesting were outlined on a field day in the Styx Valley on 09 December 2009. The field day aimed to increase awareness of variable retention as an ecological solution for maintaining biodiversity in commercial forests, and was presented by the CRC for Forestry and Forestry Tasmania. Attendees represented a wide range of organisations, including the Commonwealth and Tasmanian governments, the Forest Practices Authority, the Forest Industries Association of Tasmania, the Universities of Tasmania and Melbourne, Private Forests Tasmania and CSIRO, together with the CRC for Forestry and Forestry Tasmania.

The day commenced with a welcome by Dr Steve Read (FT's Chief Scientist) and Professor Brad Potts (University of Tasmania and CRC for Forestry). The 1950s regrowth forest at the first stop was established after one of the first clearfell, burn and sow (CBS) operations in Tasmania, and illustrated this traditional approach to management of oldgrowth wet eucalypt forests as well as the vigour and diversity of eucalypt regrowth. John Hickey (FT's Manager, Planning) then outlined the history of harvesting in wet eucalypt forests, and described the policy framework that recently led to the widespread adoption of the VR approach.

The second and third stops were in aggregated retention (ARN) coupes in the Styx valley (Styx 020A, now one year old, and the two-year-old Styx 007A), and illustrated the emerging practice of ARN as the form of VR most suitable for managing tall, wet forests for both timber production and biodiversity.

The group then convened for lunch and further discussions at the Eagles Eyrie above Maydena. Presentations covered research into the biodiversity benefits of VR by Dr Sue Baker (FT's VR Biodiversity Research Officer), comparison of early eucalypt regeneration in VR and CBS coupes by Dr Mark Neyland (FT's Principal Research Scientist, Native Forests), and the emerging science of landscape metrics by Dr Simon Grove (FT's Conservation Biologist).

Together these talks brought together the systematic and scientific approach that has underpinned implementation of VR as a novel silvicultural system for maintaining mature forest elements during oldgrowth forest harvesting. The potential role for VR in restoring mature forest elements in future harvesting of regrowth forests was also discussed.

Overall, the field day provided all attendees with a clear overview of the implementation of variable retention in management of wet eucalypt forests, and of the research that has allowed this to happen.

SCIENTIFIC FACT SHEETS

In response to demand for information regarding specific forestry issues the Division of Forest Research and Development commenced a new series of one page scientific fact sheets on a variety of topics. Available now at http://www.forestrytas.com.au/publications/scientific-fact-sheets

Use of pesticides in plantations
How Forestry Tasmania ensure chemical use in plantations is as environmentally benign as possible.

Why do we need regeneration burns in Tasmanian forests?
Explains the fire-adapted ecology of our forests, and the way in which regeneration burns mimic the natural cycle of wildfire and regrowth.

Selecting the best trees for eucalypt plantations
A background on the common hardwood plantation trees, Tasmanian blue gum (*Eucalyptus globulus*) and shining gum (*E. nitens*)

Use of pesticides in plantations

Pesticides (chemicals such as herbicides and insecticides) are widely used across Australia, but the forestry industry uses less than 2% of total national pesticide use. Forestry Tasmania only applies pesticides in plantations - native forests are chemical-free.

All pesticide application for forestry in Tasmania is regulated by the Forest Practices Code to ensure sprays are not applied outside the target area. Internal roads, drains and streams are also excluded from spraying, and there are controls on the proximity of plantations to river banks.

Eucalypt plantations are often sprayed once at establishment with herbicides, but rarely during the rest of their growth cycle. Forestry Tasmania has not used the triazine herbicides atrazine or simazine since the mid 1990s.

An annual average of about 1% of the Forestry Tasmania eucalypt plantation estate is aerially sprayed with insecticides to control defoliation by leaf beetles. The only insecticides used for aerial spraying of plantations are alpha-cypermethrin and spinosad.

