School of Resources, Environment & Society

FORESTRY • GEOGRAPHY • HUMAN ECOLOGY • RESOURCE & ENVIRONMENTAL MANAGEMENT

Yearbook 2001

THE AUSTRALIAN NATIONAL UNIVERSITY

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Resources, Environment & Society
THE AUSTRALIAN NATIONAL UNIVERSITY

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• Resource & Environmental Management	Dr Richard Greene
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• Resource Management & Environmental Science	Dr Mick Tanton (until 31.12.01) Dr Richard Greene (from 1.1.02)
• Science & Engineering of Materials	Dr Phil Evans

Further information

Prospective undergraduate students should see:
- The ANU Undergraduate Prospectus
- The Faculty of Science Information Guide
- The Forestry, Geography, Human Ecology and Resource & Environmental Management brochures, handbooks, and fact sheets

Prospective graduate students should see:
- The Graduate School Prospectus and the The Graduate School Prospectus Coursework Edition
- The Handbook for Graduate Program in Resource Management & Environmental Science

This and other information is available from the School and on line:
- for general ANU information and prospectus: **http://www.anu.edu.au/**
- for SRES, Forestry, Geography, Human Ecology and Resource & Environmental Management information, handbooks and fact sheets: **http://sres.anu.edu.au/**

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Foreword

School of Resources, Environment and Society

The creation of The Australian National University's new School of Resources, Environment and Society is an important advance for the ANU and for the School's partners, the former Departments of Forestry and Geography & Human Ecology. These Departments have been working closely together since the late 1980s; in 1990, they formed the progenitor of SRES, the School of Resource and Environmental Management.

The establishment of SRES coincides with other significant changes at ANU, associated principally with the initiatives of our new Vice-Chancellor, Professor Ian Chubb, and with new arrangements for the funding of ANU's Research Schools. These changes are promoting more collaborative structures across all parts of the ANU. SRES is one important manifestation of these changes, and is also one of the foundation partners in ANU Environment, a new alliance of the many environmental interests across the ANU's Centres, Faculties and Research Schools.

SRES focuses on the relationships between people and the environment: how societies shape and are shaped by the environment, how societies manage and use natural resources, and how people impact on the environment. The School's particular foci and strengths are represented by its four Programs: Forestry, Geography, Human Ecology, and Resource & Environmental Management.

The strengths of SRES lie both in these traditional disciplinary areas and in the integration of research and learning across disciplinary boundaries. Our capacity to draw on both the natural and social sciences to address the challenges of sustainability is one of our defining and most important features. This capacity and emphasis is exemplified by our new 1st-year unit, *Resources, Environment and Society*, which we are teaching jointly with colleagues from the Faculty of Arts, to students from both the Faculties of Arts and Science.

SRES has some 25 academic and research staff, around 10 visiting fellows, 15 support staff, 50 graduate and 20 Honours students, some 250 undergraduates enrolled directly in our programs, and many others who take the units we offer. The diversity of our research and learning is evident from the entries in this Yearbook. SRES offers the same wide range of undergraduate and graduate degree programs which were offered by the former Departments; these are summarised on page *v* of this Yearbook.

The new School was formally launched by the Vice-Chancellor on 16 July 2001, at the beginning of the second teaching semester. As we build SRES from the excellent track record of the Departments of Forestry and Geography & Human Ecology, we look forward to continuing to work in partnership with you – whether in research, learning or outreach – to advance the conservation and sustainable use of our resources and our environment. We're keen to hear about how we can work more effectively with you - please contact us.

Our 2001 Yearbook summarizes the work of SRES staff and graduate and Honours students.

Professor Peter Kanowski
Head of SRES
July 2001

SRES Degree Programs

SRES offers a range of undergraduate and graduate degree programs:

- Bachelor and Honours degrees in Forestry and Resource & Environmental Management;
- Geography and Human Ecology programs as part of Bachelor or Honours degrees in Arts or Science;
- coursework graduate programs leading to Graduate Diploma or Master degrees;
- graduate research degrees at Master or PhD level.

All programs are available full- or part-time, and are described in the respective Handbooks, available from us or online at http://sres.anu.edu.au

UNDERGRADUATE DEGREES

1. BSc (Forestry)

The four-year BSc(Forestry) degree:

- offers students a challenging education in forest science and forest management, with broad application in environmental science and resource management in Australia and abroad.
- is directed primarily to educating forest scientists and professional foresters, but its graduates are also attractive to a wide range of employers in environmental science and resource management.

The curriculum comprises:

- the basic physical and biological sciences relevant to forest ecosystems,
- the applied sciences and technologies which support sustainable forest management,
- their application in the context of the political, economic and social dimensions of resource use,

and emphasises:

- field-based learning,
- combining a broadly-based education with specific professional development,
- opportunities for specialisation.

2. BSc (Resource & Environmental Management)

The three-year BSc(ResEnvMan) degree:

- offers students the opportunity to develop an individually-structured program which best meets their interests in the environmental sciences and resource management;
- comprises a small core of units, around which students can develop knowledge of a diverse range of themes, including:
  - environmental policy
  - forest science
  - geographic information systems
  - regolith studies
  - soil conservation & land management
  - sustainable agriculture
  - vegetation management
  - wildlife science
  - land management.

3. BA, BSc and associated joint degrees

All courses offered by SRES can be taken as part of a BSc degree, and all Geography and Human Ecology courses have status for the BA degree. Geography and Human Ecology courses offer students the opportunity to explore a wide range of human - environment issues.

The programs:

- stress the importance of literacy and numeracy, graphical, verbal and analytical skills, and competence in report preparation and presentation;
- include an integral fieldwork component in most courses.

The programs have particular strengths in:

- agroecology
- development studies
- GIS applications
- environmental history
- environmental policy and planning
- human ecology

4. BSc (Forestry) jointly with BEconomics, BSc, BA, BA(Visual), BAsianStudies, BCom, BInfoTech
These five-year double degrees:

- complement and enhance the Forestry program by combining it with economics or a range of specialist science topics,
- offer graduates particular employment opportunities which capitalise on these complementarities.

5. Honours degrees
Each of the degree or double degree programs can be taken with Honours, requiring:

- achievement of sufficient academic standard in coursework, as the basis for admission,
- completion of an individual research project,
- an additional year of study, or - for the Forestry program only - concurrent enrolment in Honours in the fourth year of the degree.

Honours degrees can offer graduates a competitive edge in employment, and direct admission to MSc or PhD programs.

GRADUATE DEGREES

SRES offers:

1. Coursework-based programs

- Graduate Diploma in
  - Science.
  - Resource & Environmental Management.

One year of coursework.

- Master of
  - Geographical Sciences.
  - Forestry.
  - Resource & Environmental Management.

One year of coursework and individual research.

2. Research-based programs

- Master of Philosophy. Two years of individual research.
- PhD. Three years of individual research.

NON-DEGREE PROGRAMS

We offer a range of non-degree programs - including workshops, lecture series and short courses - on a variety of topics.

Contact us for further information.

ACADEMIC STAFF

Professor & Head

P.J. Kanowski. BScForHons(ANU), DPhil(Oxon)

Readers

P.D. Evans. BSc, PhD(Wales), AIWSC
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SUPPORT STAFF

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Z.M. Smith. BA (Modern Languages)

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Career brief

Richard was born and bred in Canberra. In 1981 he was awarded the ANU University Medal for his combined Honours degree in Archaeology and Physical Geography. He then worked as an archaeologist and oral historian for the NT Museum before completing a PhD in Human Geography at the University of Adelaide. From 1990 to 1993 he was the inaugural head of the People and the Environment section of the National Museum of Australia. He has taught Geography at ANU since 1994. In 1996 he was awarded the ANU's Vice-Chancellors award for teaching excellence.

Research and teaching

My teaching at ANU has included coordinating the first year Geography course, running "Special Topics in Geography and Human Ecology" (an advanced research based course) and teaching the 3rd year course "Environmental Policy and Planning". I have carried out research into teaching methods and been invited to speak on teaching related issues at many forums. In 1999 I took up a visiting fellowship at the University of Washington, Seattle Center for Instructional Development and Research. In 2000 I became the inaugural chair of the ANU Teaching Forum a group of award winning ANU teachers dedicated to promoting excellence in teaching and learning at ANU.

My research focuses on community participation in resource management and environmental policy. I have worked on these issues in Australia and south-east Asia. I have worked in Viet Nam with the IUCN (World Conservation Union) on issues related to community participation in wetlands management. My work in Australia has focused on indigenous communities and land management issues. This has been written up in two recent books:
Land is Life (published in 1999 by Allen and Unwin) which examined the historical and cultural geography of Aboriginal – European relationships since first contact in the Gulf of Carpentaria region of the Northern Territory and *Working on Country* (published in 2001 by Oxford University Press) which examines contemporary Indigenous management of Australia's lands and coastal regions.

Selected publications

Baker, R.M., Davies, J. and E. Young. (eds) 2001. Working on Country: Contemporary Indigenous Management of Australia's Lands and Coastal Regions, Oxford University Press

Baker, R.M. 1999. Land is Life: From Bush to Town - the story of the Yanyuwa people, Allen and Unwin, Sydney

Baker, R.M. 1999. Aboriginal Cultural Landscapes, Elaine Stratford, Australian Cultural Geographies, Oxford University Press, Geography Meridian series.

Baker, R.M. 1997. Landcare: Policy, Practice and Partnerships: Australian Geographical Studies Vol. 35 No 1 61-73.

Baker, R.M. 1996. Coming In: The Yanyuwa as a case study in the geography of contact history, 123-166, in Chapman, V and Read, P. eds Terrible Hard Biscuits, Allen and Unwin, Sydney.

Baker, R.M. 1996. Landcare groups and university students working together, in V. Brown (ed.), Landcare Languages: A Communication Manual for Landcare, Canberra, Commonwealth of Australia, 128-134.

Baker, R.M. 1996 "Supertuts", "Yes Minister" and action research: methods to assist geography teaching, p189-193 in Proceedings of the Commission on Geographical Education, 28th Congress of the International Geographical Union, Centrum voor Educatieve Geografie Vrije Universiteit Amsterdam, The Netherlands, Amsterdam.

Recent completed PhDs that I have supervised include

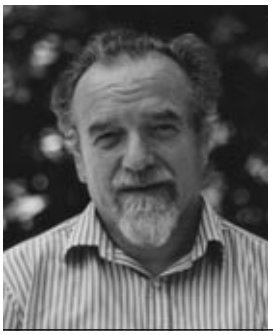
Cooper, D. 2000. An unequal coexistence: From 'station blacks' to "Aboriginal custodians' in the VRD, Northern Australia.

Gill, N. 2000. Outback or at home? Environment, social change and pastoralism in central Australia

Woodhill, J. 1999. The Landcare paradox: sustaining rural Australia

Ellemor, H. 1999. Place and natural resource management: The case of the Barmah-Millewa Forest, Australia

Further personal details, links to publications, recent graduate student details and on line articles on teaching methods are available at
http://geography.anu.edu.au/people/baker/index.html



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Career brief

After graduating in Forestry, John spent three years with Botany and Seeds Section of the Forest Research Institute working on provenance studies of Australian trees before returning to ANU to take higher degrees and joining the academic staff, developing skills in dendrology, ecology and dendrochronology and teaching at all levels. He has travelled extensively in North America, Asia and Europe in pursuit of these interests.

Research & teaching

My principal research interest is in the use of dendrochronology as a tool for answering questions about Australian trees and their environment. Tree ring studies involve dating the annual growth ring and the study of its chemical and physical attributes to answer such questions as the age of old growth forest and woodland trees, frequencies of forest fire and lethal cold events, dating aboriginal scar trees and performance of trees on disturbed sites, etc. Studies have focussed on the montane forests where trees produce a distinctive annual ring. This work is being progressively extended to other forest and woodland trees and shrubs. I also have a small poplar research program aimed at breeding veneer quality poplar clones with some salt tolerance for use in farm forestry programs.

Selected publications & student theses

1999 Banks, J.C.G., James, R. and C.L.Brack. 1999. Modelling Changes in Dimensions, Health Status and Arborcultural Implications for Urban Trees. Urban Systems3(1)35-44

Eggerton, J.G., Banks, J.C.G. and A. Gibson. Cunningham, R. B., Ball, M. C. 2000. Facilitation of seedling establishment: Reduction in irradiance enhances winter growth on *Eucalyptus pauciflora*. Ecology 8(5) 1437-1449

Banks, J.C.G. and I.F. Pulsford. 2000. Dendrochronology and the Australian Cypress Pines. Conference paper to The Perfumed Pineries, Coonabaragran, NSW 20-23 Nov. 2000

Cary, G.J. and G.J.C.Banks. 2000. Fire regime sensitivity to global climate change: An Australian perspective. Pp.233-246 In Biomass Burning and its Inter-Relationships with the Climate System. Eds. John Innes, Martin Beniston and Michel Verstraete Kluwer Academic Pubs. The Netherlands

Banks, J.C.G. 2000. The dendrochronological potential of Autralian trees. Ch.12 pages 224-230 In El Nino History and Crisis Studies from the Asia Pacific Region edt Richard Grove and John Chappell White Horse Press, Cambridge

Banks, J.C.G. 2000. Mistletoe-host relationships in Silver Fir, *Abies alba* Miller:a dendro-ecological analysis of mistletoe dynamics on a single tree. Conference paper Dendrochronology and the Third Millemmum, Mendoza, Argentina 20-24 April 2000

Banks, J.C.G. and C.L. Brack. 2001. The Wollemi Pine - a captured history. Paper to The Wollemi Pine Rescue Team, Mt Annan RBGS. 9 March 2001

Brookhouse, M. 1997. Identification and analysis of growth rings in *Eucalyptus obliqua* L'Hert. and *E. cypellocarpa* L. Johnson. (Honours thesis).

Smith, D. 1997. The relationship between ring width and precipitation in subalpine *Eucalyptus pauciflora.* (Honours thesis).

Hince, B. 1993. A history on the influence of L.D. Pryor on the development of Canberra's City Parks and Landscapes, 1944-1958. (MSc thesis).

Dr Jürgen Bauhus

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Career brief

Jürgen studied Forestry in Freiburg, Vienna, and Göttingen and worked in Europe and Canada before he came to Australia. In his PhD, obtained from Göttingen University, and subsequent work he examined the impacts of forest management on nutrient cycling. His current research focuses on silviculture of native forests, carbon cycling, and indicators of sustainable forest soil management. Jürgen also takes great interest in the dissemination of scientific knowledge in the wider community and the application of it in management, which is reflected in his work on private native forests. He is chair of the Research Working Group on Native Forest Management, and a member of the Cooperative Research Centre for Greenhouse Accounting.

Research & teaching

My research interest are primarily in the effects of forest management practices on forest ecosystem properties and processes, in particular forest structure and carbon and nutrient cycling.

Current projects investigate the use of soil chemical and biological indicators to assess the sustainability of forest management practices. This research tries to identify parameters that represent important ecological processes which are easy to determine, and thus can be used in long-term ecosystem monitoring. Two PhD students are involved in this program, working on earthworms and the relationships between organic matter and phosphorus supply, respectively.

Uneven-aged silviculture and the maintenance of structural diversity in managed forests is another research focus. Two PhD students are working on structural diversity and coarse woody debris, respectively. One MPhil student examines historical changes in stand structures of Cypress pine forests. A substantial proportion of the silvicultural research takes place in the context of forest management on private land. The work on private native forest management is carried out in collaboration with the South East NSW Private Forestry. This work is also supported by a MPhil student investigating private forest-owner attitudes and values.

Research into the dynamics of mixed eucalypt-acacia plantations is carried out by a group of one PhD and two honours students.

My teaching covers forest dynamics and silviculture, at undergraduate and postgraduate levels. In addition I contribute to courses in ecosystem measurement and plant physiology. A new development is a distance education course in native forest management.

Selected publications

Bauhus J., Aubin I., Messier C. and M. Connell. 2001. Composition, structure, light attenuation and nutrient content of understorey vegetation in a Silvertop Ash (*Eucalyptus sieberi*) regrowth stands 6 years after thinning and fertilisation. *Forest Ecology & Management* 144, 275-286.

Bauhus, J. Khanna, P. K. and N. Menden. 2000. Aboveground and belowground interactions in mixed plantations of *Eucalyptus globulus* and *Acacia mearnsii*. *Canadian Journal of Forest Research* 30, 1886-1894.

Bauhus J. 2000. Prospects for uneven-aged management of native eucalypt forests in Australia. In: Stewart, G.H., Benecke, U., and Hickey, J.E. (eds.) *Sustainable management of indigenous forests. Southern Hemisphere Prospects based on ecological research and silvicultural systems*. Proceedings of a symposium held at Southern Connection III Congress , Lincoln University 17-22 January 2000, Wickliffe Press Ltd., Christchurch, 53-64.

Bauhus J., McElhinny C.M. and G.M.Allen. 2000.The effect of seedtrees on regrowth development in a mixed-species eucalypt forest. *Australian Forestry* 63, 293-296.

Côté L., Brown S., Paré D., Fyles J. and J. Bauhus. 2000. Dynamics of carbon and nitrogen mineralization in relation to stand type, stand age, and soil texture in the boreal mixed wood. *Soil Biology and Biochemistry* 32, 1079-1090.

Khanna P.K., Ludwig B., J. Bauhus and C. O'Hara . 2000. Assessment and significance of labile organic C pools in forest soils. In: Lal, R., J.M.Kimble, R.F. Follett, and B.A.Stewart (eds) Assessment Methods for Soil Carbon. CRC/Lewis Publishers, Boca Raton, Florida, USA, 167-182.

Mackensen, J. and J. Bauhus. 1999. The decay of coarse woody debris. National Carbon Accounting System, Technical Report No.6, Australian Greenhouse Office, Commonwealth of Australia, Canberra, 40 p.

Bauhus J. 1999. Silvicultural practices in Australian native State forests - An introduction. Australian Forestry 62, 3, 217-222.

Dr Cris Brack

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Forest Measurement & Modelling

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Career brief

As a NSW forestry trainee, Cris completed his undergraduate studies at ANU in 1982. After graduation, he was a field forester in the biggest plantation district in NSW. After three years, he was transferred to Sydney as a forest inventory officer, where he designed inventories and information systems for plantations. He continued his studies on management and inventory with a PhD in Canada and returned to Australia as the Senior Inventory Officer for State Forests of NSW. He joined ANU Forestry in June 1994. Cris has subsequently undertaken research and consultancy work in Malaysia, PNG, Germany and USA.

Research & teaching

My research interests include the measurement, modelling and the effective use of information about trees and forests. The effective use of the information includes the development of decision support systems and enhancement of teaching and learning techniques.

I regularly collaborate with Federal and State agencies - including the Australian Greenhouse Office, Bureau of Resource Science, National Forest Inventory, Canberra Urban Parks and Places - to develop inventory and decision support systems. These developments include modelling fauna and flora habitat supply; advanced inventory approaches (model-based and unequal probability sampling); predicting tree growth, shape and health; and methods to estimate above ground biomass. I develop these systems at national and local forest scales, as well as in the urban environment. The decision support systems I work with incorporate a range of statistical, visual and artificial intelligence tools.

During 2000 I focused my research on two major areas: (1) urban forest inventory, modeling and management, (2) estimating biomass and carbon sequestration by forests on local and national scales. I was also nominated for an ANU Excellence in Teaching Award.

Selected publications & student theses

Good, N. M., Paterson, M., Brack, C and K. Mengersen. 2001. Estimating Tree Component Biomass using Variable Probability Sampling Methods. Journal of Agricultural, Biological and Environmental Sciences 6(2): 241-250.

Brack, C.L. 2000. State of Knowledge Report for IUFRO Unit 6.15.00 Improving education and further education in forestry. IUFRO World Conference, Malaysia, 2000. P 15. (URL: http://iufro.boku.ac.at/iufro/iufronet/d6/wu61500/skr61500.htm)

Brack, C.L., Banks, J.G. and R.N. James. 1999. Forestry out of the forests. Proceedings of the IFA Biennial Conference "Practising Forestry Today". Hobart, Tasmania 3-8 October, 1999. pp. 100-107.

Brack, C.L., James, R.N. and J.C.G. Banks. 1999. Data collection and management for tree assets in urban environments. Proceedings of the 21st Urban Data Management Symposium "UDMS'99". Venice, Italy. 21-23 April, 1999. Published on CD-ROM.

Hamilton, F. and C.L. Brack. 1999. Stand volume estimates from modelling inventory data. Australian Forestry 62(4): 360 – 367.

Banks, J.C., Brack, C.L. and R.N. James. 1999. Modelling Changes in Dimensions, Health Status and Arboricultural Implications for Urban Trees. Urban Ecosystems 1(3):

Research Working Group #2. 1999. Code of forest mensuration practice. Wood, G.B., Turner, B.J. and C.L. Brack. (eds). ISBN: 0-7315-3310-0 URL: http://www.anu.edu.au/Forestry/mensuration/rwg2/code P 64.

Brack, C.L. and P. Marshall 1998. Sequential sampling with systematic selection for estimating mean dominant height. Australian Forestry 61(4): 253 – 257.

Garner, M. 1999. Determining an Appropriate Protocol for Amenity Tree Valuation in Australia. (Honours thesis – first class).

Ozolins, A. 1999. Abundance and Decline of Isolated Trees in the Agricultural Landscape of Central West NSW. (Honours thesis– first class).

Wee, M.L. 1999. Predicting Urban Tree Benefits and Costs using Growth Models (Honours thesis– first class).

Dr Marlène Buchy

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Social Forestry, Participatory Resource Management

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Career brief

Trained in Social Science and in Forestry, Marlène has worked extensively internationally (India, Vietnam, West Africa) on social issues relating to natural resource management: specifically in community forestry, wildlife conservation and gender issues.

Research & teaching

I am facilitating the learning of future professionals in two related subject areas: Participatory Resource Management (FSTY3059) and Social Forestry (FSTY8037).
The aim of those courses is to sensitise students to the wider political and social framework of natural resources management. We also hope to propose, identify and test ways and techniques to involve the "community" in assessing, deciding, planning, implementing and monitoring resource management projects. I am also involved in adult learning programs and contribute to refresher courses for professional natural resource managers.

My main research interests are focused on the following: Participatory resource management; gender issues; participatory monitoring and evaluation, applied to development and education; policy and processes in forestry; environmental history.

Recent work has included a review of participatory practices in forest planning in Australia, a commissioned review of participatory management practices in the NRM sector for LWRRDC, and a gender study of the Australian Forestry workforce.

Selected publications

Buchy, M. & D. Race. 2001. The twists and turns of community participation in natural resource management in Australia: what is missing? *Journal of Environmental Planning*, **44**, 3.pp 293-308

Buchy, M. & K.M. Quinlan. 2000. Adapting the Scoring matrix: a case study of adapting disciplinary tools for learning-centered evaluation, in *Assessment & Evaluation in Higher Education*, **25**, 1, pp. 81-91

Buchy, M. & S. Hoverman. 2000. Understanding public participation in forest planning: a review, *Forest Policy and Economics*, 1, pp. 15-25

Buchy, M., Ross, H. & W. Proctor. 2000. *Enhancing the information base on participatory approaches in Australian natural resource management.* Commissioned under LWRRDCs Social and Institutional Research Program 138 pp.

Race, D. & M. Buchy. 1999. A role for community participation in Australian forest management? In *Rural Society* **9**, 2, pp. 405-419

Dr Geoff Cary

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Fire Science & Environmental Modelling

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Career brief

Geoff graduated with BApp Sc (Environmental Biology) (Hons), University of Technology, Sydney in 1992 and completed his PhD in ecology at the Research School of Biological Sciences, ANU, in 1998. Since 1996, Geoff has been the lecturer in fire science, and more recently environmental modelling, in the Department of Forestry.

Research and teaching

The Laurel Hill Field Trip is the field-based learning component of the first year unit *Australia's Forests*. The program runs for five days in the Tumut/Tumbarumba region during July. The 2000 tour marked the 5th running of the trip since it was comprehensively reviewed in 1996. The objectives are to address a wide range of forest and forest-related issues across a range of landscapes and tenures. The course also introduces important practical skills required by professional land managers. There are too many individuals who contribute to the Laurel Hill Field Trip to name them all here. However, I would like to recognize the contribution of staff from State Forests of NSW, the NSW National Parks and Wildlife Service, the NSW Department of Land and Water Conservation, the Tumbarumba Shire Council, the Laurel Hill Mill, and the staff and owners of *Egaline* and *Camelot* and thank them all very much for the considerable effort that they have put into the collaborative teaching with ANU Forestry via the Laurel Hill Field Trip over the last five years. Other units include Fire in the Australian Environment in 2nd year and Modelling for Environmental Management in 3rd year.

In research, I am involved with GCTE Task 2.2.2 (Relationships between global change and fire effects at the landscape scale) which received funding from the US National Centre for Environmental Analysis and Synthesis to support our ongoing research on landscape fire model comparisons. We held a workshop in Santa Barbara last November to set up the model comparison experiments and will be reviewing results at another workshop to be held there in November 2001. Later this year I will be undertaking an Outside Study Program with Dr Bob Keane (USDA Forest Service) to start work on a comparison of Australian and American landscape fire models in a northern Rocky Mountain Ecosystem. I will be based in Missoula, Montana.

Selected publications & student theses

Cary, G.J. In press. Importance of a changing climate for fire regimes in Australia. In Flammable Australia: The Fire Regimes and Biodiversity of a Continent. (Eds R.A. Bradstock, A.M. Gill, J.E. Williams). Cambridge University Press.

McCarthy, M.A. and G.J. Cary. In press. Fire regimes of landscapes: models and realities. In Flammable Australia: The Fire Regimes and Biodiversity of a Continent. (Eds R.A. Bradstock, A.M. Gill, J.E. Williams). Cambridge University Press.

Cary, G.J. 2000. What technology can do. In: Fire! The Australian Experience, National Acadamies Forum, Australian Acadamy of Technological Sciences and Engineering.

Cary, G.J. and J.C.G. Banks. 1999. Fire regime sensitivity to global climate change: An Australian perspective. In: Advances in Global Change Research. (Eds J.L. Innes, M.M. Verstraete and M. Beniston). (Kluwer Academic Publishers: Dordrecht and Boston.).

Cary, G.J. 1997. Analysis of the effective spatial scale of neighbourhoods with respect to fire regimes in topographically complex landscapes. *Proceedings of the International Congress on Modelling and Simulation*, December, Hobart, Tasmania.

Richards, R. 2000. The sensitivity of snow gum to fire scarring in relation to Aboriginal landscape burning. (Honours thesis).

Pippen, B.G. 1999. Predicting Fine Fuel Moisture in Shrubby Vegetation. (Honours thesis.)

Stein, B. 1999. A Generalised Linear Model for the Occurrence of *Corymbia maculata* (Spotted Gum) at Kioloa. (Honours thesis.)

Mr David Dumaresq

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Career brief

David studied physics and maths at the University of Melbourne before moving to philosophy and social theory at the University of Queensland graduating in 1973. He then spent six years in the Philosophy Department in the Research School of Social Sciences here at ANU working on environmental philosophy, ethics, philosophy of science and social theory. During this time he also took up organic agriculture and the practical application of sustainable production systems. During the 1980s he had a range of part-time teaching positions in the Human Sciences program at ANU while also developing and operating commercial organic farms. In 1986 he completed the first international short course on Agroecology, at the University of California, Berkeley and Santa Cruz campuses. From 1987-90 he was a member of the National Executive of the National Association for Sustainable Agriculture, Australia. In 1987 he took up a part-time lectureship in the Human Sciences Program to teach agroecology and sustainable systems. In 1991 he took up a full-time academic position in the Human Ecology Program. He has been Program convenor since 1992. He is actively involved with a range of research and extension projects with farmers and with the wider organic agriculture industry.

Research and Teaching

My research and teaching is based around three main areas. These include investigating sustainable systems, including whole farm systems and measuring environmental, economic and social impacts, in particular the sustainability of alternative management practices, especially organic farming.

Within farming systems I am researching particular agroecological interactions between farming operations, plant growth and soil ecological function. I am completing a 10 year project comparing the sustainability of organic and conventional wheat farming in Australia. Across wider agricultural systems operations I am investigating the development and regulatory frameworks for national and international organic agriculture.

Within urban systems I am involved in the application of sustainability criteria for planning and construction of human scale communities. I am developing the role of transdisciplinary studies in environmental research and teaching. This involves collaboration with graduate students in the investigation of the foundations and methods of interdisciplinary science, the development of transdisciplinary methodologies and their application to postnormal science and the development of policy. These studies include the development of human ecology as an approach to understanding social and ecological linkages.

Thirdly I have maintained a strong interest in environmental philosophy, in particular in the ethics of eating including the relationship between ecologically and ethically sound consumption. Other ethical issues of concern include the development of transgenics and the ownership of life.

Recent publications

Derrick, J.W. & D. Dumaresq. 1999. 'Soil chemical properties under organic and conventional management in southern New South Wales' Australian Journal of Soil Research, 37, 1047-55.

Dumaresq, D. & R. Greene. 1997. 'Phosphorus, fungi, fauna and infiltration in organic wheat systems in SE Australia', in Proceedings of the Xth INTERCOL Conference, Florence, Italy.

Dumaresq, D., Greene, R. & L. van Kerkhoff. (eds) 1997. Organic Agriculture in Australia. RIRDC 97/14. 220pp.

Dumaresq, D. & R. Greene. 1997. From Farmer to Consumer: the Future of Organic Agriculture in Australia. RIRDC 97/13. 40pp.

Dann, P., Derrick, J., Dumaresq, D. & M. Ryan. 1996. 'The response to superphosphate and reactive phosphate rock by organic and conventionally grown wheat', Australian Journal of Experimental Agriculture, 36: 71-78. (C1)

Carruthers, G. & D. Dumaresq. 1994. 'A Controllable and Consistent Method for the Extraction of Soil Fauna', in Pankhurst, C. E. et al. (eds) Soil Biota: Management in Sustainable Farming Systems, CSIRO. pp. 103-5.

Ryan, M., Chilvers, G. & D. Dumaresq. 1994. 'Colonisation of wheat by VA-mycorrhizal fungi was found to be higher on a farm managed in an organic manner than on a conventional neighbour', Plant and Soil 160:33-40.

Dumaresq, D. 1997. 'Industry Profile' in Dumaresq, D., Greene, R. & van Kerkhoff, L. (eds) 1997 Organic Agriculture in Australia. RIRDC 97/14: 1-4.

Dumaresq, D. & R. Greene. 1997. 'Review of the Organic Industry', in Dumaresq, D., Greene, R. & van Kerkhoff, L. (eds) 1997 Organic Agriculture in Australia. RIRDC 97/14: 95-109.

Dr Philip Evans

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Career brief

Phil took a first class honours degree in wood science from the University of Wales (Bangor). He obtained a PhD, also from the University of Wales, in 1984. He worked as a postdoctoral fellow at Abertay University Dundee, Scotland, before joining the ANU as a Lecturer in 1986. He was promoted to Senior Lecturer in 1992 and Reader in 1998. Last year he was appointed as Director of ANU's Centre for Science and Engineering of Materials.

Research & teaching

I am interested in the development of advanced wood and biobased composite materials that can more effectively compete with plastics, metals and ceramics, materials that cannot be produced on a sustainable basis. One of my major aims and one which has frustrated researchers world-wide has been to develop a highly durable exterior clear finishing system for wood. Early recognition that photodegradation of wood (beneath the finish) was responsible for the poor performance of clear finishes has led to the development of a variety of novel methods of photostabilising wood, including some that involve covalently bonding photostabilisers to lignin, the photolabile component of wood. Using such techniques we have been able to dramatically improve the performance and longevity of clear coatings on wood.

Composites materials manufactured from lignocellulosic strands, particles and fibres bonded under pressure with organic and inorganic adhesives are also a major focus of research in my laboratory. We are interested in developing composite panels that contain no artificial chemical biocides, but are resistant to biodeterioration caused by termites and basidiomycete fungi. Particleboards and fibreboards manufactured from the naturally durable wood species *Callitris glaucophylla* appear to possess similar resistance to biodeterioration as commercially manufactured products that contain fungicides and insecticides. Composites that use cement as an adhesive are highly resistant to biodeterioration, but many wood species cannot be used in the manufacture of such products because they contain low molecular weight carbohydrates and phenolic extractives that interfere with cement hydration. Research in my laboratory is currently underway to develop methods of blocking the inhibitory effects of such compounds on the hydration of Portland cement.

Selected publications & student theses

Evans, P.D., Dimitriades, S., Cunningham, R.B. and C.F. Donnelly. 2000. Medium density fibreboard manufactured from blends of white cypress pine and non-durable wood species shows increased resistance to attack by the subterranean termite C. lacteus. *Holzforschung* 54(6): 585–590.

Semple, K and P.D. Evans. 2000. Adverse effects of heartwood on the mechanical properties of wood-wool cement boards man ufactured from radiata pine wood. *Wood and Fiber Science* 32(1): 37-43.

Evans, P.D., Wallis, A.F.A., Owen, N.L. 2000. Weathering of chemically modified wood surfaces - Natural weathering of Scots pine acetylated to different weight gains. *Wood Science and Technology* 34(2): 151-165.

Kiguchi, M. and P.D. Evans. 1998 Photostabilisation of wood surfaces using a grafted benzophenone UV absorber. *Polymer Degradation & Stability* 61(1):33-45.

