Forest Practices news

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New members on the Forest Practices Board and Forest Practices Advisory Council

Graham Wilkinson, Chief Forest Practices Officer

The Minister for Infrastructure, Energy and Resources has announced the new appointments to the Board and Advisory Council, following the recent changes to the *Forest Practices Act*.

1. Forest Practices Board

Ross Waining joins the Board as the member appointed for expertise in the harvesting and processing of timber. Ross is a well known professional forester with 37 years experience in forest management, harvesting, sawmilling and woodchip operations. He has worked in both the public and private sectors at a senior strategic and policy level and currently works as an independent consultant.

Roger Chalk has been appointed as the member with expertise and knowledge of local government. Roger has had a long and distinguished career in local government. He is currently a councillor on the Waratah-Wynyard Council and has previously served as Council Warden, Chairman of the Tasmania Local Government Board and Tasmania's representative on the Australian Local Government Association.

Peter Volker joins the Board as the director from the Board of Private Forests Tasmania. Peter has been a practicing Forest Practices Officer since the inception of the forest practices system and has particular expertise in the establishment of forest plantations. Peter's role will be to work closely with the private sector in fostering a co-operative approach towards the management of the forest practices system.

Ken Felton (current Chair of the Board) remains on the Board as the director from the Board of Forestry Tasmania. Kim Evans also remains on the Board, as the Secretary of the Department responsible for the *Environmental Management and Pollution Control Act*.

(Note: Evan Rolley departs from the Board with the representation of Forestry Tasmania being reduced to one member. Evan has played an outstanding role in guiding the implementation of the forest practices

continued page 2

contents

Into the future

With this edition, *Forest Practices News* enters its second year. Many thanks to all contributors, and the readers who have responded with encouragement and ideas.

In compiling each newsletter, we attempt to provide a useful mix of information:

- current developments in forest practices;
- updates regarding resources that are available to Forest Practices Officers (FPOs) and other forest managers;
- practical information and ideas to assist FPOs to assist in the continuing improvement of the forest practices system;
- general information on various specialist disciplines to help broaden the background of forestry practitioners regarding aspects of the natural and cultural history of our forests;
- and an opportunity to discuss topical issues and innovative ideas.

The Forest Practices Board (FPB) specialists can tell only part of the story. This is YOUR newsletter, and it is YOU who are making the forest practices system work. Please tell us of your innovations and ideas, and of the practicalities on the ground. Contributions can be sent in hard copy or emailed to info@fpb.tas.gov.au. Please note, however, that formal instructions from the Board will continue to be communicated directly to FPOs by mail.

Kevin Kiernan,
Senior Geomorphologist
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continued page 2

system since its inception and his contribution on the Board has been greatly valued. We know that Evan will continue to take a keen interest in the system and make further contributions to its continued development in his broader role as Managing Director of Forestry Tasmania.)

2. Forest Practices Advisory Council

- § Ken Felton remains as the Board's representative on the Council.
- § Dr Hans Drielsma joins the Council as a person with knowledge of administration and legislation in relation to multiple use forests.
- § Andy Courbold joins as a person with expertise in, and experience of, forest harvesting and processing.
- § John Pretty joins as a person with knowledge of the State's resource management and planning system.
- § Mark Leech joins as a person with expertise in, and experience of, tree growing on private land.
- § Dr Alastair Richardson remains on the Council as a person with expertise in, and experience of, forest conservation.
- § Peter Taylor remains as a person with knowledge of administration and legislation in relation to private forests.

These are YOUR representatives. Their role is to provide expert advice to the Board and to foster good communication amongst all stakeholders. Seek out your representative and make sure you are happy with the mechanisms for delivering good two-way communication! Also remember that the CFPO, whilst not a member of the Council or Board, attends all meetings and is there to assist with the transfer of ideas and information.

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New resources

Forest Practices Board Web page

Nathan Duhig, Scientific Officer, Forest Practices Board

In these brave new days of the digital revolution, everybody who's anybody has got a web page. The FPB is no exception. Web pages can serve many purposes, such as projecting a public image and providing information and services. The FPB Web page (www.fpb.tas.gov.au) came into being because of the need to make publicly available the Review of the Soil and Water Provisions of the FPC. The page still has some material related to this review, and it has slowly evolved to include some background information about the Board, taken from the 1998-2001 Strategic Plan. For FPOs-Planning, there is a link to the Certification Numbering System, a new component of Forest Practices Plans.

The current web page is a result of these different things being tacked together and is consequently a bit of a hotch-potch. But things are about to change; David Hinley (who's credits include the layout of this esteemed journal), has been enlisted to redesign the page, and turn it into a 'site'.

The power of the web is the immediacy and speed with which changes can be made. For example a new or changed instruction for the Board can be posted immediately, and FPOs informed by email; the online Fauna Manual updated immediately as a result of a new Species being listed (or delisted) etc. [Electronic communication should be seen as complementary to the standard forms of correspondence]. Other publications such as the Code, annual reports etc will be available to the public. Access to some material will be restricted to users of the Forest Practices system, using a password authentication, as is the case with the Certification Numbering.

Ultimately many other services could be available online; the Threatened Fauna Advisor could be online and linked to an electronic Fauna Manual, or the FPP coversheet could be completed on a web page. The limits are imagination and resources.

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Access to data bases

Kevin Kiernan, Senior Geomorphologist, Forest Practices Board

The data bases that were compiled by the FPB specialists during the years when the old Forest Practices Unit was attached to Forestry Tasmania are still managed by Forestry Tasmania. The FPB specialists at the Hobart office have no direct access to these data bases, hence, they are generally not in a position to provide information from the data base to FPOs and such requests should continue to go to Forestry Tasmania. It is also worth remembering that GIS manipulations of these data are only as good as the original data on which they are based. From time to time the odd error is revealed - should you find apparent discrepancies, we would be very grateful if you would let us know so we can request Forestry Tasmania to make the necessary corrections. We are currently exploring options with FT in relation to the longer term updating and management of the databases. We also hope to develop some arrangements for ensuring that the relevant information within the databases is accessible to all FPOs and other relevant parties.

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New resources

Zoology planning tools update

Sarah Munks, Senior Zoologist, Forest Practices Board

Threatened Fauna Manual for Production Forests (FPB, 1998)

In April this year ten new forest-dependent fauna species were recommended for listing as threatened on the schedules of the Tasmanian *Threatened Species Protection Act (1995)* and one species, *Anoglypta launcestonensis*, for de-listing. The new listed species include:

Bornemissza's stag beetle, *Hoplogonus bornemisszai*
Vanderschoor's stag beetle, *Hoplogonus vanderschoori*
Burgundy snail, *Helicarion rubicundus*
Keeled snail, *Tasmaphena lamproides*
Skemps snail, Charopidae *sp*
Golden galaxias, *Galaxiasauratus*
Swamp galaxias, *Galaxias parvus*
Shannon paragalaxias, *Paragalaxias dissimilis*
Great lake paragalaxias, *Paragalaxias eleotroides*
Arthurs paragalaxias, *Paragalaxias mesotes*

In addition to these new listed threatened species we have been advised that the Priority species listed in Appendix 2 of the Regional Forest Agreement need to be taken into account by Forest Practices Officers (FPOs) in forestry operations.

To ensure FPOs can meet this requirement when drawing up Forest Practices Plans, we have been busy over the past four months adding these species to the Threatened Fauna Manual mapsheets. Profiles and recommendations for the new species are also being developed.This latest manual update is nearly complete and it will be available in the near future via the Forest Practices Web page. For more information on the listing of these species or the listing/de-listing process in general contact the Threatened Species Unit (TSU), Department of Primary Industry, Water & Environment (DPIWE).

For those interested in finding out more about Tasmania's Threatened Fauna look out for the complete Tasmanian Threatened Fauna Handbook available in the near future from the TSU, DPIWE.

Threatened Fauna Adviser

This planning tool, to be used in conjunction with the Threatened Fauna Manual, captures current scientific and expert knowledge with respect to each species. It enables Forest Practices Officers to arrive at the recommended action for the protection of threatened fauna habitat for particular operations. The recommendations delivered by the program are consistent with the generalised recommendations in Part 2 of the publicly available Threatened Fauna Manual and any Land Management Agreements, Public Authority Management Agreements or agreed Recovery Plans developed for a particular species.

As required under the RFA the recommendations delivered by this program are currently being reviewed by the Threatened Species Scientific Advisory Committee. The Threatened Species Unit, DPIWE agreed to its use by industry for a 6 month trial period which is up in November. We have been monitoring the use of the program during this time and are happy with the way it is being used, however, we would appreciate more feedback from Forest Practices Officers. When we have received comment from the Threatened Species Scientific Advisory Committee (TSSAC) any revisions will be made during mid November so please get any comments to us by then. It is hoped that use of the program by forest managers in the future will free FPB zoologists time for more field visits to problem areas with FPOs and scientific monitoring projects.