- Alpha-cypermethrin (Dominex®, Fastac®) is a synthetic pyrethroid, similar to the organic pyrethrum. It is toxic to all insects, fish and crustaceans, moderately toxic to oysters, algae and humans, and has low toxicity to birds. After spraying, it remains toxic to insects for only 2 weeks and does not persist in the environment.
- Spinosad (Entrust®, Succcess®) is an organic insecticide derived from a fungus; Entrust is approved for use on organic crops. It is toxic to larval but not adult beetles and moths, and toxic to bees and wasps if oversprayed but not when the spray has dried. Toxicity to humans, birds, fish, crustaceans and algae is low, while toxicity

Water samples are analysed after spraying of Forestry Tasmania plantations. No insecticides have been detected in hundreds of these water samples. Very rarely, herbicides have been detected after spraying, but none have been anywhere near the official health limits for drinking water. Forestry Tasmania reports the results of its water monitoring program in its Annual Forest Sustainability Report.

Forestry Tasmania supported and participated in the Tasmanian River Catchment Water Quality Initiative project, which developed the CSIRO Pesticide Impact Rating Index (PIRI) for Tasmanian conditions. Tasmania PIRI is now used extensively in agriculture and forestry operations to minimise risks of pesticides contaminating water.

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May 2010

Forestry Tasmania

Why do we need regeneration burns in Tasmanian forests?

Each autumn, Forestry Tasmania undertakes regeneration burns of recently harvested native forest. Most high intensity burns occur in lowland wet eucalypt forest.

These forests have a tall, open canopy over a dense secondary layer of small trees and tall shrubs. If this understorey contains rainforest species such as myrtle or sassafras the forest is "mixed forest", while if it contains broad-leaved shrubs such as dogwood or musk the forest is "wet sclerophyll forest".

The dense understorey and large amount of litter in these forests prevent the continuous regeneration of the eucalypts. Instead, regeneration relies on major disturbance to open the canopy and increase the amount of sunlight reaching the forest floor, prepare a mineral-soil seed-bed, initiate seed-fall, and reduce the local number of insect and mammal browsers. In nature, this disturbance is usually wildfire.

Regeneration burns following harvesting are designed to achieve the same results as nature achieves through wildfires, and establish abundant vigorous regeneration. The burn prepares a mineral-soil seed-bed free of litter. Seed is then applied aerially. Eucalypt seedlings establish readily and grow more rapidly on burnt ground than elsewhere (the 'ashbed effect').

Many native understorey species also respond positively to fires, with ground-stored seed triggered to germinate by the heat of the fire or by chemicals in smoke. Nutrients lost to the site during the fire are replaced in the growing forest by inputs in rain. The fire also releases nutrients from the soil, which stimulate plant growth.

Absence of fire after harvesting will cause an increased fire risk for many years as large amounts of fuel will be left at the site. Burning some of the fuel off-site to generate energy may reduce this risk, and make the necessary regeneration burn of the harvested area easier to manage.

Alternatives to burning are not as effective and while it is possible to mechanically rearrange or mulch eucalypt litter and harvesting debris this increases the amount of soil disturbance and compaction, and leaves much of the site under heaps of mulch. Eucalypts will not establish in unburnt mulch and mechanical disturbance of the soils also promote the regeneration of cutting grass, rather than the regeneration of shrubs which follows fire.

Fire is by far the most effective method of regenerating healthy forests. Tasmania's wet eucalypt forests are born out of fire, and the ecology of our forests is in balance when there is fire.

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Forestry Tasmania

Selecting the best trees for eucalypt plantations

The major eucalypt plantation species grown in Tasmania are *Eucalyptus nitens* and *E. globulus*. *E. globulus* is the native Tasmanian blue gum, and *E. nitens* is shining gum, a closely related eucalypt that is native to Victoria. The native forest where *E. nitens* occurs provides drinking water to Melbourne and many other Victorian cities and towns.

No plantation eucalypts in Australia have been genetically engineered, including *E. nitens* and *E. globulus* in Tasmania. Instead, plantation trees have been selected from native forest trees for better growth rate and wood properties. Seedlings are grown from seeds produced by pollination of trees in seed orchards. Crops and animals farmed in Tasmania for food have undergone far greater levels of selection and breeding than plantation trees.