Evans, P.D., Thay, P.D. and K.J. Schmalzl. 1996. Degradation of wood surfaces during natural weathering. Effects on lignin and cellulose and on the adhesion of acrylic latex primers. *Wood Science and Technology* 30(6):411-422.

Heady, R. 1997. The wood anatomy of *Callitris* Vent. (Cupressaceae)*:* an SEM study. (PhD thesis).

Ahmad, S.M.S. 1995. Weathering of Kempas and its effects on the adhesion and performance of surface finishes. (PhD thesis).

Soriano, F.P. 1994. The structural roles of extractives and hemicelluloses in King William pine (*Athrotaxis selaginoides* D. Don)

Thay, P.D. 1994. The adhesion of primers to pre-weathered wood. (MSc thesis).

Ximenes, F. 2001. Preservation of wood using oxy-aluminium compounds. (MSc thesis).

Ramos, M. 2001. Improving the gluing of eucalypt timber by plasma modification of wood surfaces. (MSc thesis).

Dr John Field

Sub-Dean, Forestry Honours Convenor

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Earth sciences, farm forestry, soil formation & management, regolith, landscape evolution

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Career brief

After growing up in Sydney and being educated at Sydney Boys High, John studied geology, geomorphology and pedology at UNSW, completing a 4 year concurrent Honours in Applied Science in 1973. He moved to UNE at Armidale and wrote his PhD on the hydro-bio-geochemistry of small rural catchments. After 6 years of teaching in the Faculty of Natural Resources at UNE, he joined CRA Exploration in Canberra as an in-house geomorphologist / consultant in their Research Group and, in 1986, joined the ANU Forestry Department to teach soils to forestry and resource management students. He owns and manages a grazing property on which he is steadily planting trees to demonstrate the integration and viability of agroforestry and farm forestry while maintaining successful cattle, sheep and goat enterprises. He acts as a consultant to the agricultural, forestry, mining and land development industries. John is student adviser and sub dean to the School.

Research & teaching

Soils and landscapes, and any aspect of soil formation and land management are a fair summary of my research interests. In this context, I was a founding member of the CRC LEME Mk I and Mk II (Landscape Environment and Mineral Exploration) and continue to work in regolith research and applications. My fundamental interest in forestry is the critical relationship that exists between trees and soil - the ways in which soil controls the growth of plants, but also the effects that trees have on soils. I have a continuing interest in multipurpose utilisation of trees in agricultural land management, planning and development.

Units I coordinate, or in which I teach, include: Earth Systems, Australian Soils, Soil Ecology and Management, Regolith, Land Management and Farm Forestry. These units are also offered at the graduate level and some are offered in professional, short course and in web format.

Selected publications & student theses

Schirmer, J. & J. Field, 2000. The Cost of Revegetation. Final Report. ANU Forestry and Greening Australia. Environment Australia, Canberra.

Field, J.B. and J.C.G. Banks. 1998. Effects of Silvicultural Treatments on Growth Rates of Trees and Diversity of Understorey in a Private Dry Sclerophyll Forest, Southern Tablelands, NSW. Practising Forestry Today, 18th Biennial IFA Conference, Hobart

McIntosh, C. 1999. Rock weathering, soil formation models and the implications for mineral exploration at Boorowa, NSW. Hons thesis, Dept Forestry, ANU, Canberra.

O'Grady, C.M. 1999. Community participation in NSW local government land use policy development processess: Implications for farm forestry. Hons thesis, Dept Forestry, ANU, Canberra.

Barnett, P. 2000. Assessing the degradation of function in ecosystems affected by dryland salinity. Hons thesis, Dept Forestry, ANU, Canberra

Otsub, M. 2000. The effects of farm forestry on public roads within the southern tablelands of New South Wales. Hons thesis, Dept Forestry, ANU, Canberra.

Webb, R. 2000. Commercial native species selection for farm forestry on the southern tablelands of New South Wales. Hons thesis, Dept Forestry, ANU, Canberra.

Scown, J. 1999. The influence of livestock dung on earthworm distribution. Hons thesis, Dept Forestry, ANU, Canberra.

Dr Richard Greene

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RMES Graduate Program Convenor (from 1/02)

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Career brief

After completing a BSc (with honours in Physical and Inorganic Chemistry) in 1970 from the University of Western Australia, Richard undertook a PhD in Soil Science from 1971-1975, also at the University of Western Australia. He then joined the Victorian Department of Agriculture, and from 1975 to 1985 worked as a soils research officer at the Irrigation Research Institute, Tatura. Then from 1985 to 1993, he worked as a Senior Research Scientist in the CSIRO Division of Wildlife and Ecology, firstly at Deniliquin, NSW, and later in Canberra, ACT. In 1993 he joined the Australian National University as a Soils Lecturer in the Department of Geography and Human Ecology, School of Resource Management and Environmental Science.

Research, teaching, & professional activities

After finishing my PhD in Soil Science in 1975, I have gained extensive research experience through a range of activities in agricultural and environmental management. In agricultural research, I have worked in all three areas of (i) dryland cropping, (ii) irrigation, and (iii) extensive rangeland management. In environmental management, I have experience in minesite rehabilitation, aeolian accessions to the landscape, as well as the rehabilitation of degraded alpine ecosystems. My research has involved extensive collaboration with other universities (both in Australia and overseas), state and federal government agencies, as well as private companies. Much of this research has been funded from competitive research grants from NSCP, RIRDC, HRDC and from small ARC grants.

My areas of specialisation include:

- Rehabilitation of degraded agricultural lands
- Amelioration of soil structure
- Development of sustainable cropping enterprises
- Rehabilitation of minesites and alpine ecosystems
- Aeolian dust: implications for mineral exploration and environmental management

My research supervision includes four Ph.D. students, one MSc student, and two honours students and I lecture in five undergraduate units in soil/land/regolith management.

I am a member of the CRC for Landscapes, Environment and Mineral Exploration, the national president of the Australian Association of Natural Resource Management, and the secretary of the Australian Clay Minerals Society. I am also author of over 40 refereed publications in topics such as clay colloid chemistry, the amelioration of soil structure, the rehabilitation of degraded lands, and the development of sustainable cropping systems.

Recent Publications

Greene, R.S.B., Nettleton, W.D., Chartres, C.J., Leys, J.F. and R.B. Cunningham. 1998. Runoff and micromorphological properties of grazed haplargids, near Cobar, N.S.W., Australia. Australian Journal of Soil Research. 36, 1-21.

Noble, J.C., Greene, R.S.B., and W.J. Muller. 1998. Relationships between rainfall, soil-water and Herbage production following rainfall redistribution in a semi-arid mulga (Acacia Aneura) woodland in western New South Wales. Australian Rangelands Journal. 20, 206-25.

Butterworth R., C.J. Wilson, C.J., Herron, N.F., Cunningham, R.B., and R.S.B. Greene. 2000. Geomorphic controls on the physical and hydrologic properties of soils in a confined stream valley in NSW Australia. Earth Surface Processes and Landforms. 25, 1161-1179. .

Greene, R.S.B., Eggleton, R.A. and P. Rengasamy. 2001. Relationships between clay mineralogy and hardsetting properties of soils in the Carnarvon Horticultural District of Western Australia. Applied Clay Science (in press).

Greene, R.S.B., Valentin, C. and M. Esteves. 2001. Runoff and erosion processes. In Banded Vegetation Patterning in Arid and Semi-arid Environment-Ecological Processes and Consequences for Management. (Eds. C. Valentin, D. Tongway, J. Seghieri and J.M. d'Herbes), Springer-Verlag. (in press).

Greene, R.S.B. 2001. Hardsetting soils. In: The Encyclopedia of Soil Science. (Ed. R.Lal). Marcel Dekker, Inc.

Greene, R.S.B., Gatehouse, R., Scott, K.M., and X.Y. Chen. 2001. Aeolian Dust: Implications for Australian mineral exploration and environmental management. Australian Journal of Soil Research, 39, 1-6.

Valzano,F.P., Murphy, B. W. and R.S.B. Greene. 2001. The long-term effects of lime and gypsum and tillage on the physical and chemical properties of a sodic red brown earth. Australian Journal of Soil Research, 39 (in press).

Valzano, F.P., Greene, R.S.B., Murphy, B.W., Rengasamy, P., and S.D. Jawal. 2001. Effects of gypsum and stubble management on the chemical and physical properties of a sodic grey vertosol in Western Victoria Australian Journal of Soil Research, 39 (in press).

Dr Susanne Holzknecht

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Career Brief

Trained in Anthropology and Sociology, Linguistics and Teaching English as a Second Language. For 12 years, lectured at PNG University of Technology, Lae, in Language and Communication Studies, specialising in teaching English for academic purposes, mainly to Forestry, Agriculture, and Natural Resource management students.

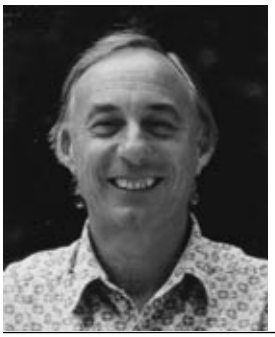
1993 joined Graduate Program in Environmental Management and Development, National Centre for Development Studies, ANU as Academic and Research Skills adviser to graduate students. Then worked in ANU's Study Skills Centre for 3 years, as adviser to undergraduate and post-graduate students. Now back in NCDS and in Forestry Dept part-time, working mainly with post graduate students.

Research and Teaching

In Forestry, I am holding weekly sessions with post graduate students, focussing on concerns of graduate level academic reading and writing. I also have individual consultations with students, particularly about their writing of essays, theses and so on. From time to time, I do guest lectures within undergraduate Forestry units at the invitation of the lecturers, for example on doing a literature review and on collaborative learning. I am committed to the aims and objectives of collaborative learning.

Selected Publications

With Annie Bartlett and Alison Cumming Thom. 1999. *Preparing Students for Graduate Study: To Hit the Ground Running*, Asia Pacific Press, Canberra (Teachers' Manual and Student Workbook).



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Career brief

Ryde began his career in forestry in 1960 with the New Zealand Forest Service, subsequently receiving scholarships from the NZFS and NZ Government to study botany at the Victoria University of Wellington and forestry at the ANU. After graduation, he worked in forest planning at the NZFS Head Office, then as a scientist at the NZ Forest Research Institute. He took leave to obtain a Doctorate from Oxford University. Returning to the NZ FRI, he eventually became Program Manager for the Plantation Management Research Group. Ryde took up his current position in the Department of Forestry, ANU, in 1992.

Research & teaching

My research falls into three categories: silviculture and the manipulation of plantation crops, forest planning, and urban forestry.

Recent silvicultural research has involved the analysis of growth response over twenty years to unconventional thinning treatments aimed at restricting the diameter distribution of crop trees; and the influence of tree breeding on the quality of trees and logs in tree crops. I am an associate member of three research groups investigating plantation silviculture: an Australian-wide Farm Forestry program coordinated by the Queensland Forest Research Institute, the CRC for Sustainable Production Forestry and the Breeding Objectives Program of the Queensland Forest Research Institute.

Forest planning describes activities at a range of scales from the national to the compartment level in the field. My work has concentrated on the higher levels, having been involved, with Dr Brian Turner, in providing the official estimates of wood flows by region, through time, for forest plantations in Australia. This work required the application of forest growth models, yield models and the informed interpretation of outputs from these models.

Urban forestry represents a new research initiative for myself and colleagues, Dr John Banks and Dr Cris Brack. We have developed a computer based management system for urban tree assets with the street as the basic unit and are working on the development of management systems at other levels.

Selected Publications

Kramer, H. and R.N James. 2000. Neuer Wald fur neue stadt. *Forstarchiv* 71:158-164.

Banks, J.C.G., Brack, C.L. and R.N. James. 1999. Modelling changes in dimensions, health status and arboricultural implictions for urban trees. *Urban Ecosystems* 3(1).

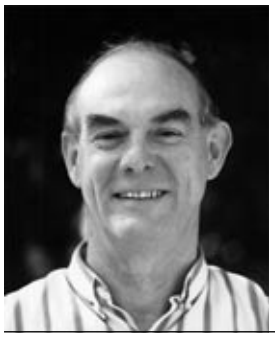
James, R.N. 1998. Planted forests - Factors to be considered in planning. In Chan et al. (eds) Proceedings of a conference *Planted forests in Sarawak*. Forest Department Sarawak.

James, R.N. 1998. Evaluation of diameter distribution as a criterion for selecting crop trees in a pulpwood regime. *NZ Journal of Forestry Science* 28(2): 195-201.

Maddern, L. and R.N. James. 1998. The effect of tree breeding on size and utilisation potential of radiata pine in two research trials. *Institute of Foresters of Australia Newsletter* 39(3)41-47.

James, R.N. 1997. The effect of thinning regime on production of wood with "mature" properties in plantation grown radiata pine in NZ. In Népveu, G. (Ed), *Connection between silviculture and wood quality through modelling approaches and simulation softwares*. Conference held under the auspices of IUFRO WP S5. 01-04, South Africa, August 1996.

Turner, B.J. and R.N. James. 1997. *Australian Forest Plantations - How much wood will they produce?* Proceedings of the 4th Joint Conference of the Institute of Foresters of Australia and the NZ Institute of Forestry, April 1997.



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Career brief

Ken studied geography and economics at the University of Queensland before moving to a research-teaching position at the University of Glasgow in the Department of Social and Economic Research. During this time his interests focussed on the economics and location of distribution, first of retailing and then wholesaling and intermediate warehousing. As transport systems changed the importance of these activities became paramount. On return to Australia and the Urban Research Unit of the ANU the knowledge gained was extended to research into the processes of urban development, with a particular focus on Melbourne. In this work interests of the research group ranged from the policy and planning of public authorities to processes of residential selection and property markets. Since joining the Department of Geography in 1972 Ken has taught in a wide range of courses from urban geography to the geography of Australia, and, more recently extended to longer term variation in climate as seen in the instrumental record.

Research & teaching

Over this wide ranging career my interests have regularly returned to the issues of policy and planning. This involves the institutions and instruments by which our society organises itself. Tracing the changes of policy and planning in both urban and rural areas from the 1950s to the deregulated days of the turn of the century is fascinating. Seeking to interpret and explain the changes for people and the landscapes of the places where we live is a continuing challenge.

Teaching and research have come together from a deep interest in data analysis. Creating information from data has always posed problems and the development of analytical systems has extended the frontiers of teaching and research. My teaching-research program deals with temporal and spatial data. One of the greatest problems facing data analysis is understanding environmental change, and climate in particular. The record is complex and widely applied techniques inflexible and the outcomes not 'user friendly' for the wider community. Developing ways of teaching the nonlinear and nonparametric techniques of the 1990s and researching the information the records contain has been a focus of my attention. The challenge of teaching the techniques and the interpretation of the results led to a deep interest in the nature of human intelligence and its development for these ends.

Selected publications & student theses

Johnson K.M. and H.C. Garnett. 1970. *The economics of containerisation*. Allen and Unwin, London

Johnson, K.M. 1992. *The AUSMAP atlas of Australia*, Cambridge University Press, Melbourne.

Johnson, K.M. 1994. Creating place and landscape. Chapter 3 in Stephen Dovers, *Australian environmental history*. Oxford University Press, Melbourne.

Johnson, K.M. 1991. The long-term variation of seasonal rainfall in the Darling basin. Proceedings of the 2nd Australian conference on agricultural meteorology.

Quinn, M.J. 1995. Possessing the west; the public management of the Western Division of NSW. PhD thesis, Australian National University

Lane, R. 1995. Local environmental knowledge and perspectives on change; a case study of the Tumut district. MA thesis, Australian National University

Lloyd, A. 1999. Community and environment in the Burra valley of NSW. Honours thesis, Department of Geography, ANU.

Professor Peter Kanowski

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Career brief

Peter Kanowski grew up in country Queensland, with a forester father, schoolteacher mother and six siblings - all attributes which helped prepare him for his current role. He was Schlich Medallist at ANU's Department of Forestry and a Rhodes Scholar at Oxford University; his honours and doctoral work were both in forest genetics. Peter worked as both a forest and a research program manager with the Queensland Department of Forestry, before moving to Oxford University's Forestry Institute in 1988, where he lectured in forest policy and forest genetics. He took up the Chair of Forestry at ANU in August 1995, became Head of the Department of Forestry in January 1996, and Head of the School of Resources, Environment and Society in July 2001.

Since coming to ANU, Peter has chaired scientific advisory groups and the NSW Southern Regional Forest Forum under the Regional Forest Agreement process; he is a member of the Crawford Fund Forestry Committee.

Research & teaching

My research and teaching interests and activities cover both forest policy and forest genetics. My work in policy addresses a range of topics, including plantation and farm forestry, forest conservation and management, and forest policy processes. In association with colleagues in Canberra and elsewhere, I have undertaken reviews of each of these topics, and attempted to transfer ideas into practice by working with partners in government, industry and non-government and community organisations.

My research in forest genetics began with Honours and Doctoral work in quantitative genetics and its implications for tree breeding strategies. In association with colleagues in Oxford, my interests expanded to cover forest population and conservation genetics; I have written both specific and review papers in each of these topics. As with my work in forest policy, my principal concern is in transferring knowledge and ideas into practice.

Some of my work in both policy and genetics is now part of the research program of the Cooperative Research Centre for Sustainable Production Forestry. Other collaborative genetics research projects with the Queensland Forestry Research Institute are supported by the Forest and Wood Products Research and Development Corporation. Other work has been conducted as commissioned studies for agencies such as AFFA and Environment Australia.

My teaching reflects these diverse interests: I coordinate undergraduate and graduate courses in both forest policy and forest genetics, and contribute to courses in farm forestry. I have also coordinated a series of national and international short courses and workshops in each of these subject areas.

Selected publications

Kanowski, P.J. and M. Buchy. 2001. Advances in research and development – social sciences: context, critique and evaluation. In: M Connell *et al* (Eds). *Intensive management of regrowth forest for wood production in Australia*. CSIRO. 78-84.

Kanowski, P.J. 2000. *Forestry's contribution to a sustainable Australian society*. Paper to Austimber 2000, Albury, 15 March 2000. http://www.anu.edu.au/Forestry

Kanowski, P.J. 2000. Politics, policies and the conservation of genetic diversity. In: AM Young, DH Boshier and T.J. Boyle. (Eds). Forest conservation genetics: principles and practice. 275-287.

Kanowski, P.J., Sinclair, D. and B. Freeman. 2000. *Establishing comparability and equivalence amongst forest management certification schemes*. AFFA. 46 p. http://www.affa.gov.au/docs/forestry/certification/critical.html

Dargavel, J., Proctor, W and P. Kanowski. 2000. Conflict and agreement in Australian forests. Ch. 6 in: L. Tacconi (Ed.). *Biodiversity and ecological economics*. Earthscan. 101-115.

Kanowski, P.J., Sinclair, D. and B. Freeman. 1999. International approaches to forest management certification and labelling of forest products: a review. AFFA. 47p. http://www.affa.gov.au/docs/forestry/certification/cert_label.html

Kanowski, P.J. et al. 1999. International forest conservation: protected areas and beyond. Discussion Paper for IFF. Environment Australia. 52pp. http://www.anu.edu.ay/Forestry

Kanowski, P.J. 1998. Reflections on forestry and the forest products industries at the millennium. Commonwealth Forestry Review 77: 130-135.

Kanowski, P.J. 1997. Plantation forestry for the 21st Century. Special paper, XI World Forestry Congress. 3: 23-34.

Kanowski, P.J. 1997. Regional Forest Agreements and future forest management. In: Outlook 97. 1: 225-235.

Kanowski, P.J. and D.H. Boshier. 1997. Conserving the genetic resources of trees in situ. In: N Maxted et al (eds). Plant conservation: the in situ approach. Chapman and Hall. Ch 13.

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Career brief

Shawn graduated with a BSc (Hons) from ANU in 1994. After working at CSIRO Division of Water Resources he has been working on his PhD in the Geography and Human Ecology Department at ANU. Since 1999, Shawn has been a lecturer in the department of Geography & Human Ecology teaching Applied GIS and Rivers and Catchments.

Research and Teaching

My research focusses on the integration of geocomputational tools to understand and address geographic problems and issues. Applications include investigating how much relationship there really is between properties of the regolith and vegetation and topography, the spatial variation of serrated tussock infestations, analyses of the geographic distributions of endemism in the Australian vascular flora, and using no-geometric models of spatial sampling for use in geostatistical modelling.

Last year saw the break up of the old third year GIS unit into two courses, of which I developed the third year Applied GIS course. This involved the implementation of numerous cutting edge geocomputational tools and techniques for students to use for their work. On the applications side, the students used these methods to analyse real world problems around Jindabyne, NSW, ranging from serrated tussock infestations to assisting with the future development of the Jindabyne township. This is as part of a collaboration with the Snowy River Shire Council.

The Rivers and Catchments unit has the aim of teaching students how to understand the landscape in terms of its geomorphic features and history. Such an understanding enables better implementation of management practices. This unit will be co-taught with Professor Wasson in 2001.

I was also involved in teaching the professional short course GIS for Development Planning and Resource Decisions with Dr Lees. This was followed by a two month fellowship for two Indian foresters from Tamil Nadu to spend more time learning GIS skills.

Selected Publications & student theses

Crisp, M.D., Laffan, S.W., Linder, P. & A. Monro. 2001. Endemism in the Australian flora, Journal of Biogeography, vol 2.

Langaas, S., Jansen, I.J. & S.W. Laffan. 1999. Utprøving av RESURS MSU-SK data for kartlegging i små målestokker (Assessing RESURS MSU-SK data for mapping over large areas), Project report to Norwegian Space Centre (in Norwegian and English).

Laffan, S.W. 1999. Spatially assessing model error using geographically weighted regression, Fourth International Conference on GeoComputation, Mary Washington College, Virginia, USA, July 1999.

Laffan, S.W. 1998. Visualising neural network training in geographic space, Third International Conference on Geocomputation, September 1998, Bristol, UK.

Laffan, S.W. 1996. Rapid appraisal of groundwater discharge using fuzzy logic and topography, Third International Conference/Workshop on Integrating GIS and Environmental Modeling, Santa Fe, New Mexico, January, 1996. http://www.ncgia.ucsb.edu/conf/SANTA_FE_CD-ROM/sf_papers/main.html.

Whiteway, T.G. 2000. “Fine sediment and pathogen budgets for the Googong catchment”. (Honours thesis, co-supervised with with Prof Wasson).

Dr Brian Lees

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Career brief

Brian was initially commissioned as a regular officer in the RAF, serving in the Middle East, Europe and Africa. He subsequently gained civil commercial pilot's and flight navigator's licences and flew with ADASTRA on mineral exploration and mapping projects. He then took a first-class honours degree in geomorphology from the University of Sydney. Following this he worked on a number of joint-venture projects becoming a director of two small exploration companies and the exploration manager of a third. He then formed a company to carry out environmental and exploration services for larger companies. Brian obtained a PhD, also from the University of Sydney, in 1984. He joined the ANU as a Lecturer in 1985, was promoted to Senior Lecturer in 1992 and Reader in 1995. Brian has received a number of awards for his work including the Walter Reid Prize, University of Sydney, 1976; the COOK Scholarship, University of Sydney, 1976; the Australasian Institute of Spatial Information Science and Technology (AISIST) Prize in recognition of a "substantial contribution to the study of the science of Urban and Regional Information Systems", 1997; the Land Victoria Fellowship, University of Melbourne, 1999 and the Eminent Individual Award; Australasian Urban and Regional Information Systems Association (AURISA) 1999. He is also editor of the International Journal of Geographic Information Science, and on the editorial boards of GEOINFORMATICA and, until recently, Transactions in GIS. He is a Member of the International Association of Science and Technology for Development (IASTED) Technical Committee on "Modelling and Simulation", and a member of the International Task Force on Metadata for GIScience Education Materials, part of the Instructional Management System project.

Research & teaching

I maintain an active research and teaching program focussed on aspects of Global Change. The first phase was the construction of a database of geomorphic evidence for past climate change across northern Australia. The second phase arose from the initial international Global-Biosphere Program (IGBP) meetings where it was clear that a great number of scientists from other disciplines were placing an unwarranted reliance on remote sensing to detect global change. I set up a research program to improve the reliability of change detection techniques. This led to my work in adapting inductive and data driven modelling techniques to the predictive mapping of land cover and land degradation. I, and my students, have built up comprehensive GIS databases based on a range of field sites. These have been used to test, and refine, the use of inductive learning, and other artificial intelligence techniques such as neural networks and genetic algorithms, for environmental management. We have been very successful. My research activity continues to be the development and application of tools to carry out integrated analysis of these global data. I have been trying to develop spatial modelling tools which will enable appropriate conservation and management techniques to mitigate some of the crises facing large parts of the globe. I believe that we have made a number of significant conceptual advances in this, including developing the spatial analysis of spectral data. My teaching is intimately linked with my research.

Selected publications & student theses

Lees, B.G., Hayne, M. & D. Price. 1993. 'Marine transgression and dune initiation on western Cape York, northern Australia.' MARINE GEOLOGY, 114: 81-89.

Lees, B.G., Stanner, J., Price, D. & Lu Yanchou. 1995. Thermoluminescence dating of dune podzols at Cape Arnhem, northern Australia. MARINE GEOLOGY, 129; 63-75.

Lees, B.G. 1996. 'Species mapping in forest ecosystems.' in Saramaki, J, B. Koch and H. Gyde Lund (eds), Remote Sensing and Computer Technology for Natural Resource Assessment, Tiedonantoja 48, University of Joensuu, Finland, 129-137.

Lees, B.G. 1997. 'Data and questions in Geocomputation.' in Pascoe, R.T. (ed.), Geocomputation '97, Spatial Information Research Centre, University of Otago, Dunedin, N.Z., August 1997, 288-297. ISBN 0-473-04564-8. (E1).

Lees, B.G. & S. Hafner. 2000. 'The separation of natural from cultural spatial patterns in an area of intensive agriculture using GIS and artificial intelligence.' In 'GIS and Geocomputation', P. Atkinson & Martin, D. (eds). Taylor & Francis, London. 188-205. ISBN 0-7484-0928-9.

Roddick, J.F. & B. Lees. 2001. 'Paradigms for Spatial and Spatio-Temporal Data mining'. Chapter 2 in 'Discovering Geographic Knowledge in Data Rich Environments', Miller, H & J. Han (eds).). Taylor & Francis, London.

Pearson, Diane. 1998 'The analysis of biodiversity using GIS modelling.' (PhD thesis)

Gallant, John. 2000 'Modelling terrain attributes.' (PhD thesis).

Benger, Simon. 2001 'Methane budgets for Australian wetland types.' (PhD thesis)

Dr Janette Lindesay

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Climatology, Greenhouse science, climate variability and change

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Career brief

Janette obtained her Honours degree, Postgraduate Teaching Diploma and Doctorate from the University of the Witwatersrand in Johannesburg. All her graduate work was in the field of statistical and dynamical climatology. She worked as a research scientist in the Climatology Research Group at Wits, while lecturing in climatology at the same university, and became Deputy Director of the group in 1991. Janette came to the ANU in 1993 as a Lecturer in the Department of Geography, and was promoted to Senior Lecturer in 1995. She is currently on secondment to the Cooperative Research Centre for Greenhouse Accounting, in the position of Education Manager.

Research & teaching

My principal research interests are in climatic variability during the period of instrumental record, characterising the nature and degree of variability and also investigating impacts. Much of my research has focussed on the El Niño Southern Oscillation phenomenon; I am currently studying low-frequency fluctuations in ENSO. I am also interested in applications of Global Climate Models in the study of climatic variation and its impacts.
Another area of research interest is thermo-topographic boundary layer effects. My interest in this area began with a study of sea-breeze regimes in the Namib Desert, south-western Africa; a current research project is investigating damaging advective frost events and their impact on viticulture in the Canberra region.

I teach undergraduate courses in atmospheric science and climatology, in which I aim to develop students' understanding of atmospheric processes, weather and climate, and their impacts and significance for the earth system. I have a particular interest in Greenhouse science and climate change, and the role and impacts of climatic variability in earth system processes and human affairs. I also make contributions on these topics in first-year courses.

I have coordinated the Geography Honours program for several years, and is also active in supervising postgraduate students. At postgraduate level she teaches a Masters course on understanding climatic variability and change.

Selected publications

Mackey, B.G., D.B. Lindenmayer, A.M. Gill, M.A. McCarthy and J.A. Lindesay. 2000. *Wildlife Refugia, Fire Regimes and Climate Change in the Central Highlands of Victoria*, CSIRO Publishing, Melbourne (in press).

Reason, C.J.C., Allan, R.J., Lindesay, J.A. and T.J. Ansell. 2000. ENSO and climatic signals across the Indian Ocean Basin in the global context: Part I, Interannual composite patterns, *International Journal of Climatology*, 20, 1285-1327.

Hobbs, J.E., Lindesay, J.A. and H.A. Bridgman. (Eds). 1998. *Climates of the Southern Continents: Present, Past and Future*, John Wiley and Sons, Chichester, 297 pp.

Lindesay, J.A. 1998. Present climates of southern Africa, in *Climates of the Southern Continents: Present, Past and Future*, Eds J.E. Hobbs, J.A. Lindesay and H.A. Bridgman, John Wiley and Sons, Chichester, 161-206.

van Wilgen,B., Andreae, M.O., Goldammer, J.G. and J.A. Lindesay. (Eds). 1997. *Fire in southern African Savannas: Ecological and Atmospheric Perspectives*, Witwatersrand University Press, Johannesburg, 256pp.

Reason, C.J.C., Allan, R.J. and J.A. Lindesay. 1996. Dynamical response of the oceanic circulation and temperature to interdecadal variability in the surface winds over the Indian Ocean, *Journal of Climate*, 9, 97-114.

Allan, R.J., Lindesay, J.A. and D.E. Parker. 1996. *El Niño Southern Oscillation and Climatic Variability*, CSIRO Publishing, Melbourne, 405pp.

Dr Brendan Mackey

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Career Brief

Brendan has a PhD in Plant Ecology from the Australian National University. He has worked as a research scientist with the CSIRO and the Canadian Forest Service. He is currently jointly appointed between SRES and CRES in the Institute of Advanced Studies. He is a co-project leader in the CRC for Greenhouse Accounting.

Research, teaching, professional practice & outreach

The main focus of my research is improving our understanding of the significance of landscape ecosystems and landscape-scale processes in maintaining globally-scaled life support systems, especially the carbon and water cycles. Of particular interest is the impact of land use activity on the functioning of these ecological systems. We still only have a poor understanding of the roles of genetic diversity and natural selection in the continued functioning of ecological systems, and the consequences of replacing these natural processes with human engineered management systems. Current research projects include the development of a landscape-wide, temporally dynamic, multi-agent based, simulation model of carbon and water fluxes.

I am involved with a number of international academic, professional and outreach activities, including: I am an Associate Editor with *Environmental Conservation*, an international journal of environmental science published by Cambridge University Press; I am a member of the Core Planning Committee for the 5th conference/workshop on GIS and Environmental Modeling to be held in 2003; I am a member of the International Earth Charter Drafting Team (the Earth Charter is a new international document articulating universal values and principles for sustainable living); I am a core member of the IUCN/Commission on Environmental Law (CEL) 'Working Group on Ethics and Jurisprudence', which has the aim of ensuring consistency between the Earth Charter and the IUCN draft legal covenant on environment and development; I am Theme Editor-Biodiversity for a major new publication being coordinated by UNESCO called The Encyclopedia of Life Support Systems.

Selected papers

Mackey B.G. and D.H. Lindenmayer. In press. Towards a hierarchical framework for modelling the spatial distribution of animals. *Journal of Biogeography*.

Mackey B.G., Mullen I., Sims R., Baldwin K., Gallant J. and D.W. McKenney. 2000. Towards a spatial model of boreal forest ecosystems: the role of digital terrain analysis. Chapter 16 In. *Digital terrain analysis: principles and applications*. Edited by John Wilson and John Gallant. John Wiley and Sons Inc, New York.

Mackey B.G. 1999. Comment: Environmental scientists, advocacy and the future of Earth. *Environmental Conservation* 26(4):245-249.

Mackey B.G, Lesslie R., Lindenmayer D.H, and H.A. Nix. 1999. *The role of wilderness in nature conservation*. Commonwealth Government of Australia http://www.environment.gov.au/heritage/anlr/assets/rolewild.pdf

Mackey B.G., McKenney D.W., Yang Yin-Qian, McMahon J.P and M.F. Hutchinson. 1996. Site regions revisited: a climatic analysis of Hill's site regions for the province of Ontario using a parametric method. *Canadian Journal of Forest Research* 26: 333-354.

Examples of student research theses

Lesslie, Robert. 1998. The relations between human disturbance and ecological integrity. PhD thesis.

Yung, En Chee. 1999. A comparative carbon inventory of a native forest and a pine plantation. Honours Thesis. University Medal.

Dr Mahen S. Mahendrarajah

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Natural resource & environmental economics

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Career brief

As well as being a senior lecturer in the School of Resources Environment and Society, Mahen is also a Research Associate of the Division of Economics of the Research School of Pacific and Asian Studies (RSPAS), ANU. His previous appointments include Research Fellow in Economics, RSPAS, ANU, and Senior Lecturer in Economics at Victoria University of Wellington. His research experience has also included a spell in Sri Lanka. He holds a Masters degree in agricultural development economics and a PhD in economics, both from ANU.