Fauna Technical Notes Series

This series of technical notes supplements the information available in the FPB fauna manuals. The original aim of the notes was to provide specific guidelines on a variety of issues often encountered by Forest Practices Officers when preparing a Forest Practices Plan. However, we have also included the fauna record sheets you are familiar with in this series. Some of this information may be of use during advanced planning of forestry activities.

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The Technical Notes on the bottom of page 5 are currently available. You can contact Kylie Dillon at FPB via e-mail for copies, they will also available in the future via the FPB,s WEB site. Some of these Notes are also provided in the Threatened Fauna Adviser Help file.

If there are any issues which you would like addressed in a Technical Note let us know. I am particularly interested in any examples of how problems encountered in meeting the intent of specialist recommendations have been overcome in particular operations.

New resources

Draft recommendations for forest management on Basalt Talus
(Based on previous recommendations of Duhig and Laffan, with modifications.)

Landform slope class	Majority slope angle	Timber harvesting	Plantation establishment
Rolling	0-11° (0-20%)	Clearfelling OK if no signs of active landslides or seepage; keep road cut batters low; **avoid:** • cutting into toes of old landslides when roading • disturbing wet areas	No cultivation within 5 m of Class 4 stream, or 10 m of Class 3 stream, or 20 m of a Class 1 or 2 stream, on farmland (but spot spraying OK); for previously forested land, the no-machinery limits of Code, table 8 apply; keep road cut batters low; during ground preparation **avoid:** • deep ripping • cutting into toes of old landslides when roading • disturbing wet areas • concentrating (ponding) water behind mounds • creating "new" streams
Hilly	12-19° (21-35%)	Clearfelling OK if no signs of active landslides or seepage; consult with FPB soil specialist if slopes >15° (see Code, table 9); keep road cut batters low; **avoid:** • cutting into toes of old landslides when roading • disturbing wet areas	No cultivation within 10 m of a Class 4 stream or 20 m of Class 1, 2 or 3 stream on farmland (but spot-spraying OK); for previously forested land, the no-machinery limits of Code, table 8 apply; contour-mounding (topsoil only) recommended; angle contour-mounds to existing drainage lines; keep road cut batters low; during ground preparation **avoid:** • deep ripping • cutting into toes of old landslides when roading • disturbing wet areas • concentrating (ponding) water behind mounds • creating "new" streams
Steep	20-26° (36-49%)	Consult with FPB soil specialist; clearfelling may be OK if no signs of active landslides or seepage, or on short slopes; limit disturbance - no roads	No mounding; spot disturbance only (see Code, table 12) (rotary spot cultivation not recommended) but not within 20 m of any stream; spot-spraying OK; avoid disturbing wet areas; limit disturbance - no roads
Very steep	27° + (50%+)	Protection forest advisable; no ground-based logging; no roads; under certain circumstances, e.g slopes just exceeding 26°, cable logging may be permitted but consult with FPB	Plantations not advisable – allow land to revert to native forest or plant for soil conservation; no ground-based machinery or cultivation (see Code, tables 5 and 12); no roads.

Version: 13.9.99

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New resources

Revised "basalt talus" guidelines – your comments wanted

Peter McIntosh, Senior Soil & Water Scientist, Forest Practices Board

In October 1998 Nathan Duhig circulated guidelines for timber harvesting and land cultivation on "basalt talus" soils. (Basalt talus is really a misnomer – these soils are actually formed on slumped basalt.) There is a lot of interest in using these soils for plantations, especially at higher altitudes where traditional uses like dairy farming and grazing for beef are less viable than they used to be. This interest has prompted several enquiries to the FPB on slope stability matters, particularly relating to cultivation and clearing of forest remnants. Consequently I have tabulated and modified the existing guidelines to make them clearer and to cover more situations. I would be grateful for comments from FPOs on whether the revised guidelines are workable or unnecessarily restrictive.

Quarry Code of Practice

Chris Mitchell, Forest Practices Adviser, Forest Practices Board

The Department of Primary Industry, Water & Environment has recently issued a new Quarry Code of Practice. Copies cost $10 and are available from Service Tasmania outlets.

Book Review and Special Offer

Fred Duncan, Senior Botanist, Forest Practices Board.

Vegetation of Tasmania

Editors: J.B. Reid, R.S. Hill, M.J. Brown and M.J. Hovenden

Published by: Australian Biological Resources Study

The 'Vegetation of Tasmania' (both the book and its subject) have had a long evolution. The book has been developed as a University text, though it has a much wider audience, particularly as there is great international as well as local interest in Tasmania's flora and its management.

The book covers the major facets of Tasmania's vegetation. Chapters cover different vegetation types, the evolution of the flora, eucalypt biology and the composition of the vascular and non-vascular flora. The richness of the vegetation, at the community level and species level, continually shines through. For example, over 1600 species of vascular plants, over 600 species of bryophytes and 650 species of lichens are native to the State. The concluding chapters, dealing with pattern in the vegetation and conservation of the vegetation, bring together many of the themes that have been developed in preceding chapters.

The text is clear and complemented with good photographs, diagrams and illustrations. The list of references is very detailed. Because of the time taken to produce the book, some recent research findings and trends are not covered, including those that are likely to result from the RFA (though the book, at over 450 pages, is already thick enough – in fact it would make a very useful substitute for a plant press).

In conclusion, the 'Vegetation of Tasmania' would made a very useful addition to the libraries of Forest Districts and companies, as well as to the libraries of FPOs (and others) with a particular interest in Tasmania's vegetation – its beauty, complexity, evolution and future.

The Recommended Retail Price for the 'Vegetation of Tasmania' is $60. However, FPB can procure copies for $45, for a limited period. So, if FPOs/companies/districts would like a copy at this price, please return the attached form to Fred Duncan.

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VEGETATION OF TASMANIA SPECIAL BOOK OFFER

Please order 'Vegetation of Tasmania' at the

SPECIAL INTRODUCTORY PRICE OF $45

Name: _____

Address: _____

_____

SEND NO MONEY NOW!!!!
(Offer expires end of October, 1999)

Fauna Technical Note 1:	**Establishing Priorities for Searching Coupes for Nest of Wedge-tailed Eagles.**
Fauna Technical Note 2:	**Wedge-tailed Eagle Nest Conservation – some hot tips.**
Fauna Technical Note 3:	**Wedge-tailed Eagles: Nest sites and breeding behaviour.**
Fauna Technical Note 4:	**Bird of Prey Nest Record Sheet.**
Fauna Technical Note 5:	**FPB Instruction – What to do if nest found.**
Fauna Technical Note 6:	**Wedge-tailed Eagle Nest Search – Planning Record Sheet.**
Fauna Technical Note 7:	**Location of wildlife habitat clumps - flow diagram**
Fauna Technical Note 8:	**Guidelines for the Location and Management of Wildlife Habitat Strips**
Fauna Technical Note 9:	**Fauna Record Sheet**

New resources

Forward training program – Forest Practices Board
Confirmed and proposed training Sept. 1999 – Dec. 2000

Chris Mitchell, Forest Practices Adviser, Forest Practices Board

From now on Forest Practices News will include this table on forthcoming training. We hope it will be useful for forest managers and FPOs as they plan their busy schedules.