No *E. nitens* or *E. globulus* plantation trees in Australia have been selected for toxicity to insects or browsing mammals. Studies have been undertaken on the natural variation of eucalypts to resist insect and mammal browsing based on natural leaf chemistry, but this has not resulted in any selection.

All eucalypts contain oils that have natural antiseptic/antibiotic properties when they are concentrated, and that are used in many common household products. These oils are toxic if ingested in large quantities. *E. nitens* has lower levels of oils than do most other eucalypts in Tasmanian native forests.

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Forestry Tasmania

Southern Connections: Tasmania, Patagonia and Tierra del Fuego

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Southern Connections

Simon Grove, Mark Neyland and their colleague Fred Duncan (Forest Practices Authority, retired) attended the VI Southern Connections Congress (www.sccongress2010.com.ar), held 15-19 February 2010 in San Carlos de Bariloche, a small city nestled into the eastern Andes of Argentina, amongst lakes and mountains and with forests of *Nothofagus* prominent in the landscape.

There were many useful sessions for forest aficionados attending the Congress. Early presentations on the geologic and biogeographic history of Patagonia gave a perspective for other speakers. The session on the role of long-term research sites in austral cool-temperate forests was well-attended, and focussed on ecological, management and conservation findings. Simon and Mark gave presentations on research and forest management practices at Warra and in the broader experimental forest landscape. Relevant South American contributions included talks on involvement of local communities and tourists in forest management in Tierra del Fuego and southern Chile (Christopher Anderson, Universidad de Magallanes and University of North Texas), and research on different silvicultural systems in southern Argentina (Pablo Peri, University of Santa Cruz and National Institute of Agricultural Technology) and Tierra del Fuego (Guillermo Martinez Pastur, Centro Austral de Invesitgacion Científica).

*Lenga (*Nothofagus pumilio*) forest near Bariloche, with an understorey dominated by* Alstroemeria aurantiaca. *Photo courtesy Fred Duncan*

Patagonia

After the Congress, Simon, Fred and Mark travelled through Patagonia, where they visited forest study sites in low forest of ñire (*N. antarctica*), to Tierra del Fuego, where they saw variable retention harvests in better-quality *N. pumilio* forests. Variable retention harvests in these forests look similar to those in Tasmania, but *N. pumilio* forests regenerate prolifically without fire, whereas fire is essential to successful regeneration following harvesting in Tasmanian eucalypt forests. In Tierra del Fuego, all contributed to a very successful course in Forest Management attended by some 25 researchers, foresters, staff of regulatory agencies, and land managers from Chile and Argentina. Information was presented on the ecology, soils and silviculture in the forests of Tierra del Fuego, and similarities and differences in ecology, silviculture and regulation in Tierra del Fuego and Tasmania were discussed.

The Council on Australia Latin American Relations (Commonwealth Department of Agriculture, Fisheries and Forestry) is thanked for financial support for the trip, as is the Australian ambassador to Argentina (John Richardson) for his interest, many Argentinean friends and colleagues (notably Vanessa Lencinas, Mercedes Villarreal, Pablo Luis Perí and Rosina Soler Esteban), and particularly Guillermo Martinez Pastur.

Presenters at the 'long-term research' session at the Southern Connections congress, left to right Cecilia Pérez , Chris Anderson, Guillermo Martinez Pastur, Pablo Peri, Mark Neyland, Simon Grove.

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Horton B, Glen M, Davidson N, Mohammed C, **Wardlaw TJ** (2009) Sampling for soil fungi: is there a better way? Poster presentation at 10th International Congress of Ecology. 16-21 August 2009, Brisbane, Australia.

Horton B, Gates G, Glen M, Mohammed C, Davidson N, **Wardlaw TJ** (2009) Ectomycorrhizal fungal communities of native highland and lowland Tasmanian eucalypt forests. Poster presentation at 10th International Congress of Ecology. 16-21 August 2009, Brisbane, Australia.

Horton B, Glen M, Davidson N, Mohammed C, **Wardlaw TJ** (2009) The ecology of *Eucalyptus delegatensis* dieback in Tasmania. Poster presentation at 10th International Congress of Ecology. 16-21 August 2009, Brisbane, Australia.