Research & teaching

The degradation of natural resources and environment, if unchecked, can be the single most important factor that impinges on the wellbeing of future generations. My research interests over the past few years have been concerned with optimal resource use; resource degradation issues and their mitigation such as land degradation and deforestation; the transfer of village level coconut oil extraction technology invented at the ANU for rural development, mitigation of deforestation and closing the energy cycle in the South Pacific island economies; carbon offset and biomass energy, non-market valuation; and environmental accounting and environmental macroeconomics. I teach natural resource economics, and economics of forestry and Environment

Recent supervision of graduate student research has covered areas such as economics of multiple use forest management in Victoria, incentives and mechanisms for promoting forest plantations in Australia, estimating demand for sawn timber, economics of hedgerow planting for reclamation of imperata infested lands in the Philippines, and the impact of economic reform on deforestation in Vietnam.

Selected publications

Mahendrarajah, S., Jakeman, A.J. and M. J. McAleer. Eds. 1999. *Modelling Change in Integrated Economic and Environmental Systems*, John Wiley & Sons, Chichester.

Etherington, D.M. and S. Mahendrarajah. 1998. *Economic Benefits of Direct Micro Expelling Coconut oil in the South Pacific*. Proc. of the International Cashew and Coconut Conference Topper, T. *et al.* (eds). Dar es Salaam, BioHybrids International Ltd, Reading. 457-468.

Townsend, P. and S. Mahendrarajah. 1997. The Economics of *P. radiata* Farm Forestry. In Bachelard, E.P., Brown, A.G. (eds*) Preparing for the 21st Century*. Proc of the ANZIF Conference 97 Canberra. 277-285.

Thampapillai, D.J. and S. Mahendrarajah. 1997. *Environmental Macroeconomics: Some illustrations with reference to the Indonesian Economy*. Research Report, GSE Publication 9702, Macquarie University, Sydney, 14p.

Mahendrarajah, S., Jakeman, A. J. and P.C. Young. 1996. Water supply in monsoonal Asia: Modelling and predicting small tank storage. *Ecological Modelling* 84: 127-137.

Mahendrarajah, S. 1995. Evolution of Institutions and efficiency in the Management of Common Pool Flux Water Resources. In: Tharun, G., Bautista, M., Calilung, E. and Canillas, D.B. (eds) *Experiences in the Development of Small-Scale Water Resources in Rural Areas*. Carl Duisberg Gesellschaft, South East Asia Program Office, Bangkok. 37-48.

Mahendrarajah, S. and P.G. Warr. 1993. Accounting for Environmental Resources: Land Degradation. In: *Modelling Change in Environmental Systems.* Jakeman, A.J., Beck, M.B. and McAleer, M.J. (eds). John Wiley & Sons, 557-579.

Mahendrarajah, S., Warr, P.G. and A.J. Jakeman. 1992. Optimal Extraction of Small-Scale Surface Water Storage in Asia. *Water Resources Research.* 28(5):1207-1219.

Dr Digby Race

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Career brief

Digby joined ANU Forestry in January 1998, and has over 10 years of agroforestry and farm forestry experience in Australia and overseas. His current research focus is analysing the social and economic outcomes of farm forestry for regional Australia, as a partner of the CRC for Sustainable Production Forestry. In addition, Digby has current (or recent) research contracts with the Commonwealth's Agriculture, Fisheries & Forestry – Australia (AFFA), Australian Greenhouse Office, CRC for Greenhouse Accounting, Greening Australia Ltd., Dames & Moore NRM, Murray-Darling Basin Commission and the United Nation's Food & Agriculture Organisation (FAO).

Digby is regularly invited to speak at regional, national and international forums on various aspects of farm forestry development. He has published over 40 research reports, refereed and conference papers, and other texts on various aspects of agroforestry and farm forestry. He also contributes to course development, post-graduate lecturing, and supervision of post-graduate research at ANU Forestry.

Research and teaching

Digby's main teaching contribution is as coordinator of two post-graduate courses:

Farm Forestry: Policy and practice (FSTY 6558) – which explores the policy environment for the conservation, sustainable management and restoration of farm trees and forests. This course also examines the on-farm options for delivering these outcomes. This course is delivered in partnership with Dr John Field and Prof. Peter Kanowski, as part of the new National Graduate Program in Farm Forestry – launched in February 2001.

Social Forestry (FSTY 8037) – which explores the theoretical concepts and practical applications to enrich the social dimension of forestry, particularly when forestry is pursued for community development. This course is delivered in partnership with Dr Sango Mahanty, Dr Marlène Buchy and numerous guest lecturers.

Some of Digby's recent research projects have included:

Co-Project Manager - *'Development of Evaluation Skills at the Regional Level for Commercial Farm Forestry'*, conducted with Dames & Moore NRM, Jul.1999 - Jun.2000. Commissioned by AFFA's Farm Forestry Program;

Project Manager – *'Global review of small-scale grower & forestry industry partnerships'*, Sept.1999 - Feb.2000. Commissioned by United Nation's FAO;

Consultant – *'Farm forestry feasibility study of north-west Victoria'*, May 1998 - May 1999. Conducted with Virtual Consulting Group and University of Melbourne; commissioned by Department of Natural Resources and Environment and Buloke Shire;

Project Manager - *'Development of strategies to optimise farm forestry in regional Australia'*, Mar.1995 - Jun.1997. Commissioned by Joint Venture Agroforestry Program;

Project Manager - *'Market, economic and social assessment of low rainfall carob agroforestry in the Murray Valley'*, Aug.1996-May 1997. Commissioned by Joint Venture Agroforestry Program;

Project Manager - *'Evaluation of DPIE's Farm Forestry Program'*, Jul.-Dec.1995. Commissioned by AFFA's (formerly DPIE) Forest Unit;

Co-Project Officer - *'Farm Forestry Success Stories'*, Nov.1996-Jan.1998. Commissioned by Greening Australia Ltd.

Selected publications

Race, D. 2000. *Farm Forestry in Europe and the United States: Synopsis of Field Research*. Technical Report No.30, Cooperative Research Centre for Sustainable Production Forestry: Hobart, 13 pp.

Desmond, H. and D. Race. 2000. *Global survey and analytical framework for forestry out-grower arrangements*. Final Report submitted to the Food and Agriculture Organisation (FAO) of the United Nations: Rome, Italy. 54 pp.

Race, D. and M. Buchy. 1999. A role for community participation in Australian forest management? Rural Society, 9 (2): 405-419.

Race, D. 1999. Regional farm forestry industries: Potential dimensions and possible outcomes. Australian Forestry, 62 (2): 182-192.

Race, D. and A. Curtis. 1999. Farm forestry in Australia: Improving links between small-scale growers and industry. Journal of Sustainable Agriculture, 13 (4): 67-86.

Race, D., Curtis, A. and B. Booth. 1999. Carob agroforestry industry: An assessment of its potential for the low-medium rainfall Murray Valley region. Australian Journal of Experimental Agriculture, 39 (3): 325-334.

Race, D. and L. Robins. 1998. Farm forestry in Australia: Research and policy update. Report for National Research Working Group 11 (Farm Forestry) and Rural Industries Research and Development Corporation: Canberra, ACT. 38 pp.

Curtis, A., Robertson, A. and D. Race. 1998 Lessons from recent evaluations of natural resource management programs in Australia. Australian Journal of Environmental Management, 5 (2): 109-119.

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Career brief

Susan was raised on a farm in the mallee country of south-western Australia. She started studies as a biology and English teacher at the Western Australian Secondary Teacher's College, but abandoned that in favour of nursing. Two years after qualifying as a nurse she returned to teacher's college, completed the teaching qualification, and spent the next three years as an Assistant Lecturer at the School of Nursing, Edith Cowan University. Unable to quell the need to work with animals any longer she went back to full time studies, and completed a BSc in biology at Murdoch University (1990). Honours followed with a study of dolphin behaviour; then a 6 year field-based PhD investigating the ecology of the marsupial brushtailed phascogale. Much of the next two years were spent in Africa; firstly studying vervet monkeys in South Africa, then assisting with research on bats, rats, and seals, and later traversing the national parks of several countries as a wildlife author for the guidebook company Lonely Planet. She joined the academic staff at ANU in March of this year.

Research and teaching

While my past research has focussed on wildlife, particularly mammals, such work has led to a broader interest in ecology and conservation. The past and current impacts of forest and land management practises on hollow-dependent fauna were an intergral part of my research. Presently my interests lie in developing a better understanding of the ecological constraints that govern animal behaviour and biology in relation to threatening processes. My current priority is to publish my work to date, and to encourage study of the little-known brushtailed phascogale. Five of seven 'manuscripts' submitted in 2001 are now 'In Press' or published (two books, two journal papers, one report), and in July I delivered a paper at the annual Mammal Society Conference in Brisbane. Nestbox-based surveys for phascogales are being conducted in the ACT and I have provided assistance to Environment Australia staff, and undertaken a consultancy for the NSW National Parks and Wildlife Society. I am currently coordinating and teaching landscape ecology.

Selected Publications

Andrew, D. and S.G. Rhind. 2001. 'Watching Wildlife: East Africa'. Lonely Planet Publications. Melbourne. Victoria.

Rhind, S.G., Bradley, J. S. and N. K. Cooper. In Press. Morphometric variation and taxonomic status of brush-tailed phascogales, *Phascogale tapoatafa* (Meyer 1793)(Marsupialia: Dasyuridae). *Australian Journal of Zoology*.

Spencer P. B. S., Rhind S. G. and M. D. B. Eldridge. In Press. Phylogeographic structure within Phascogale, (Marsupialia: Dasyuridae) based on partial cytochrome b sequence. *Australian Journal of Zoology.*

Hunter, L. and S.G. Rhind. In Press. 'Watching Wildlife: Southern Africa'. Lonely Planet Publications. Melbourne. Victoria.

Rhind, S.G. & O. Nichols. 2001. A nestbox survey for brushtailed phascogales in the northern jarrah forest: results and implications. Internal report; Alcoa Ltd.

F. Scarff, S.G. Rhind, and J. S. Bradley. 1998. Diet and foraging behaviour of brush-tailed phascogales (*Phascogale tapoatafa*) in jarrah forest of south-western Australia. *Wildlife Research* 25: 511-26

Rhind, S.G. 1996. Habitat tree requirements and the effects of removal during logging on the marsupial Brush-tailed Phascogale (*Phascogale tapoatafa*) in Western Australia. *The Western Australian Naturalist* 21 (1): 1-22

Dr Mick Tanton

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Career brief

After completing undergraduate and postgraduate studies in the Department of Zoology and Applied Entomology, Imperial College, London Mick worked from 1960 to 1965 with the British Nature Conservancy, in the Woodland Research Section at the Monks Wood Experimental Station, Huntingdonshire. He studied mainly populations of the Bank Vole and Wood Mouse. In 1965 he joined the Department of Forestry, ANU, to lecture in forest entomology, since which time his interests have broadened considerably to include all areas of forest zoology and ecology. Retires at the end of 2001.

Research & teaching

Courses taught at first year to third year level include Forest Entomology, Meteorology, Introductory Statistics, Resource Biology, Issues in Environmental Management, Forest Ecology, Wildlife Measurement, Forests and Woodlands, Biodiversity Assessment, and Wildlife Management.

For many years a Faculty Subdean for undergraduates in the Forestry Department, for the past 5 years has been Convenor for the Graduate Program in Resource Management and Environmental Science.

Research includes integrated management of forest insect pests, forest wildlife management and conservation, and environmental impact assessment in terms of wildlife. The publications listed below give an indication of the range of research.

Selected publications & student theses

Mo, J.H., Tanton, M.T. and F.L. Bygrave. 1997. Within-tree distribution of attack by *Hypsipyla robusta* Moore (Lepidoptera: Pyralidae) in Australian Red Cedar (*Toona australis* F. Muell.) Harmes). *Forest Management and Ecology* 96: 147-154.

Tanton, M.T. 1996. *Murwillumbah Management Area: Proposed Forestry Operations - Environmental Impact Statement.* Volume C, Fauna Appendix, State Forests of New South Wales, Sydney. 619 pp.

Rishworth, C., McIlroy, J.C. and M.T. Tanton. 1995. Factors affecting population densities of the Common Wombat, *Vombatus ursinus*, in plantations of *Pinus radiata*. *Forest Ecology and Management* 76: 11-19.

Lindenmayer, D.B., Tanton, M.T. and K.L. Viggers. 1994. Fur-inhabiting ectoparasites of Leadbeater's Possum *Gymnobelideus leadbeateri* (Marsupialia: Petauridae). *Australian Mammalogy* 17: 109-111.

Claridge, A.W., Cunningham, R.B., Tanton, M.T. and I.D. Moore. 1993. Foraging patterns of the Long-nosed Potoroo (*Potorous tridactylus*) for hypogeal fungi in mixed species and regrowth eucalypt forest stands in south-eastern Australia. *Forest Ecology and Management* 61: 75-90.

Claridge, A.W., Tanton, M.T. and Cunningham, R.B. (1993). Hypogeal fungi in the diet of the Long-nosed Potoroo (*Potorous tridactylus*) in mixed-species and regrowth eucalypt forest stands in south-eastern Australia. *Wildlife Research* 20: 321-337.

Lindenmayer, D.B., Tanton, M.T. and T.W. Norton. 1992. *Identification of forest habitats for possums and gliders in Central Victoria.* Panther, Canberra, 47 pp. ISBN 0 85926 005 4.

Bugg, A.L. 1995. Brush-tailed Rock-wallaby *Petrogale penicillata* habitat assessment using spatial analysis: the application of Geographic Information Systems and Remote Sensing to wildlife survey and management. (Honours thesis).

Connolly, A. 1995. Past and future refuge for the Brush-tailed Rock-wallaby (*Petrogale penicillata*) in the southern ACT. (Honours thesis).

Claridge, A. W. 1993. Hypogeal fungi as a food resource for wildlife in the managed forests of south-eastern Australia. (PhD thesis).

Gichora, M. W. 1992. The significance of fungal decay of *Eucalyptus regnans* F. Muell. Heartwood for some aspects of the biology of *Coptotermes lacteus* (Froggatt) (MSc thesis).

Kavanagh, R. P. 1987. Floristic and phenological characteristics of a eucalypt forest in relation to its use by arboreal marsupials. (MSc thesis).

Epila. J.S.O 1978. Interaction of *Paropsis atomaria* Ol., larval parasites and insecticides. (PhD thesis)

Dr Chris Tidemann

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Wildlife conservation through adaptive management and sustainable use

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Career brief

Chris was awarded a BSc from Adelaide University in 1969 and a Diploma of Education in 1970, and a PhD from ANU in 1986. Chris is a member of the ACT Government's Flora and Fauna Committee and of three of IUCN's (World Conservation Union) Specialist Groups: Bats, Sustainable Use of Wildlife and Invasive Species. Chris has been on the academic staff of the Department since 1987.

Research & teaching

Two current research projects are (i) optimisation of biodiversity in suburban areas by development of safe, humane and effective technologies for controlling feral birds and mammals and (ii) development of sustainable technologies for managing native wildlife, e.g. minimisation of kangaroo and wombat roadkills and prevention of browsing damage by kangaroos. A complementary research theme is the devolvement of simple, reliable estimators of biodiversity to assist community groups generate solutions to environmental management problems. Teaching areas include biodiversity assessment and monitoring, wildlife management and conservation and conservation of natural resources through sustainable use.

Selected publications

Vardon, M.J., Brocklehurst, P.S., Woinarski, J.C.Z., Cunningham, R.B., Donnelly, C.F. and C.R. Tidemann. 2001. Seasonal habitat use by flying-foxes, *Pteropus alecto* and *P. scapulatus* (Megachiroptera), in monsoonal Australia. Journal of Zoology, London 253: 523-335.

Vardon, M.J. and Tidemann, C.R. 2000. The black flying-fox (*Pteropus alecto*) in north Australia: juvenile mortality and longevity. *Australian Journal of Zoology* 48: 91-97.

Tidemann, C.R. 1999. Biology and management of the Grey-headed Flying-fox, *Pteropus poliocephalus. Acta Chiroterologica* 1: 151-164.

Pell, A.S. and C.R. Tidemann. 1997. The impact of two exotic hollow-nesting birds on two native parrots in savannah woodland in eastern Australia. *Biological Conservation* 79: 145-153.

Tidemann, C.R., Kelson, S.L. and G. Jamieson. 1997. Flying-fox damage to orchard fruit in Australia - incidence, extent and economic impact. *Australian Biologist* 10: 179-186.

Tidemann, C.R. and M.J Vardon. 1997. Pests, pestilence, pollen and protein: the need for community-based management of flying-foxes in Australia. *Australian Biologist* 77-83.

Er, K.B.H. and C.R. Tidemann. 1996. Importance of yellow box-Blakely's red gum woodland remnants in maintaining bird species diversity: inferences from seasonal data. *Corella* 20: 117-128.

Webb, N.J. and C.R. Tidemann. 1996. Mobility of Australian flying-foxes, Pteropus spp. (Megachiroptera): evidence from genetic variation. *Proceedings of the Royal Society of London* B 263: 497-502.

Tidemann, C.R., Yorkston, H.D. and A.J. Russack. 1994. The diet of cats, Felis catus, on Christmas Island, Indian Ocean. *Wildlife Research* 21: 279-286.

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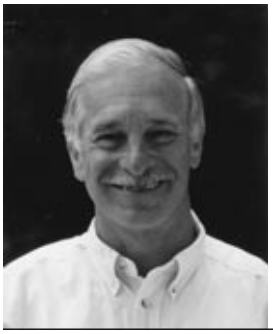

Dr Brian Turner

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Career brief

Brian's career in forestry started with the NSW Forestry Commission on the North Coast and in Sydney. During that period, he went to Yale University in the USA to gain Master and Doctor of Forestry degrees. In 1969, he started teaching and research at the Pennsylvania State University, and returned to Australia in 1984 to take up his current position.

Research & teaching

My interests range over the broad field of forest management planning, including models for prediction of future production of goods and services from managed native forests to techniques for collecting and analysing GIS and remotely sensed data. Current research projects include:

Remote Sensing: Research here is increasingly concentrating on the spectral characteristics of tree components (leaves, branches, bark, understorey) to gain a better understanding of the reflectance patterns collected by airborne and satellite sensors. The ultimate goal is for improved forest pattern recognition through intelligent analysis of hyperspectral data.

Large-scale Planning Models for Native Forests: Research is continuing in the use of large-scale optimisation models such as the US Forest Service's Spectrum to predict the long-term growth of native forests managed for the sustained production of a wide range of goods and services.

Modelling Growth of Native Forests: A constraint on the building of some planning models is the lack of growth models, particularly for uneven-aged forest stands. Through a variety of tools including dynamical models, dynamic programming and GIS, we are beginning to address this need despite a lack of long-term growth measurements. This interest extends to the estimation of carbon in such forests.

My primary teaching role is in three final year courses: Resource Management, Forest Planning and Regional Forestry.

Selected publications & student theses

Dury, S.J., Jia, X., and B.J. Turner. 2000. From leaf to canopy: determination of nitrogen concentration of eucalypt tree foliage using HyMap image data. *Proceedings of 10th Australasian Remote Sensing and Photogrammetry Conference, Adelaide, Australia,* CD, Paper No.5, pp. 875-891.

Chikumbo, O., Mareels, I. M. Y., and B. J. Turner. 2000. A stand optimization model developed from dynamical models for determining thinning strategies. In: Vasievich,, J.M., Fried, J.S., Leefers, L.A. (Eds.) *Seventh Symposium on Systems Analysis in Forest Resources; 1997;* Traverse City, MI. USDA For. Serv. Gen. Tech. Rep. NC-205. Pp. 355-360.

Chikumbo, O., Mareels, I. M. Y., and B. J. Turner. 1999. Predicting stand basal area in thined [sic] stands using a dynamical model. *Forest Ecology & Management* 116: 175-187.

Wood, G.B., Turner, B. J. and C. L. Brack, (Eds). 1999. *Code of Forest Mensuration Practice.* Aust. Forestry Council Research Working Group #2. 62 pp.

Turner, B., Wells, K., Bauhus, J., Carey, G., Brack, C., and P. Kanowski. 1999. *Woody Biomass: Methods for Estimating Change.* National Carbon Accounting System (Aust. Greenhouse Office) Tech. Report 3. 38pp.

Turner, B.J. 1998. An appraisal of methods and data used by CALM to estimate wood resource yields for the Southwest RFA Region of Western Australia. Commonwealth & WA RFA Steering Committee.

Turner, B.J., Dibley, G.J. and S.J. Dury. 1998. Hyperspectral characteristics of Australian native eucalypt forests, In: Schaepman, M., Schlapfer, D. and Itten, K. (eds.) *1st EARSeL Workshop on Imaging Spectroscopy*, University of Zurich, Switzerland, 6-8 October 1998, pp.317-330.

Chikumbo, O. 1997. Applicability of dynamical modelling and theoretical control methods in tree growth prediction and planning. (PhD thesis).

Avila, R. B. A. 1996. Transformative contest: the state, civil society and the environment. (PhD thesis).

Alimohammadi, A. 1995. Probabilistic modelling of stability and resolution of thematic classes from remotely sensed and digital terrain data. (PhD thesis).

Long, Y. 1995. Integrating satellite and ancillary data to predict site quality. (PhD thesis).

Dr Peter van Diermen

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Career brief

Peter's early academic studies were in economics and education at the University of Adelaide. After teaching high school in Australia and New Zealand, Peter went on to complete a Masters degree in development studies from Flinders University and a PhD in economic geography from ANU. From 1989 to 1992 he taught at the Centre for Development Studies at Flinders University and from 1995 to 1998 he was a staff member of the Institute of Development Studies at Massey University. Since 1998, he has been a staff member of the Geography Department at ANU.

Research and teaching

My research is in the field of Economic Geography & Development Studies. Major themes include industrial development & employment in Developing Countries. Research topics include the informal sector, small-scale enterprises, local/global economic relations, entrepreneurship, circular migration and rural-urban links. These topics have been primarily explored in Southeast Asia. Most recently I have worked in Indonesia, Thailand, Singapore and Sri Lanka.

My teaching is directly related to my research. I teach a course on the geography of Southeast Asia and also a course on population and resources. Every second year I coordinate a four-week fieldwork course in Southeast Asia for ANU students.

I continue to do extensive fieldwork and research on relevant regional issues by doing short-term consultancies for multilateral agencies such as the World Bank and the Asian Development Bank.

Currently I'm also Convenor of the Graduate Program in Geographical Sciences.

Selected Publications

van Diermen, P. and G. Azmat. 2001 (forthcoming). Cottage and Small Firm "Presence" in Indonesia manufacturing between 1975-1996, *Small Business Economics*.

Manning, C. and P. van Diermen. (eds.) 2000. *Indonesia in Transition: Social Aspects of Reformasi and Crisis*, Singapore: ISEAS/ London: Zed Books. ISBN 981 230 093 7.

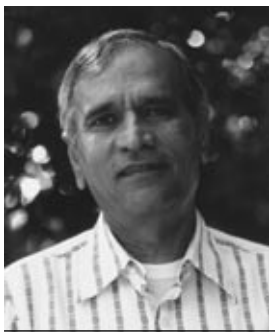
van Diermen, P. (ed.) 2000. *SME Policies in Indonesia: A New Direction*. Manila: The Asian Development Bank.

van Diermen, P. 1998. 'Global patterns of production and Industrial Organization of Small Family Businesses in Jakarta', in *Malaysia Journal of Tropical Geography*, Vol. 29, No.1, pp. 39-52.

van Diermen, P. 1997. *Small Business in Indonesia*. London: Ashgate. ISBN 1 85972 592 9.

van Diermen, P. 1997. 'Labor Remuneration in Jakarta's Small Enterprises: Exploitative or Equitable?' *World Development,* Vol. 25, No. 12, pp. 2129-2141.

van Diermen, P. 1997. 'Is Small Beautiful? The Environmental Impact of Small-Scale Production' in *Development Bulletin,* Vol. 41, April, pp.28-31.



Dr U.N. Bhati

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Career brief

U.N. Bhati's formal education is in agriculture and economics, and he has taught and carried out research in these subjects in India, Malaysia and Australia.

About twelve years ago, while at the Australian Bureau of Agricultural and Resource Economics (ABARE), he had a chance encounter with forestry economics and marketing. He quickly found them to be professionally both challenging and satisfying subjects. Since then, U.N. has become hooked on these topics. He has done some teaching but most of his time has gone into research on subjects such as forestry market outlook, forest plantations and farm forestry. He has written articles, conference papers, consultancy reports, inquiry submissions and monographs.

Research

Currently, I am devoting most of my time to the ANU Forestry Market Report project, which started in June 1997. It has the objectives of preparing and disseminating nationally a high quality quarterly market report on forest products and inputs for Australian forest growers. The market reports are primary for small scale growers.

By March 2001, market reports have been completed on 15 topics eg : stumpage trends in South Australia; Japanese woodchip import market; Carbon credited markets; Market trends in the 1990s; Market for forest products in South Korea; Trends in sawnwood market; Cost of log transport; Log exports; Cost of tree seedlings and cuttings; Log and agricultural product prices beyond 2000; Structural timber prices.

Forestry and agricultural newsletters, magazines and web sites have published these reports. They are available on the ANU Forestry web site: http://www.anu.edu.au/forestry/info/marketreport/index.html.

Selected publications

Dargavel, J., Conley, K., Proctor, W., Ferguson, I. and U.N. Bhati. 1999. *Direct and Indirect Employment in the Forest Sector and Forest Sector Employment as a Proportion of Total Employment*, Montreal Process Project 6.5a, Final Report, School of Forestry and Resource Conservation, The University of Melbourne, January.

Bhati, U.N., Mahendrarajah, S. and P.D. Evans. 1998. *Australian woodchip export markets*. In Dyason, R., Dyason, L. and Garsden, R. (eds), Plantation and Regrowth Forestry: A Diversity of Opportunity, Australian Forest Growers Biennial Conference Proceedings, 6–9 July, Lismore NSW, pp. 177–88.

Shand, R. and U.N. Bhati. 1997. *Nepal: Economic Profiles in South Asia*, Australia South Asia Research Centre, Research School of Pacific and Asian Studies, Australian National University, Canberra, July.

Bhati, U.N., Hafi, A., Hooper, S., and L. Stanford. 1996. *Papaya Fruit Fly: Cost-benefit Analysis of the Proposed Eradication Campaign*, ABARE project 1380, an ABARE consultancy report to the Australian Quarantine and Inspection Service, Canberra, February.

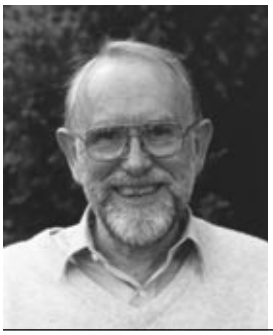
Wilson, S., Whitham, J., Bhati, U.N. and Y. Tran. 1995. *Trees on Farms: Survey of Trees on Australian Farms, 1993-94*, ABARE Research Report 95.7, Canberra.

Bhati, U.N. and J. Whitham. 1994. 'Farm forestry in Australia', in ABARE *Quarterly Forest Products Statistics*, September quarter, 1–3.

Bhati, U.N. and R. Rose. 1992. *Prospects for Australia's wood based industry: Effects of some microeconomic policy reforms*. ABARE Conference Paper 92.22 presented at 'Australia's Timber and Forest Industry: A Strategy for the Future' Conference, Sydney, 28–29 May.

Bhati, U.N., Klijn, N., Curtotti, R., Dean, M. and M. Stephens. 1991. *Financial mechanisms for and structural impediments to the development of commercial plantations*. ABARE consultancy report to the National Plantations Advisory Committee, Canberra, May.

O'Regan, M. and U.N. Bhati. 1991. *Pricing and Allocation of Logs in Australia*, ABARE Discussion Paper 91.7, AGPS, Canberra.



Dr John Dargavel

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Forest history & forest policy

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Career brief

John has degrees from the Universities of Edinburgh and Melbourne and from the Australian National University, as well as having undertaken research in the University of Georgia. He has worked in the forest service in South Australia and for twenty years in Victoria as an industrial forester mainly concerned with management planning. He has lectured on forest economics, resource and management planning in the Department of Forestry, and has researched issues of forest policy as a Fellow in the Centre for Resource and Environmental Studies. On retirement, he was appointed a Visiting Fellow, first in the Research School of Social Sciences, and currently jointly in the Department of Forestry and the Centre for Resource and Environmental Studies. He is President of the Australian Forest History Society.

Research

My research interests lie in forest history and in the political economy of the forest sector. I have written extensively and critically on forest policy, the Regional Forest Agreement process, environmental conflicts and employment. A large part of my academic life has been concerned with convening groups of people with different perspectives and disciplines concerned with policy and history. In 1999 I researched the history of the Avenues of Honour and Remembrance planted in Australia after several wars and sought to interpret that history in terms of both personal grief and national identity.

A consortium of people at ANU, Macquarie University and the Australian Forest History Society arranged the *Perfumed Pineries* conference on the history of the white pine (*Callitris*) region in NSW and Queensland. It was held on Coonabarabran in November 2000 and embraced themes of Indigenous use, fire and biodiversity, climatic and other events, public history and heritage, ecological science, use, abuse and management, and values and social identification. My own contribution was on the history of forest planning. The proceedings are now published by CRES.

I am also concerned with the history of ideas in forestry and their relation to the changing political economy of different countries.

Selected publications

Dargavel, J., Hart, D. and B. Libbis. (eds) 2001. *Perfumed pineries: environmental history of Australia's Calitris forests*. Canberra: Centre for Resource and Environmental Studies, the Australian National University.

Dargavel, J., Proctor, W. and P. Kanowski. 2000. Conflict and agreement in Australian forests. in Luca Tacconi (ed) *Biodiversity and Ecological Economics: Participation, Values, and Resource Management*. Earthscan Publications, UK and USA: 101-15.

Dargavel, J. 2000. More to grief than granite: arboreal remembrance in Australia. *Journal of Australian Studies* 64: 187-95.

Dargavel, J. 2000. In the wood of neglect. in M. Agnoletti and S. Anderson (eds) *Forest history: International studies on socio-economic and forest ecosystem change*. Wallingford: CABI Publishing, pp. 264-77.

Dargavel, J. and B. Libbis (eds). 1999. *Australia's ever-changing forests IV Proceedings of the fourth national conference on Australian forest history*. Canberra: Centre for Resource and Environmental Studies, The Australian National University.

Dargavel, J. 1999. Trees age and memories change in the Avenues of Honour and Remembrance. In J. Dargavel and B. Libbis (eds*). Australia's ever-changing forests IV*.

Dr Ross Florence

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Ecology & silviculture of eucalypt forests; forest policy & planning

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Career brief

Ross graduated in 1952 (Queensland University, Australian Forestry School) and joined the Queensland Department of Forestry as a research forester, concerned mainly with native forest silviculture. He was appointed to the Department of Forestry, ANU in 1965 where his main teaching and research interests have been in the ecology and silviculture of eucalypt forests, and forest policy and planning. Ross retired in 1995 and was appointed a Visiting Fellow.

Research

I am the author of *Ecology and Silviculture of Eucalypt Forests*. I see the eucalypt forests and woodlands as a fascinating response to environmental stresses associated with continental drift. Present-day species and community patterns are seen in terms of the progressive adaptation of the eucalypt progenitor(s) to declining soil nutrient and water status. Adaptation to a dry environment is particularly remarkable given that the eucalypt remains a mesophyte - albeit a drought tolerant mesophyte. An appreciation of the evolutionary history and physiological attributes of the eucalypt should provide a salutory lesson for the forester: ecologically sustainable forest management must be based on an appreciation of natural community patterns and structures, and the consequences for stand dynamics and health of departing too far from these patterns and structures.

My teaching in areas of policy and planning, and many submissions on these matters to conferences and inquiries, have long focused on the essential need for Australian forestry to adapt to changing social circumstances, and particularly, to develop more environmentally sensitive approaches to native forest management. We are seeing movement in the direction but there remains quite some way to go.

Selected publications

Florence, R.G. 1996. *Ecology and Silviculture of Eucalypt Forests*. CSIRO Australia 413pp.

Florence, R.G. 1994. The ecological basis of forest fire management in NSW. In *The Burning Continent: Forest Ecosystems and Fire Management.* Current Issues. Institute of Public Affairs, Perth. pp.15-33

Florence, R.G. 1993. Forestry in transition in Australia: from the primacy of wood production to ecologically sustainable development. *Commonwealth Forestry Review* 72: 321-337.

Florence, R.G. 1991 Planning for sustainable development. In *Directions in Forestry: Costs and Benefits of Change* (Whyte, A. and J. Allen, eds), ANZIF Conference, Christchurch, N.Z. pp.173-181.

Dr Ann Gibson

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Tree physiology

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Career brief

Ann joined the Botany Department, ANU, as part-time demonstrator in 1961, after graduating BSc(Agr) Hons from the University of Sydney, and obtained her Dip.Ed. in Tertiary Method there before moving to the Secondary level. Through the 70s she was invoved in school-based curriculum development and in the writing of science for children. Currently she reviews information books for the Children's Book Council. She returned to the ANU in 1982 as a Ph.D. student interested in the adaptations of eucalypts to difficult situations. She has contributed to ACIAR projects concerning the use of eucalypts and acacias, acting as a project scientist and project reviewer.