Course (Contact)	Timing	Duration	Location	Course Content
PTR Applications[1] (G.Wilkinson)	30 Sept. 1999 12 Oct. 1999	1 day	Launceston	Train selected FPOs to complete part B of PTR applications
Fauna values forest management (S.Munks)	25 - 28 Oct. 1999	4 days	St. Helens or Scamander	Course for fauna liaison officers and others to train in identification and management of sensitive fauna
Cultural Heritage Refresher (D.Gaughwin)	Nov. 1999	1 or 2 days	One each in south and north west	Recognition and management of Aboriginal and historic sites, and new developments
Forest botany and plant identification (F.Duncan)	mid-Nov. 1999	1 day	Hobart, Burnie, Hollybank. (one each)	Flora of Tasmania, Tasmanian eucalypts, identification of trees and shrubs, forest types, effect of forest practices, conservation
Risk assessment (C.Mitchell)	Nov. 1999 (to be confirmed)	1 day	To be confirmed	Train selected FPOs to complete a safety risk assessment for trees retained under the FP Code
Forest Practices training[2] (C.Mitchell)	Autumn 2000	4 days	To be confirmed	General training in forest practices for FT supervisors
Forest Practices Code (C.Mitchell)	Autumn 2000	1 day	To be confirmed	Briefings to all FPOs on changes to FP Code following issue of FP Code 2000
FPO (Quarry) Course[2] (C.Mitchell)	Autumn 2000	2 or 3 day	To be confirmed	Course to train FPOs who wish to certify Quarry FPPs
FPO Course (C.Mitchell)	Winter 2000	12 days	Various	FPO course for new trainees
Forest Practices Manager training (C.Mitchell)	Winter/ Spring 2000	2 day	To be confirmed	Update forest managers on requirements of the forest practices system
Integrated karst management (K.Kiernan)	To be confirmed	2 day	To be confirmed	Train FPOs who work in karst areas on fauna, cultural heritage soil, water & geomorphological requirements

Notes:

1. Course to be run by Private Forests Tasmania and Forest Practices Board jointly.
2. Dependent on demand

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FPO trainees discussing the finer points of texture contrast soils on limestone in the Florentine Valley, 25 August 1999

Noticeboard

Guidelines for contributors

Forest Practices News is published quarterly by the Forest Practices Board, Tasmania. FPN provides a means for communicating new ideas and developments among those interested in the sustainable management of Tasmania's forests – it is not just as a bulletin from the FPB. We particularly welcome contributions from practicing FPOs. Let us all know about your latest innovative ideas. We welcome both feature articles and shorter contributions of even just a paragraph or two. Articles should preferably be no longer than two pages (for guidance, one page equates to about 780-800 words). Shorter contributions can be as brief as a few sentences! Please include illustrations with your contributions if at all possible. Contributions can be supplied either as hard copy or electronically. If forwarding material electronically, the address is info@fpb.tas.gov.au. We look forward to seeing you in print in FPN!

Instructions to Forest Practices Officers

Forest Practices News seeks to keep the Forest Practices community abreast of developments and new planning resources, to offer material that will help broaden the background of practitioners, and to provide a forum for discussion. However, it does not replace formal instructions to Forest Practices Officers from the Forest Practices Board. Formal instructions will continue to be conveyed to FPOs directly by mail.

Forest Practices Officers

are you moving?

To help us maintain an accurate database of FPOs and to ensure that circulars reach you, please advise us if you are transferring, resigning or retiring.

Thanks –
Kylie and Sheryll,
phone (03) 6233 7966; e-mail info@fpb.tas.gov.au

Contributors to this issue:

- Jennie Whinham
- Kevin Bonham
- Gordon Bradbury
- Karen Richards
- Bob Mesibov
- Fred Duncan
- Peter McIntosh
- Chris Mitchell
- Denise Gaughwin
- Fred Duncan
- Sarah Munks
- Graham Wilkinson
- Kevin Kiernan

Feature

Endemic, rare and hard to find

Bob Mesibov & Kevin J. Bonham

If every animal species was widespread and abundant, FPOs wouldn't have to worry about fauna. There wouldn't be a Threatened Fauna Manual, and there wouldn't be a Senior Zoologist in the Forest Practices Board.

In fact, only a minority of animals are widespread and abundant. These are the ones you see everywhere and often, like wombats and jack-jumpers. Because they're so familiar, it's easy to think that they're 'typical', or 'representative' animals. They aren't. *Most* animal species are *not* widespread and abundant. This article is about how the majority of Tasmania's forest animals are distributed.

Endemic

In biogeography, 'endemic' means 'native to a particular place'. A plant or animal that's endemic to Tasmania is found nowhere else on Earth. Endemicity is a slippery idea, though. Every species is native to *some* place, so there's no special honour in being called an endemic. Furthermore, a species that's endemic to Tasmania is also endemic to southeastern Australia, to Australia and to the Southwest Pacific. It depends where you're looking from.

On a finer scale, there are very few species that are endemic to Tasmania as a whole. Most are endemic to a part of the State and aren't found outside that part. Some are restricted to very small areas indeed. These species are sometimes called 'narrow range endemics' (NREs), but there's no legal or official range size that defines NREs. Under Tasmania's threatened species legislation, we start worrying that a species might be endangered if the outline of its total known range contains less than 5000 km^2. That's only 7% of the State.

Nevertheless, there are more than a few invertebrates with ranges less than 2000 km^2 which are remarkably abundant on their home ground. For example, the burgundy snail *Helicarion rubicundus* is found only on the Forestier Peninsula and a small part of the Tasman Peninsula, but within that range it's nearly the commonest snail species. A large pill millipede, *Procyliosoma* sp., is known only from the St Marys area, but you could literally collect a bucketful of the animals in half an hour near Elephant Pass. The threatened crayfish *Engaeus spinicaudatus* has only 4 km^2 of known habitat near Scottsdale, but Dr Pierre Horwitz estimates that as many as 2 000 000 *E. spinicaudatus* may be living there.

Nevertheless, at some point on the scale of range size, forest NREs have distributions so small that the smallness itself is a worry, regardless of how abundant the animal might be. The guidelines promoted by the International Union for the Conservation of Nature (IUCN) advise that a species with a total range less than 100 km^2 may be critically endangered if its habitat is under threat. Two newly discovered stag beetles, *Hoplogonus bornemisszai* and *H. vanderschoori*, have very small ranges in northeast Tasmania. According to a July 1999 report by Karen Richards, both species appear to tolerate selective logging and occasional fire, but are disadvantaged by clearfall/burn silviculture and are eliminated by plantation establishment. Local forest managers need to plan their operations to avoid threatening these animals with the very real possibility of extinction.

Rare

'Rare' has lots of meanings, but the one we prefer to use is 'low in abundance'. It surprises some people to hear that the vast majority of animals are rare in this sense, but it's a fact.

The graph shows the number of millipede specimens collected in a recent survey in the Northwest. The species total was 36. Notice that a few species are represented by a large number of individuals, but that most species are represented by only a few individuals each. This pattern is seen in all fauna surveys, regardless of what animals are collected. It applies to forest fauna, freshwater fauna and marine fauna. It's so universal that some ecologists think there may be a natural mathematical law behind it.

The practical consequence of the pattern in the graph is that a 'quick and dirty' survey of a coupe is unlikely to turn up anything but the most common animals. You have to hunt long and hard to find the rare ones, simply because there are so few of them present. Most of the species diversity at a forest site is hidden.

Why so many species are uncommon is a good question. One explanation is that the rare species have special habitat requirements but are very good at

their particular way of living. This specialisation gives them an advantage over less 'finely tuned' species. On the other hand, those special habitat needs are likely to be in short supply in the landscape. This keeps populations of the fussy specialists at low levels. In agreement with the specialisation hypothesis, many rare species are also NREs, while many widespread and apparently non-fussy species are also very abundant.

Hard to find

Unfortunately, 'hard to find' describes many of the animals studied by the authors. We envy the botanist who can lay out a 20 x 20 m quadrat in a coupe and catalogue all the vascular plants in an hour or less. Long after the botanist has left, Bonham is still picking over moss looking for a snail 1.5 mm in diameter, while Mesibov is still looking for a tiny velvet worm hiding in the middle of a big, rotting eucalypt log.

Forest animals such as earthworms, snails and velvet worms are particularly hard to conserve, because the information needed to conserve them is so hard to get. The snail *Roblinella agnewi* is known for certain only from Mt Wellington, where a grand total of seven specimens has been found in over 50 hours searching. We don't have a good idea of where on Mount Wellington to expect *R. agnewi*, let alone where else we might start looking for other populations.

Another good example is the northwest velvet worm, *Ooperipatellus cryptus*. One of the reasons for its listing under the *Threatened Species Protection Act 1995* was its (apparently) small range. The range has been slowly growing as new localities for this extremely elusive animal are recorded. We now know that the *O. cryptus* range extends 120 km from the Gawler area, south of Ulverstone, to just east of the Arthur River mouth on the West Coast (same distance as Hobart to Conara). We estimate that each locality record represents, on average, at least four hours of deliberate searching within that known range. How many hours would be needed to do a population census of this species?

The authors are lucky, in that their favourite animals can be hunted at any time of year without special equipment. Consider the tiny flies in our forests. There are hundreds of species. They spend most of their lives as inconspicuous grubs. For a brief period they fly, perhaps at treetop level, looking for a mate. This sexually mature stage is the only one that can be positively identified to species. We know next to nothing about these flies and their conservation.

In summary, most Tasmanian animals are rare, some have very small ranges and a few are very, very hard to find. Fauna conservation is a difficult job, to put it mildly. The approach we recommend is the one already in place: a wide scattering of formal and informal reserves, between-coupe strips and corridors, and within-coupe habitat clumps and stream reserves. And the more the better!