Jordan L (2009) Training for 2009 -10 leaf beetle monitoring season. October 2009, Northern and southern Tasmania.

Keenan RJ, **Read SM** (2010) Conserving and managing old growth forests in Australia in a changing world. Submitted for presentation at IUFRO Congress 2010 session B18.

Koch A, **Baker SC** (2009) Using aerial photographs to remotely assess tree cavity availability. Poster presented at the 13th World Forestry Congress, Buenos Aires, Argentina.

FIELD DAYS AND PRESENTATIONS

Neyland MG (2010) Silvicultural performance of alternatives to clearfelling in lowland wet eucalypt forests: Findings from long-term research at Warra, Tasmania. Presentation to the VI Southern Connections Congress held in Bariloche, Argentina, February 15 to 19, 2010.

O'Reilly-Wapstra J, **Wardlaw TJ,** Miller A, Potts B (2010) Integrated browsing Management. Oral presentation at CRC Forestry, Annual Science Meeting. 19-20 May 2010. Fremantle, Western Australia.

Prihatini I, Glen M, Smith AH, **Wardlaw TJ**, Mohammed CL (2009) Survey of the needle fungi associated with Spring Needle Cast in *Pinus radiata*, Proceedings of the 17th Australasian Plant Pathology Conference, Plant Health Management. 29 September-1 October 2009, Newcastle, NSW.

Roberts SL (2010) Managing Forest Water Use at the Landscape Level. Presentation at the People Forests and Landscapes Symposium. CRC for Forestry, University of Tasmania, Hobart 29 March 2010.

Roberts SL, **Barton-Johnson RJ** (2009) Predicting *Eucalyptus nitens* plantation transpiration in Tasmania using growth parameters. 32nd Hydrology and Water Resources Symposium. 30 November-3 December 2009, Newcastle, Australia.

Read SM, Grove, Baker SC (2009) Long-Term Ecological Research at Warra: science to policy, science to land management. Invited paper presented at the 10th INTECOL meeting, Brisbane, Australia.

Read SM (2009) Science communication: How to give science talks. Tasmanian branch of the Ecological Society of Australia, University of Tasmania, 14 August 2009.

Read SM (2009) Science to land management: outcomes from native forest research at the Warra LTER site in southern Tasmania. Department of Forest and Ecosystem Science, University of Melbourne. Creswick.

Shaw C, Hilger A, Kurz WA, Smyth CE, **Moroni MT,** Hagemann U (2009) Evaluation of the Carbon Budget Model of the Canadian Forest Sector (CBM-CFS3) Using the Canadian National Forest Inventory (NFI) Ground Plot Data. ASA-CSSA-SSSA 2009 International Annual Meeting, Pittsburgh, PA. 1-5 November 2009.

Stephens H, O'Reilly-Wapstra JM, **Baker SC,** Munks S, Potts B (2009) Aggregated retention and mammal conservation in old growth forests. Poster presented at the 10th International Congress of Mammalogy, Mendoza, Argentina.

Wardlaw TJ (2009) Tasmanian flux site: Warra LTER. Presentation at Ozflux 2009. July 2009, Charles Darwin University, Darwin, NT.

Wardlaw TJ (2009) Policy, science and operational reality: An evaluation of the cessation in the use of compound 1080 on Tasmania's State forests. Plenary talk at the Australasian Wildlife Management Society Conference, November 2009, Napier, New Zealand.

Wardlaw TJ (2010) Management of mammal browsing by Forestry Tasmania: Eucalypt plantations. Oral presentation at DPIPWE Alternatives to 1080 Workshop. April 2010, Launceston, Tasmania.

Wardlaw TJ (2010) Pest management in Tasmania. Oral presentation at the CRC Forestry workshop on integrated pest management in temperate eucalypt plantations. 17 May 2010, Murdoch University, Perth WA.

Wardlaw TJ (2010) Industry-wide co-ordination of pest management. Oral presentation at the CRC Forestry workshop on integrated pest management in temperate eucalypt plantations. 17 May 2010, Murdoch University, Perth WA.