Research and teaching

The aim of my research is to identify and understand the physiological mechanisms by which different provenances of River Red Gum and Coolibah survive and grow in the wide range of conditions in which both these wide spread, fast-growing riverine species have evolved. My particular interest is in their water-use efficiency. I have taught botany, dendrology and tree physiology to undergraduates and

become a mentor to some of those in need of special care and I have provided study skills support to graduate students, particularly those from non English speaking backgrounds, as well as supervising research students in physiology - work I now relinquish in order to return to research.

Selected publications & student theses

Tuomela, K, Koskela, J. and A. Gibson (in press). Relationships between growth, specific leaf area and water use in six populations of *Eucalyptus microtheca* from two climates grown in controlled conditions.Australian Forestry

Gibson, A., Bachelard, E.P. and K.T. Hubick 1995. Relationship between climatic and provenance variation in *Eucalyptus camaldulensis Denhn*. Australian Journal of Plant Physiology 22:453-60.

Franks, P.J., Gibson, A. and E.P. Bachelard. 1995 Xylem permeability and embolism susceptibility in seedlings of *Eucalyptus camaldulensis Dehnh*. from two different climatic zones. Australian Journal of Plant Physiology 22:15-21.

Sardabi, H. 1998. An investigation of the relationship between penetration resistance, soil physical properties and the growth of selected tree species (PhD thesis).

Egerton,J.J.G. 1999. Effect of reduced light during autumn and winter on snow gum seedling establishment (MSc thesis).

Ochieng, E. O. 2001. Comparative responses to drought and salinity in three provenances of *Acacia holosericea* (MPhil thesis).

Dr Madan K. Gautam

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Biophysical aspects of agroforestry management
Community forestry planning and management

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Career brief

Madan was born in Nepal, where he completed his first degree in BSc (tropical forest management). In 1991, he completed a Masters in Environmental Forestry from University of Wales, UK specialising in Indigenous Ecological and Silvicultural Knowledge in Community Forest Management. Later, he completed an PhD at Lincoln University, NZ, specialising in Biophysical Aspects of Agroforestry. His study specifically focused on tree and pasture interaction for soil moisture, temperature and below ground space for root competition. In addition during his study, he was also involved as a teaching assistant in soil nutrients, and ecophysiology.

During his career he has worked with the Nepal-UK Research Project, Nepal-Australia Community Forestry Project, USAID/Nepal, and with Agricultural Extension and Rural Development Department, Reading University, UK. In addition, he has worked as a consultant for IFAD/ Nepal, FAO/Thailand, UNDP/India and Nepal. After completion of his PhD, he was working as a postgraduate tutor in Soil, Plant and Ecological Sciences Division, Lincoln University, NZ.

He has currently completed an assignment with UNOPS/ Malaysia where he was a pioneer in developing methodology and conducting pilot studies for social impact assessment in the rural poverty alleviation program for six countries in the South Asia. Part of this study became his thesis for an MA Sociology in University of Canterbury, NZ.

Research

His current research projects focus on problems which have been encountered in managing farm forestry in Australia. He is involved in on-going research on (a) Effect of magnesium in Pinus radiata, (b) Effect of tree roots on soil properties (c) Alteration of soil pH and Pinus radiata growth, and (d) Management of tree lucerne (Chamaecytisus proliferus subsp. palmensis) for farm forestry.

In addition to the above, he has extensive experience and interests in community forestry, the methodology of development of project management, i.e. participatory planning, social impact assessment, indigenous forest management, and RRA/PRA (rapid/participatory rural appraisals) in poverty alleviation and rural development.

Selected Publications

Gautam, M.K. 2000. Social impact assessment of South Asia Poverty Alleviation Program: Nepal Syanja a pilot study .Impact Assessment Technical Report. SAPAP/UNDP/ UNOPS / RAS – 96-600 United Nations Office for Project Services, PO Box 13673, Kuala Lumpur – 50818, Malaysia, September 2000.

Gautam, M.K. 2000. Root system variation in *Pinus radiata* clones: experimental study under semi-dry temperate sylvopastoral ecosystem in New Zealand. Forest and Farm Plantation Management Cooperative, New Zealand Forest Research Institute/Industry Research Cooperatives, Technical Report pp34.

Gautam, M.K., Mead, D., Frampton, C., and S. Chang. 1999. Coarse root system characteristics and toppling of clonal and seedling trees of *Pinus radiata* on Canterbury Plains. New Zealand Journal of Forestry 44 (1):15-18.

Gill K, Gautam, M.K. and B. Suwal. 1999. Agroforestry technical review. Hills Leasehold Forestry and Fodder Development Project, Nepal, United Nations Office for Project Services, PO Box 13673, Kuala Lumpur – 50818, Malaysia.

Gautam, M.K. 1998. Rooting characteristics of *Pinus radiata* as influenced by understorey competition in an agroforestry ecosystem. PhD thesis, Lincoln University, New Zealand.

Gautam, M.K. 1996. Review of tree root studies. Forest and Farm Plantation Management Cooperative, New Zealand Forest Research Institute/Industry Research Cooperatives, Review paper No. 30.

Gautam, M.K. 1992. Agroforestry Appraisal with Multipurpose Tree and Shrub Species for Community Forestry Plantation. A four year project planning prepared for Nepal-Australia Community Forestry Project, c/o ANUTEC Pty Ltd, PO Box 4, Canberra, ACT, Australia.

Gautam, M.K. 1990. Indigenous knowledge on community forest management of natural woodlands of the middle hills of Nepal: case study. MSc Thesis, University of Wales, UK.

Shrestha, R. and M.K. Gautam. 1989. Pre-germination seed treatment of Bhimal (*Grevillia robusta*). Technical paper 4/89, pp8. Lumle Agricultural Research Centre, c/o British Embassy, PO Box 106, Kathmandu, Nepal (also in CAB abstract).

Sthapit B.; Gautam, M.K. Gale N. and D. Gurung. 1988. Traditional systems of soil fertility management in the lower hills of Nepal: Discussion paper 12/87, Soil Fertility Thrust, Lumle Agricultural Research Centre, c/o British Embassy, PO Box 106, Kathmandu, Nepal. (also in CAB abstract).

Gautam, M.K. 1986. *Effect of ectomycorrhizal inoculation in Eucalyptus camaldulensis seedlings*. Honours dissertation paper submitted for BSc Forestry, Tribhuvan University, Nepal.

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Career brief

Roger grew up on a dairy farm in Jarrah-Karri timber country near Margaret River, Western Australia, and left school at 14 years of age. He joined the RAAF and spent the following 12 years on various airforce stations in Australia and south-east Asia. He was awarded the Australian Service Medal for one year of duties on the US airbase at Ubon during the Vietnam War. After discharge from the RAAF in 1968, Roger came to Canberra to work as an electronics technician at the Satellite Tracking Station at Orroral Valley. While employed tracking satellites, he studied part-time and obtained a Degree in Applied Science, a Graduate Diploma in Resource Management, and a Graduate Diploma in Electronics from CCAE (now University of Canberra). On the closure of the Tracking Station in 1983, he commenced employment as a Technical Officer at the ANU's SEM Unit which was at that time, located in the Forestry Engineering Wing. In 1991, he began part-time research on the wood anatomy of *Callitris* (cypress pine) using electron microscopy, for which he was awarded a PhD in 1997.

Roger is currently employed full-time as a senior technical officer at the ANU Electron Microscopy Unit, located in the Research School of Biological Sciences and is a Departmental Visitor in the Forestry Department.

Research & teaching

I am often the first point of contact for ANU staff and postgraduate students wishing to make use of the facilities of the Electron Microscopy Unit for their research. The Unit offers a range of imaging and analysis techniques: transmission and scanning electron microscopy, light microscopy, and x-ray analysis (EDXA). I give assistance to those wishing to use these facilities, provide help with specimen preparation, and initialise and operate equipment for specific tasks. I am conversant with the cryogenic techniques required for EM investigations of delicate biological specimens such as leaves and flowers.

My main interest is in the use of scanning electron microscopy (SEM) for the study of wood anatomy. I find that SEM is ideally suited to this application and there is ample scope for high-resolution microscopy studies of the wood of many Australian species. I am particularly interested in the wood anatomy of *Callitris*.

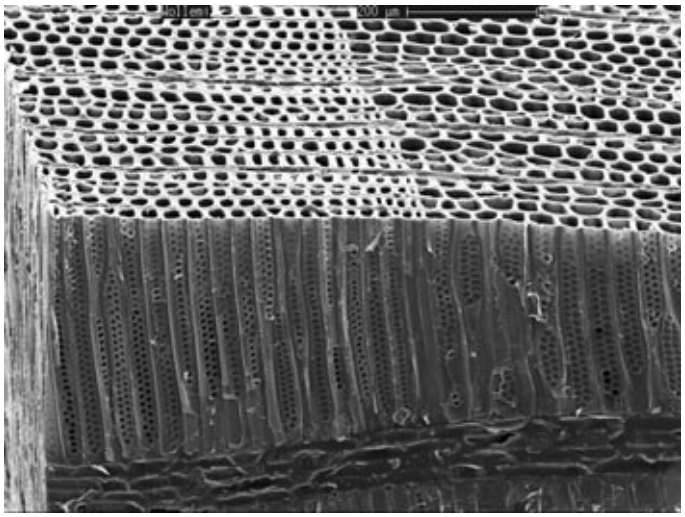
During the past year I assisted several post-graduate Forestry students with research involving electron microscopy. I refereed two papers relating to wood anatomy for a scientific journal. I presented a paper entitled "A history of the wood anatomy of Callitris" at the Conference on the environmental history of Australia's cypress pine at Coonabarabran in November 2000. In February 2001 I began a major research study of the wood anatomy of Wollemi pine.

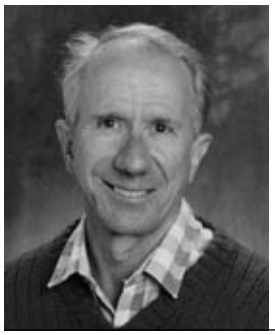
Selected publications

Heady, R.D. and P.D. Evans. 2000. Callitroid thickening in *Callitris*. IAWA Journal 21(3):293-319.

Ride, W.D.L., Pridmore, P.A., Barwick, R.E., Wells, R.T. and R.D. Heady. 1997. Towards a Biology of *Propleopus oscillans* (Marsupialia: Propleopinae, Hypsiprymnodontidae). Proc Linn. Soc. NSW., 117:243-328.

Heady, R.D., Cunningham, R.B., Donnelly, C.F. and P.D. Evans. 1994. Morphology of warts in the tracheids of cypress pine (*Callitris* Vent.). *IAWA Journal* 15(3):265-281.





Dr Joe Landsberg

Visiting Fellow
Environmental physiology, forest modelling

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Career brief

Joe Landsberg was born in Africa, in the country then called Rhodesia – now Zimbabwe. He has a first class honours degree in agriculture, and a Masters degree, from the University of Natal, worked in agricultural research in Rhodesia and in Natal. From there Joe's interests in micrometeorology and environmental physiology led to the University of Aberdeen, Scotland, to work on exchange processes and physiology of Sitka spruce. After three years in Aberdeen he became head of the Micrometeorology Section at Long Ashton Research Station, near Bristol. Joe obtained his Ph.D from the University of Bristol for a thesis on orchard microclimate and its effects on the growth of apple trees in 1974. Team leadership and collaborative work with European groups in horticulture and forestry during 10 years at Long Ashton led to his appointment as Chief of CSIRO's (then) Division of Forest Research in Canberra in 1981.

Joe completed his term as Divisional Chief in 1988, was Director, Natural Resources Management, in the Murray-Darling Basin Commission, and then worked in NASA headquarters in Washington DC, on the BOREAS (land-atmosphere interaction) project carried out in Canada. Joe returned to CSIRO in mid 1994 and from then until his retirement from CSIRO at the end of 1998 worked in the Centre for Environmental Mechanics.

Research

My research interests have been mainly in tree growth and environmental physiology, with a strong move in recent years towards process-based modelling. I am also interested in the use of remote sensing as a tool for the assessment of forest biomass and growth rates.

I am a strong believer in the value of multi-disciplinary research (including modelling) aimed at producing the knowledge needed to predict the responses of (forest) ecosystems to change and disturbance. I am also much concerned with the application of scientific knowledge by managers and the use of process-based models as operational tools. There are very few instances of this around the world; probably the only way it will happen in forestry is by introducing training in the development, use and evaluation of such models into the curricula of forestry schools. The fact that this is happening at the ANU is very encouraging.

Selected publications

Makela, A and J. Landsberg (Eds). 2000. Process-Based Models for Forest Management. *Tree Physiology* 20(5/6) 289-419.

Makela, A., Landsberg, J., Ek, A.R., Burk, T.E., Ter-Mikaelian, M., Agren, G.I., Oliver, C.D. and P. Puttonen. 2000. Process-based models for forest ecosystem management: current state of the art and challenges for practical implementation. *Tree Physiology* 20(5/6) 289-298.

Landsberg, J.J. and N.C. Coops. 1999. Modeling forest productivity across large areas and long periods. *Natural Resource Modeling* 12(4) 383-411.

Landsberg, J.J. and S.T. Gower. 1997. *Applications of physiological ecology to forest management* Academic Press. pp 354.

Landsberg, J.J. and R.H. Waring. 1997. A generalised model of forest productivity using simplified concepts of radiation use efficiency, carbon balance and partitioning *Forest Ecology & Management* 95: 209 - 228.

Coops, N.C., Waring, R.H. and J.J. Landsberg. 1997. Assessing forest productivity in Australia and New Zealand using a physiologically-based model driven with averaged monthly weather data and satellite derived estimates of canopy photosynthetic capacity. *Forest Ecology and Management*. 104: 204-221.

McMurtrie, R.E. and J.J. Landsberg. 1992. Using a model to evaluate the effects of water and nutrients on the growth and carbon partitioning of Pinus radiata. *Forest Ecol. & Management*. 52: 243-260.

Landsberg, J.J. 1986. *Physiological ecology of forest production*. Academic Press. pp. 198.

Jarvis, P.G.; James, G.B. and J.J. Landsberg. 1976. Coniferous forests. *In Vegetation and the Atmosphere* Vol.2. (Ed. J.L. Monteith) pp. 171-240. Acad. Press. London, N.Y.

Dr Rob Lesslie

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Human/environment interaction, wilderness

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Career brief

Rob has degrees from Macquarie University, the University of Adelaide and the Australian National University. He has worked as a management planner in the South Australian National Parks and Wildlife Service, taught geography at the University of Adelaide and natural resources management at Roseworthy Agricultural College. He has consulted privately in natural resource assessment for extended periods, most notably as architect and principal consultant for the Commonwealth Government's National Wilderness Inventory. During this time he also worked on the development of wilderness legislation in South Australia, collaborated in overseas wilderness assessment programs and pursed research interests in landscape and ecological modelling as a visiting fellow at CRES and at the University of Adelaide. Rob is currently with the Bureau of Rural Sciences managing aspects of catchment-scale land use mapping.

Research

Rob has long-standing research interests in the spatial analysis of human/environment interaction at landscape scales - particularly to support strategic assessment and planning in nature conservation. This includes theory and practice in the spatial modelling of human activity in landscapes with a focus on environmental and ecological interactions. Recent work includes research with the World Conservation Monitoring Centre in modelling the exposure and vulnerability of global forest resources to human activity. He has a continuing interest in wilderness, particularly spatially explicit methods for modelling the distribution of large, relatively undisturbed natural areas and in evaluating the role these places have in nature conservation.

Selected publications

Lesslie, R. 2001. Landscape classification and class relatedness: assessing native cover loss in far south-east Australia. *Biodiversity and Conservation* 10(3): 427-442.

Kapos, V., Lysenko, I. and R. Lesslie. 2000. *Assessing Forest Integrity and Naturalness in Relation to Biodiversity*. World Conservation Monitoring Centre and FAO.

Lesslie, R. 1999. *The Size of Wilderness*. New South Wales National Parks and Wildlife Service, Sydney.

Mackey, B., Lesslie, R., Lindenmayer, D and H. Nix. 1998. Wilderness and its place in nature conservation in Australia. *Pacific Conservation Biology*, 4(3): 182-185.

Dr Gary Richards

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Greenhouse

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Career brief

After completing his bachelor's degree in 1983 Gary was a founding partner in a small silvicultural business, later joining the ACT Parks and Conservation Service where he remained until 1991. Over this time he also completed both a Graduate Diploma in Outdoor Recreation and a Master of Applied Science in Resource Management at the University of Canberra. In 1990 Gary commenced his PhD in the Forestry Department, while also joining the ACT Planning Authority to develop the legislation and administration for environmental impact assessment.

On completing his PhD in 1993 Gary joined the National Capital Planning Authority and worked as a consultant to the Department of Housing and Regional Development in developing multi-disciplinary regional planning strategies. In his time with the Authority Gary also co-authored the national evaluation of the Commonwealth Government's $816M Better Cities Program.

In 1996 Gary left the Commonwealth Government to join local government, taking charge of planning for a small Southern Tablelands Council. During this time Gary was active on the Steering Committee for the SE Region State of the Environment Report. 1998 saw Gary rejoin the Commonwealth Government service, taking a role as Senior Scientific Adviser to the Australian Greenhouse Office in regard to carbon accounting for land based sources and sinks. Gary is currently the Manager and Principal Scientist for the development of the National Carbon Accounting System.

Research

My research interests have moved away from an initial interest in the social aspects of resource planning and management and resource planning systems. My work within government saw a developing interest in multi-disciplinary planning and policy related issues. Work within local government also saw the development of interests in the application of GIS systems to land use and infrastructure decision making and as a spatially based land information system.

My current interests and focus of my carbon budget model which will allow assessment of carbon budget implications of given forest management and planning scenarios.

Selected publications

Richards, G.P. and J.L. Heywood. In Press. *A Territory-Wide Application of the Opportunity Spectrum Approach Using Marketing Techniques.*

Richards, G.P. and J.L. Heywood. In Press. *The Development and Use of Setting Specific Experience Items to Describe Experience and Setting Associations*.

Richards, G.P. and J.L. Heywood. In Press. *The Consistency of Desired Experiences and Setting Attribute Values Across Settings*.

Richards, G.P. 1990. *Community Expectations of Urban Open Space Maintenance Standards: A Review Using Importance-Performance Analysis*. ACT Parks and Conservation Service Internal Report, 90/2, 50pp. Canberra.

Richards, G.P. 1990. *Motives for the Recreational Use of Natural and Plantation Areas of the ACT*. Internal Report 90/11, ACT Parks and Conservation Service, Canberra.

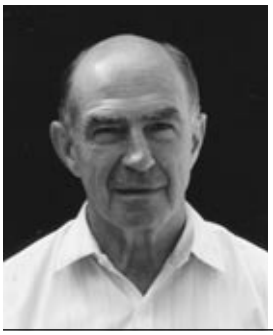
Richards, G.P. 1988. *Outdoor Recreation: The Opportunity Spectrum Approach Applied in the ACT*. Joint Publication of the Canberra College of Advanced Education and ACT Parks and Conservation Service, 294pp, Canberra.

Richards, G.P. Planning for the Outdoor Recreation Product. In, *New Viewpoints in Recreation Planning and Research*, D. Mercer (ed.).

Richards, G.P. 2001. *The FullCAM Carbon Accounting Model: Development, Calibration and Implementation for the National Carbon Accounting System*. National Carbon Accounting System Technical Report No. 28. 92 pp.

Richards, G.P. (ed.) 2001. *Biomass Estimation: Approaches for Assessment of Stocks and Stock Change*. National Carbon Accounting System Technical Report No. 27. 160pp.

Richards, GP and D.W. Evans 2000. *CAMFor User Manual v 3.35*. National Carbon Accounting System Technical Report No. 26. 47pp.



Dr Mike Slee

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Tree breeding, plantation silviculture, tropical forestry, new crops

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Career brief

Mike graduated in Forestry from Oxford in 1960. He worked for eight years with the Queensland Department of Forestry as a tree breeding officer, specialising in the development and introduction of the tropical plantation species *Pinus caribaea* and the *elliotti* x *caribaea* hybrid.

Mike joined the ANU in 1968 and completed his PhD which showed that tropical climatic conditions caused malformations in the growth of *Pinus caribaea*. His major teaching has been in tree breeding and plantation silviculture. He has also specialised in plantation consultancy work in various Asian countries. He has supervised 28 postgraduate students from 19 different countries and was convenor of the graduate program in environmental science at ANU for the four years up to 1995. He retired from full time teaching in 1997 but retains research and departmental interests.

Research & other interests

Recently, Mike has been working on the development of new crops especially the oil producing eucalypts and tea trees and has developed low cost breeding procedures for the blue mallee *Eucalyptus polybractea*.

He has an interest in assisting the department to maintain contacts with former students and keeping departmental statistics and data up to date.

Selected publications

Slee, M.U. 1997. *Study of flowering and hybridization in blue mallee*. Final report. Project ANU 19A. Rural Industries Research and Development Corporation, Canberra.

Slee, M.U. 1996. *Eucalypt oil production - Establishment of a breeding program*. Final report Project ANU 10A, Rural Industries Research and Development Corporation, Canberra.

Slee, M.U. 1995. *Genetic variation in oil production and quality in Tea Tree*. Final report. Project ANU 11A. Rural Industries Research and Development Corporation, Canberra.

Harrison, D. L. and M.U. Slee. 1992. Long shoot terminal bud development and the differentiation of pollen and seed cone buds in *Pinus caribaea* var *hondurensis*. *Canadian Journal of Forest Research*. 22(11): 1656-1668.

Slee M.U. 1991. Twenty five years of postgraduate education at the Department of Forestry, Australian National University. *Commonwealth Forestry Review*. 70(4) 200-212.

Mr Piers Bairstow

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Field Services

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Career Brief

Piers joined the Department in 1995 as a technical officer in the field services unit. His main roles are to provide logistical and technical support for undergraduate fieldwork and laboratory based practical classes. Liaison and advice on methodology for project and postgraduate research is also part of his role. Maintenance and purchasing of field equipment, laboratory equipment and vehicle requirements is also included in Piers' duties. Piers has been known to cook the odd BBQ and is also the first aid officer for field services and the Geography building.

Mr Peter Beutel

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Forest products & processing

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Career brief

Peter started his working career in 1983 with the Queensland Department of Forestry, Gympie, as a Forest Overseer. He then moved to hoop pine plantation management in Monto and Maryborough. In 1989, I joined the Department of Forestry, ANU, as a Technical Officer and was promoted to Senior Technical Officer in 1992.

Research & teaching

In the year 2000-2001, I provided technical and administrative assistance to the forest products and processing section. I assisted in several postgraduate student research projects, including the development of techniques for rapidly assessing the surface checking of preservative treated sawn timber and associated weathering trials of treated pine decking timber. I provided general support for the ACIAR funded project on wood-wool cement board; the RIRDC Joint Venture Agroforestry Program funded research project on inorganic-bonded wood-composites manufactured from mallee eucalypt and melaleuca species; collaborative research with Department of Engineering (FEIT) evaluating the resistance of solar collectors to accelerated weathering; collaborative research with the Department of Applied Mathematics, RSPSE in developing techniques to 1, improve the gluing of eucalypts using plasma modification. 2, quantitatively analyse the checking of preservative treated timber. I continued to support the Australasian Timber Drying Group by upgrading their web site.

I provided a technical support role in the Forest Products and Forest Operations units. I continue to be the Managing Editor of the Journal of the Australian National University Forest Operations (1998-00). I provided a minor technical role in the under-graduate units of Plantation Management, Plantation Planning, Ecological Measurement and Resource Biology.

I continued to consult to ANUTECH Development International on the PNG Forestry Human Resource Development Project (funded by AusAID) as their Specialist Scientific Technician.

I successfully fulfilled the duties of Secretary and co-organiser of the 5th Pacific Rim Bio-Based Composites Symposium (Canberra, 10-13 December 2000). The symposium was successful with 170 delegates (120 were international delegates).

I completed the Comcare accredited Heath and Safety Representative training with Workwatch in January 2001. I conducted an OHS audit of the Forestry Building and represented the department in the Planned Investigation by Comcare in April 2001.

Selected publications

Beutel, P.J. & J. Tan. 2000. The Journal of the Australian National University Forest Operations (JANUFO), Department of Forestry, The Australian National University, Third Edition; ISSN 1441-6948

Beutel, P.J. and P.D. Evans. 2000. A comparison of the diffusion of boron from two types of solid preservative rods into the heartwood of 3 Eucalypt pole species. Proceeding of IRG 31 Conference, Hawaii, USA.

Evans, P.D., Beutel, P.J., Donnelly, C., and R.B. Cunningham. 2000. Surface checking of CCA-treated Radiata pine decking timber exposed to natural weathering. Proceeding IRG 31 Conference, Hawaii, USA.

Ms Debbie Claridge

Senior Technical Officer
Forest biology & ecology

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Career brief

Debbie provides technical and teaching support in a range of areas within the field of forest ecology. Part of her work has included research on bats and ecological surveys for ground-dwelling forest mammals and herpetofauna (reptiles and amphibians). In addition, she has worked on forest products such as *Eucalyptus* and *Melaleuca* (tea-tree) oils, and has been involved in experimental design of glasshouse-based experiments.

Debbie's other major contribution to the Department is in the Public Relations area. Aside from being the principal departmental photographer, she also helps design many scientific posters, pamphlets, brochures and displays, (eg. ANZIF, Science Festival and Careers Exhibitions), as well as taking part in the design and development of our online Web site.

Research & teaching

In 1993, I completed a degree in Applied Science, majoring in Vegetation/Wildlife Management and Biometry at the University of Canberra. I also completed a course in Herpetology at the Sydney Technical College in order to further my interest in forest-dwelling frogs.

These skills were further enhanced in 1994, when I took a 12 month-posting to the Pacific Northwest United States, where I participated in a study examining the distribution and abundance of frogs, newts and salamanders in Douglas Fir forests. I also had substantial involvement in research on the ecology of Douglas Fir Beetles. My other research involvement included work on mycophagy (fungus-eating) Flying Squirrels, the primary prey of the Northern Spotted Owl. Since my return from the United States and beyond my role as Senior Technical Officer, I continue to pursue diverse interests in the ecology of Australian mammals and mycophagy.

I provide teaching assistance to students in the courses *Biodiversity Assessment* and *Wildlife Management*. Also, I'm involved in class preparation and teaching of students the operation and practical application of Geographic Information Systems (GIS), in the courses *Resource Management*, *Ecological Measurement* and *Forest Planning*.

Selected publications

Claridge, A.W., Trappe, J.M. & Claridge, D.L. (submitted) Mycophagy by the swamp wallaby (*Wallabia bicolor*): disperser of fungal spores in recently burned habitats. Submitted to *Wildlife Research*.

Claridge, A.W., Jumponnen, A.M., Trappe, J.M. & Claridge, D.L. (in prep) Predicting associations among hypogeous fungi and host plant species based on field data. To be submitted to *Mycological Research*.

Claridge, A.W., Trappe, J.M., Cork, S.J. & Claridge, D.L. (1999) Mycophagy by small mammals in the coniferous forests of North America: nutritional value of sporocarps of *Rhizopogon vinicolor*, a common hypogeous fungus. *Journal of Comparative Physiology B* 169, 172-178.

Claridge, D.L. and C.R. Tidemann. 2001. *Biodiverstiy Survey of Jindalee State Forest, NSW 20th - 23rd September 2000. Report on the spotlighting of Arboreal Gliders and Possums for NSW National Parks & Wildlife Service, Threatened Species Unit, Southern Directorate.* School of Resources, Environment and Society, Australian National University. (Unpub.)

Chick, R.R., Morris, B., Claridge, D.L. and C.R. Tidemann. 1997. *The Flora and Fauna of Big Bush Nature Reserve, Temora, NSW. A Biodiversity Survey Report to the NSW National Parks and Wildlife Service*. School of Resource Management and Environmental Science, Australian National University. (Unpub.)

Brookhouse, M., Tidemann, C.R., Tanton, M.T. and D.L. Claridge. 1996. *Flora and Fauna of Ingalba Nature Reserve, NSW. An Ecological Survey Report to the NSW National Parks and Wildlife Service*. School of Resource Management and Environmental Science, Australian National University. (Unpub).

Mr Mauro Davanzo

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Career brief

Mauro was born and raised in Canberra, completing his HSC locally. He joined the Forestry dept in August 1991, after working for the Australian Defence Force Academy in supplies and transport. Mauro has over 15 years experience in vehicle management and supply related services.

Mauro has completed several courses that allows him to teach a number of selected training programs such as, the safe use of 4WDs, chain saws and workshop safety. He also maintains his senior first aid certificate.

As the Manager of Forestry Field Services, he is responsible for the Field Services area, providing technical and administrative support for Field Services and the department in general. He actively supports field practicals and regularly assists in research projects. He is also the department's vehicle controlling officer. One of his many objectives is to continue contributing to solve the schools future challenges.

Ms Anne Gilles

Graduate Program Administrator

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Career Brief

Anne has studied Arts/Law (Political Science and Australian Studies). She completed an internship with a NSW politician.

Anne has lived and worked in QLD-NSW-SA-ACT. She has travelled extensively in the Middle East and Europe.

Mr Clive Hilliker

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Cartography & Design

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Career brief

After 14 years experience in the fields of botany, forestry, ceramics, microbiology, analytical chemistry, plant physiology, graphic design, instructional design, web design, and as a Technical Coordinator, Clive became Faculties Cartographer in August 1999.

Clive's qualifications include a Bachelor of Science (Botany) completed in 1984 and a Graduate Diploma (Management/ Administration) completed in 1993. More recent courses include AutoCad, Graphic Design, University Teaching & Learning, 3D Studio Max, Multimedia Development and GIS/Environmental Modelling.

Research & teaching

Prior to 1997 much of my time was spent demonstrating aspects of plant physiology and web design. Concurrently I was supporting research by developing and implementing protocols for the quantitative analysis of leaf oils using gas chromatography. Most effort during this period went into establishing methods of visual communication for use in teaching. This information proved popular within ANU and was presented to educators and others at the following seminars; ACTEIN, National Science & Technology Centre, Canberra, 1995 "Low Cost Animations for Graphically Illustrating Information"; Otago University, New Zealand, 1995, "Low Budget Multimedia in University Teaching".

Now my focus is on visual communication in print media, primarily cartographic illustration as well as creating graphics for scientific publication. This also includes the design, layout and production of reports for publication, posters and promotional materials.

Selected publications

Trevitt, C., Brack C.L., Ryan M., Hilliker, C. and S. Hedenstroem. 1995. Forestry education and information technology at ANU: tools, toys or a turn-up for the books? Proceedings from IFA Conference Applications of New Technologies in Forestry. Ballarat, Victoria, 18-21 April 1995, Bren and IFA Inc, Canberra. p 169 - 178.

Mr Steve Leahy

IT sponsor (Faculty of Science) & Programmer

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Career brief

Steve is one of that scary breed of computer-literate environmental scientists who are plotting to take over Geography Departments worldwide. His only interest is improving the IT literacy of academic staff members. And making computers do what he expects....

Amongst his interests are shaming academics into learning how to use their computers properly; bullying said computers into behaving themselves; maintaining an ever-growing series of web-sites; non-linear editing of digital video; occasionally making the acquaintance of a dictionary; paraphrasing Monty Python where-ever it seems appropriate; boldly splitting infinitives where no-one has split them before; and writing about himself somewhat facetiously in the third-person. tlhIngan vIbe'

Ms Judy Lejins

Technical Officer

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Career brief

Judy joined the Department in 1980 as an office assistant. She was regraded as a Laboratory Technician in 1986 and worked in field services and administrative areas until her retirement in December 1999. Judy returned to the Department in February 2000 as a Technical Officer on a half-time basis working again in field services and administrative areas. She now works one day a week. Her work involves overseeing the photocopying area, purchasing of goods on Visa or petty cash and maintaining stationery supplies.

Mr Mark Lewis

Financial Coordinator

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Mark joined the Department in May of 2001as a finance officer after working in the Faculty of Science as a Special Purpose Funds Officer since September 2000. Mark's main roles include budget analysis and all financial transactions for the Department. He has a degree in accounting from the University of Canberra and is currently studying the CPA Australia Program.

Mr John Marsh

Senior Technical Officer
Soil chemistry

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Career brief

John joined ANU Forestry Department in 1974 as a Junior Laboratory Technician, was promoted to Technical Officer, Analytical Facility in 1987, and in 1989 was appointed to the position of Senior Technical Officer Analyst in Charge, which he still occupies. As Analyst in Charge of the Soil and Plant Analytical Facility he is responsible for servicing the needs of Academic, Graduate and Undergraduate demands for elemental analysis of soil, water and plant material.

John graduated from the University of Canberra in 1980 with BSc Applied Science (Biology Major).

Research & teaching

The results obtained in my analytical work are used for academic research, teaching and practical classes, graduate and undergraduate reports. I am also responsible for hands-on technical training associated with analytical chemistry and instrumentation.

Selected publications

Marsh, J. 1988. *Analytical methods developed and used by ANU Forestry*. (Unpublished)

Mr Karl Nissen

IT Support & Programmer

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Career brief

Karl has a Bachelor of Engineering Degree from the University of Auckland. He has worked at The Australian National University since 1996, with a two year absence in Japan. Prior to joining the University he worked at the Australian Centre for Remote Sensing at Fern Hill Park in Belconnen as both a production engineer and project engineer.