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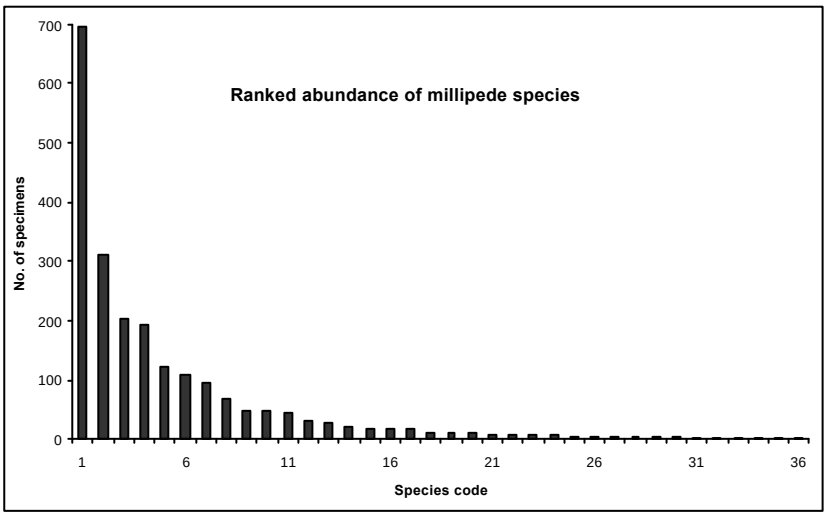

Travel log

Some observations from the Land of the Long White Cloud

Fred Duncan, Senior Botanist, Forest Practices Board

Following an all-too-brief holiday in the North Island of New Zealand, I made the following observations, which my be of interest to readers of FPNews:

1. In most areas of the North Island there are only remnant patches of native forest, following centuries of dedicated land clearing by Maoris and Pakeha (Europeans). Many of the remnants, as you would expect, are in steeper or less accessible country. Despite this, it was still amazing to see the steepness of some of the cleared land. Landslides, slipping and other forms of erosion are very widespread.

2. There are immense areas of pine plantation, some of them planted on incredibly steep slopes. Pine wildlings have colonised nearby native vegetation (and in some cases distant native vegetation), including subalpine environments. I was surprised at how few plantings of eucalypts there were. They would certainly make the possums feel more at home. Though possums are even less popular in NZ than they are in Tasmania. They damage native and agricultural plants in all environments. Their fur is being used to make mohair-like garments, and also as a down.

3. The patches of remnant native bush that I wandered through were very beautiful and very diverse. There is often a mixture of subtropical elements (e.g. vines, palms and broad-leaved trees) growing with temperate flora which would be familiar to Tasmanian FPOs. These species include celery-top pines, rimu (related to Huon pine) and beech (*Nothofagus* species). The fern flora is overwhelming; and some of the wetter forests literally drip with ferns, from huge terrestrial *Blechnum* species, to gigantic trunked ferns (*Cyathea* and *Dicksonia*) and epiphytic species (eg *Asplenium*) which have fronds over a metre in length. Huge bunches of lilies (*Astelia*) grow on the trunks and branches of trees – these are called widowmakers with good reason (if you are standing underneath them when they dislodge).

4. There are some great walks through remnant patches of native forest – they are highly valued by tourists and locals alike (patches of remnant bush will greatly increase the real estate value of properties in many areas). As Joni Mitchell sings "You don't know what you've got till it's gone….." Is there a lesson here for Tasmania?

5. The North Island climate, coupled with disturbance history, means that it is a weed-watchers paradise. In places, whole hillsides, from the coastal outcrops to the highest ridgelines, are covered with weeds. Some of the most persistent include gorse, broom, willow, blackberries, boneseed, solanum, asparagus fern and a whole lot of subtropical weeds too. Pampas grass is widespread, but NZ has some native species of pampas grass too (more delicate than the South African species). Heather has taken over some of the drier, volcanic areas, including much of the Togariro National Park. It was introduced from Scotland in 1916, to provide good habitat for grouse (which was to be subsequently introduced, but never was). It covers huge areas, but a biological control program, using some beetle, has just started.

6. New Zealanders are completely obsessed with the forthcoming Rugby Union World Cup. For some reason, they don't like to be reminded of Australia's recent victory in the Bledisloe Cup. In other sporting news, a Tasmanian FPB Botanist was successful in cleaning up a couple of Kiwi snowboarders on the beginners' slopes of Whakapapa ski-field.

7. While I was there, I caught up with staff of the New Zealand Forest Practices Board (see photo below). Apparently, there are very few breaches of the NZ Forest Practices Code…..

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Flora

Sinkholes & *Sphagnum* – unusual landforms with interesting flora

Dr Jennie Whinam, Department of Primary Industry, Water & Environment

In the area of limestone in the Mole Creek region, there are numerous sinkholes. A few of these are associated with *Sphagnum* peatlands. These peatlands are quite striking because they are isolated, occasional wetlands scattered amongst eucalypt forests. The water level varies from quite shallow up to about 1 metre deep.

Some of the values of the polygonal karst sinkholes with *Sphagnum* beside the Mole Creek-Mersey road near Sensation Gorge have been documented in a 1989 publication 'Ecology and conservation of Tasmanian *Sphagnum* peatlands (Whinam, J., Eberhard S., Kirkpatrick, J. & Moscal T.). These aquatic-*Sphagnum* bogs were proposed for reservation because of the unusual occurrence of these peatlands in limestone and because of their rarity. Until the end of 1997 their tenure was State Forest, but they are now part of the expanded Sensation Gorge Conservation Area. These peatlands have been subject to degradation because their proximity to the road means they are used for dumping rubbish (which causes physical disturbance and alters nutrients in a nutrient-poor environment) and also because fires through the area have caused changes (increased sedimentation, death of shrubs and drying out of sites). A recent re-evaluation of the same sinkholes surveyed in 1989, showed that at least one sinkhole no longer has a groundcover of *Sphagnum* moss, that the occasional shrub layer in several sinkholes has died (with burnt stags remaining) and that the oozy-peat of the sinkholes has dried out (probably due to a combination of increased dryness and burning).

More recent survey work has identified another area of sinkholes to the northwest of this area, between Dogs Head Hill and Standard Hill. These have significant conservation potential, as they are not next to a major road and are not subject to the firing and rubbish dumping that have caused degradation of the sinkholes near Sensation Gorge. Not all the sinkholes around Dogs Head have a groundcover of *Sphagnum* moss, but those that do tend to be dominated by the aquatic moss species, *Sphagnum falcatulum*, often growing in association with other aquatic and semi-aquatic vascular flora (*Eleocharis sphacelata*, *Patersonia fragilis*, herbs, etc.). The moss cover is often quite 'pure' and may extend across the sinkhole or may only occur around the margins. The sinkholes can be fringed by *Leptospermum scoparium* and/or *Carex gaudichaudiana*. Some of these sinkholes are within the Dogs Head Hill Forest Reserve, but the main group is in State Forest just to the south of the reserve boundary.

Both these areas contain unusual landforms with an associated peatlands flora scattered in eucalypt forests. Both areas are worthy of protection from disturbance that may jeopardise their continued long-term existence (particularly fire and other activities that would lead to increased sedimentation).

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Sphagnum peatlands in sinkholes in the Mole Creek area.

Fauna

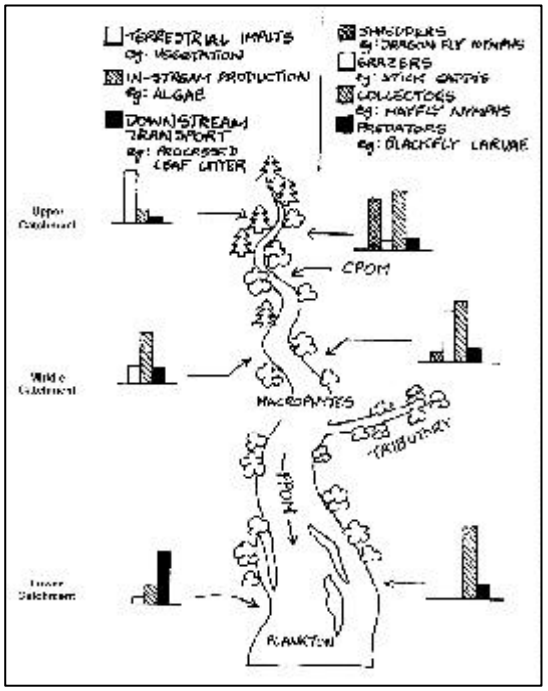
Fish, Platypus, Caddis Flies and Riparian Vegetation

Sarah Munks, Senior Zoologist, Forest Practices Board.