Wardlaw TJ, Wotherspoon K (2009) Operational Forest Health Management: Using the detection power of forest health surveillance to make better health management decisions. Oral presentation to ForestTech2009. 10-12 November 2009, Rotorua New Zealand and 16-17 November 2009 Albury Australia

Williams DR (2010) Outline and benefits of the Yong'An Forestry Group Silviculture and Genetic improvement program. Presentation made to Fujian Forestry Bureau. Yong'An, China. March 2010.

Wood MJ (2010) Managing plantations for growth and quality. Farm Forestry Research Seminar: Plantation Thinning and Pruning, DPI Victoria, Melbourne, 04 June 2010.

forest tours and lunchtime talk series

Forest Tours

During National Science Week 2009, Forestry Tasmania invited primary schools to visit the Tahune AirWalk to see a variety of science displays, and experience all the attractions at the AirWalk. Forestry Tasmania's scientists also accompanied the school groups on walking tours of the forest answering questions for the young enquiring minds and also highlighting the unique features of the Tahune Forest Reserve.

The scientists also provided an insight into the research being undertaken across the Tahune bridge at the Warra Long-Term Ecological Research (LTER) site. Over the weekend of National Science Week, DFRD's scientists also hosted free bus tours into the Warra LTER site, where participants saw first-hand the extensive research being undertaken.

Lunchtime Talk Series

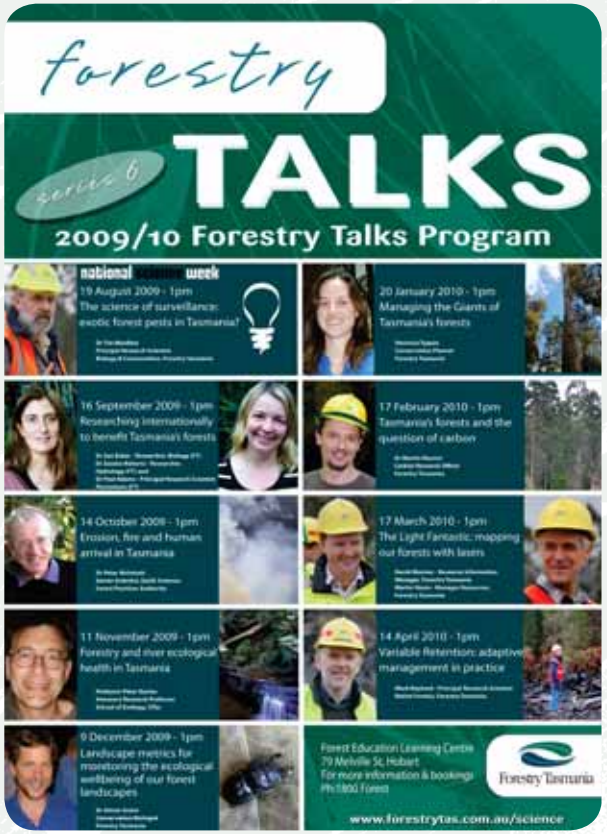
The Division presents regular lunchtime talks in a series known as Forestry Talks. The broad theme is "Applying Science to Modern Forest Management". The presentations incorporate talks by Forestry Tasmania's scientists, and also by visiting scientists and from institutions such as the University of Tasmania. For a complete listing of Forestry Talks visit:
http://www.forestrytas.com.au/science/forestry-talks

Bold: Forestry Tasmania scientist

Forestry Talks 2009 - 10

- 19 August 2009 **Tim Wardlaw**
  The science of surveillance: exotic forest pests in Tasmania?
- 16 September 2009 **Sue Baker, Paul Adams and Sandra Roberts**
  Researching internationally to benefit Tasmania's forests
- 14 October 2009 Peter McIntosh
  Erosion, fire and human arrival in Tasmania
- 11 November 2009 Peter Davies
  Forestry and river ecological health in Tasmania
- 10 December 2009 **Simon Grove**
  Landscape metrics for monitoring the ecological wellbeing of our forest landscapes
- 20 January 2010 **Veronica Tyquin**
  Managing the Giants of Tasmania's forests
- 17 February 2010 **Martin Moroni**
  Tasmania's forests and the question of carbon
- 17 March 2010 **David Mannes & Martin Stone**
  The light fantastic: mapping our forests with lasers
- 14 April 2010 **Mark Neyland**
  Variable retention: adaptive management in practice