After graduating from University he was lucky enough to receive a two year scholarship at the University of Wisconsin Physical Sciences Laboratory, which is a research engineering laboratory. Work done there included the development of a long distance Ethernet bridge, digital frequency synthesiser design and the development of a programmable environmental chamber controller.

Currently he is responsible for the day to day operation of the PC and UNIX computers and teaching laboratory support.

Ms Sylvana Ransley

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Centre for Science and Engineering of Materials

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Career brief

Sylvana joined ANU in March 2001 as part-time administrative support to Phil Evans at CSEM (currently being hosted by the Department of Forestry).

She has worked and lived in Germany and France and speaks both languages. She moved to Canberra after discharging from the Australian Army as a Corporal. Sylvana has worked for numerous government departments and private companies as Executive /Personal or Administrative Assistant and is now embarking on a career as a 3D animator studying with the Academy of Interactive Entertainment at Watson.

Ms Shirley O'Reilly

Librarian

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Career brief

Between 1967 and 1993, Shirley worked in the Reference and Information areas of the Australian National University Library. Previous employment includes experience in the City of Sydney Public Library, Commonwealth Department of Customs and Excise, CSIRO Division of Land Research and Regional Survey, National Library of Australia Training School and the Australian National University Archives of Business and Labour.

Shirley has a Bachelor of Arts degree, a Diploma in Education, and is an Associate of the Australian Library and Information Association. In 1989 Shirley completed the ACT Travel Consultants Course at the ACT Institute of Technical and Further Education, and the Real Estate Course at the School of Business Studies at the Canberra College of Technical and Further Education in 1983.

Selected publications

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Career brief

David works part-time for the Centre for Science and Engineering of Materials (which is currently being hosted by the Department of Forestry) producing its newsletter (Materials Monthly), maintaining its website and assisting with recruitment activities aimed at getting more students into materials science at ANU. He has also been assisting with recruitment for the BSc in Resources and Environmental Management (for SRES).

Prior to this David was the editor of The Helix, CSIRO's magazine for science students, for 11 years; Communications Manager at CSIRO Wildlife and Ecology for 2 years; and editor of Newton, Australian Geographic's popular-science magazine for 2 years.

David possesses a BSc (Hons) in marine biology (Sydney University) and worked as a research assistant in electron microscopy and plant taxonomy at Sydney University for three years before moving into science communication.

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Career brief

Zosha has a Bachelor of Arts (Modern Languages). She has worked and lived in the Middle East, Africa and Europe.

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Career brief

Probyn holds a Diploma of Applied Ergonomics and is certified in Installation and Maintenance of Local Area Networks, CNE and MIAME. He is an Associate of the Ergonomic Society of Australia and is currently involved in courses of Microsoft 2000 Certified Engineer. Probyn worked for 12 years in the Public Service in the areas of Management Consultancy, Electronic Office Management, Ergonomic Design and Office Automation. He worked for three years in sales, engineering, tutoring and management in the private sector and then for 2 years as Manager of a private company (ComputerLand Solutions). He was self-employed for eight years as a consultant/engineer in his own company (Textrine Networking Services) before he joined the ANU.

Auro Campi de Almeida

PhD scholar

Application of a process-based model for predicting and explaining growth in eucalyptus plantations

The 3-PG forest growth model has been calibrated for *Eucalyptus grandis* plantations in Aracruz, Brazil. The model will be used to explore sensitivity of stand growth and as a tool in assisting forest management decision making.

Hidayat Alhamid

PhD scholar

Indigenous forest management in West Papua: a comaparative study in Vogelkoep

This study aims to answer questions of how decisions about forest management are made at the indigenous community level and how these decisions impact on both the forest and forest management. It will focus mainly on two aspects of indigenous forest management, namely management practices and social construction behind these practices. This study will also examine the impact of external influences on indigenous forest management and the forest in two study areas in Vogelkoep (Birdhead's peninsula) of West Papua. This work is supported by AusAID.

Nicolette Burford de Olivereia

PhD scholar

The role of communication systems in defining rural youth culture and its environmental ramifications in a Brazilian Amazonian caboclo community

This research examines how indigenous and modern communication systems influence the relationship between cultural and environmental change. It focuses on how and to what effect 16-21 year olds participate in natural resource decision making. Land-use policy makers need to understand how communication affects the environmental attitudes and practice of young people set to be the future guardians of natural resources.

Rico Cabangon

PhD scholar

Flexural viscoelastic properties of wood-wool cement board

Wood-wool cement board (WWCB) is being increasingly used in the Philippines as a construction material. However, we have observed that in certain applications, WWCB exhibit flexural creep. The aim of this project is to gain a greater understanding of the flexural viscoelastic behaviour of WWCB. We propose to examine the effect of board composition, structure, and environmental factors on the creep properties of WWCB and develop models to predict its creep behaviour. Ultimately, we aim to develop practical solutions that will minimise the creep of WWCB used in buildings in the Philippines.

Major findings so far have shown that the creep and physical properties of WWCB can be radically improved by manually aligning cement-coated strands within boards. This result could have a significant impact because it would extend the uses of WWCB into structural purposes and/or provide cost-effectiveness in terms of material requirement to make boards of a certain strength. More importantly, this strand orientation technique appears to be technically feasible for commercial adoption in WWCB plants in the Philippines because they mat-form strands by hand and therefore, it is possible to manipulate board structure in a production situation. Meanwhile, varying board constituents such as type and amount of cement, and the addition of accelerator was also found to affect both physical and creep properties of WWCB.

This study is supported by a John Allwright Fellowship of the Australian Centre for International Agricultural Research (ACIAR). Detailed information on the WWCB industry in the Philippines is available at the ANU Forestry web site http://www.anu.edu.au/Forestry/wood/nwfp/woodwool/woodwoolphil.html.

David Carpenter

PhD scholar

Increasing the social-ecological resilience of asian farming systems in transition.

Throughout Asia farming systems are in transition. With the help of governments, NGO's and through their own organizations and efforts small farmers are developing post-green revolution farming systems that are more ecologically and socially sustainable. By investigating several cases of successful and unsuccessful transitions this project aims to ascertain the key factors that contribute to resilience. In the context of agriculture, resilience refers to the ability of social-ecological systems to withstand disturbance, adapt to changing circumstances and renew themselves. An integral aspect of resilience is the extent to which social and ecological systems are linked via feedback mechanisms. In order to investigate these adaptive relationships this project adopts a systems-based approach that looks at the structure and function, spatial behavior, stability and dynamic variability of both agroecosystems and the social systems put in place to manage them.

Anne Casson

PhD scholar

Oil palm expansion and resistance in Indonesia

After decades of forest exploitation, the area of natural forest available for harvesting in Indonesia has diminished substantially. To meet a perceived growing demand for tree products, and to relieve pressure on natural forests, the Indonesian government has set about promoting the establishment of large scale mono-culture timber, oil palm and rubber plantations. Plantation forests are expected to create new employment opportunities and bring in much needed revenue for the Indonesian government. However, despite these benefits, plantation forests have long generated considerable opposition from community groups and created a vocal anti-plantation movement that condemns plantations as being ecologically destructive and detrimental to local villager interests. This research will examine resistance to the expansion of the plantation sector in Indonesia. In doing so, it will examine various political and economic factors that have influenced the expansion of the plantation sector, identify the social and environmental impacts resulting from plantation development, and attempt to identify ways in which various groups resist plantation developments. Finally, this research will attempt to determine whether or not resistance against plantation development has deterred further expansion and altered forest policy and plantation practices. This will be analyzed within the context of political, social, economic and environmental change in three outer island regions - Irian Jaya, Sumatra and Kalimantan.

Bruce Doran

PhD scholar

An investigation into the spatio-temporal nature of the fear of crime

Since becoming an issue of concern in the late 1960s, the fear of crime has continued to receive attention as a serious social problem. Fear of crime impacts upon society by causing individuals to avoid areas they perceive as dangerous or to adopt protective measures. This reduces people's quality of life and incurs a significant cost to the individual and to society.

The aim of this project is to investigate where and when people are afraid of crime, which is a critical component of any program designed to reduce the fear of crime. The study will also investigate the spatio-temporal relationship between peoples' fear of crime and the actual occurrence of crime. An area that has received little attention prior to this project is the overlap between areas or times where peoples' fear of crime is low but actual crime rates are high. The relevance of investigating this overlap lies in the potential for people in such situations to be more susceptible to victimization.

The proposed modeling approach is to use Geographic Information Systems (GIS) to investigate the fear of crime in a manner relevant to people's daily routines. The study area is Wollongong, NSW. Currently, official approval for the project from the NSW Police Service is being awaited before starting fieldwork.

John Dore

PhD scholar

How can transborder environmental governance in the Greater Mekong subregion be enhanced?

Transborder environmental governance is recognised as being currently inadequate.
The regional and transborder nature of environmental problems requires a more innovative, nuanced and coordinated response by regional actors which the existing environmental governance institutional framework is struggling to deliver. Recognising this, in the GMS there are various responses occuring. The thesis examines lessons which can be gleaned from theory and an examination of some of the contemporary practical responses.

Understanding differing interests explains actors' behaviour
Actors are motivated by very different paradigms which are reflected in their 'interests' and hence their institutions, institutional processes, public behaviour, policy positions and use of various mechanisms to implement their agenda.

Power-agency is a relative concept
Regionalism is resulting in a redistribution of powers between the various actors, however, agency of certain actors is relative, and so therefore is their capacity to influence the overall environmental governance institutional framework.

Potential benefits from normalisation of governance 'pillars'
The public good, in terms of social and environmental benefit, would be enhanced, or less diminished, if the regional actor network identified problems and solutions to adopting the types of environmental governance norms espoused in Agenda 21, particularly relating to access to information, participatory decision-making and deliberative processes.

Concluding proposition
Transborder environmental governance in the GMS can be enhanced via insights from global analyses of the 'new regionalism' and modern theory of discursive democracy; coupled with the systematisation of the 'pillars of good governance' (accountability, transparency, predictability, participatory).

Sue Emmett

PhD scholar

The role of native earthworms in maintaining biological soil fertility in wet eucalypt forest ecosystems

This ARC funded project investigates the relationships between vegetation, soil properties (chemical, physical, and biological) and native earthworms at several tall eucalypt sites in south-eastern Australia. In addition the effects of disturbance from forest management operations on native earthworms are being examined.

David Forrester

PhD scholar

Dynamics of mixed species plantations

Despite the potential benefits of mixed species plantations, their current establishment in Australia is very restricted, possibly due do to a perceived risk of failure in mixed species plantations. The success of mixed species plantations in improving productivity depends on a number of factors including species interactions, species composition, proportions of species and the extent to which the interactions might be influenced by growth limiting resources.

The aim of this project is to (1) identify the growth habits and physiological characteristics in tree species that will allow an assessment of the likely competition between species; and, (2) to determine how the ecological interactions between nitrogen-fixing and non-nitrogen-fixing species change with resource limitations, in particular water and phosphorus limitations, which are very common in the Australian environment.

This project is being carried out in collaboration with CSIRO F&FP and SF NSW. Financial assistance from the Forest and Wood Products Research and Development Corporation is gratefully acknowledged.

Houshang Farabi

PhD scholar

Planning for minimising impacts of forest operation on soil erosion and water quality.

Harvesting and road construction in forests have impacts on abiotic and biotic parts of the ecosystem. In this research, various methods of forest exploitation with regard to their consequent impacts on soil and water quality will be studied. A review of the available methodologies will be done. A suitable method will then be chosen based on the characteristics of the area of study and the needs and facilities available. Following this, a data-base will be constructed in a GIS and the impacts of various harvesting methods will be evaluated interactively on the computer through changing of model parameters. Samples will be taken in the field to validate the results. The best model will be offered using the results of field sampling and GIS evaluation.

Gae Gowae

PhD scholar

Simulating the growth and yield of Pometia species in PNG

Gae Gowae is continuing his research into developing a growth and yield model for uneven-aged and mixed species forests. He is attempting to integrate distance and contagion (pattern) indices into a cohort modeling approach. Data is being collected and made available for north coast N.S.W. hardwood forests and lowland topical forests of Papua New Guinea. Gae has completed 1 year of his 3 year PhD program.

Ingo Heinrich

PhD scholar

Dendroclimatology of the Australian Red Cedar in Eastern Australian Rainforests

Whilst a number of annually resolved long-term climatic proxydata records exist in the tropics and subtropics elsewhere, comparable sources for Australia are still lacking. Therefore, several tree-species of Eastern Australia were examined in the past. The most promising genera were *Toona*, *Melia, Araucaria* and *Callitris* all of them exhibiting distinct growth rings.

This study will concentrate on the most promising species *Toona ciliata* M. Roemer. The Australian Red Cedar occurs naturally in Eastern Australian subtropical and tropical rain forests ranging from Cape York Peninsula to just south of Sydney. Trees were sampled at several sites along this latitudinal range.

The analysis revealed distinct tree rings but asymmetric growth. False rings, which can be distinguished through crossdating, seem to be more common in the tropics than further south. Anatomically, the annual tree ring follows a sequence of parenchyma cells appearing as a white band. This is directly followed by the large vessels of the early time of the year, which then decrease in size and number as the season progresses.
The analysis also indicates that rainfall and temperature are the most important factors influencing tree growth.

Leah Horowitz

PhD scholar

The relationship between cultural identity and environmental coneservation in New Caledonia's Loyalty Islands

According to conservationists, New Caledonia is home to one of the world's top priority ecosystems, the highly endemic dry sclerophyllic forest of the main island. However, to date very little effort has been directed at conserving this ecosystem, which is severely threatened by cattle ranching, careless burning, and perhaps most importantly by mining. Meanwhile, the nation,s primary social justice issue is the desire of a percentage of the local population, mainly Kanak, for political independence from metropolitan France. Toward this end, leaders of pro-independence groups are searching for means of achieving economic autonomy, which leads them to embrace multi-national mining companies, promises of employment and equal shares in revenues.
Kanak have historically been marginalised by the colonial administration, deprived of any power to make decisions concerning the use of their lands or other natural resources. However, in a contemporary world increasingly intolerant of human rights abuses, metropolitan France can no longer repress protests with violence. Instead, they have been steadily providing more financial aid, thus creating an „assisted economy‰ and encouraging dependency, but have simultaneously been granting greater autonomy to the provinces and the territory. Kanak leaders now have the power to negotiate with mining companies and to choose whether or not to accept the projects. At the local level, residents can and often do organise strikes or block roads in order to make their voices heard.
I chose to investigate the environmental impact of this gradual drive towards greater economic equality and local autonomy. I wanted to determine whether any members of local communities express an interest in conservation (and/or an opposition to the environmentally destructive aspects of development) and if so, what this concept means to them, why they believe it to be important, and how if at all it translates into action. On the other hand, I wanted to examine the motivations and decisions of those who embrace forms of development that lead to pollution and habitat destruction, especially when they do so in the attempt to lay the economic foundations of a future independence. Therefore, I decided to study Kanak reactions to and discourses on environmental degradation and the resource exploitation activities that cause it, focusing on a potential mining project on the Koniambo massif but also collecting data from other places around

New Caledonia for comparative context.
Here are my specific questions:

- Who within the community is in favour of the mining project, and why (what reasons do they give, and what other motives do I infer)?
- Who is opposed to it, and why?
- What conflicts are generated by these tensions (pro- and anti-mining)?

- between community members and outsiders
- among community members
- within individuals

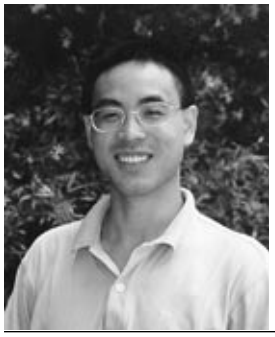
Through examining these questions, I aim to achieve a better understanding of the links between habitat conservation and social justice issues in New Caledonia. In other words, when people oppose mining projects (and other manifestations of Western forms of development) in the name of environmental conservation, or when they support such projects in the name of economic development and financial independence from metropolitan France, what motives and interests lie behind these discourses and actions, and what conflicts do they generate? What does this tell us about the potential for conservation and/or social justice in New Caledonia?

Susan Hoebee

PhD scholar

Conservation genetics of the endangered shrub Grevillea iaspicula McGillivray (Proteaceae).

Grevillea iaspicula (Proteaceae) is an endangered, self-incompatible, hermaphrodite plant that is restricted to south-eastern Australia. Current priority setting and recovery planning for this species is based primarily on ecological and taxonomic information, with little emphasis on genetic considerations. Yet, it is becoming increasingly clear that genetic processes are also important for maintaining viable populations. Therefore, this project aims to determine whether genetic processes, such as genetic drift and inbreeding, affect the viability of *G. iaspicula* populations. Initial allozyme studies suggest that the populations maintain moderately high levels of genetic diversity but that paternal diversity within seed arrays is low. This work also indicates that gene flow among the populations is limited and that the populations are substantially differentiated. Microsatellite markers have allowed us to explore more directly the fine-scale mating patterns operating in these populations. Again, high levels of genetic diversity were found. Paternity analyses suggest that mating may not be as restricted as previously thought and that immigration could be as high as 18%. In smaller populations, plant size correlates with paternal reproductive success and, as a result, larger plants dominate within population paternity. In larger populations, more paternal plants contribute to individual seed arrays. This may be a function of stand age structure. There is some evidence of inter-specific hybridisation that could threaten the integrity of the species. Given that clones have been re-introduced into some populations, these results have important implications for effective conservation of the species.



Zhi Huang

PhD scholar

Combining artificial intelligence models for multisource predictive forest mapping

Artificial Intelligence models such as Artificial Neural Networks and Decision Trees have demonstrated their better performance on application of complex forest mapping than traditional parametric-based models. However, there is great concern about the limitations of these models, and the instability of their modeling outcomes. Artificial Intelligence models usually require much time spent on finding an optimal solution. They are

more sensitive to sample size and sample representation, and more resource demanding. Moreover, each of them has certain "blind spots", and there is not a best single model. On the other hand, there are great uncertainties associated with the process of forest mapping from sampling, data collecting, to modeling and displaying of results. Using single model cannot reduce these uncertainties. To improve the mapping performance, and to provide the measurement of confidence, a combination approach is suggested.

In the project, three models including a backpropagation neural network, a Decision Tree, and a model of Dempester-Shafer's Theory of Evidence are combined into an integrated system-Flight System. Fuzzy set theory is applied in the combining process, and a fuzzy-based expert system is eventually developed on the base of Flight System.

Stuart Johnston

PhD scholar

Alpine herfield characteristics and processes critical to sustaining ecosystem equilibrium

The objective of this work is to provide a framework for determining the soil and vegetation characteristics and processes which determine the inherent ecological stability of alpine herbfields. From this, a state and transition model for alpine herbfield ecosystems is to be developed to help in the understanding of ecosystem function and help in management

Dominic Kain

PhD scholar

Inheritance of wood properties in slash x caribbean pine hybrids

Artificial hybrids are currently enjoying a resurgence of interest in forestry. Hybrids can be used to combine favourable phenotypic characteristics from the parental taxa, to introgress desirable genes (eg for cold hardiness) from one taxon into another, or to produce heterosis, where the hybrid outperforms both parents in a given trait (eg increased volume growth). Despite their growing popularity, little genetic information is available on which to base breeding and deployment decisions in hybrids. This study investigates inheritance of important wood properties in Pinus elliotii (slash pine) X Pinus caribaea var. hondurensis (Caribbean pine) hybrids and their parental populations, using unique experimental material provided by Queensland Forestry Research Institute (QFRI). The project also involves a collaboration with North Carolina State University (NCSU), providing expertise in hybrid genetics.

This year I completed the collection and analysis of wood density data and the analysis of growth and spiral grain data in both the hybrid and parental populations. I also investigated the effectiveness of techniques for assessing stem wood properties in the field and demonstrated that these can provide accurate assessments of breast height whole-stem wood properties at a fraction of the cost of conventional laboratory assessment. QFRI is now further investigating and incorporating these methods into their hybrid wood quality improvement program.

Other foci of the study include investigating the genetic mechanism underlying hybrid performance using a novel genetic model for hybrid populations developed at NCSU, and methods of predicting hybrid performance from pure species genetic information. Submission of the project is scheduled for September 2001. Ongoing financial assistance, from both the Forest and Wood Products Research and Development Corporation and QFRI is gratefully acknowledged.

Dana Kelly

PhD scholar

Community participation in government rangeland management programs - the role of power

This research examines the reasons why community participation by government in rangeland natural resource management issues is successful in some instances and not in others. In the Australian rangelands, the trend in policy and government guidelines has been to promote participatory approaches for a variety of reasons. The use of local knowledge and diverse perspectives in developing land management solutions is recognised as essential.

Preliminary results indicate that a large range of approaches are used to involve local communities. The factors that enhance or hinder participation include existing institutional arrangements and the different perspectives of government staff and landholders, particularly about the level of power sharing in decision-making. A model has been developed to highlight the complexities of participation processes.

Ernst Kemmerer

PhD scholar

Optimal thinning sequences for eucalypts on varying site quality

This study looks at the use of dynamical models and optimal control theory to determine the best thinning regime for eucalypts (specifically *E. pilularis*). Central to finding a theoretically 'optimal thinning regime' is developing a *system of equations* that describe growth response following thinning, and changes in site quality. In eucalypts the thinning response was found to vary with stand age, site quality, and thinning intensity (or frequency and proportion removed). Thinning response therefore has to be described by a system of equations which vary with time, space and intensity. This was found to be quite difficult given the limited experimental data for thinning of blackbutt stands. The current work is to develop a system of equations by combining empirical and knowledge based information to mathematically describe the thinning response. In this way the dynamical model is based on best available evidence, rather than purely from empirical data sources.

Karen King

PhD scholar

Simulating the effects of hazard reduction burning on patterns of biodiversity in landscapes

The FIRESCAPE fire regime model is being implemented for the World Heritage Area in southwest Tasmania. The model will be used to address hypotheses concerning the optimisation of hazard reduction burning with respect to wildfire prevention and protection of biological diversity.

Rassoul Mahiny

PhD scholar

Cumulative impact assessment for mitigating and prioritising enhancement measures in remnant vegetation patches

Nowadays, most areas of every country, except in remote parts, have undergone some kind of human-induced changes. Amongst those changes, vegetation clearance has been a major component, destroying habitat of fauna and hence decreasing biodiversity. As well as determining the possible effects of newly proposed development plans on the remnant vegetation patches, a major task is to compensate for the changes that have been brought about by past developments. Within the Environmental Impact Analysis context, this can be done through various ways, one of which is rehabilitation of the patches. For this to be effective, there needs to be a sound appreciation of the degree, magnitude and significance of impacts on the remnant patches in the past. Based on this, the direction of change could be reasonably identified and mitigation practices can be suggested.

The research project will be carried out in two stages. The study area is to the north of Boorowa, NSW. First, changes in remnant patches over nearly 25 years will be studied and parameters involved modeled through remote sensing and G.I.S. Then the model will be used to predict the changes for a reasonable time in the future. For assessing cumulative impacts in the patches, landscape metrics and physiognomic and floristic aspects will be integrated. Scoring of the cumulative impacts will be done using the integrated change calculations for the past 25 years and what is actually predicted to occur in the near future. The impact scores will show the degree of change as well as vulnerability of the patches and hence their priority for mitigation. Also the relationship between the impact scores and landscape parameters will be explored. In the second stage, priority areas for mitigation will be compared to the potential and actual land-use planning and the best scenario for incorporation of patch rehabilitation into the process of multi objective land allocation will be determined.

Chris McElhinny

PhD scholar

Quantifying structural diversity in forest and woodland ecosystems

There is substantial evidence that forests and woodlands with a diversity of structural components are also likely to have a diversity of resources and of species which utilise these resources. Landholders concerned with protecting and enhancing biodiversity are therefore increasingly concerned with the maintenance of structural diversity.

The aims of this study are:

- to develop an index which can be used to measure structural diversity;
- to assess the effectiveness of this index as a tool for quantifying the biodiversity value(s) of remnant vegetation, and the effect of different silvicultural practices on the structural diversity of production forests.

Currently a review is underway of literature relating to forest and woodland structure, measures of structural diversity and the habitat requirements of vulnerable flora and fauna. This review will be used to identify a subset of key structural elements, and to develop a framework for incorporating these elements into a stand level index of structural diversity.

Tom Measham

PhD scholar

The role of landscape perception in decision making for natural resource management

This project will explore the role of landscape perception in aspects of contemporary natural resource management. A selection of case studies in regional Australia where contrasting perceptions of landscape influence decision making processes will be undertaken and methods for better incorporating these differences into decision making will be developed and trialed.

Angela Newey

PhD scholar

Organic matter decomposition as a function of depth in the soil profile

Soil organic matter is a critical component of the biosphere with direct links to atmospheric composition and to agricultural production and sustainability. Much of the work on soil organic matter to date has focussed on the top 10-20cm of soil, and while this is typically the zone of greatest organic matter concentration per unit of soil mass, a considerable amount of organic matter (and consequently carbon) can lie below 20cm. For example, at least 50% of carbon in the top meter of soil typically lies below 20cm. As carbon stocks and fluxes from deep soil layers can be significant, and most plant roots extend well below 20cm depth, an understanding of the processes controlling organic matter breakdown and nutrient cycling in the sub-surface soil layers is important from both an agricultural production perspective and that of a greenhouse accounting perspective. In fact there is some evidence to suggest that the processes controlling organic matter cycling at depth may differ from those at the surface, making extrapolations from existing information about surface soils to deeper layers of limited value. For example, in a recent analysis of >2,700 soil profiles in 3 global databases, Jobbagy and Jackson (2000) found surface soil carbon stocks to be well correlated with climatic variables, but the deeper soil stocks were not. Further, researchers in the area of carbon dating have found that deep soil carbon is consistently older than carbon residing at the surface, indicating organic matter may be more stable at depth. This PhD research will comprise a number of interrelated experiments designed to study the processes controlling the decomposition of organic matter in the soil, and how these may vary with depth in the profile.

Chris O'Hara

PhD scholar

The availability of P associated with different fractions of organic matter in Australian forest soils

This project utilises a combination of novel and conventional methods to investigate the availability of phosphorus (P) associated with different physical fractions of forest soil, with an emphasis on the soil organic matter (SOM). The role of soil physical fractions in the cycling of P is being examined.

Jeewook (Jason) Rim

PhD scholar

An exclusive bus lane and its impacts on the urban transport system:
A case of city of Seoul

In the process of rapid urbanization, the transport system has been a backbone of urban development in Seoul. In particular, the passenger demand on transport often exceeds the capacity of system. The excessive transport demand generates a series of transport-related problems including traffic congestion, pollution and accidents. In particular, the strong preference on private vehicle extensively reduces the public transport use and worsens the problem. The decrease is closely related to the inferiority of conventional public transport in terms of trip time and convenience. The improvement in service of public transport mode is able to compete with private vehicles.

As the attempt to alleviate the problem with additional road construction failed, a number of approaches including transport system management (TSM) and transport demand management (TDM) are adopted in transport planning. Recent researches reveal the implication of exclusive bus lane (EBL) in both TSM and TDM. This study will highlight the potential of EBL in urban transport management. To evaluate the effectiveness of EBL as a management tool, the case of Seoul, South Korea will be used. In the process of evaluation, this study will be dealt with policy framework and user response in the case of Seoul. By doing this, the study will test of the need of the diversity in transport mode to sustain urban development.

Ray Roberts

PhD scholar

Factors affecting the penetration of resins into décor papers used for low pressure melamine overlays

Resin impregnated paper overlays are used as a decorative and hard-wearing surface on wood composite panels. Resin impregnated paper overlays are manufactured in two stages. First, paper is saturated with an inexpensive urea formaldehyde (UF) resin, which is then partially cured, Secondly, the resin impregnated paper is coated with an expensive melamine formaldehyde (MF) resin. Excessive consumption of MF resin during the process of manufacturing the paper overlays, and defects in the surface of overlays when they are pressed on to wood composite panels are thought to result from inadequate saturation of voids in paper sheets when they are treated with UF resin. The aims of this project is to confirm of refute this hypothesis and secondly to gain a greater understanding of how the pore structure of paper and the physico-chemical characteristics of resins influences the saturation of paper by UF resin and the quality of resin impregnated paper overlays. This project involves the collaboration of CSR Timber Products, the Department of Forestry and Research School of Physical Sciences and Engineering, Department of Applied Maths.

Jacqui Russell

PhD scholar

Development of critical human ecology as a research methodology

Concerns about environmental degradation are increasingly being linked to the ways in which humans interact with their environments. While human ecology is often described as being the study of the interactions between humans, their culture and their environments, to date, it has lacked the capacity to comprehend the ways in which maladaptive cultures have been created and are perpetuated. In order to redress this failing of human ecology, I propose the development of a new methodological framework which would combine the understandings of human ecology with those of the critical social sciences. The transdisciplinary approach being developed has been entitled 'critical human ecology'.

Jacquie Schirmer

PhD scholar

Evaluating the effectiveness of conflict resolution techniques in natural resource management disputes

The study aims to evaluate the usefulness of different conflict resolution techniques in a range of dispute situations. Both participatory and regulatory resolution techniques will be studied. The results of the work will be applied to an in-depth study on the social and economic concerns being expressed over the development of plantation forestry on cleared agricultural land in Australia and internationally. The work is supported by the Cooperative Research Centre for Sustainable Production Forestry in Hobart.

Kate Semple

PhD scholar

Suitability of Australian acacias and eucalypts for wood-cement composites.

The first phase of this project researched commercially important tropical species of *Acacia* and *Eucalyptus* planted in South East Asia to provide information on their suitability for the manufacture of wood-cement composites such as wood-wool cement board (WWCB). Wood from tropical acacias such as *Acacia mangium* is becoming more widely available in many countries and shreds into good quality wood-wool, however the presence of heartwood polyphenols significantly reduces its natural compatibility with Portland cement. To make the wood useable, pre-treatments such as aqueous extraction and/or the addition of mineral salts are necessary, and the pre-treatment strategy best suited for use with *A. mangium* has been investigated and tested in the manufacture of WWCB.

The second phase of the project deals with wood grown in Western Australia arising from broad-scale re-vegetation programs to combat salinity on farmland. Woods from mallee eucalypts and bluegum (*Eucalyptus bicostata*) are being tested alongside pine (radiata pine and maritime pine) for their potential as suitable raw material for any future wood-cement composite industry in WA. Wood from five species of mallee has been shown to have moderate to good compatibility with cement, with only minor reduction in compatibility caused by the presence of bark in most species. An important problem to be addressed, particularly for the eucalypts, is ease of conversion into the correct furnish type (either flakes or wood-wool) for the desired type of wood-cement composite panel. Semi-commercial scale tests of manufacturing wood-wool cement board and wood-cement particleboard from WA eucalypts and pines are to be conducted this year.

Recent publications

Semple, K.E. and Evans, P.D. (2000). Compatibility of 8 temperate Australian *Eucalytpus* species with Portland cement. Holz als Roh- und Werkstoff 58: 315-316.

Semple, K.E., Cunningham, R.B. and Evans, P.D. (In Press). The suitability of five Western Australian mallee eucalypt species for wood-cement composites. International Crops and Products.

Doug Somerville

PhD scholar

Availability, distribution and quality of floral resources used by honeybees in NSW

This study is aimed at defining the availability, distribution and quality of foraging resources used by commercial honeybees in NSW. The first part of the study has been a survey through apiarists using State Forests and documentation of resources accessed in relation to climatic variables, principally rainfall. The second part of the study is a field and biochemical investigation of pollen yield and quality of various staple foraging resources. The outcomes of the project will be used to inform management of the honeybee industry. Mr Somerville is an apiarist with NSW Agriculture. these relationships and on soil conditions will also be determined. As a means of achieving these aims, three areas within Australia with distinctly different sodic soil types and management regimes have been selected. These areas include Peak Hill NSW, Carnarvon WA and Natimuk Victoria. Initial results suggest that sodic soil water availability increases significantly following the application of either lime or gypsum. A tillage-chemical ameliorant interaction was present. Other factors such as soil clay mineralogy also appear to be influencing water availability in these systems.

A single application of lime will have longer lasting beneficial effects on acid-neutral sodic soils than the application of gypsum. Combinations of lime and gypsum, however, deliver both short and long term benefits.

Lorrae van Kerkhoff

PhD scholar

Integrated environmental research: from independent experts to post-modern process managers?

”Integration” has rapidly become a buzzword in environmental research, in a trend that appears to be international, and increasing. Yet as a concept it remains vague, and as a practical guide for research management it is ambiguous, to say the least. To date there has been little investigation of how environmental researchers or research teams, often trained in biophysical disciplines, deal with the increased complexity, theoretical contradictions and practical uncertainties of this “integrated” research.

This is an exploratory, qualitative study that examines how the notion of integration is being implemented in

two environment sector Australian Cooperative Research Centres. Each are concerned with different environmental issues, and operate in different social and political contexts.

The first stage of this study has indicated that most researchers and managers view integration as a technical issue, a process of generating integrated products or outcomes. In contrast, the topics that were of most concern to the participants in this study have centred around social factors, not technical ones. By focusing on the technical outcomes rather than social processes, research managers may overlook important social dimensions of integrative research, such as trust, repsect and fairness.

Yet it is likely that these act as a precondition for the genuine mutual learning that is necessary for integrated outcomes to be achieved. These preliminary findings and ideas will be tested as the study continues.

This doctoral research is supported by Land and Water Australia.