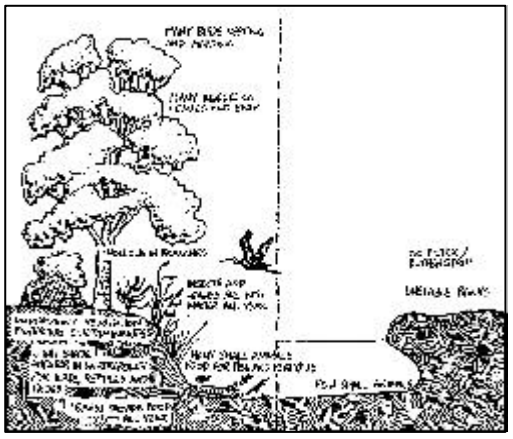
Since riparian (stream-side) vegetation is out of the water most of the year, and therefore one step removed from the aquatic environment, its relationship to and importance for freshwater animals is not immediately obvious. However, this vegetation plays a critical role in the health and vitality of stream organisms by contributing to food supply, shade, protection from predators, shelter (from fast flowing water) and water quality.

In any area of native forest, riparian vegetation balances the two major energy sources for the stream ecosystem, sunlight and organic matter (leaves and twigs, and terrestrial invertebrates on the leaves which fall in the water). It does this through filtering sunlight and the pattern of leaf fall. This in turn influences the diversity and numbers of the small aquatic creatures inhabiting the stream. These invertebrates such as mayfly nymphs, caddis flies, hydrobiid snails, stonefly larvae and water beetles process the leaves and other food which originates from the river bank vegetation. They are extremely important for the maintenance of a healthy aquatic ecosystem. Amongst the huge variety of important tasks they perform are the control of algal growth, nutrient recycling and providing food for creatures higher up the food pyramid such as fish, platypus, the Tasmanian orange-bellied otter (otherwise known as the water rat) and of course the Fisherman (or woman).

As well as the food inputs from the river bank, aquatic invertebrates may obtain food from algae growing within the stream and leaf litter floating downstream. The relative importance of the three different food sources varies as you move down a river system. In the upper catchment streams (classified as 3 and 4 in the Forest Practices Code) the most important food source for the aquatic food chain is provided by riparian vegetation.



The river continuum.
(adapted from Vannote et al. 1980).



Comparison of vegetated and unvegetated riverbanks
(modified from Anon 1990).

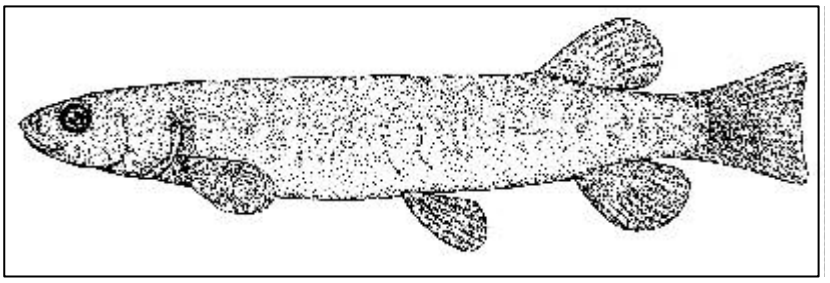
Riparian vegetation also plays an important role in the maintenance of daily and seasonal water temperatures to which our aquatic animals are adapted. It provides shade over the stream, and buffers streamwater against high summer temperatures which can be lethal to fish, aquatic insects and other invertebrates. For example, the giant freshwater crayfish, *Astacopsis gouldi* cannot withstand extended periods of temperatures above 18oC and the juveniles of some native fish in Tasmania cannot survive temperatures above 29oC. Elevated water temperatures combined with increased nutrient levels contribute to algal blooms. These in turn may adversely affect fish and lower dissolved oxygen levels necessary for fish respiration. Temperature is a cue for the development and hatching of many invertebrates and changes may disrupt their lifecycle. Shading by trees and shrubs on the stream bank provides important spawning areas for at least two species of native fish. Both the broad finned *galaxias* (*G. brevipinnis*)and the spotted galaxias (*G. truttaceus*) use the unusual spawning strategy of laying eggs on the banks of streams. These eggs are out of the water for several

Fauna

days and without vegetation to shade them they would dry out rapidly.

Fallen logs and branches from the river bank vegetation help trap food in the stream. This woody debris also helps to slow the passage of water and provides shelter for many aquatic animals. Some creatures such as the giant freshwater crayfish (*Astacopsis gouldi*) feed on the decaying wood and its associated microbes. Many species of fish have adhesive eggs and need the variety of in-stream surfaces provided by the tangle of dead wood in a stream for spawning. The native blackfish depends on woody debris. Adult blackfish (*Gadopsis marmoratus*) spend most of their time in a single pool adjacent to a snag pile. They spawn in the pile of dead wood, and lay their eggs in split and decaying logs. Their young feed and shelter among the leaf litter trapped in the debris and in leaf piles on the margins of pools and runs. The dependency of blackfish life history on snags is so strong that removal of snags from streams results in the elimination of blackfish populations.

As well as providing food and habitat for aquatic animals riparian vegetation significantly influences the quality of water in a stream or river system. It does this by filtering and/or absorbing nutrients, chemicals and sediments derived from upslope areas. Vegetation on the banks of streams and rivers also helps to reduce or prevent bank erosion and hence sedimentation . Heavy sedimentation due to erosion which smothers habitat, food sources and spawning sites transforms the instream environment into the equivalent of a lifeless desert for fish and other aquatic creatures. The role riparian vegetation plays in buffering inputs varies as you move down a river catchment. In the upper catchment streams (classified as 3 and 4 in the Forest Practices Code) it plays a central role whereas in the lower catchment flood plain rivers it is less effective in buffering runoff.



Climbing galaxias (*Galaxias brevipinnis*). (R.M. McDowall).

Unfortunately the loss of riparian vegetation in agricultural areas throughout many river catchments in Tasmania is extensive. For example, an assessment of the extent of riparian vegetation in the Meander river catchment found that 42% of the river banks were bare or were covered in weeds. This has had a disastrous effect on aquatic fauna in this catchment but the full impact has not yet been realised. Continuity of healthy riparian vegetation in any river catchment is important, because the degraded riparian vegetation not only effects the adjacent stream section but also affects stream sections further down.

The Forest Practices Code offers the most comprehensive approach to managing riparian vegetation in the production landscape (forestry and agriculture) in Tasmania. Protection of native riparian vegetation rather than costly rehabilitation after its removal is a first priority. Nevertheless there is still room for improvement. By their nature, forestry operations (roading, harvesting, plantation establishment etc.,) can create a number of adverse impacts on the aquatic environment, through the loss of adequate shading, increased sedimentation, chemical runoff, changes to the flow rate of the stream and woody debris input etc. Some of these impacts may only be short lived but some may last into the long-term. The long-term impact on populations of stream fauna in the catchment will depend on the number of streams disturbed in the catchment at any one time. To minimise impacts a catchment approach should be taken when planning forestry activities, ensuring that not all the upper catchment streams are disturbed at once. Retention of existing riparian vegetation is extremely important. The streamside reserves prescribed Table 8 of the Forest Practices Code are minimum widths. Forest Practices Officers are encouraged to adopt wider streamside reserves particularly on the important smaller upper catchment streams (class 3 and 4) and where important habitat or conservation values (in particular, threatened aquatic species) are identified. Some scientific studies show that at least 30m streamside reserves are required to adequately buffer the aquatic environment from adjacent landuse practices. More work needs to be done on ways to achieve protection of riparian vegetation on upper catchment streams running through coupes, particularly where site preparation involves clearfell and hot burns. This practice hits the part of the catchment where riparian vegetation arguably plays its most important role for aquatic fauna.

For more information see:

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Munks, S.A. (ed) (1996) *A guide to riparian vegetation and its management.* Department of Primary Industry and Fisheries, Tasmania.