A DVD of Forestry Talks presented by DFRD during 2009 -10 is included inside the back cover of this publication.



divisional publications

The publications below are available from the Division
Tel: 03 6235 8219 or email research@forestrytas.com.au

A History of Innovation - 85 years of Research and Development at Forestry Tasmania

A New Silviculture for Tasmania's public forests

Native Forest Silviculture & Technical Bulletins

No. 1: Eucalypt Seed and Sowing

No. 2: *Eucalyptus delegatensis* Forests

No. 3: Lowland Dry Eucalypt Forests

No. 4: High Altitude *Eucalyptus dalrympleana* and *Eucalyptus pauciflora* Forests

No. 5: Silvicultural Systems

No. 6: Regeneration Surveys and Stocking Standards

No. 7: Remedial Treatments

No. 8: Lowland Wet Eucalypt Forests

No. 9: Rainforests

No. 10: Blackwood

No. 11 : Silvicultural Effects and Use of Fire

No. 12. Monitoring and Regeneration Protection

No. 13: Thinning Regrowth Eucalypts

Pests and Diseases & Leaflets

Insect Pests of Trees and Timber in Tasmania

Identifying pests in Tasmania's forests:

1 – Tasmanian Eucalyptus leaf beetle

2 – Southern Eucalyptus leaf beetle

3 – Autumn gum moth

4 – Gum leaf skeletoniser

5 – Gum tree corid bugs

6 – Large green sawfly

7 – Sirex wood wasp

Weed control in Tasmania's forests

1 – Docks (Rumex species)

2 – Bracken (*Pteridium esculentum*)

3 – Cumbungi/Bullrush (*Typha spp Pers.*)

4 – Gorse (*Ulex eruopaeus L.*)

5 – Ragwort (*Senecio jacobaea L.*)

6 – Thistles

7 – Wild radish (*Raphanus raphanistrum*)

8 – Silver wattle (*Acacia dealbata*) & Black wattle (*Acacia mearnsii*)

9 – Pampas Grass

10 – Grasses (*Poaceae*)

11 – Sorrel (*Rumex acetosella*)

Soils & Soil Bulletins

Forest Soils of Tasmania

No. 1: Soils of Tasmanian State forests. 1. Piper sheet, North-east Tasmania

No. 2: Soils of Tasmanian State forests. 2. Forester sheet, North-east Tasmania

No. 3: Soils of Tasmanian State forests. 3. Forth sheet, Northern Tasmania

Tasforests

Vol. 10 - 18 available in hard copy

Vol.1 - 18 available on-line

http://www.forestrytas.com.au/publications/tasforests

Zoology

Tasmanian Forest Insects and their Host Plants

Scientific Information Sheets

Use of pesticides in plantations

Why do we need regeneration burns in Tasmanian forests?

Selecting the best trees for eucalypt plantations

http://www.forestrytas.com.au/publications/scientific-fact-sheets

divisional management structure & key staff

The Division is headed by the Chief Scientist, who oversees the following management team:

Principal Research Scientist (Native Forests)
Manages research on techniques aimed at increasing productivity of the harvestable areas in native forests. Coordinates continuous improvement of ecologically sustainable forest management.

Principal Research Scientist (Plantations)
Manages research and extension on plantation silviculture and forest hydrology. Manages operational implementation of plantation research and quality standards monitoring.

Principal Research Scientist (Biology & Conservation)
Manages research into the conservation of natural values and management of pests and diseases. Manages the forest health surveillance program.

Forest Nursery and Tasmanian Seed Centre Manager
(until Jan 2009, when reporting responsibility moved from DFRD to Forest Operations)
Responsible for the annual production of over 8 million pine, eucalypt and other tree seedlings from the Forest Nursery in Perth. Responsible for the collection, storage and distribution of native seed for regenerating native forest and the production of high-quality selected seed for plantations.