Kimberly Patraw Van Niel

PhD scholar

Reconciling geographical and ecological paradigms: modelling multi-layered species distribution and abundance for dynamic mapping of vegetation

This study examines the conflicts between ecological theory and geographic process and methods and seeks to reconcile them through new geographic processes and data constructs. While accepted ecological theory maintains that individual species vary individually, geography has been dominated by methods of mapping communities or dominant species. In order to advance understanding of the spatial aspects of species distributions, geographic methods and processes must relate specifically to current ecological knowledge. This includes the use of proper statistical methods, error analysis, data design and storage, and data combination analysis, while still considering the needs of environmental managers and other third party data users. Kimberly is supported by both ANU and OPRS scholarships, and also conducts research in remote sensing and the uses of pseudorandom number generators in GIS.

Eddie Webber

PhD scholar

The dynamics of carbon sequestration in the coarse woody debris of eastern Australian forests

This study is aimed at defining the decay dynamics of coarse woody debris (CWD) in different forest types along a latitudinal gradient. The quantity of carbon (C) stored in different decay classes, and the movement of the CWD between the different decay classes is of major importance when accounting the sequestered C in these forests. Modelling of this pool of sequestered C will lead to the formulation of management strategies of the CWD in these forest types, which is lacking at the present time. This work is supported by the Cooperative Research Centre for Greenhouse Accounting in Canberra.

Kusuma Yulita

PhD scholar

Generic delimitation of Shorea and Hopea (Dipterocarpaceae)

Despite the importance of the family Dipterocarpaceae, its taxonomy remains confused. This study, undertaken with support from the Global Environmental Facility and in cooperation with the Indonesian Institute of Science, is using both morphological and molecular techniques to review the taxonomy of the Hopea and Shorea complex.

Andrew Deane

Master of Philosophy

Changing stand structures and the consequences for silviculture in white cypress forests in NSW

This study focuses on stand structure responses to past silvicultural treatments in *Callitris gaucophylla* stands in the Dubbo region of NSW. In this part of the state there are good records of past management activities going back over the 20th century.

These periodic tree data is being assessed and will be modelled to understand the dynamics of manipulated stands.

Peter Deane

Master of Philosophy scholar

Values, knowledge and practices surrounding the management of native forests by private landowners in the Eden region

This research, which is funded by the South East New South Wales Regional Plantation Committee, is part of a larger National Heritage Trust project, the South East NSW Private Native Forest Management and Value Added Project, that is promoting private native-forest management in the Eden Region.

There are three broad questions that this research focuses upon: (1) to explore how landowners (in the South East of NSW) use their native forest; (2) to investigate the relationship between landowner behaviour/ attitude towards using private native forest and environmental values; and, (3) to investigate the place that native forest holds for landowners, in their day to day lived reality.

Largely, the research approach is an example of applied, exploratory social science and adopts a pragmatic paradigm combining quantitative / qualitative methods and analysis. Methods used are self-administered (mail) survey, personal (semi-structured and in-depth) interviews, direct observation and document collection.

The research draws upon empirical studies emerging from forestry and environmental science as well as theory from sociology and social psychology. The formal area of inquiry is agrarian political economy. The substantive areas of inquiry are land (forest) management and property rights.

Surendra lal Karna

Master of Forestry scholar

Benefit-Cost analysis of a fast-growing firewood tree species plantation in Nepal

Firewood is one of the major sources of domestic energy in the developing countries. People use it because it is one of the most economic and available sources of energy. Increased population in developing countries has resulted

in high consumption of firewood, which brings a number of problems. In the industrial countries, firewood fulfils only a small proportion of energy requirement; many other affordable alternatives of energy are available there. In many of the developing countries scarcity of firewood is a big problem, which adversely affects the socio-economy and also brings many environmental problems.

While this problem is addressed by planting fast-growing tree species, some fast-growing species can be better solution. It seems that fast-growing exotic species may also bring a better economic returns. However, plantation of exotic firewood species may have considerable negative impacts on the natural ecosystems. These impacts must be weighed against the benefits the plantations the society gains. The environmental cost of exotic fast-growing species may exist as non-marketed goods and services. While, the trend of planting fast-growing tree species is increasing, the real net benefit is experienced only after a time. Therefore, an economic analysis is essential to gather information on what is the real net social benefits from the fast-growing exotic firewood species plantation project.

This study aims at evaluating the social net benefits from the fast-growing tree species – specially, Eucalyptus spp., planted for firewood purposes in the developing country with the case study mainly focussed on Nepal and to compare the situation with other natural and social environments.

Lei Luo

Master of Environmental Science scholar

Temporal geographic information system (TGIS)

Temporal GIS (TGIS) is very useful and important in environment monitoring and assessment because it provides conventional GIS with the capability to handle geographic data not only in spatial but also in temporal scenario. Unfortunately, many of today's GISs lack this particular ability due to either an inappropriate data model or weak data processing methods. This research focuses on how the time dimension and time coordinates can be incorporated to the GIS data model to establish a temporal GIS conceptual model. For a temporal GIS with 4 dimensions (X,Y,Z and t), the data processing and analyzing methods/algorithms can be very complex, the topology relationship is also very difficult to establish. To simplify the question, we need to create a cross-section of the geo-database view for a given time and project the data needed on this cross-section. The topology relation can then be built and the data analyzed with conventional methods.

Magdalene Maihua

Master of Forestry scholar

Blending forestry and tourism (ecotourism): can this be a socially sustainable development option to commercial logging in papua New Guinea

The scope of the main sub-thesis is to find an alternative to commercial logging in Papua New Guinea due to lack of socially sustainable development achievement over the past two decades. Ecotourism is therefore selected as an alternative to commercial logging. Ecotourism is described as nature-based tourism that entails biological conservation, economical and social benefits. The existing legislative systems from Tourism, Forestry and Environment and Conservation are examined and critiqued, as eco-tourism is relatively new to PNG. Eco-tourism impacts are also critique through the opportunities and constraints examined. Through this thesis suggestions will be provided for the three lead agencies to re-examine the current policies and allow for integrated development with more emphasis on people participation, equity, governance and improved living conditions.

Papua New Guinea (PNG), is a country endowed with rich

natural resources of both renewable and non-renewable resources. The forest resource is one of the natural assets. PNG's economy depends on the development of natural resources and no doubt it will continue its dependency on natural resources. Despite the development of mega-scale logging projects, social conditions of the forest community by and large has deteriorated in terms of living conditions and general welfare leading to high mortality rates (UNDP 1997). In view of this, from the forestry's perspective, this sub-thesis aims to explore other development options, particularly ecotourism as an alternative to logging if an area especially of high biodiversity is earmarked for commercial logging. Lessons will be drawn from three projects (Vanimo, Oro Butterfly Project and April Salumei in PNG and overseas ones particularly from around Australia).

Mahalle Punyalal

Master of Environmental Science scholar

The Economics and Greenhouse Gas Abatement of an Alternative Biofuel for Sugar Mills: the case of camphor laurel (Cinnamomum camphora) a bioenergy source for sugar mills in Tweed and Byron Shires of New South Wales

Establishment of plantations with high growth rates and efficient use of biomass are successful in forestry related greenhouse mitigation. This sort of greenhouse mitigation can be combined to control noxious weeds. This study focuses on the project proposed by State Forest New South Wales into the control of camphor, a noxious weed, and its replacement with eucalypts. It is planned that camphor and eucalypts biomass will be used as timber and bioenergy for the nearby sugar mills.

State Forests New South Wales has conducted preliminary studies showing positive carbon net benefits, however, these studies have not taken into account the overall greenhouse gas emissions in estimating the greenhouse gas budget. This study aims to estimating the greenhouse emissions at each stage of the project and evaluate the project's economic feasibility. Results of this study are intended to of valuable policy implications for the implementation of the State Forest New South Wales project.

Eko Maiguo

Master of Forestry scholar

Principles and application of silviculture of harvesting natural forests in Papua New Guinea

Harvesting of natural forests in PNG started about 50 years ago and it continues. In recent times harvesting of the natural forests has received serious public criticism because of unsound application of harvesting systems. The current harvesting method is selection logging and criteria for species selection and tree- marking is based on the use of 50 cm diameter breast height (dbh). It has also been noticed that not a single forest area previously logged has conditions which allow for the next harvesting cycle. Furthermore, many forest areas harvested seems to be abandoned for ever – no post-harvest stand management has been carried out.

This paper aims to show how the natural forests of PNG can be harvested more appropriately based on silvicultural principles. The study will first look at the current practices adopted and their failures. Secondly, it will discuss silvicultural systems in existence now. Then it will outlines the application of silvicultural to various forest types. Finally, the study will show application of different silvicultural systems to maintain forest conditions and the same time meet societal demands.

Essa Matti Pyykkonen

Master of Environmental Science scholar

Evaluation of the viability of the emerging sandalwood industry in Western Australia

Assessment of the viability of a planned sandalwood plantation near Carnarvon, WA. This includes an evaluation of the ecological requirements of santalum alba and the suitability of the site for plantation growth. Included in the evaluation are also the viability of the sandalwood market in Australia and the effect on the local economy. Social considerations are viewed from the perspective of employment among the local aboriginal community.

Santa Maya Shrestha

Master of Forestry scholar

Conflict management for sustainable development of community forests in Nepal

The community forests of Nepal are one of the targets of highest priority programs of the forestry sector of Nepal and are widely applied throughout the country. Since 1978 large numbers of national forests have been handed over to the local communities. Despite many successes in community forestry (CF), there are some challenges ahead in CF management and development. A number of conflicting issues are arising at different stages of CF processes. The management of the forests and sustainable development can only be achieved if such conflicts can be managed.

Therefore this study aims to identify and analyse various conflicts in CF in Nepal. It also evaluates different approaches of conflict management and recommendations will then be made to manage the conflicts successfully in CF in Nepal. This work is mainly based on literature and Santa's work experience in community forestry.

Shyam Shrestha

Master of Forestry scholar

Participatory process / approaches as a viable option for the development of watershed management in Nepal

Watershed management (WM) is basically the management of forest, soil, water and people of a particular hydrologically bounded geographical area for the sustainable production and use of goods and services needed by the people. It requires coordinated action to internalise the externalities and to tap the linkages among the various resource uses within an area drained by a system. Thus, participatory WM is the management of these resources for poverty alleviation and food security of the poor and marginal farmers of the hilly areas.

Basically, the middle hills of Nepal consist of high population density and more than 90 % of the people derived their livelihood from the forest and agriculture land. Therefore, the sustainable development of the upland areas through true peopleís participation in WM is one of

the options to raise socio-economic conditions of the rural people in Nepal. Consequently, this project / study will be developed through selection of case studies, especially from western middle hills of Nepal. Furthermore, the study will also be developed from different literatures of WM in Nepal, secondary information or data and personal experiences worked in the Department of Soil Conservation and Watershed Management in Nepal as a Forest officer.

One of the important findings of this study will be the level of awareness, motivation and institutional development of the local people, which are the basic requirements for peopleís participation or participatory approaches in WM in Nepal. Thus, the outcomes of this study will be used to know the successful development of rural hilly people and watershed area of the middle hills in Nepal.

Graduate Diploma in Science

John Mosoro

Graduate Diploma scholar

The role of environmental auditing as a regulatory tool in sustainable forest management practice in Papua New Guinea: principles and applications.

The research project examines the role of environmental auditing as regulatory tool for sustainable forest management practices in Papua New Guinea. It focuses on the principles and the applications of environmental auditing in forest industry and subsequently the forest dependent communities. Further, to determine whether environmental auditing is an effective tool to help and maintain compliance with current environmental regulatory requirement.

The environmental management practices relating to forestry in Papua New Guinea has long been a concern, but of late it has become an even more pressing issue, as economic and social conditions place ever more stress on the forest industry and subsequently on the forestry-dependent communities through out the PNG. Many factors play a role in the environmental management practices of the forestry industries and consequently the forestry-dependent communities, there is no single solution to the problems. The forest dependent communities are often caught in the web of a variety of local, regional, national, and international forces, over which they often have little or no control. In spite of this, communities can take action to improve their environmental management systems and the sustainability prospects within their community. A very important step in this regard is for communities to take stock of themselves, economically, socially and with greater environmental consciousness.

The application of environmental auditing may help the forest Industries and the forest dependent communities to accomplish that task with assistance from the local, provincial and the national authority responsible for the environmental matter. The research project is a little contribution to the sustainable forestry management practice systems and further to the many other environmental management and policy research work that have been written by the Papua New Guinean authors and international academics and scholars who have contributed on this area of environmental management.

Gabriel Anderson

Biological factors affecting regolith redistribution in dry sclerophyll forests.

Organisms are recognised as one of the five soil forming factors, yet there are many areas where the influence of plants and animals is unknown. For example, do soil fauna, through activities such as nest building, burrowing and feeding contribute to, or work against the process of soil horizon formation? It is hoped that this honours project will produce some insights into questions relating to biotic activity and its influence on regolith redistribution, mineral deposit dynamics and soil formation.

One of the major aims of the project is to gain an understanding of the dynamics and processes of movement of material by biota (plants and animals) throughout the regolith and soil. I will be trying to answer questions such as, how much material is moved around the soil profile, how far is it moved, what type of material is moved, what biota are involved and do trees move minerals around the landscape by uptake into tissue and cycling back to the soil? I will be assessing and measuring the activity of various biota including ants, earthworms, termites, echidnas, wombats, rabbits and trees in dry sclerophyll forest at 'Mulloon Creek' near Braidwood, NSW.

Maria Arnold

The role of Geographic Information Systems (GIS) in the in situ conservation of chimpanzees in Western Uganda.

Threatening processes such as habitat loss, degradation and fragmentation continue to imperil primate species throughout the African continent. This project aims to examine those practices threatening the long term survival of chimpanzees in Western Uganda, using GIS to identify and analyse patterns in data, to detect possible underlying trends, and to enhance managements predictive capacity given projected changes in land use and environmental conditions.

Brett Brown

Quantifying Animal Behaviour near Roads to inform mitigation of roadkills.

This study is examining animal behaviour near main roads in the Kosciuszko National Park to determine the factors that are important in influencing animal mortality due to collisions with cars. The study will be conducted using a variety of survey methods to determine which are the most appropriate to measure the exposure of animals to main roads. Results from the study will then be compared to roadkill data supplied by the NPWS to investigate the potential for mitigating roadkills.

Sonya Duus

Investigating the Scope for Conflict Resolution in Environmental Disputes

This honours project intends to investigate the current status and future direction of conflict resolution techniques in disputes over Australia's natural resources. The study will draw on experiences in other countries and sectors where mediation and conflict resolution techniques have been developed, and parallels will be drawn where appropriate. Given the increasing awareness of the importance of involving all stakeholders in decision making, it is hoped that this investigation will add to our understanding of ways to make decisions just and sustainable for communities as well as the environment.

Rory Eames

Organic farming and the sustainable agricultural paradigm in Australia.

This research examines the relationship between organic farming and the sustainable agricultural paradigm in Australia. The sustainable agricultural paradigm is understood in this thesis to be an umbrella term for initiatives directed at creating more socially, ecologically, and economically sustainable food production in Australia. Organic agriculture is chosen as representative of a viable and established alternative system than high input conventional agriculture. The purpose of this research is to use organic agriculture as a tool to understand the current adaptability of existing agricultural institutions to more sustainable farming systems.

Hugh Griffin

Biospheric Carbon Sinks and the Kyoto Protocol: Science, Policy and International Law

This thesis will consider the interaction between science, policy and legal developments in relation to carbon sequestration and the Kyoto Protocol. The effectiveness and reliability of scientific literature in relation to carbon sinks, and its resulting impact on policy development will be assessed. The Kyoto Protocol itself will be analyised within the broad framework of international environmental law treaties in order to determine whether it is faced with typical setbacks, and whether other treaties have an equivalent to carbon sinks. Finally, an analysis will be made of future scenarios that may result depending on the success or failure of the Protocol.

Fiona Hill

Regional Landcare Networks: Are they the answer to many of the problems in Landcare? Lessons from the Ovens Valley

The Decade of Landcare was announced by the then Prime Minister, Bob Hawke, in July 1989. The initiative arose from a joint submission by the NFF and the ACF, with both parties having recognised the severity of environmental land degradation as Australia's greatest problem. The problems Landcare set out to address continue to worsen, and problems continue to emerge in program logic and implementation.

This thesis explores the potential of recent regional Landcare Networks to overcome the well-documented problems of Landcare, by the adoption of a 'whole of catchment' approach. In theory the 'scaling-up' of Landcare activity improves the capacity for more meaningful and representative public participation, improves inter-group and agency communication, enhancing effective partnerships, and enables groups to 'pull-down' government funding and resources. This thesis examines the achievements of the Ovens Valley Landcare Network in north-east Victoria, exploring capacities and limitations to effective Landcare group activity.

Matthew Holloway

The Impact of Dairy Deregulation on Farmers and Farming Communities

Through my research I am aiming to find what the consequences of deregulation have been for dairy farmers in New South Wales. I am also looking at the flow-on effects of deregulation on the communities in which farmers operate.

Clare Irwin

Incentives for the protection and re-establishment of native vegetation on private land in the Mount Lofty Ranges, SA.

The protection and re-establishment of native vegetation on private land has been recognised as important not only for the preservation of biodiversity but also for addressing increasingly severe rural land degradation issues. However, it is clear that rural Australian landholders often lack the financial and technical resources to undertake re-vegetation on their properties and thus incentives must be provided.

My honours research aims to evaluate the success of the revegetation incentive scheme provided by the Mount Lofty Ranges Catchment Program (MLRCP) from a 'landholder' or 'landcare group' perspective, in light of the goals and objectives outlined in the recently released Mount Lofty Ranges Revegetation Strategy. The objective of this research is to produce recommendations on how the promotion, content and delivery of the MLRCP revegetation incentive package could be improved to ensure the greatest possible participation, long-term commitment and on-ground change in the region.

Stefan Kaufman

Decision making within human/environmental systems

Supervisor: David Dumaresq (Geography, Human Ecology). This project will attempt to articulate a plain English decision making methodology for use in human/environmental systems based on case studies such as the LWRDC, the MDBC, or ACT urban planning. It will integrate recognition of 1) the subjective position of groups and individuals, 2) the interactive and uncertain nature of inquiry into the human environment with 3), consideration of the effect of hierarchies of scale and complexity on the inquiry and action capabilities of decision makers.

Carolyn King

Tangible and intangible values of dry sclerophyll forests

The project aims to provide a methodology to value (tangible and intangible, including conservation, biodiversity and wood values) dry sclerophyll forests. This will be determined through literature review and community consultation to define what values dry sclerophyll forests hold for owners and the community in general. The range of tangible and intangible values will be collected through extensive field based measurements. Indicators for biodiversity will focus at the stand (structural complexity, patch size, focal species) and landscape level (connectivity, type of neighbouring ecosystems, Habitat Complexity Score etc.) utilising sites where data on populations of groups of animals already exist. These measurements will be conducted to determine the extent, nature, ecological condition, species presence and abundance (particularly wildlife), growth rates, biomass and standing volumes of timber in dry sclerophyll forests on the Southern Tablelands of NSW.

Tijmen Klootwijk

Modeling crown rise in Eucalyptus grandis W. Hill ex Maiden (Flooded gum) on the northern coast of NSW

The reduction of native forest harvesting, has led to an increasing perception of plantation grown eucalypts as an alternative source of high value timber products.
The recovery of high value products from plantation grown eucalypts has, however, been very disappointing. Knot related defects, resulting from the inefficient shedding and occlusion of branches has been the major cause of downgrading.
Pruning live branches, or green pruning has been recognized as a means of reducing the knotty core and maximising the production of knot-free timber or clearwood, under the reduced timeframes inherent of plantations. Green pruning however reduces the photosynthetic capacity of the trees, impacting upon their growth. To limit this, pruning should be scheduled to remove the lower branches just before they die.
The aim of this study is to model the rise of the green crown in *E. grandis* growing on the northern coast of NSW. Quantifying the height to the live crown base in relation to age, stocking density and site quality is essential for the timely scheduling of pruning operations, which aim to maximise the production of high value clearwood.

David Little

Litter and Soils at an Inverted Treeline

Frost hollows in the Eucalypt forest are largely confined to the subalpine zone in South East Australia. The forest boundary surrounding these frost hollows, the inverted treeline, is strongly defined and this provides the opportunity to study the soil and litter chemistry on either side of this boundary. Previous work by Hedenstroem (1993) and Banks (1997 unpubl.) have already shown marked differences in soil chemistry across this ecological boundary along a slope of low gradient. A study site was selected at Long Plain in the northern section of the Kosicuszko National Park to confirm and expand upon these findings.
The results show that there are marked changes in the litter and soil chemistry that corresponds with the woodland-grassland boundary. Characteristic nutrient cycling processes (litterfall, and root action) were related to the differences in soil chemistry between the two adjacent ecosystems.

Amber Pares

Soil Organic Carbon Sequestration in Mixed and Pure Plantations of Acacia and Eucalyptus

This study examines carbon sequestration in Australian native hardwood species Acacia mearnsii and Eucalyptus globulus. Information presented in this project will contribute significantly to the soil component of Greenhouse Accounting. It is the primary objective to identify wether sequestration of soil organic carbon increases under the influence of nitrogen fixing Acacia species. Secondly, the effect of nitrogen fertiliser on soil carbon sequestration rates is assessed. Research was undertaken at a 10 year old experimental plantation site situated at Cann River in East Gippsland, Victoria. The following hypotheses are tested:

1. “Increasing proportions of N-fixing trees increase carbon sequestration”.
2. “Application of mineral N-fertiliser increases carbon sequestration”.
3. “Differences in soil carbon sequestration between mixtures of Eucalypts and Acacias can be explained by differences in above-ground productivity”.

This project emphasises the role of nitrogen in carbon sequestration and provides an understanding of the relationship between carbon and nitrogen storage, and availability for plant uptake, in the temperate Australian environment. The ecological importance of soil carbon will also be addressed in sustainable forest management. This research will also aid forest management by providing recommendations for the establishment and tending of two commonly used plantation species.

Shane Paton

Using microsatellite markers to examine the relationship between inbreeding and growth in native populations of Pinus radiata. Specifically looking at the Guadalupe Island population trial

The project examines the relationship between inbreeding and growth in a native population of *P. radiata* established from seed collected on Guadalupe Island, Mexico. The trial planting was established in 1982, approximately 30 km NE of Tumut in Buccleuch State Forest N.S.W. Growth measurements of height and diameter have been collected from this trial planting, in addition to needle samples collected for use in the microsatellite marker analysis.

The use of microsatellite markers will enable the identification of trees that are a product of inbreeding, as well as the identification of those that are a product of mating between unrelated individuals. By analysing both the microsatellite data and the growth measurement data it will be possible to draw conclusions about the effect that inbreeding has on growth in native populations of *P. radiata*.

Richard Reilly

Soil carbon and soil structure under burnt cane Management regimes in sub-tropical eastern Australia

In northern NSW, sugarcane agriculture has traditionally included pre- and post-harvest burning of the cane trash (leaves). Consideration is currently being given in the industry to halting these burning practices and to instead collecting the green cane trash for electrical cogeneration purposes. Although the alluvial sugarcane soils have been generally naturally high in organic matter, there is some concern that this ongoing deprivation of organic material from the soil could be contributing to poorer crop yields and soil compaction problems through a gradual degradation in soil structure.

The aim of this study is to understand the dynamics of soil carbon under burnt cane management in NSW sugarcane soils. The study looks at trends in soil carbon by analysing historical soil test data and re-sampling selected sites, and examines the effect of cane cultivation on soil carbon through a program of paired site sampling - comparing three time periods of continuously cultivated sugarcane (<10yr; 30-50yr; and >70yr) with adjacent uncultivated land. Soil structure is tested to analyse correlations with soil carbon levels. The effect of flood mud in ameliorating hypothesised soil carbon decline is also examined as part of this study.

Alice Thompson

An environmental history of the Monaro region, using serrated tussock grass (Nasella trichotoma) as an indicator of change

This project will aim to gain a greater understanding of the interaction between landuse and landscape change in the Monaro region of South-Eastern NSW, with a particular focus on serrated tussock grass. This study will test whether it is possible to find patterns of change in the landscape integrating historical and recent documentary, scientific and oral/anecdotal data. It will also evaluate the usefulness of an historical approach to contemporary management problems. Ultimately, I hope this study will provide insights into when and what are the conditions where control of serrated tussock grass is possible.

Michael Turner

Characterisation of pore space and factors affecting fluid flow in regolith materials

This project is looking at how heterogeneities at the pore-scale affect pore space and fluid flow characteristics. The effect of system chemistry will be studied for its role in changing the physics of the pore space. Present assumptions about fluid flow and modelling may be questioned.

Aaron Van Winden

Identifying factors contributing to increased productivity in mixed Acacia mearnsii and Eucalyptus globulus plantations at Cann River Victoria.

Mixed species plantations have a range of possible benefits including potentially higher productivity for carbon sequestration and timber production, improved bio-diversity values, diverse range of timber and non-timber products and reduced fertiliser inputs.

At the Cann River site above ground productivity in mixed stands (*Acacia mearnsii* and *Eucalyptus globulus*) has been increased by up to 60% when compared to monocultures of the two component species. In Hawaii increases of up to 20% have been found in mixed *Eucalyptus saligna* and *Albizia falcataria* plantations, compared to component monocultures. However, many mixed species plantations are less productive than their component monocultures but limited research has been done to clarify the reasons for this. The aim of this project is to identify the ecological

processes contributing to increased productivity in mixed Acacia-Eucalypt plantations at Cann River (VIC).

The following hypotheses are to be investigated; (1) Canopy stratification in mixed stands increases light capture resulting in greater total levels of photosynthesis, and (2) Improved nitrogen nutrition affects photosynthetic processes and crown structure. This project is supported by the CRC for Greenhouse Accounting.

Sam Wood

How effective are simulation models at estimating the carbon content of Eucalyptus forest ecosystems?

Aim of Research

To investigate the effectiveness of simulation models in estimating total carbon content of *Eucalyptus* forest ecosystems

- inclusive of environmental heterogeneity at the landscape scale?
- inclusive of the effects of commercial timber harvesting?

: noting that fire regimes potentially vary between logged and unlogged ecosystems

Research Objectives

- Predict the potential carbon content at equilibrium of a Eucalyptus forest ecosystem using landscape scale simulation models of net primary productivity (NPP) and net ecosystem productivity (NEP).
- Estimating the 'observed' carbon content of a (disturbed) eucalypt forest at Kioloa National Park using field survey techniques.
- Compare the predicted potential and observed carbon stores
- Seek to explain the results of this comparison by investigating working hypotheses.

Working Hypotheses

There are three possible outcomes:

Predicted=Observed
P>O
P<O

Depending on the results, there are a number of working hypotheses to explore:

a. if P< or> than O, is this due to the possible effects of logging and fire regimes on the basis that these variables preventing the forest ecosystem reaching equilibrium, or

b. is the differences due to inability of the models to account for landscape scale variation in the environmental constraints on NPP/NEP, or

c. some combination of (a) and (b), or

Can further simulation modelling help identify which of these hypotheses is most likely?

(i) run model simulating logging and fire regimes
(ii) run modelling simulating landscape scale heterogeneity in environmental constraints for which real data are lacking
(iii) use Remotely Sensed NDVI/fPAR to drive NPP model under assumption that it reflects some integral of logging/fire history

d. If P=O, how can this result be interpreted given uncertainties in data and models?

Martin Alexander

Crown fire thresholds in pine plantations

Fire managers in Australasia currently lack the basis that would permit them to objectively evaluate the potential for crown fire development in exotic pine plantations under any specified set of fuel, weather and topographic conditions. The existing crown fire initiation models all have inherent weaknesses or lack applicability, thereby rendering their utility questionable. A model that would enable them to predict the onset of crowning has been developed from a combination of physical insights and mathematical modelling coupled with relevant field and laboratory experiments. The six model inputs include at least two environmental parameters (ambient air temperature, in-stand wind speed) and possibly a third (slope steepness) where applicable, two surface fire behaviour characteristics (line-fire intensity, flame front residence time) and two crown fuel properties (foliar moisture content, live crown base height).

The most fundamental principle incorporated in the model is that temperature rise above ambient conditions is determined by the intensity of the heat source at the ground surface, the height above ground in question, and the angle formed between the ground surface and the surface fire plume. Ignition or initial combustion of the needle foliage at the base of the live or green crown layer is in turn judged to be a function of the duration of heating experienced and the temperature achieved in the convection column at this height, assuming the presence of a pilot flame source(s). One of the unique features of the present crown fire initiation model is that the influence of within stand wind speed on the trajectory of the thermal plume has been considered in terms of its relative effectiveness in the convective heating of the lower live crown layer. This is considered to be a very significant improvement over C.E. Van Wagner's criteria for crown fire initiation and coupled with variable allowances for ambient conditions and duration of convective heating should thereby permit extrapolation to a wider range of burning conditions. Furthermore, a simplistic methodology has been formulated for deriving the needed empirical constant in the model, that essentially reflects the surface and bridge or ladder fuel characteristics of structurally dissimilar plantation stand types, based on the height of lethal crown scorching that could be obtained from low-to moderate-intensity surface fires, thereby negating the need for direct temperature measurement above the surface fire flame front. This has in turn resulted in new insights into the modelling and prediction of crown scorch height.

The model has been tested against independent documentation obtained from experimental fires, operational prescribed fires and wildfires, with exceedingly encouraging results. The validity of C. E. Van Wagner's concept of a critical minimum crown fire rate of spread in relation to the crown bulk density in order to achieve continuous crowning has been substantiated for the first time in an operational setting. Also emerging from a detailed wildfire behaviour case study is evidence that under certain conditions, two distinctly different states of fire spread and intensity could exist in a given plantation fuel complex at a specific level of fuel moisture depending on the wind speed and arrangement/character of the plantation age-class mosaic. The model will allow exotic pine plantation managers the means of quantitatively and objectively assessing the various fire and fuel management practices designed to limit the incidence and impact of crown fires such as pruning, thinning, prescribed underburning, and plantation layout/design considerations (e.g., diverse age-class mosaic). The model could easily be extended to forest fuel complexes other than exotic pine plantations with a minimal of effort.

David Cooper

An unequal coexistence: From 'station blacks' to 'Aboriginal custodians' in the VRD, Northern Australia.

The thesis addresses the broader theme of coexistence between black and white Australians through an extended case study of the mediation of overlapping Aboriginal 'heritage' interests in land with the interests of non-indigenous landowners and land managers in the Victoria River District of the Northern Territory (the 'VRD'). The thesis shows that while an historical perspective reveals marked changes in many of the outward manifestations of intercultural relations (for example, changes in white categorisations of Aboriginal people from 'station blacks' to 'Aboriginal custodians', and changes in the conduct of relations from violent to non-violent behaviours), the overall tenor of relations has changed little. The VRD community remains 'racially' segregated, characterised by separate cultural domains, poor intercultural communication and entrenched Aboriginal marginality

and socio-economic disadvantage. The thesis shows how recognition of Aboriginal heritage interests in land is largely determined by the parameters of this pattern of relations, which are analysed in the thesis through the themes of power, cultural difference and strategic action. The thesis also examines the Western paradigm of heritage, from its conceptual origins to the structures and processes which have subsequently been developed in indigenous heritage policy, including heritage protection legislation and processes of consultation. The integration of heritage protection with development approvals processes has created many difficulties for Aboriginal communities in the VRD, whose heritage interests are often placed in opposition to the economic interests of the wider Australian community. The thesis endorses a coexistence approach to mediating indigenous heritage interests with the interests and needs of non-indigenous land owners and land managers. This must include effective statutory protection of indigenous heritage interests together with mechanisms and resources to promote and negotiate voluntary agreements between indigenous and non-indigenous stakeholders.

Sasha Courville

NOT JUST TRADE: Steps toward incorporating social and ecological costs into international trade. Lessons learned from 'better' case studies of coffee production-to-consumption systems, in June 2001.

In an increasingly interdependent world, activity in international trade is one of the most important factors in determining a country,s prospects for development. Whether international trade can contribute to sustainability depends on the regulatory structures in place. Given that current WTO rules ensure that governmental regulatory frameworks are unable to integrate social and international costs into international trade, the starting point for this thesis is an examination of non-governmental initiatives working to address these issues, using strategies such as fair trade and organic certification and labelling systems. By looking at the how individual actors are integrating social and ecological issues into their own activities, a great deal can be learned about what kinds of structures and systems are necessary to incorporate these costs into international trade.

In the past year, Sasha has also presented a number of papers and workshops at various venues including the International Society for Ecological Economics Conference at the ANU in July 2000, an African workshop on Developing a Global Code of Conduct for Organic Traders in Egypt in November 2000, the Biofach Organic Trade Fair in Nuremberg, Germany in February 2001, the American Association of Geographers conference in New York City in March, 2001, and the KF European Consumer Co-operative Conference on Health and Well-being, Globalisation and Sustainable Consumption, in Malmo, Sweden in April, 2001.

Digby Race

The social and economic implications of farm forestry development for regional Australia

Farm forestry, defined here as the management of trees and shrubs integrated with agricultural systems for multiple products and benefits, is viewed favourably by sections of government, the forest industries and landholders, in Australia and internationally, because of its potential to generate positive outcomes in both biophysical and socio-economic terms. Indeed, several examples of 'successful' farm forestry have emerged in Australia over recent years. Nevertheless, some aspects and outcomes of farm forestry remain complex and uncertain – analysis of the forestry and agricultural industries suggests that simply increasing the level of activity within an industry, for example by expanding the area of commercial trees through the adoption of farm forestry, will not necessarily contribute positively to regional development.