RIPRAP, Issue 4, Riparian Vegetation Program newsletter produced by LWRRDC

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Fauna

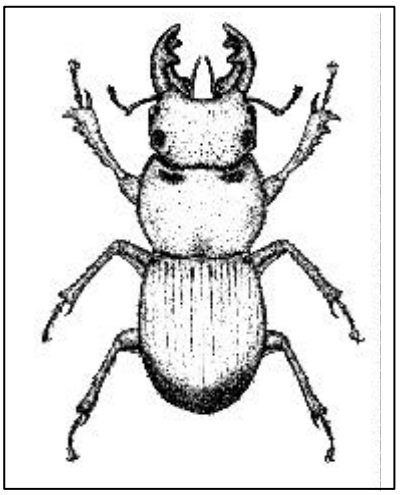
Two new threatened species in Northeast Tasmania

Karen Richards, Zoologist, Forest Practices Board

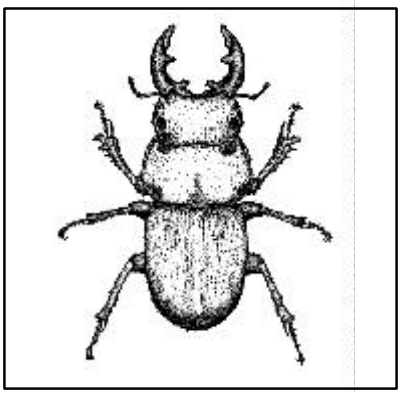
Crawling around in the undergrowth, scrambling up leech-infested gullies and getting bogged are just part of a day's work when hunting the elusive Stag Beetle. Two new species of *Hoplogonus* are to be added to the *Threatened Species Protection Act* and FPB & FT undertook a project researching their distributions earlier this year.

During January and February 1999 surveys were undertaken in Northeastern Tasmania to gather information on the distribution and preferred habitat of two recently described stag beetles, *Hoplogonus bornemisszai* and *H. vanderschoori.* These beetles were first discovered in 1994/95 and described in 1996. Prior to our work they were known from only a handful of sites. Results of this study have increased the known range for both *H. bornemisszai* and *H. vanderschoori*, with the range of the latter more than doubling that previously known. Preliminary observations indicate a patchy distribution for *H. bornemisszai* across its range, with greatest numbers occurring amongst leaf litter within riparian zones, while fewer specimens were located within forest regenerating after clearfell. From the limited information available, *H. vanderschoori* appears to have a much lower population density relative to *Hoplogonus simsoni* and *H. bornemisszai* and a patchy distribution across its range.

There are three species of *Hoplogonus* endemic to Tasmania, all are restricted to the northeast and all are considered 'threatened' due to restricted distributions, low population densities and loss of habitat. Members of the genus *Hoplogonus* can be described as medium-sized (1–3 cm), flightless, black beetles with exceptionally large mandibles and possessing humeral spines or spurs on their elytra. While the humeral spines are a distinguishing character of the genus the shape of the mandibles on the adult male can differentiate the species. *H. bornemisszai* can readily be determined by its rounded three-pronged mandibles, whilst *H. vanderschoori* and *H. simsoni* both possess two-pronged mandibles differing in shape. *H. vanderschoori* has the more rounded two-pronged mandibles whereas those of *H. simsoni* are generally less rounded and a slight turn up at the tip. While it is known that the adults can be found under logs or amongst leaf-litter there is little information on the habitat requirements of *H. bornemisszai* and *H. vanderschoori.* Preliminary information from this survey indicates that they may share similar habits to *H. simsoni*. In addition, the larvae of *H. bornemisszai* appear to be soil-dwelling as do the larvae of *H. simsoni*.



Hoplogonus bornemisszai



Hoplogonus vanderschoori

The distribution of the two species is limited, with *H. bornemisszai* restricted to approximately 7-km2 northeast of Goulds Country and *H. vanderschoori* confined to the St. Columba Falls region. Further information regarding the distribution of the species can be found in the report that is available from the Forest Practices Board.

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Landscape

A Passion for Landscape

Gordon Bradbury, Acting Landscape Planner, Forest Practices Board

By the time you read this I will have vacated Bruce's chair at FPB and gone back to my humble desk at FT Planning. Nevertheless my time at FPB has rekindled many passions and interests that I have developed over the years, that focus on issues of landscape and its place in our lives and culture. I wish therefore to take this opportunity to share some thoughts.

I think my concern for the Australian landscape originated as a rebellion against my fathers indifference to what I call the native landscape. He would much prefer to cut down 10 stately old gum trees and plant an Oak or Cedar, than recognise the beauty and cultural value of that which nature has already given us. In expressing these values he is not alone. Indeed these values I believe are still the dominant values of Australian society. As a society and as individuals I believe (and observe) that we are still a long way from understanding and valuing those elements of the landscape which give us a unique sense of place and identity (a place to call Home!).

I grew up on a little farm outside Melbourne where the native woodland was still a dominant feature of the landscape and certainly of my childhood. It was my "Enchanted Wood" in which every tree was a potential "Faraway Tree" (in reference to one of my favourite childhood stories, which being a new father I can now revisit). Even then I recognised this landscape as a unique and major element of my identity. One of my greatest pains is to now revisit this same landscape where my parents still live, and see what 35 years of neglect, abuse and misunderstanding have done, and continue to do (not just by my parents, but by their neighbours also).

In the subtle and ancient physical landscapes of mainland Australia trees *are* the dominant visual element where they occur, outside of the built environments of the towns and cities (even some towns are dominated by trees, eg. Ballarat, Toowooba). But my point is that not all trees are the same. The dominant trees of my childhood were Red Box and Red Stringybark. Not far away was a forest of Red Ironbark. Over the river were the basalt plains with their woodlands of River Red Gum. These trees provided a powerful and unique character to the landscape which no amount of Oak and Cedar can hope to replace. But that is what my father wanted to do, and what many Australians still insist on doing.

And not all eucalypts are the same either. Replacing my childhood woodlands with plantings of Yellow Gum and Spotted Gum would be just as insensitive and out-of-character as planting Oak and Cedar. A well known local company runs a public relations/ community extension program providing trees to community groups. One of its premises is that planting trees is a good thing to do (no problem with that), and any tree will do. The result is that local character and identity is diminished, and the cultural cringe which I feel many Australians have towards their local landscape (or is it just lack of understanding?) is reinforced.

By way of contrast, the Landcare movement has largely recognised the value of the *local* landscape and seeks to restore, protect and re-establish species which give each area its uniqueness and character.

Because forestry deals with trees, which also happen to be the dominant visual element in the rural landscape, forestry can have a major impact on the visual rural landscape. In Tasmania, because of the scale of the industry, forestry has *the* most significant impact on the visual rural landscape. Through the establishment of plantations, and the clearing of native forest, the character and identity of our Tasmanian rural landscapes is gradually being eroded. The recent acceleration in plantation development is hastening this process.

While working at the Forest Practices Board I have been a part of the process seeking to manage and direct this change in the landscape. It is a huge task for one person, working to direct the tide of culture and society, seeking to preserve our unique landscapes, our sense of identity, place and home.

I am passionate about how our landscapes look and feel. I would like everyone who works in the forest industry to have some of that passion too.

Trees are the dominant visual element in the Australian rural landscape;

Not all trees are the same;

Local character and identity is largely a function of the local tree species;

Native forest clearing and plantation development erode local character, identity and landscape quality.

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Archaeology

Australian Forest History Society

Denise Gaughwin, Senior Archaeologist, Forest Practices Board

I attended the Australian Forest History Society conference at the Gympie forest centre in April this year. Some FPOs may know this forest centre. If so they will remember the excellent facilities, friendly staff, mountains of food and the amount of exercise needed post conference to work it off.

Eve Fesl opened the conference by welcoming the participants to the country on behalf of the local Aboriginal people. Tom Heinsohm and Anitra Nelson followed this by a session on indigenous perceptions of the Australian forests. Tom used evidence from New Ireland to remind us that the debate over forests is sharpened by differing social, political and disciplinary influences. Anitra examined Aboriginal practices in East Gippsland and concluded that they were truly forest people. Paul Star then moved our thoughts to 1874 New Zealand when he agreed that the earliest attempts of forest conservation were based on worries about future timber shortages and desiccation and should not be seen as the origins of environmentalism. Rather the late 20th century view of these early environmental concerns express more about the New Zealanders defining a national identity based on an historical view of the relationship between their ancestors and "the bush". Brett Stubbs outlined the attitudes to the "big Scrub" or rainforests of northern New South Wales. From 1850 clearance was undertaken of this forest with only small remnants surviving today due to the activities of local communities over the past 100 years. Dale Saunders profiled the history of tourism and recreation in the forests of Western Australia as one driven by a slowly developing interest in the bush by town dwellers.

Excellent historical studies were provided of individual detailed sawmilling companies by Peter Davies in the Otways, another researcher on Pettigrew Sim's Dundathis Mill in Cooloola and closer to home, Peter McFie on the township of Maydena. Judith Powell broadened the subject by looking at the intense debate about the use of the Brooloo State forest (near Gympie) between 1909 and 1915.

After listening to these papers it was with some relief that we toured the nearby woodworks museum where we were treated to display of local craft by a very colourful local identity.