Business and Communications Manager
Manages the Division's commercial activities, communications and marketing.

Executive Officer
Manages administrative and financial matters.

STEVE READ
(Chief Scientist)

Dr Steve Read commenced as Chief Scientist in 2004. Steve was previously on the staff of the School of Forestry, University of Melbourne, Creswick and the School of Botany, University of Melbourne, Parkville and has a PhD in plant development and biochemistry from the University of Cambridge, UK. His research interests range widely across forest science.

Steve was involved in the previous CRC for Hardwood Fibre and Paper Science and is part of the current CRC for Forestry. He has also:

- authored some 30 research papers and 50 conference publications and supervised 20 Masters and PhD students
- served as Associate Dean (Coursework) in the University of Melbourne Institute of Land and Food Resources 2001 - 2004
- worked on the Land & Biodiversity Implementation Committee of the Glenelg-Hopkins Catchment Management Authority in western Victoria

Steve also maintains a position as an Honorary Associate Professor, Department of Forest and Ecosystem Sciences, University of Melbourne.

MARK NEYLAND
(Principal Research Scientist – Native Forests Branch)

Mark graduated from the Australian National University in 1980 with a Bachelor of Science in Forestry, and in 2009-2010 was a PhD student at the University of Tasmania. Mark has spent most of his career as a botanist and ecologist. His research has included the ecology and conservation of rare butterflies, and the conservation and management of relict rainforest in eastern Tasmania, tree ferns and dry forests and woodlands. Mark joined Forestry Tasmania in 1998 as a research officer and became the Principal Scientist in Native Forests Branch in 2005. The Warra Silvicultural Systems Trial has been a major focus of his work throughout that time. He has authored over 60 publications, from peer-reviewed scientific papers through to technical documents designed to transfer the results of research into forest management systems and guidelines.

PAUL ADAMS
(Principal Research Scientist – Plantations Branch)

Dr Paul Adams has been a forest researcher for nearly 20 years, for the last 10 focusing on soil, nutrition and productivity-related research in pine and eucalypt plantations. This work includes the development of secondary fertiliser programs, monitoring and decision-support

systems to improve the productivity and quality of *E. nitens, E. globulus* and *P. radiata* plantations. Other interests include off-site impacts of fertilising, sustaining long-term productivity, and weed management.

TIM WARDLAW (Principal Research Scientist – Biology & Conservation Branch)

Dr Tim Wardlaw has a Bachelor of Science (Hons) and a PhD from the University of Tasmania. He has 25 years experience in applied forest pathology research, with particular emphasis on disease survey, impact assessment, diagnosis and development of management strategies. Tim introduced forest health surveillance to Tasmania in 1997. He has a strong record of successfully securing funds for research projects, and has undertaken many consultancies in the Asia-Pacific region. Tim has authored more than 25 peer-reviewed publications and book chapters as well as numerous technical reports and conference publications.

PETER HOPSON
(Business & Communications Manager)

Peter commenced with the Forestry Commission after leaving Elizabeth College in 1974 and has been with the organisation for over 35 years. Peter commenced with the Finance Branch and worked in a variety of jobs within the section before moving to Forestry Tasmania's Plant Branch as the Senior Clerk. In 1993 Peter became the Division's Executive Officer and remained in this position until 2004 when he transferred to Corporate Relations & Tourism, changing from 'financial/admin' duties to web and graphic design with communication responsibilities. Peter was appointed to the position of Divisional Business & Communications Manager in July 2007.

ROBYN LEACH
(Executive Officer)

Robyn commenced her career with the Australian Taxation Office in 1985 prior to commencing work with Forestry Tasmania as a part-time Digitizer in 1989. Robyn completed a Diploma of Business (Accounting) with the Hobart Institute of TAFE in 1995. Since that time Robyn has undertaken administration for various offices within Forestry Tasmania, including the Regional Forest Agreement, Native Forest Program, Planning and Resources and now Forest Research and Development. Robyn brings to the team a wealth of administrative and financial experience.

key contacts

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