This research addresses the extent to which farm forestry development is likely to provide social and economic benefits to regional Australia. Issues important for the understanding of how farm forestry can be expected to benefit regions relate to resource control, trade relationships, dynamics of regional markets, and national policies guiding government's support. The extent to which farm forestry had fulfilled, was likely to fulfil, expectations was investigated in three of the key farm forestry regions in Australia – the Green Triangle, Tasmania, and south-

west Western Australia. Interviews and workshops with a wide range of farm forestry stakeholders, review of key documents, and observation of development activities were the main methods of data collection. Individual-farmer case studies, of initiatives widely viewed as successful, were also examined within these regions.

The principal results of this research are:

- understanding of the social and economic dimension of farm forestry remains poor, or is poorly reflected in current regional development;
- while a broad vision of farm forestry is espoused, typically its development follows only a single model – plantations for industrial wood production (eg. for hardwood pulp) which yields an equally narrow range of benefits;
- prospects for small-scale non-aligned growers remain highly speculative – while there are some strategies to reduce the risks for such growers, these are limited in value and capacity;
- benefits from farm forestry will vary considerably – for different growers within regions, and between regions;
- the nature of partnerships between growers and industry/government have important implications for the equity of returns; and
- Federal and State government farm forestry policy and program development tend to be overly-optimistic in their assessment of what small-scale growers will accept and can achieve within the context of highly competitive forest industries.

Given the current policy context and emerging market opportunities, it appears likely that a diversity of farm forestry opportunities will emerge in regional Australia. Four possible future scenarios have been developed to illustrate some possibilities. Analysis of these scenarios helps suggest strategies by which industry and government can work more effectively with landowners to achieve beneficial farm forestry outcomes.

Frank Valzano

The effects of chemical ameliorants, tillage and stubble practices on sodic soils in Australia

Sodic soils are defined as containing 6% or more exchangeable sodium on the cation exchange complex. They are one of the major contributors to land degradation in Australia. When wetted, these soils swell, disperse and/or slake, causing poor water infiltration, water logging and erosion. On drying, a hard surface crust is formed which inhibits crop or pasture establishment. It is estimated that sodic soils cost Australia in excess of 1.3 billion dollars a year through direct production losses and indirect environmental effects. Methods of managing these soils and alleviating the effects of sodicity are therefore critical to the long term viability of Australian agriculture.

This thesis examines the effects of chemical ameliorants (gypsum and/or lime), tillage and stubble management on neutral to alkaline sodic soils with a variety of physical and chemical properties, located in three study areas. Each soil comprised different characteristics, ranging from the heavy duplex soils of Peak Hill, N.S.W, to the gradational loam soils of Carnarvon, W.A. and the heavy uniform soils of Natimuk, Victoria. The Peak Hill and Natimuk study areas were used for dryland cereal/oilseed production and the Carnarvon site was used for irrigated horticultural production. The soils at each of these sites were initially characterised by high levels of sodium in the surface horizons and subsoil. Consequently, in the absence of stabilising constituents all the soils were prone to mechanical and spontaneous dispersion, resulting in degraded structural properties such as poor infiltration, water logging, compaction and erosion. Therefore, the overall aim of this investigation was to evaluate the effects of the chemical/tillage/stubble management treatments on soil properties and on relationships between these properties in the short and long term.

At all sites, the results indicated that gypsum was the most effective ameliorant of sodic soil properties in the short term (~1 year). However, in the longer term the beneficial effects of this ameliorant at rates ≤ 5 Mg ha^{-1} were limited due to its high solubility and hence rapid leaching from the upper part of the soil profile. At rates of 10 Mg ha^{-1}, gypsum was found to have both short and long term effects on a heavy grey vertosol (Natimuk), but only short term effects on a lighter textured yellow kandosol (Carnarvon). This difference was related to less leaching in the heavier soil profile at Natimuk compared with the lighter soil at Carnarvon.

Lime (at rates of ≤ 5 Mg ha^{-1}) did not improve soil properties in the short term, but was moderately effective in reducing dispersion and increasing hydraulic conductivity in the longer term (3 years). Combinations of lime (2.5 Mg ha^{-1}) and gypsum (1 Mg ha^{-1}) gave comparable results to the equivalent gypsum treatments in the short term, and enhanced (sometimes synergetic) improvements in the long term. These long term improvements in soil physical properties were equivalent to, or better than those observed for greater quantities of lime or gypsum in isolation. The initial soil pH also appears to be critical to the success or failure of the lime treatments.

Soil texture influenced the depth of the treatment effects in all instances. In the heavy soils of NSW and Victoria, all treatment effects were limited to the surface 100 mm as the subsoil formed a dense and impenetrable layer. This differed from the lighter textured soil at Carnarvon, where gypsum treatments affected soil properties to a depth of 800 mm.

Tillage and stubble treatments affected soil physical properties. The reduced tillage practices at the NSW sites were found to give lower penetrometer resistance values than equivalent direct drill practices. These tillage treatments were also shown to interact with the chemical ameliorants, e.g. reduced tillage practices increased the rate of dissolution of lime into the soil compared with equivalent direct drill practices. At the Natimuk site, stubble retention increased the depth of effect of the gypsum treatments. This effect was related to increased surface cover, enhanced soil faunal activity and higher organic carbon levels.

Past management regimes (prior to the commencement of the present study) had a direct effect on soil behaviour and response to the applied treatments. There was a dramatic increase in the amount of water entering the solum at sites where management practices changed from a predominantly grazing environment to a tillage and/or horticultural system. As the throughflow of water into the soil increased under cropping, the level of sodium or electrolyte in the surface horizons decreased regardless of chemical or tillage treatment. This effect was not as marked at sites where tillage had been previously used.

Soil clay mineralogy/organic carbon levels at each of the sites clearly influenced the extent of clay dispersion observed at different sodium levels. In smectitic soils, the level of dispersion for a given level of sodium was higher than that for a similar soil with illitic mineralogy. These differences in dispersion were related to the higher negative charge in smectitic clays compared with illitic clays. Soils comprising high levels of organic carbon (>1.5 %) were not as susceptible to dispersion (mechanical or spontaneous) at very low electrolyte levels (<1 $mmol_c L^{-1}$) as were soils with less organic carbon.

Relationships between different soil parameters or components (e.g. the exchangeable sodium percentage and the sodium adsorption ratio) were shown to vary between the different sodic soil types, within similar soil types and between horizons in a soil profile. The water content of a profile, in particular, influenced the relationship between soil parameters such as ESP and SAR. These differences highlight the difficulties associated with making generalisations about the properties of sodic soils.

This investigation has shown that the behaviour of sodic soils and their response to chemical ameliorants and tillage/stubble management is difficult to predict, as there are many factors that need to be considered. However, the importance of electrolyte in the soil solution and organic carbon levels have been identified, and the potential for using lime or combinations of lime and gypsum as alternative treatments to the standard gypsum applications has also been recognised. Based upon the findings of this study, to improve sodic soil physical properties, combinations of lime and gypsum, stubble retention and crop rotations are required, but care needs to be taken in applying these techniques to a range of different soils.

Jim Woodhill

Sustaining rural Australia: A political economic critique of natural resources management

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This thesis examines the institutional response to land degradation in rural Australia. Sociological and political economic perspectives are used to critique the claims that community-based natural resources management (NRM) initiatives, in particular landcare and integrated catchment (regional) management, are empowering farmers and local communities to tackle land degradation. By analysing the institutional order of modernity and reflexive modernisation theory, the structural causes of land degradation that lie beyond the direct influence of farmers and local communities are explored.

The research integrates material from seven action research case studies and 10 years of personal experience with NRM in rural Australia, with a theoretical perspective on the political economic changes of late modernity.

Part One introduces the argument, establishes the methodological and epistemological assumptions and outlines the empirical basis for the thesis.

Part Two critiques the logic of the policy and practice of NRM in rural Australia from the mid 1980s to the late 1990s. It illustrates how a series of dilemmas and contradictions emerge that can only be understood by taking a theoretical perspective on the intellectual, social, democratic and economic institutions of modernity and late modernity.

In Part Three the relationships between land degradation, the wider ecological crisis and contemporary political economic change are examined to identify and clarify the structural causes of land degradation and the implications

for NRM policy. This raises the prospect that the root cause of our inability to sustain the health and productivity of agricultural lands lies ultimately in the conception and execution of democracy in modern times. Thus it is argued that the real impact of landcare and catchment/regional approaches to NRM may lie more in their democratic potential than in their short term capacity to affect land degradation.

Finally, Part Four proposes the adoption of social learning, an increasingly prevalent concept in the sustainable development literature, as a paradigm for guiding NRM towards an improved response to the structural causes of land degradation. Social learning is explained and developed in terms of three key elements: philosophical reflection; methodological pluralism and institutional design. Returning to the practical implications of a social learning NRM paradigm, the current political paradoxes in rural Australia are examined and the democratic potential of landcare and catchment/regional management is assessed. It is concluded that for this potential to be realised social learning must be institutionalised by strengthening civil society, enhancing mechanisms for sustainable regional development, developing more open processes of policy deliberation and improving NRM knowledge systems.
In summary, the thesis examines the importance of the interplay between theory and practice and of philosophical reflection for NRM. In so doing, the relevance is established of contemporary social and political economic theories, in particular the work of Anthony Giddens and Ulrich Beck, to the problems of land degradation in Australia.

Margaret Yonga

Definition of the symbiotic relationships of 11 leguminous species native to Kakadu National Park with their rhizobia

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The nodulation and nitrogen fixing potential of 157 isolates of rhizobia obtained from 11 native legumes (6 acacias) selected for revegetation of waste rock dumps in Kakadu National Park, Northern Territory, were studied in glasshouse experiments. Growth properties, symbiotic effectiveness and host range of the various isolates were determined. The isolates were analysed using phenotypic and genotypic approaches including carbon substrate utilisation, antibiotic resistance, pH change of the growth media, tolerance to salt, multilocus enzyme electrophoresis and partial analysis of one rRNA gene sequence.

Acacia holosericea nodulated with the highest proportion of isolates and,in general, the acacias were more promiscuous than the other genera. *Crotalaria medicaginea* was the most selective. Appropriate host-rhizobium combinations for effective nodulation were identified for use in mine site regeneration.

The isolates were classified into three groups by cluster analysis - those with affinities to the fast growing *Rhizobium* species, those with closer affinities to the slow growing *Bradyrhizobium* species and those differing sufficiently from the latter to be tentatively assigned as a new genus, *Pseudo-Bradyrhizobium*.

K. Kamboya

Master of Forestry

Genetic variation in a family-in-provenance trial of acacia mangium willd. And the implications for improving pulp production in indonesia

The performance of *Acacia mangium* provenances and families from Papua New Guinea (PNG) and Queensland (Australia) was assessed in a trial at Wonogiri in Central Java. The trial material comprised 8 PNG provenances and 8 Australian provenances, with total of 134 individual family seedlots. Three traits - height, dbh and form - were assessed at age 16 months.

Significant variation between countries and provenances was detected for the traits assessed, and for stem volume which was derived from height and dbh. However, there was no significant difference, except for form, between families within provenances.

At a country level, the mean performance of PNG provenances was greater than that of Australian provenances, for all traits. The best provenances for volume were Wipim and Bimadebun (PNG provenances). However, the Australian provenances of Pascoe River Area SL 35815 and Claudi River-Iron Range were the straightest. Boite provenance from PNG was the best choice for a combination of volume and form.

Genetic parameters were estimated for both overall (pooled Australian and PNG) and separate country data sets, using REML procedures to account for imbalance in the data. Heritabilities estimated from the overall data set were quite low for all traits, from 0.03 to 0.09. When country data sets were separated, Australian provenances had greater heritabilities (-0.04 - 0.07) than those of PNG provenances (0.08 - 0.12). Genetic correlations between all traits were positive and high. However, given the nature of the experimental material and its early stage of domestication, the interpretation of the results places more emphasis on country and provenance level results than from family-level analysis.

The results are broadly consistent with those of companion traits elsewhere in Indonesia. There would be only modest gains from family-level selection at this stage; it would be more appropriate to concentrate on expanding the genetic resource of good provenances, and on breeding which drew from these good provenances. The results suggest some obvious short-term strategies for multiplying superior material, and some implications for breeding strategy. It is also apparent that genetic variation in traits which influence pulp quality and yield needs to be assessed, and the information used to refine breeding strategies for *Acacia mangium* for pulp production in Indonesia.

Sascha Kaminski

Master of Environmental Science

The challenges for more effective management of flying-foxes in Australia.

Flying-fox management requires a complex integration of conservation, political, economic and social issues, which have not been effectively combined in current management practices.

Management of *Pteropus* species; Order Chiroptera: Family Pteropodidae, can be effective with adequate resources that are appropriately allocated.

It is axiomatic that flying-foxes be conserved as they are part of Australia's biodiversity. They may be keystone species in maintaining our ecosystems through their role in pollination and seed dispersal. Their conservation is, however, problematic as the challenges described and discussed in this paper must first be addressed effectively.

The first challenge is to obtain reliable data on their biology - numbers, distribution and habits. The second challenge is to protect and restore habitat, the third to coordinate conservation management across diverse jurisdictions and the fourth is to provide stakeholders adversely affected by the animals, particularly commercial fruit growers, with effective management strategies.

The management objective must be to strike a balance between conservation and control and I conclude that that will require a better understanding of the animals and more effective cooperation amongst all stakeholders at all levels of governance.

Mario Ramos

Master of Forestry

Improving the gluing of eucalypt timber by plasma modification of wood surfaces

The effect of plasma treatment on wood surface and gluing properties of four eucalypt species, namely, blackbutt, Gympie messmate, rose gum and spotted gum was examined in this thesis. The aim of the study was to determine whether plasma treatment could improve glue bond strength of 'difficult to glue' eucalypts. Changes in wood surfaces properties of eucalypts were evaluated through measurement of wettablilty (contact angle and area) and SEM observations of wood surfaces. Improvement in gluing properties was assessed through lap-shear tests and estimation of wood failure in treated specimens compared to untreated controls.

Preliminary experimentation on the gluing of eucalypt species with six commercial adhesives that, when tested in the dry condition, Gympie messmate specimens had the highest shear strength. Specimens with freshly sanded surfaces and in those banded with AV203 (UF adhesive) also had relatively high shear strength. Specimens glued at a moisture content of 12% were significantly stronger than specimens glued at a 20% moisture content. When tested wet, specimens with freshly sanded surfaces and those glued at 12% moisture content or bonded with AV203 showed high glue bond strength. Probability of wood failure was generally higher in specimens with high shear strength, except for rose gum specimens, which had low shear strength but showed high probability of wood failure.

Plasma treatment significantly increased the wettability of wood surfaces in all four eucalypt species. The improvements of wettability were positively correlated with treatment power and treatment time. Treatments in spotted gum species with plasma at low energy levels did not improve glue bond strength even though it greatly increased wettability of wood. Significant improvement in glue bond strength of spotted gum were however, obtained plasma treating wood surfaces at high energy levels (150W /5min).

When used as a pre-treatment (prior to gluing) the combination of plasma treatment and sanding produced the largest improvement in glue bond strength of eucalypt specimens. Plasma treatment on its own also improved both dry and wet shear strengths. Combination treatments also increased the probability of wood failure occurring during dry and wet testing. Specimens treated at high energy levels (15W/10min) also showed high probability and percentage of wood failure, further suggesting that plasma treatment improved glue bonding.
Plasma treatment of wood particularly at high energy levels (15W/10min) resulted in changes in the physical and morphological properties of eucalypt wood. Plasma treatment increased permeability of wood and caused permanent losses in weight of rose gum and blackbutt veneers. Plasma treated wood appeared cleaner and the plasma degraded membranous structures in wood most notably vestures and warts. Changes in the physical properties of wood as a result of plasma treatment at high energy levels may account for the positive effect of plasma treatment on glue bond strength.

David Saywell

Master of Environmental Science

Participation in environmental policy and decision making in Australia: a story of the politics of censensus and unholy alliances

This thesis explores the role of public participation in environmental policy development and decision making in Australia from the late 1960s to the present day. It does this by examining four case studies, the Battle for Kelly's Bush, the subsequent Green Ban movement, the Hawke Government's term in power with its consensus - corporatist approach to governing, and a product of this approach to governing, the Landcare movement. In broad terms this thesis is an examination of an awakening in the Australian community of the lack of regard for environmental and heritage issues by governments and business and a realisation that the public had little say in decisions that were being made. It is an examination of the publics' demands for change and the way governments and business reacted to these demands. It is argued that despite the introduction of legislation, policy and mechanisms in the 1970s designed to increase public participation in environmental policy and decision making processes, the nature of the Australian political system and subsequent actions by governments, business and peak lobby and interest groups have served to actually restrict public participation. Other issues addressed throughout this thesis include the reasons why and how disparate interest groups form alliances with respect to environmental issues, the role the media plays in public participation, the potential for new communication technologies to be used as participatory vehicles and the role that Not In My Backyard (NIMBY) movements play, or can play, in environmental policy and decision making processes.

Fabiano Ximenes

Master of Forestry

Preservation of wood using oxy-aluminium compounds

Wood-inorganic composites (WICs) have been recently developed and tested for wood preservation purposes. Many combinations of inorganic compounds could potentially be used as WICs. The main objective of this study was to develop WICs from aluminium compounds and test their effectiveness in relation to some essential requirements of wood preservatives. It was the hypothesis of this study that aqueous solutions of oxy-aluminium salts, particularly aluminium potassium sulphate, combined with bases and other salts could form insoluble compounds within wood which would improve the resistance of wood to destructive environmental agents. Four different treatments (T1, T2, T3 and T4) were developed.

The weight percent gains (WPGs) obtained after treatment of Scots pine and Norway spruce with oxy-aluminium (OA0 solutions varied according to the impregnation method used. The use of vacuum-impregnation as opposed to double diffusion was more beneficial in obtaining higher WPAs for OA treated wood. Higher WPAs had a beneficial effect on dimensional stability and fire resistance properties of wood. Inorganic deposits were detected throughout the structure of treated wood, as observed under a scanning electron microscope (SEM). Infra-red spectroscopy of OA treated wood gave indications of complex formation between T1 (sodium aluminate) and T2 (aluminium hydroxide) and lignin constituents. The same features were not seen in the spectra obtained for T3 (magnesium aluminate) and T4 (aluminium borate)-treated wood.
All the OA treatments imparted a good degree of dimensional stability to wood, especially to Scots pine. Although some f the inorganic compounds were leached from wood during exposure to running water, OA treated wood still retained significant dimensional stability after leaching. In contrast, OA treatments did not impart water-repellency to wood, probably due to the increased hygroscopicity caused by the inorganic deposits. This was also one of the likely reasons for the negative effects of such treatments (especially T2 and T3) on tensile strength properties of wood. OA treatments did not impart significant weathering resistance to treated wood.

The decay resistance of OA treated wood to soil-inhabiting microorganisms was dependent on the treatment, soil type, temperature and exposure times. All OA treatments imparted considerable decay resistance to Scots pine blocks exposed to a sandy soil, where the main hazard was brown rot. The bulking effect caused by OA compounds in wood was probably the main reason for the improved decay resistance. T1 and T2 were more effective than T3 and T4 in protecting Scots pine exposed to a compost mix in which soft rot was active. Improved fire-resisting properties were imparted to Scots pine and Norway spruce by OA treatments. T1, T2 and T4-treated wood showed similar curves in differential thermal analysis (DTA) and thermogravimetric analysis (TGA) experiments, which indicated that they caused a decrease in the amount of volatiles liberated and an increase in the amount of char produced. T3-treated wood showed the highest residual weights until the final stages of thermal decomposition, suggesting that such a treatment could be particularly beneficial in situations where fire could be extinguished quickly.

The results obtained in this study demonstrated that it is possible to develop WICs from oxy-aluminium compounds which can improve several properties of treated wood. The treatments developed here may be of interest to the wood preservation industry, although further research is needed to improve some characteristic of the oxy-aluminium -treated wood.

Lisa Blanch

Good cops, bad cops: contemporary alliances of the Australian environment movement

This thesis examines the significance of the current popularity of 'alliances' formed by the Australian environmental movement (AEM). It is in response to the common view that the post-Rio Conference (1992) period has been difficult for Western environment movements. The concept of 'alliance building' has become popular as a means to strengthen the AEM and enter a new phase of environmentalism. But the term 'alliance' is used vaguely by leaders and participants in the AEM, and in their contexts carries different meanings.

This thesis uses two theoretical concepts to show that alliances are part of the increasing complexity of environmental politics. These are (1) the divergence of the AEM into 'radical' and 'reformist' strategic approaches, and (2) changes in environmental governance as the number of stakeholders with an interest in environmental conflicts increases, and their relationships change. These two concepts are evident in the history of the AEM, and are now underscored by the globalisation debates.

The study was based on an extensive literature review, participant observation and interviews. Case studies of contemporary radical (the 's11' alliance that blockaded the World Economic Forum in Melbourne, September 11-13 2000) and reformist (by Australia's leading national environmental organisation, the Australian Conservation Foundation, with primary producers and business) alliances were conducted. The study showed that contemporary alliances are forming with disparate stakeholders outside the AEM who are also from opposite ends of debates concerning globalisation and governance.

Alliances play an important role in the ongoing development of the politics of the environment by leading paradigm shifts and involving new stakeholders. But they are themselves limited in the change they can achieve individually and at an aggregate level.

This research also showed the usefulness of the discipline of environmental politics, and the historical method, in understanding the significance of developments in environment movements. Also, although the AEM, and similarly environmental politics, are becoming increasingly more complex and encompassing more stakeholders and issues, we tend to judge them by the simple radical-reformist dualism.

David Carpenter

The Moral Ecology of the Peasant: A Case Study of Agricultural Transition from the Philippines

The concept of moral ecology refers to the exchange of resources between people and the environment and to exchanges within social systems. Using the concept of Moral Ecology as a departure point, a Moral Ecology Framework (MEF) was developed and used to analyze the transition from green revolution to organic rice farming by small resource poor farmers on the Philippine island of Bohol. The MEF focused on the epistemology of the two farming systems and how epistemology influences management principles and practice. The orienting concepts of *systemic understanding, exchange between society and the environment, local versus extra-local exchange* and *scope* were integral to this analysis. The case study demonstrated how the ostracism of nature under the green revolution system led to ecological instability and a decrease in economic viability, two important components of a sustainable agricultural system. Whereas the transition to organic farming and the concomitant incorporation of ecological processes allowed the farmers to increase the economic viability and ecological stability of their farming systems by altering the exchange processes within the social-ecological system.

Scott Channing

The value of linear bushland fragments as habitat for arboreal marsupials, nocturnal birds and microbats: a case study from the south west slopes of New South Wales

The South West Slopes of New South Wales have been extensively cleared and developed for agricultural production and urbanisation. Conservation reserves protect less than 1% of the remaining vegetation. Much of the remnant vegetation outside the reserve network occurs as linear fragments along roadsides and waterways. These linear fragments constitute a significant proportion of extant native vegetation in the region and are thought likely to provide critical habitat for woodland-dependent fauna.

This study aimed to investigate the importance of these linear fragments as habitat for three broad faunal groups: arboreal marsupials, nocturnal birds and microbats. This aim was achieved by conducting surveys of these target fauna at 60 sites across the region over two sampling periods, November 1999 and March 2000. Surveys revealed that a diversity of nocturnal vertebrates inhabit

the linear fragments including four species of arboreal marsupial, three species of nocturnal bird and at least twelve species of microbat. Three of the species recorded during the study are listed as vulnerable under the New South Wales Threatened Species Conservation Act 1995: the Squirrel Glider (*Petaurus norfolcensis*), Large-footed Myotis (*Myotis adversus*) and Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*).

Statistical models based on vegetation type, fragment width, habitat attributes and the environmental conditions at the time of survey, were developed for the occurrence of some of the commonly recorded taxa. Vegetation type was an important explanatory variable for several of the taxa, but the type of response varied. Fragment width was found to influence the occurrence of four microbat taxa. The occurrence of several taxa was also significantly related to habitat attributes such as understorey cover, ground cover, hollow-bearing trees, decorticating bark, canopy cover and crown dieback. The detectability of only one taxon, the Inland Broad-nosed bat (*Scotorepens balstoni*) was related to environmental conditions. Finally, significant differences in the detecability of four microbat taxa, between each of the two sampling periods, were recorded.

These findings indicate that a range of management strategies will need to be implemented to effectively conserve the target species in this region. These strategies include maintaining and enhancing existing habitat, adopting a landscape approach and involving all stakeholders, particularly local governments and private landholders, if the goals of nature conservation are to be achieved.

Key future research needs to further explore the existing dataset and examine the occurrence of nocturnal fauna in relation to landscape context; investigate movements of these species in linear fragments; assess the long-term viability of the target taxa; examine the effectiveness of the management proposals; and implement a long-term monitoring program.

Allison Driscoll

Insulation qualities of nest sites of the western ringtail possum

This study, in Jarrah forest in the south-west of Western Australia, set out to determine a reason for the use of Balga (*Xanthorrhoea preissii*) as nesting sites by the Western Ringtail Possum (*Pseudocheirus occidentalis*). It also aimed to increase the limited knowledge about the habitat requirements of the Western Ringtail Possum.

Thirteen Balga and twelve trees were tested for insulation quality by measuring minimum and maximum temperatures inside and outside nests or hollows. A general linear mixed model was fitted by restricted maximum likelihood to a subset of the data. Hourly maximum temperatures were analysed visually.

Statistical results showed that Balga nests had slightly lower insulation qualities than hardwood hollows, but in biological terms, there was no difference in suitability between a nest in a Balga and a hollow in a hardwood. Ambient temperatures would need to reach 53.0ºC and 47ºC before a Western Ringtail Possum would become heat stressed inside a Balga or a tree hollow respectively. Temperatures of this degree have never been recorded in the vicinity of the study site.

This study indicated the need for silvicultural guidelines that include the protection and retention of Balga as a valuable resource for the Western Ringtail Possum during harvesting and other silvicultural activities such as prescribed burning. It should also encourage continued research into habitat requirements of the Western Ringtail Possum and provide a basis for further investigation into the use of Balga as a commonly used refuge type.

Amanda Engel

Dilemmas of Participation: A case study from the Southern Regional Forest Agreement (RFA) process.

Public participation is of growing importance in Australian forestry but this thesis argues that there are several dilemmas in its theory and practice. This research aims to identify dilemmas that impede meaningful participation and offer ways in which they can be addressed in order to design better participatory approaches.

Four dilemmas are identified from the literature. Briefly they are: the meaning of participation, from theory to practice, representative or participatory democracy and, the history of Aboriginal exclusion. The case of the Southern Regional Forest Agreement (RFA) is used to assess the degree to which the dilemmas identified in the literature are present in a practical example. The case study deals in particular with Aboriginal peoples' experience. The dilemmas are revealed most starkly in this case.

The framework of this thesis is informed by critical theory. As the purpose of inquiry within the critical theory paradigm is critique and transformation, it relates to the research aims in two ways. First through critique, dilemmas that impede meaningful participation emerge. Second, the transformative nature of critical theory is appropriate for addressing the aim of improving public participation.

The research concludes that the case study depicts a traditional top-down government-owned process in which the public were offered a façade of false empowerment rather than being allowed to participate in actual decision-making. Opportunities for public participation in Australian forest planning processes will be constrained whilst these dilemmas remain unresolved. Unravelling them and exploring the political context in which forest conflicts are played out, can provide a starting point for an exploration of new relationships.

Joern Fischer

The value of paddock trees for birds in a pastoral landscape in southern NSW.

The value of paddock trees for birds was examined in a pastoral landscape north of Tumut and east of Gundagai, southern New South Wales. The aims of the study were (1) to identify which bird species used paddock trees, (2) to compare the bird species composition in paddock trees with the bird species composition in woodland patches in the surrounding landscape, (3) to examine which factors were related to occupancy patterns at the site and landscape levels, and (4) to assess if paddock trees were used as stepping stones by birds.

A total of 70 sites (46 single paddock trees and 24 clumps of paddock trees) was surveyed for 20 minutes each in the morning, and 36 sites were surveyed again in the afternoon of March 2000. During these surveys, the presence of birds, and their direction of arrival and direction of departure to and from the site was recorded. Several site and landscape variables were measured at each site for use in data analysis.

When incidental observations were included in the field survey data, 44 bird species were observed using paddock trees. During the formal surveys, 31 species were observed using paddock trees, including several that are traditionally considered woodland species.

Data from bird surveys in woodland patches that were obtained in a separate study in November 1999 were used to compare whether there was a relationship between the abundance of a given bird species in woodland patches and paddock trees. Birds that were commonly detected in paddock trees also tended to be common in woodland patches in the surrounding landscape. However, some birds that were common in woodland patches were absent from paddock trees (for example shrub-foraging species like the White-browed Scrubwren).

Site occupancy patterns of birds were modelled for several guilds of birds using logistic regression. Foliage foraging birds were more likely to occupy clumps of trees and sites with a high tree size index. Nectarivores were most likely to be detected at sites more than 200m from the nearest woodland patch. The probability of detecting granivores was higher at sites with a low tree size index. Open country species were most likely to occupy large trees and sites that were located more than 200m from the nearest woodland patch.

Foliage foragers tended to follow relatively densely vegetated areas when moving through the landscape. This trend was weaker for nectarivores and granivores. Open country species did not prefer densely vegetated areas for their movements. Departure directions of birds relative to their arrival direction were clustered around 00 and 1800, i.e. birds tended to either return to their point of origin or move in the opposite direction of arrival.

The study demonstrated that a large number of bird species benefit from paddock trees, which are used for foraging, and contribute to landscape connectivity. Accordingly, the conservation value of paddock trees may have been underestimated in the past. Implications of these findings for land management, the establishment of new softwood plantations, wildlife corridor design, and revegetation strategies are discussed.

David Forrester

Early coppice growth in thinned Silvertop Ash forests

This study examined the effect of thinning intensity and site quality on coppice growth in regrowth stands of Eucalyptus sieberi L. Johnson (Silvertop ash), which were located in the Eden Region of south-eastern New South Wales. To assess the influence of thinning intensity and site quality, the growth and some physiological attributes of coppice and the retained regrowth stems were determined. The coppice at these sites was between two and three years old. The mean coppice height was about 4 m with a maximum coppice height of 8 m. The mean coppice diameter was 21 mm with a maximum of 63 mm.

Thinning intensity explained a large amount of the variation in the proportion of the stand that was coppice, expressed as a percentage of basal area, which increased with thinning intensity. This relationship was exponential at the lowest quality site and linear at the highest and medium quality sites. At the lowest quality site, thinning intensity also explained a large amount of the variation in the proportion of the pre-thinned stand that was coppice two to three years after thinning, expressed as a percentage of basal area, which increased with thinning intensity. At the lowest quality site coppice growth was related to the leaf area, basal area, and sapwood area of the overstorey, however at the higher quality sites these relationships were weak. Coppice growth, expressed in basal area, at the highest site quality was much lower than that in stands of lower site quality.

At the lower quality sites thinning intensities removing over 70% basal area resulted in coppice growth that occupied over 10% of the total basal area. This coppice was only two years old. At the highest quality site the coppice occupied less than 2% of the total basal area after thinning intensities of over 70%. The lower coppice growth at the high site quality may be genetically determined.

The specific leaf area was higher in the coppice leaves (6.7 m^2 kg^{-1}) than in leaves from the regrowth trees (3.7 m^2 kg^{-1}). The foliage nutrient concentrations of phosphorous, nitrogen, potassium and magnesium in regrowth trees were

generally low. The foliage concentrations of phosphorous, nitrogen, potassium, magnesium and calcium were higher in coppice leaves than in leaves from the regrowth trees. This increase was significant for all nutrients except nitrogen. The stomatal area of coppice leaves was higher than that of leaves from regrowth trees, indicating a higher potential transpiration in the coppice. Assuming identical sap flow rates for the coppice and the regrowth component, the coppice may contribute up to 21%, 23% and 3% of stand transpiration at the low, medium and high site quality, respectively.

These results show that there may be a need to control coppice on medium to low quality sites thinned at high intensities. The control of coppice in *E. sieberi* forests requires further attention. Root grafting has been observed in other ash forests and if this occurs in *E. sieberi* there may be a need for a mechanical method of coppice control for stands of different ages.

Mark Garner

Determining an appropriate protocol for amenity tree valuation in Australia.

An examination of the performance of six different amenity tree valuation methods, from three different countries was conducted during this study. The results were compared to determine the precision or repeatability of each method, the effect of different levels of assessor expertise on the methods, the ability of the methods to distinguish between different trees and the sensitivity of the methods to individual factors.

The purpose of the study was to identify the strengths and weaknesses of the methods so that the information could be used to develop a set of guidelines, which can contribute to the establishment of a standard valuation method, appropriate for Australian conditions.

The assessment of the methods consisted of two practical valuation exercises and a computer based sensitivity analysis. The results showed that the methods perform differently in comparison to each other and in the hands of assessors with different levels of knowledge. They also indicate that the level of repeatability between methods different and in particular, that the current 1999 Australian/ New Zealand draft standard performs poorly in this area.

It was found that the methods examined were able to distinguish between trees exhibiting different characteristics. However, they are susceptible to producing extremely variable results when applied by biased operators. The effect of such bias is unbalanced, with tendencies toward high scores having a much greater effect on the outcome than lower scores.