IMBIL

Another tour took us to the Imbil plantation where we were impressed with the hoop pine plantations, which Brian McCormack (Principal District Manager – Imbil) described, and outline their management practices. John Huth detailed the practices of the Hoop pine nursery from 1922. We were also treated to visits to the Hynes mill, the biggest hoop pine mill in the world, the side of the 'Balts' barracks post-WW2, and the bunya tree with Aboriginal toe hole scars. Lunch was eaten at the Imbil Forestry Centre where we took a short walk to see the commemorative planting by the Vice Regal part (1918) and the British Empire Conference delegates (1928). Another highlight was the rail motor trip from Gympie to Imbil that passed through some spectacular country much of which had been inundated in the recent extremely high floods.

Back in the conference rooms interesting papers on the rise and demise of the Victorian Forests Commission (Norm Endacott) from "Bush to managed Forests" (Moray Douglas) and early outcomes of Government forestry department (Kenneth Jackson) put us back on the main theme of the forest history. Arboreta, trail planting's, Avenues of Honour and Remembrance, school forests and afforestation in the ACT were covered by myself, John Dargavel, John Gray and Lindy Robins. These topics introduced the elements of experimentation, patriotism and morality learnt through hard work.

A session on aesthetic values of forests with Juliet Ramsay and Jane Lennon caused some comments about the methods used to assess aesthetic significance for registering places on the Register of the National Estate as part of the RFA process in Queensland.

The conference proceedings will be published later this year in the Australia's Ever Changing Forests series. You can read the full accounts when this is available.

The Australian Forest History Society is now an incorporated body. At the AGM the society expressed concern at the state of forest records with much important material not archived and decisions about what records were (or were not) of historical significance being left to District offices staff not experienced in record management. Also concern was expressed at the lack of data about aboreta across the country. The society formed working groups to suggest ways that these issues could be tackled. John Dargavel was selected President, I was elected Vice-President and a committee selected for the society.

The next conference will be in Tasmania in 2000. Maybe we will see some of you there. I'm sure that you would enjoy the relaxed nature of the conference, the range of topics, the interest of society members in forest history. You needn't wait until to join the society. If interested contact Australian Forest History Society Inc, 20 Laidley Place, Florey, ACT 2615 or John Dargavel email address – dargavel@spirit.com.au

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Soils

Problem soils: aeolian deposits on dolerite

Peter McIntosh, Senior Soil & Water Scientist, Forest Practices Board

In certain places in Tasmania wind-blown silts and sands have moved inland from the coast, or have got blown from floodplains of major rivers or from glacial outwash, and have accumulated on soils derived from dolerite. These silts and sands are usually quartzose, and have a much paler colour than the underlying soils from dolerite. They usually occur in small patches, tens of metres in diameter, and may be half a metre to several metres thick.

These deposits are interesting geologically – they probably moved when there was no forest cover, i.e. during the Last Glaciation, which ended about 12 000 years ago. They have the potential to give scientists information about past wind directions, the severity of the climate in the Last Glaciation, and the date of the cool periods. However, they create some big problems for foresters and contractors, especially if they are not recognised during plantation establishment. This is because the aeolian deposits have very high erodibility (as is expected from poorly-structured soils formed in Quaternary sands and silts) but are usually a minor component in coupes that otherwise have soils of low erodibility (i.e. the soils formed in dolerite). High erodibility is unexpected in dolerite terrain, and these aeolian soils can cause problems out of all proportion to the area they cover. For example, they can be washed down roads and into streams, and they can accumulate in depressions. If cultivated when wet, silty deposits can set hard when dry. They can flow down furrows between mounds, even on gentle slopes of 1-5°.

These soils from aeolian deposits overlying dolerite have been observed on the East Coast, on the Tasman Peninsula, and in the Upper Derwent Valley. FPOs may have noticed them in other locations.

If FPOs are planning or supervising coupes on dolerite which are being converted to plantations it is worthwhile noting any areas of unusually pale and sandy soils that occur. Contractors are likely to notice these too: they will behave quite differently to the normal dolerite-derived soils. They have low load-bearing strength especially when wet, they are not stony, and they can flow when saturated. The main points to watch are:

- Mark the pale sandy soils on coupe maps
- Inform the contractor about the unusual properties of the soils
- Don't cultivate these soils if slopes are greater than 11° – and consider the advisability of a lower slope limit, or no cultivation
- Don't cultivate these soils in wet weather, or when the soils are saturated or wet
- If cultivating, cultivate strictly on the contour
- Avoid snigging over these soils and don't build roads through them
- Align windrows strictly along the contour
- When windrowing, leave the topsoil intact – the topsoil is the only protection against erosion that these soils have.

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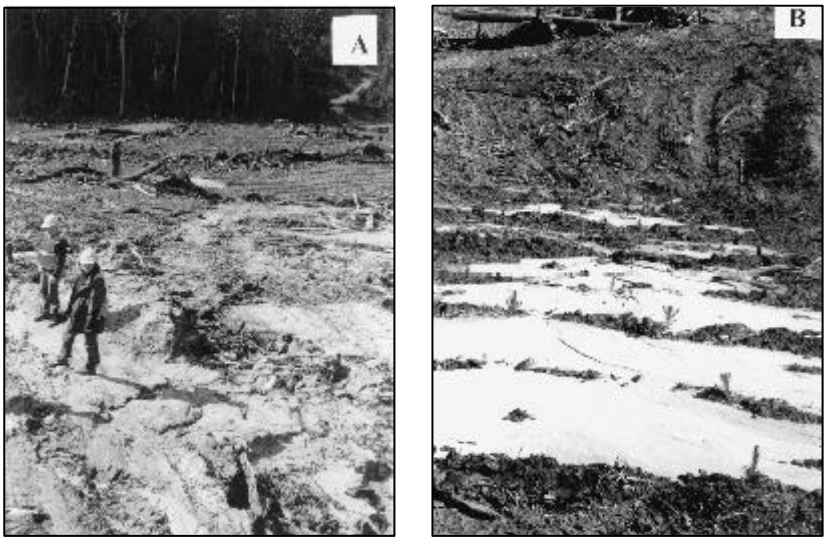

Figure 1: In this coupe, in which the soils are formed predominantly in dolerite, cultivation and disturbance of a patch of highly erodible soils formed in aeolian deposits has resulted in downslope movement of silts and sands. Heavy rain has washed sediment from the highly erodible soils down a track behind the figures (A) and the silt and fine sand has accumulated behind a windrow (B).

Geomorphology

Did the Earth Move For You?

Kevin Kiernan, Senior Geomorphologist, Forest Practices Board

A few years ago an outbreak of landslides in the Great Western Tiers coincided with an earth tremor felt widely through the district, triggering suggestions that the tremor caused the landslides. Earthquake-induced landslides are indeed common in some parts of the world, and can be calamitous. However, these landslides in the Tiers also coincided with heavy rain, a common factor in Tasmanian landslides and which I suspect was much more likely to have moved some unstable slopes to relieve themselves in this case. Nonetheless, the incident is thought-provoking and provides a useful excuse to reflect upon another group of landforms in Tasmanian forests that have both geoconservation and geohazard implications: *tectonic landforms*, formed due to movements of the Earth's crust.

Tectonic processes have been occurring for as long as the Earth has existed. They produce landforms in their own right, such as upthrust mountains. Tectonic landforms come in a variety of types and at differing scales. They form by slow, progressive movement and/or during sudden earthquakes that are triggered by the progressive build-up and sudden release of stresses in the crust. Many are millions of years old, but others are more recent. Tectonic processes also produce geological structures in the crust, which, when revealed at the surface, guide erosion of rock materials of differing resistance with important implications for landform evolution.

We tend not to think much about earthquakes in Tasmania because Australia does not lie on the Pacific "Ring of Fire" and hence Tasmanian society has not experienced the earthquake catastrophes visited upon some of our neighbours. But tectonic processes such as earthquakes have been important in the development of Tasmania's geomorphology, and even today our part of the world is not totally quiet – as the 1989 Newcastle earthquake (magnitude 5.6) brought home to us, at a cost of 12 lives and $4 billion. The Australian Seismological Centre in Canberra estimates that on average an earthquake of equivalent or greater magnitude to the Newcastle quake is experienced in the Australian region about every 10 months. The probability of an earthquake of magnitude 6 or more occurring within 100 km of one of Australia's eight capital cities in any 100 year interval has been estimated at ~40% by McCue and colleagues. And first on the current United States Geological Survey web site list of the ten biggest earthquakes this decade is a record from our region, a magnitude 8.2 event on the Macquarie Island Ridge south of Tasmania in 1989, a small *tsunami* (earthquake generated ocean wave) from which was detected on the Tasmanian south coast. (For comparison, the August 1999 earthquake in Turkey was magnitude 7.4.)

Landform geoheritage

Tectonic processes produce several different types of landforms, and contribute to others. Most earthquakes occur along a *fault*, a fracture in the crust where one side moves relative to the other. Perhaps the most basic tectonic landform is the *fault scarp*, which forms where the ground surface on one side of a fault is thrust upwards relative to the other side. Fault scarps may erode back over time to produce a *fault-line scarp* of which the crest of the Great Western Tiers is probably an example, now probably well back from the position of the original fault. However, some fault scarps are continually rejuvenated by ongoing movement. On a larger scale, the broad troughs in which Hobart, Launceston and the midlands lie are *grabens* or *rift valleys*, formed where block faulting has left depressed areas between relatively raised *horsts* that form the hills to the east and west.

Australia's freshest fault scarp is in the Scotts Peak area, where the Lake Edgar fault has probably been active since Cambrian times (500 million years ago). A scarp ~5 m high remains intact and a small lake formed against the scarp has not yet silted up. Various smaller landforms, such as rifts, cracks, mounds and slumps, are often also produced by earthquakes. There may also be other landforms in Tasmanian forests that are the result of earthquakes or tectonic movements, such as diverted stream channels, or ponds and lakes impounded by earthquake-induced landslides. A flight of stream terraces south of Birchs Inlet at Macquarie Harbour appears to be the result of channel migration caused by relatively recent tectonic activity involving downward movement of the western block.

Geomorphology

Large scale tectonic landforms are robust and unlikely to be damaged by human activity, although specific key exposures of rock materials or structures that help inform geoscientists as to the age or type of movement involved may be more vulnerable in some cases. The drowning of crucial parts of the Lake Edgar fault scarp beneath an hydro-electric reservoir provides another example of the vulnerability of geoheritage to human activity. As always, the potential for recovery from damage depends upon the magnitude of the disturbance and whether the natural process responsible for producing a landform remains active today. Work by Michael-Lieba suggests that a magnitude 5.5 quake that was felt in Tasmania in 1880 probably occurred on the Edgar Fault, and we know this particular fault has been active for over 500 million years, so its present circumstances may not dampen its spirits – perhaps in this case the human activity is more vulnerable than the geoheritage? Some other smaller landforms may be more vulnerable to permanent damage.

Many of Tasmania's large scale tectonic landforms are relatively ancient, but the altitude to which old coastal landforms have been raised above sea level provides some insight into the influence of recent tectonic activity on Tasmania's geomorphology. Evidence from the stable Eyre Peninsula coast in South Australia suggests sea level was ~2 m higher than now during the Last Interglacial (~125,000 years ago (just moments ago in geological time), and this provides a benchmark against which to measure coastal land level since then. Some less stable mainland areas show old shoreline features a couple of metres higher. But at one site in southeastern Tasmania work by Murray-Wallace and Goede has shown marine deposits of this age to lie 24.6 m above present sea level. This suggests a much higher level of activity in Tasmania than is the norm around the Australian coast. But uplift around the Tasmanian coast appears not to have occurred evenly. The highest sites of equivalent age so far recorded from far northwestern Tasmania are at only12.3-14.3 m. The maximum heights recorded for marine deposits of the same age on Flinders Island and King Island are only 2.1 m and 3.7 m respectively. However, deposits a few hundred thousand years older on Flinders Island reach 11.2-18.0 m altitude. The overall pattern has prompted the suggestion of a phase of uplift that occurred earlier in the Bass Strait region than it did further south, and that it may be related to the northward drift of the Australian plate over a "hot-spot".

Work by Chick has shown old shorelines occur along Tasmania's NW coast at 1 m, 11 m, 14 m, 20 m and 34 m. Elsewhere around the Tasmanian coast there are pronounced terraces and surfaces at up to ~80 m that suggest the uplift of much older shorelines, coastal plains or stream plains that were once graded to sea level. Hence, in some parts of the state where the relief is low, coastal landforms and deposits now occur many kilometres inland, deep inside forest areas. Such landforms include various types of old sea cliff, sea caves, sand dunes and sand sheets, while important marine fossil sites are also known well inland. In addition to being valuable in their own right, such old coastal landforms may host other important resources, such as the archaeological deposits in an old sea cave now at 15 m altitude that provided the first published evidence of ice-age human colonisation of Tasmania.

There may also be other effects on the coast that do not require the earthquakes responsible to be local. Tsunamis can leave a much more prominent legacy of depositional landforms than may conventional storm waves. The small tsunami on Tasmania's south coast in 1989 was a midget compared to some that may have rolled across the oceans in the past. Bryant and Young from Wollongong University have suggested that while tsunamis that have hit the Australian coast since European settlement have only been small, a tsunami 16-25 m high about 105, 000 years ago caused major erosion, modified most headlands and destroyed evidence of earlier sand barriers between Newcastle and the Victorian border. (For comparison, the July 1998 tsunami in New Guinea was only ~10 m high). Bryant and Young suggest smaller tsunamis have occurred on several occasions over the past 3000 years, and that at one NSW site blocks weighing up to 75 tonnes have been heaped together during a smaller tsunami that may not long have preceded European settlement. The jury is still out. No-one seems to have thought of looking for old tsunami landforms in Tasmania yet.

Geohazards

Some former landslip sites may not be as old as we often think, or entirely stable. Sites of doubtful slope stability are probably safest avoided – recurrent seismic activity is another possible trigger for movement of potentially unstable slopes (Figure 1), especially where their stability has been compromised by changes in water loading due to logging or road drainage, or where toe support has been removed by excavation.

Michaeil-Lieba has collated some historical newspaper accounts that tell us how during some

Geomorphology

Figure 1: Landslides triggered by an earthquake in the Arthurs Pass area, New Zealand, in 1994. This damage was caused by an earthquake of magnitude 6.7 – smaller than some of the earthquakes experienced in Tasmania since European settlement.

Tasmanian earthquakes: "the greatest alarm prevailed, and a large number of people ran into the streets, expecting to see the houses fall about them: (Launceston *Examiner*, 14 July 1884); and of how "bricks landed in Dr Jermyn's room and crashed onto the verandah, greatly alarming the patients, 'some of whom fainted and others went into fits' " (Northwest Post, 28 January 1892). In rural Upper Ringarooma "large trees were distinctly seen to tremble and shake, causing birds to fly out in alarm [and] cattle were observed to leave off grazing and look about in wonder" (The Examiner); while we learn the revealing news that at Scottsdale "in bed the oscillations and jerkings were anything but agreeable" (Hobart Mercury).

Such accounts may appear quaint and amusing, but they contain a warning. Each year between 36 and 90 seismic events are recorded in Tasmania. While most are less than magnitude 2, there have been some quite large events since European settlement. Up to 2500 seismic events occurred off NE Tasmania as recently as the late 1880s, the largest of magnitude 6.9 (1892) which, together with at least two others (6.4 in 1884, 6.8 in 1885) was felt from southern Tasmania to SE NSW. Michael-Lieba has documented various others, notably near Robbins Island (5.4 in 1859); inland of Sandy Cape (5.2 in 1924); off Ocean Beach (4.8 in 1911); near Queenstown (4.8 in 1908) and near Scotts Peak (5.5 in 1880). These are not trivial earthquakes – last year alone, worldwide, events smaller than Tasmania's larger historical earthquakes killed over 6,600 people, injured over 15,000 and destroyed or damaged over 150,000 structures, leaving hundreds of thousands of people homeless. Tasmania's historical earthquakes occurred away from population centres and prior to significant urban growth, but still caused some damage (Launceston, 1884, 1885, 1892, 1929, 1946) and nearly loss of life. Tasmania's 1892 event was of the same magnitude (6.9) as Japan's Kobe earthquake in January 1995 that caused 5,400 deaths, left tens of thousands injured and cost over $200 billion.

Is it alarmist to suggest we might consider earthquake risk in planning our forest roads, structures and operations? Perhaps so, but then they probably once thought that in Newcastle - building guidelines geared to Australian conditions are now available. Tasmanian forest managers obviously have more pressing things to worry about than possible earthquakes, and probably not even such a surfing enthusiast as our esteemed senior botanist would head to the beach with his forest practices board in hope for a tsunami. But some rational risk assessment is warranted, and some thoughtful decisions somewhere between the opposing poles of unwarranted paranoia and the lackadaisical "all-life-is-a-gamble" philosophy. Relatively small quakes may have the potential to damage structures such as forest roads and bridges, or trigger landslides. There is a geological saying that the present is the key to the past: we need to remember that the reverse can also apply. And just as communities used to heavy rain, snowfall or bushfires generally cope better than those who are unfamiliar or unprepared ...

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