The results also indicate that if one tree characteristic such as health is particularly low or particularly high, then assessors then to link this to other factors and alter their scores accordingly.

Based on the results of this project, it is apparent that the current 1999 Australian/New Zealand draft standard requires modifications if it is to be consistently repeatable and practical to sue. It is essential that any standard is able to meet these criteria in order to achieve wide spread acceptance.

The guidelines developed from this study can be used as a tool for comparing different methods and also as a basis for making the necessary modifications required to the current draft standard to improve its overall performance.

Sara Hely

The interactive effects of elevated carbon dioxide and temperature on the competitive interactions of a native (Austrodanthonia eriantha (H.P Linder) and invasive (Vulpia myuros (C.C Gmelin)) grassland species

It is expected that in the next 100 years there will be a doubling of CO_2 concentration and a 3.40C increase in temperature predicted for Eastern regions of Australia associated with climate change.

It has been proposed by many past authors that these increases will have direct implications on plants and their competitive interactions, particularly in sensitive communities such as grasslands. Past research into the effects of CO_2 and temperature on plants have suggested generally positive responses for C3 plants. However, their responses have been seen to vary widely depending on the species and environmental factors.

Changes in plant responses associated with climate change have lead to investigations into possible implications on competitive interactions. The mechanisms driving competitive interactions still cause considerable debate. In particular, one such mechanism is known as Initial Advantage, or "Snowball" cumulation, which has received no past research in regard to climate change.

This project sought to establish the effect of climate change on competitive interactions (specifically initial advantage) between a native and invasive grassland species.

It was found that CO_2 and temperature did not affect above ground competitive interactions, but rather a possible diversion of plant responses to below ground growth and biomass. Further investigation into this aspect however, is needed to firmly establish whether this was in fact the case.

The Initial Advantage Theory was found not to be consistent with the interaction of the native (Austrodanthonia eriantha) and an invasive (Vulpia myuros) grassland species examined in this project. Rather, the results suggest the effect of an inherently superior competitor (or aggressive species) was more important in competitive outcome. This was suggested to be a result of faster initial establishment and development which is characteristic of an annual grass species such as Vulpia. There also appeared to be some evidence that Austrodanthonia facilitated the success of Vulpia when in competition with a plant of the same initial size.

Future research directions suggested are to incorporate measurements of below ground growth and biomass and an extension of this study over a longer time frame and into a field environment.

Gary Koh

The evolution and impacts of advective frost in the Canberra viticultural region

The occurrence of frost poses a perennial threat to all forms of agriculture, and is especially relevant to grape growing, as viticulture is mostly found in regions of cool climate. In Australia, these regions are found in the southern part of the continent, and are susceptible to episodes of advective frost, which, being both more severe and more difficult to avoid or mitigate than normal incidents of frost, cause widespread damage. The Canberra viticultural district is a region that has recently experienced such an episode.

Being a large-scale event, the occurrence of advective frost is driven by synoptic scale processes which influence most of the southeast Australian regions. The construction of a synoptic climatology for advective frost, and comparison of this to an atypical case, identifies synoptic elements associated with advective frost, and the role of external factors. The primary driving force in this case is the pressure field, which sets up mechanisms for entraining air of sub-antarctic origin onshore. This is manifested in wind patterns across the region. The passage of the air across varying surfaces, however, subjects it to modification at the boundary layer, and air properties across the region differ considerably. Thus, an understanding of the mechanics of this modification may well be the key to linking synoptic scale processes to local scale occurrences of advective frost.

In the Canberra region, returns from a grower survey indicate that there is a perceived need for better meteorological information for the region. This need is based on significant differences in conditions, particularly temperature, between official forecasts and those found at the growing region. These differences are found to occur mainly during the night, and appear to be more pronounced under conditions that are conducive to the occurrence of advective frost.

Better meteorological information for the growing region in future therefore relies on the successful linkage, vertically and horizontally, of scale and microclimatic variation respectively.

Kirsty McMaster

Interpretation for summer recreation in the Kosciuszko Alpine area.

Interpretation is an essential tool that can be utilized by National Parks agencies to promote enjoyable, safe and educational visitor experiences and to assist in visitor management. This thesis identifies the barriers to effective interpretation in Australian National Parks, with a focus on NSW National Parks, and explores ways to address and overcome these barriers. To achieve this aim, the relevant literature is explored and interpretation at a case study site, the Kosciuszko alpine area, is evaluated. The evaluation of interpretation in the Kosciuszko alpine area is visitor orientated; it is based on observations of visitor behaviour and feedback from interviews and questionnaires. This feedback reveals that interpretation in this area is not fulfilling its potential role to promote visitor safety, provide environmental education and is not being used effectively as a tool for visitor management. The results from the Kosciuszko alpine area are compared with examples from literature to highlight the barriers to effective interpretation in Australian National Parks. Interpretation in the Kosciuszko alpine area and other Australian National Parks is hampered by inadequate interpretation planning, limited interpretation funding, a poor understanding of National Park visitors and a lack of systematic interpretation evaluation. The thesis concludes suggesting strategies to overcome these barriers.

Katherine Minto

The role of extension in developing farm forestry for landholders: A case study of the southern tablelands, NSW

This thesis examined the extension of farm forestry for landholders and discussed the development issues that were required for improvement in management and knowledge of suitable farming systems. It is argued that in farm forestry, landholders are commonly reliant on promotional advice that may be biased and limited in quality of information. This was shown by the dependence of demonstration tree plantings rather than scientific trials. There also needed to be further understanding of the

potential for a commercial enterprise of native species for rural and regional areas. Opportunities for more intensive forms of extension were examined through the Master TreeGrower program that integrated regional information and used key landholders as representatives of farm forestry practices in the area. Many landholders were seeking to integrate the environmental and lifestyle benefits of farm forestry with the economic value of trees. The Southern Tablelands Farm Forestry network, a Regional Plantation Committee for NSW was used as a case study of the key extension approaches used in farm forestry. Coordination of regional information was flexible but required greater decision-making powers for further development.

The balance between the production aims of the forestry industry and the constraints and preferences of those managing agricultural systems required further adaptation. For landholders, farm scale variables included the type of species used, the site suitability, and the markets available for commercial operations. With further research on commercial enterprises and improved understanding of farm scale issues, the adoption of farm forestry is likely to increase and landholders issues to be addressed.

Michael D. Otsub

The effects of farm forestry on public roads within the southern tablelands of New South Wales

The increase in farm forestry across the Southern Tablelands of New South Wales has been perceived as having detrimental effects on farm roads. In traditional timber producing Shires such as Tumut and Tumbarumba, studies have shown very large tonnages of timber being moved as a result of farm forestry. Based on this, there is a supposition that farm forestry will place additional wear and tear on public roads. The perception by Local Government in other areas that farm forestry has detrimental effects on public roads may, however, be in error for the Southern Tablelands. The Southern Tablelands Farm Forestry Network (STFFN), which promotes the development of farm forestry in the region as the local Regional Plantations Committee, has noted that under the recently gazetted Plantations and Reafforestation Act 1999, tree growers will be expected to contribute a road use levy for the road haulage of timber at the time of harvest. There are no such charges levied on graziers, farmers, horticulturalists or other agricultural activities. Hence, there may be an inequity among the road users in the Southern Tablelands Farm Forestry Network area. Therefore the issue of road use by a range of rural land uses requires further investigation to establish whether the levy is justified.

Both qualitative and quantitative research methods were employed in this study. A survey was conducted in three stages with three types of respondents including landholders, officers of Australian Capital Territory Forests and State Forests of New South Wales and officers from all the Shires represented in the STFFN region. Shires outside the area were used for comparison. All inclusive and non-random snowball-sampling techniques were employed to select seventy landholders for both interview and phone survey. A structured questionnaire was used to yield quantitative data on inputs and outputs of land use operations, based on the records of the landholders and forestry officers. Another structured questionnaire was used to collect data on land use planning and financial contribution relating to various rural land uses from the Shires included in the study. The data was analysed quantitatively using an Excel ™ program. Interviews were conducted from 4 July 2000 to 30 October 2000.

The results of this study demonstrated that farm forestry timber (softwoods and hardwoods) road haulage produced only 17.6 tonnes per hectare annually. This is substantially less than the 312 tonnes per hectare of rural / industrial land uses and the 163 tonnes per hectare of intensive agricultural activities. When farm forestry timber was compared to extensive agricultural activities, the latter produced road haulage of 15.1 tonnes per hectare less than farm forestry. Small farm forestry plantings in the STFFN area produced only half the output per hectare when compared to the larger plantations in the Tumut and Tumbarumba areas. Farm forestry used a total of 0.5 truck movements per hectare per year; compared to rural / industrial land uses and intensive agricultural activities which used 208 and 249 truck movements per hectare per year respectively.

Farm forestry timber travelled an average of 37 kilometres per hectare when compared to rural / industrial land uses and intensive agricultural activities with an averages of 15 and 725 kilometres per hectare respectively. Also, the study found that farm forestry operations occur mainly during dry periods. Finally, the Shires studied have different Development Application requirements and charges for the same rural land uses in the same State, a further source of inequity.

In conclusion, it was found that farm forestry in the STFFN area has only a minimal effect on public roads, particularly under the current pattern of establishment of small plantings. A road use levy targeting only farm foresters is thus inequitous and unjustifiable in this area. It is recommended that further research is needed on issues such as the type of physical damage that may be inflicted by farm forestry transport on roads in order to quantify the extent of damage per tonnage hauled.

Tiffany Parsons

Control of the house mouse (Mus domesticus) through the manipulation of refuge habitat.

The role of refuge habitats in maintaining breeding populations of the House Mouse (*Mus domesticus*) was investigated in an irrigated grain-growing region of New South Wales (Murrumbidgee Irrigation Area). The efficacy of refuge habitat manipulation through the application of herbicide was tested. There were three treated and three untreated sites. Roundup" was applied to the refuge habitat once a month (on the final day of each trapping period) at each of the treated sites. There were significant reductions in the abundance of mice and in the proportion of reproductive and breeding female mice on the sites treated with the herbicide. At each of the sites, resource availability (high-quality food and cover) was measured to determine if the refuge habitats were acting as 'donor' habitats supporting a breeding population of mice. The herbicide treatment significantly reduced the vegetation biomass (cover) and food resources (seed biomass and invertebrate biomass).

The study indicated that refuge habitats do act as 'donor' habitats and provide resources necessary for the maintenance of a breeding population of mice. Whilst the manipulation of the refuge habitat did not effect the level of damage to adjacent crops, the effects on population dynamics were strong, given the small scale of this manipulative experiment. The small proportion of the landscape that is refuge habitat (<5% in the study area), indicates that its manipulation is a practical and promising method for reducing the growth of mouse populations, and therefore, for reducing the impact of mice on irrigated agricultural crops.

Daniel Payne

Modelling the effect of forest management on the carbon pools in a Eucalyptus pillularis (blackbutt) regrowth forest

Carbon storage in forest ecosystems is an important concept that relates to the reduction of atmospheric carbon dioxide (CO_2). Variations in forest management presented as alternative methods for increasing the carbon storage of forests has been included in the Kyoto Protocol. However, the initial interpretation of the Kyoto Protocol has restricted the use of managed native forests in the calculation of Australia's reduction commitment. Future negotiations however could enable the incorporation of native forest management as part of the reduction target. It is therefore essential to be able to estimate the amount of carbon that is absorbed by a native forest (sink) or released through harvesting (source).

This study aimed to estimate the pre- and post-harvest carbon storage capacity of a typical native forest and model future management options elating to the conservation and production aspects of forestry.

Using a case study of an actual *Eucalyptus pilularis* (blackbutt) dominated forest, the pre- and post-harvest carbon storage capacity was estimated, through the concept of partitioning the forest into discrete "pools". The total carbon stored by each pool was estimated through various forest inventory techniques and destructive sampling. This produced a snapshot of the changes that occur with the carbon storage capacity in a harvested native forest. The dominant pool in the forest ecosystem is the overstory. The total on-site storage of pre-harvest carbon was 163 t/ha and 139 t/ha post-harvest, with 24 tonnes removed as products.

Rochelle Richards

The sensitivity of snow gum to fire scarring in relation to aboriginal landscape burning

Several authors have discussed the impacts of Aboriginal landscape burning by making inferences based on a variety of evidence. These inferences could be used to justify management decisions for hazard reduction or ecological burning purposes. The interpretation of Banks' (1982) data, while just a small part of an in-depth discussion, provides an excellent example of such inferences. For example, the low record of fire scars prior to European contact in snow gum (*Eucalyptus pauciflora*) forest (Banks, 1982) has been used by Bowman (1988) to infer that Aboriginals could have burned the snow gum forest more frequently, but at such low intensities that the fires did not scar the trees, although there is no historical evidence to support this. The aim of this research therefore was to test this inference by analysing the sensitivity of snow gum to fire scarring by low intensity fire.

The study is based upon an understanding of the mechanisms of fire scarring, which was used to develop the analysis in two, independent, ways: 1) a literature review, analysing the sensitivity of snow gum to fire; and 2) a survey of the Piccadilly Circus Fire Ecology Plots, quantifying the sensitivity of snow gum to fire. The results were then applied to the interpretations of Banks' (1982) data.

The literature review established that snow gum is sensitive to scarring by low intensity fire. Furthermore, it was found from the field survey that snow gum will be scarred by around eight out of ten low intensity fires. Hypotheses were developed regarding the possibility of Aboriginal burning in the snow gum forest, and tested using the results obtained from the literature review and survey. If Aboriginals did burn the snow gum forest more frequently

than recorded by Banks (1982) and at the lowest intensity possible, approximately 2.34 scarred tree-rings would have been counted per decade. When compared to an average of 0.6 fire scarred tree-rings recorded per decade by Banks (1982), it is clear that the hypothesis of Aboriginal burning must be rejected given the available evidence. These results show that Banks' data (1982) cannot be used to justify the inference that Aboriginals burned the snow gum forest at low intensities without scarring the trees. Also, the outcomes of the study illustrate the need to test inferences for their validity and impact before making decisions based upon them.

Oliver Story

Commercialisation, customer focus and public participation in the electricity and water sectors.

This thesis examines the role of utility-sponsored public participation in operations and decisions in the electricity and water sectors. Public participation in the electricity and water sectors has a relatively short history around the world. It arose as an alternative to technically-driven infrastructure development, in recognition of the fact that there are social and political considerations and implications to such development. As well as being influenced by arguments of good governance, utilities have seen public participation as a way of achieving better outcomes and of reducing conflict with public interests. These reasons for utility interest in public participation are present in Australian water industry literature and, to a more limited degree, in electricity industry literature. However, the North American electricity industry has a history of involving the public based on similar reasons to those present in the Australian water industry.

The past decade has seen many previously government-provided services being operated on an increasingly commercial basis. Competition, and its requirements, have meant the changes have been much more pronounced in the electricity industry than the water industry, but commercialisation has had an effect on both. This thesis seeks to address the questions of whether, and how, commercialisation of utility services has affected utilities' reasons for, and approaches to, involving the public in decisions and operations. It does so both by looking at the literature surrounding commercialisation of utilities, and through a case-study in ACTEW, a combined electricity, water and sewage utility in the Australian Capital Territory.

Despite the important effects of commercialisation and its accompanying changes, other factors may be more important in a particular utility's approach to involving the public in its operations. The limited strength of public concern and previous experiences with involving the public may be more important factors.

In a commercial context public participation is still important for utilities as a means of resolving or pre-empting conflict and, to a limited degree, as a way of achieving better outcomes to decisions. However, it is not relevant as a fundamental part of good governance, simply because commercial utilities are not responsible for governing. In place of participation as good governance is a focus on customer needs. While this focus means that utilities are more likely to involve people closely in many decisions, people are involved as individual customers rather than within socio-political processes which trade multiple values against each other. Even where utilities offer customers more complicated choices than price-for-service, the public involvement of consumer choice can only partly fulfil the promise public participation as good governance had for addressing issues of collective social and political concern.

Janelle Tappe

The seasonal growth of Pinus radiata (D. Don) in the Canberra region.

The major aim of this study is to quantify the seasonal growth patterns of *Pinus radiata* (D. Don) in the Canberra region and to determine factors which may influence these growth patterns.
The study was conducted at two sites in the Canberra region - Mount Stromlo and Pierces Creek - and with two different aged plots (planted 1992 and 1985/88). The height and diameter of 25 trees at each plot were measured monthly for a period of 22 months.

Both diameter and height growth occur in seasonal patterns. The onset of growth of both parameters occurs during September, with high growth rates continuing through until November. The onset of this growth is influenced by factors other than rainfall. Further peaks of growth rates during other periods of the year occur in response to rainfall, with height showing an increased correlation to rainfall of the previous month. There is, however, little evidence to suggest that site, tree age or dominance class significantly influence seasonal patterns.

While these results can be used to ensure that the application of silvicultural practises are more appropriately timed to encourage maximum growth, they can also be used to develop a growth simulation model. Analysis of models used in Canberra but developed elsewhere, found that the onset of height and diameter growth in these other regions occurs at different times. Therefore this study has proposed a preliminary model, which distributes the percentage of monthly growth throughout the year, for use in Canberra. The proposed model includes a "deviation zone" from April to August, as growth during this time is highly dependent on rainfall which can not be accurately

predicted. While this model was not developed using long term data to accurately determine the actual percentage of monthly growth, it is believed that the model patterns of distribution are representative of the yearly growth.

Carl Warburton

A paradigm of catchment condition: assessing the biophysical environment of the Ginninderra.

Ecological sustainable development (ESD) is a concept encompassing both economic development and environmental quality. Although widely accepted, ESD lacks and explicit definition which inhibits its application to improve the condition of the environment. Catchment condition is proposed as a measure that can be quantified to enable scientists and the broader community to measure environmental condition and trends at that scale. It can be considered as a sub unit of ESD that better relates to integrated catchment management. Catchment condition can be quantified in biophysical terms. However, different users of catchment goods and services can view condition from perspectives other than biophysical. In this way value judgements enter the estimation of condition. This thesis looks at how three groups of society (politicians, scientists and community workers) perceive the condition of the Ginninderra catchment in northern Canberra. It then compares perceptions of catchment condition with a quantified biophysical evaluation or benchmarked assessment.

The methodology consists of first defining the issues relevant to the Ginninderra catchment. Then a key set of attributes (indicators) are used to establish condition. The individuals from the three groups were interviewed and their opinions sought with respect to catchment condition were also focused on.

Politicians perceived the catchment to be in fair condition, forming their perceptions on management indicators. Community workers perceived the catchment to be fair although, slightly degraded; this perception was mainly based on water quality data and Environment ACT assessments. Scientists rated the condition as verging on poor, and used biophysical indicators including erosion, biodiversity loss, water quality and weed infestation. The scientific opinion is close to the benchmarked evaluation which, was based on biophysical attributes. Politicians rated the catchment as fair, and used indicators such as effective urban management, social amenity, water quality and community participation through Landcare to reach a rating.

Another aspect to the formulation of perceptions is that the groups used different landscape units to assess condition. Politicians mainly used the urban areas to assess condition, perhaps relating to the fact that the majority of constitutes reside in Belconnen and Gungahlin and urban areas are intensively managed. Scientists used the whole catchment or riparian zones to assess condition, this is related to general biophysical trends. Community workers used either the riparian zones, which is where they are currently working, or the whole catchment, which corresponds to the Environment ACT assessment of catchment condition. These different perceptions complicate efforts to actively improve the environment given the mixed nature of the catchment condition comments.

By including key perceptions and issues into the measurement of catchment condition the benchmarked assessment becomes more applicable to the catchment users. Presently the process of benchmarking, communication of results and catchment monitoring are not well combined and may not lead to on the ground actions. This situation is possibly related to a lack of funding to community groups and a lack of knowledge support networks.

Kristyna Wasaha

The hypsometric approach to modelling hillslope scale erosion and deposition patterns at Gungoandra Creek catchment, NSW

Erosion is a major problem throughout the world. Research for practical solutions to alleviate the drastic impact of erosion is severely limited by poor understanding of erosion processes. The lack of simple quantitative methods for determining erosion and deposition in the field, has lead to the creation of computer based erosion models. These rely on Digital Elevation Models, which divide the landscape into individual cells. Known as grid-based DEM's these models are able to predict the behaviour and spatial variability of erosion processes through each of these cells. Whilst popular, these DEM's do have deficiencies, where most of them are not able to successfully represent the topography and erosion processes. As a response to these disadvantages the possible role of the hypsometric model was investigated in this study.

The hypsometric curve represents the three-dimensional form of a catchment as a graph. In this study the hypsometric curve has been integrated with the sediment transport capacity equation to create a hypsometric model with the ability to predict potential, relative erosion and deposition for individual hillslopes. Its main use is as a tool for determining sediment patterns in catchments where erosion is transport limited and topography exerts the greatest influence over erosion, compared with other processes such as; vegetation cover, soil infiltration capacities etc.

The hypsometric model, used in this study, was applied to a 5km^2 area of Gungoandra Creek Catchment. The resulting sediment patterns obtained from the hypsometric model were compared against a conventional grid-based model, Terrain Analysis Program for the Environmental Sciences-Grid version (TAPES-G) and field assessment. This was to see whether the hypsometric model was capable of producing a reasonable assessment of the existing sediment patterns within the catchment.

The major results showed that the hypsometric model is capable of predicting both erosion and deposition and that the scale which the patterns are represented provide the greatest flexibility for land managers. Overall, these results suggest that the hypsometric model was vastly superior to TAPES-G, particularly when the user is mainly concerned with determining sediment sources and sinks in a catchment. Suggestions for further work to improve the running of the model and its applications in hillslope erosion studies are given.

Amanda Watson

Public participation in domestic wastewater management

Public participation in domestic wastewater management is a two-way process that contains explicit water quality and implicit soft-system objectives. The first mode of the two-way process is expressed as: public participation can improve the quality of domestic wastewater by controlling domestic sources of pollution. The second direction of the process is an implicit objective of public participation programs and relates to the notion that: 'public involvement creates public learning'. Soft-system objectives are often expressed as levels of awareness and environmental values including a sense of responsibility for an environmental management issue and a willingness to participate in pro-environmental behaviour past the life-cycle of the public participation program. Due to their longer-term nature, soft-system objectives are not explicitly stated in public participation program's objectives and are therefore rarely measured. However, to investigate the potential for *greater community awareness and public participation to contribute to a sustainable approach to urban wastewater management* both water quality and soft-system impacts of urban wastewater public participation programs require consideration.

To explore the potential for public participation to improve the quality of domestic wastewater, impact analysis data from two previous public participation programs is reviewed. The two programs, the PhosWatch Campaign and the Thurgoona Detergent Phosphorus Study (TDPS), were conducted in the Albury-Thurgoona region. The programs aimed to encourage individuals to use phosphorus-free laundry detergent to improve the quality of their household's domestic wastewater entering the local Sewage Treatment plant. The results of the two case-studies demonstrate that public participation programs can significantly improve the quality of domestic wastewater. However, post-study findings from the TDPS suggest that there is a tendency for public participation to return to pre-program levels within a short-time frame once the program has finished. This finding has implications for the potential for stengthening the relationship between the public and domestic wastewater management. This theme warranted further investigation and forms a significant component of the second component of this research: the 2001 Thurgoona Post Study (TPS) Questionnaire.

The 2001 TPS Questionnaire was constructed to explore the longer-term impacts of a public participation program. The results of the 2001 TPS Questionnaire demonstrate that public participation programs have longer-term benefits. Awareness, sense of responsibility and willingness to become involved in wastewater management programs were expressed by residents of the Thurgoona community three years after the TDPS. However, after conducting interviews with state, catchment and local government representatives it became clear that ownership of the phosphorus issue from the top-down was lacking. These findings suggest that public participation has the potential to significantly contribute to domestic wastewater management objectives but only with continuing top-down support in terms of providing a coordinative framework (the program), and support in terms of information and funding for necessary monitoring and performance review.

Christopher Webb

Macropod browsing damage: impacts in Namadgi National Park and techniques for its control

Browsing of seedlings can cause significant economic losses in plantation forestry and has been identified as a threat to the regeneration of woody plants in conservation habitats. This threat arises from the potential for browsing damage to kill seedlings, as well as preferential browsing, which can alter the structure and/or composition of vegetation. Among the species that have been implicated in browsing damage in Australia are members of the family Macropodidae and the introduced European Rabbit (*Oryctolagus cuniculus*). However, while the impact of some macropod species and the efficacy of conventional control techniques are well documented, the browsing habits of other species, and the effectiveness of many alternative methods in mitigating macropod browsing damage, remain largely unknown.

In this study, the effects of browsing by Eastern Grey Kangaroos (*Macropus giganteus*), Red-necked Wallabies (*M. rufogriseus banksianus*) and European Rabbits were

investigated over a five month period at the Boboyan Pine Forest, a rehabilitation site within Namadgi National Park, Australian Capital Territory. Browsing damage to Candlebark (Eucalyptus rubida), silver Wattle (*Acacia dealbata*), Blackwood (*A. melanoxylon*) and Red-stemmed Wattle (*A rubida*) seedlings were assessed by periodically measuring the severity, type and extent of damage, and the survival and height growth of unfenced seedlings were compared. In addition, I field tested an eight wire electric fence designed to control macropods and conducted a feeding trial with captive Eastern Grey Kangaroos to determine the short-term efficacy of a chemical repellent (Deer Away ®) in reducing browsing damage to *A rubida* seedlings. Factors affecting the level and control of browsing damage by commonly implicated browsing animals were also reviewed.

Browsing damage to unprotected *A. melanoxylon*, *A. rubida* and *A. dealbata* seedlings at the Boboyan Pine Forest was found to be extensive and sever, both in terms of type and severity of damage: after 189 weeks exposure to browsing, 50-70% of planted seedlings had lost more than 50% of their foliage and 69-83% of seedlings either had a portion of their foliage and stem removed or were clipped near the base. Significant effects on survival and seedling height were also detected. Irrespective of species, 75% of
fenced seedlings survived to 18 weeks compared with just 51% of unfenced seedlings, and the heights of the Acacia seedlings were significantly reduced. In contrast, unfenced E. rubida seedlings suffered only minor damage and neither their survival nor growth were significantly affected by browsing. Among the four seedling species studied, *A. melanoxylon* was most severely damaged (i.e.preferred), followed by *A. dealbata*, *A. rubida* and *E. rubida*.

Electric fences erected at the same site significantly reduced (by 75%) counts of macropod faecal pellets. In addition, they significantly reduced damage levels to the three Acacia species and significantly improved their survival and height growth compared with unfenced seedlings. Although the relative contributions of Eastern Grey Kangaroos and Red-necked Wallabies to damage levels were not determined, browsing by European Rabbits and the two macropod species were estimated to have reduced seedling survival by 21% and 12% respectively (33% in total).

After 24 hours exposure to captive Eastern Grey Kangaroos, seedling treated with Deer Away® were significantly taller and less damaged than control seedlings, indicating that the treated seedlings were highly distasteful. However, Deer Away® was later found to be phytotoxic to the *A. rubida* seedlings and ultimately killed them.

These findings suggest that browsing by Eastern Grey Kangaroos, Red-necked Wallabies and European Rabbits may be an impediment to reforestation of the Bonoyan Pine Forest site, and that measures to mitigate browsing damage may therefore be necessary. In addition, they demonstrate that electric fencing and chemical repellents can be highly effective in alleviating early browsing damage caused by macropods, although further research is needed to determine: (í) the long term efficacy of these techniques in the field; and (ñ) their suitability for use with different plant and animal species.

Rachael Webb

Commercial native species selection for farm forestry on the southern tablelands of New South Wales

Increasing interest in farm forestry has led to the question of which species should be chosen in each region to provide a resource. Both the process and the resulting 'best bet' species are important. To analyse the process of species selection, a series of eight interviews were conducted on four different groups involved in farm forestry to see if the role of the selector is influential.

While the basic elements of species selection were similar in the responses of all the interviewees, the order in which these elements occurred in the process, and the importance placed on each element differed. The assessment of the site conditions and development of a list of species that could perform well was paramount for the research scientist, while end use and product potential was of greater importance to those more directly affected by the outcome of the selection – the farm foresters and processors.

The second component of this study was designed to provide a practical guide to which native species are appropriate for farm forestry on the Southern Tablelands, when focusing on the major end products of sawn timber, farm timber and firewood. A significant number of farmers have expressed their preference for Australian species rather than exotics such as Pinus radiata.

The Southern Tablelands region has a range of edaphic and environmental factors that limit the choice of species that will survive in the area. Limited rainfall, a high level of frost occurrence, shallow soils and low soil fertility restrict the number of species that can be recommended as 'best bets'. In the first place, it is essential that tree species planted for a commercial purpose are able to survive to harvest, and then it is important that they thrive so as to maximise the returns.

The species selected as 'best bets' for the Southern Tablelands (in alphabetical order) are:
Acacia decurrens, A. mearnsii, Casuarina cunninghamiana, Eucalyptus albens, E. fastigata, E. fraxinoides, E. macrorhyncha, E. melliodora, E. nitens, E. obliqua, E. polyanthemos, E. sideroxylon (+ E. tricarpa), E. sieberi, and *E. viminalis.*

Tanya Whiteway

Fine sediment and pathogen budgets for the Googong catchment

Recently there has been a concerted approach to better manage drinking water quality. In particular the management of health threatening agents such as pathogens has come under intense investigation. Currently the water industry has inadequate pathogen management options. Testing and water treatment procedures are inaccurate, and most current procedures are limited to *in situ* monitoring and reactive responses to pathogen outbreaks. This study through the use of fine sediment as a proxy for pathogen movement, explores the sources, transport and traps of pathogens in a landscape. The aim of pathogen budgeting is to provide a tool that supports the maintenance of water quality through catchment management, as an alternative to current reactive water treatment techniques.

To trial the pathogen budget methodology, three sub-catchments from the Googong catchment in New South Wales have been investigated. The study includes a highly modified rural residential area, a grazing landscape and a near-natural landscape. Fine sediment budgets were constructed for all three sub-catchments, and were the basis for subsequent pathogen budget development. Fine sediment has been proved as a suitable proxy for pathogen mobilisation and transport. ^{137}Cs and ^{210}Pb tracing were used to determine the sources. Dam sediment studies conducted using trap efficiency calculations and particle size analyses were the basis for fine sediment budgets. Knowledge of animal behaviour, faecal dispersion and flotation, local climatic factors and landscape characteristics were used to complete the pathogen budgets.

Based on combinations of these analyses, gullies and cattle were identified as important sources f sediment and pathogens respectively, Where they occur at the same location, their impact is compounded and the rate of pathogen mobilisation and transport is rapid. Results also indicate that the highly modified landscape has the highest rate of sediment and pathogen mobilisation, and the near-natural catchment the lowest. However, farm dams in the modified landscape effectively remove coarse sediment. Dams also reduce the fine sediment and pathogen flux, although the effectiveness is dependent on the magnitude of rainfall events and dam trap efficiency.

During low rainfall and flow periods few pathogens will be mobilised. Most will be trapped in farm dams, and a large proportion will die in the dams or on the hillslopes. During high flow events faecal material and live pathogens will be moved into the farm dams rapidly. Where farm dams are not 100% trap efficient farm dams and pathogens will move through the dams first, and into the main drainage channels. Hence, large amounts of pathogens will reach Googong reservoir during high flow events.

Possible management options include dam development at the base of gullies, but they will only effectively trap coarse sediment. Solitary dams are not effective pathogen traps unless they are 100% trap efficient. Therefore other methods of pathogen control are necessary. Alternatives include the use of chains of dams that together have high trap efficiency, and the management of riparian zones and natural traps. It may also be viable to work with farmers to manage livestock around drainage lines.

Gemma Woldendorp

Estimating carbon in mature eucalypt forests

Carbon storage was estimated immature unlogged forest in the south coastal region of New South Wales. This was achieved through a field survey of 12 sites in tall, open eucalypt forests. The sites were selected on the basis that there was no apparent disturbance from anthropogenic activities, particularly logging.

Results from the field survey were used to estimate carbon storage in the components of overstorey vegetation, coarse woody debris, litter, and soil, and two total carbon budgets were developed. These data were compared with carbon estimates in managed eucalypt forests from published data.

A selection of allometric regression equations were tested for comparison of vegetation biomass estimations using a sample of data from the field survey. Results varied widely, but two equations were selected to estimate the biomass in this study, that represented the upper and lower limits of the estimates.

The estimates of biomass varied depending on which allometric equation was used and also affected the allocation of total carbon in each component. Nevertheless, the vegetation biomass was found to hold the greatest proportion of total carbon (a mean of 66% or 78%) due to the large amounts of biomass in the large trees. Soil held the second largest carbon pool (a mean of 26% or 16%), followed by coarse woody debris (a mean of 7% or 5%), and litter (a mean of ~ 1%).

Carbon estimates in the mature forests from this study generally exceeded those in the published literature, especially for logged forests. However, there were a few exceptions when examining carbon storage in the individual components, notably, soil carbon density. Therefore, although maturity (age) and disturbance history were found to have a dominant effect on total carbon storage in a forest, they are not the sole controlling factors on the litter and soil components.

Department of Forestry - Overview 2000

There were significant developments in forestry in Australia in 2000, mirroring those globally. These included the effective conclusion of the Regional Forest Agreement process, focused on the allocation and management of Australia's native forests; the development of major strategic initiatives to address the challenges posed by salinity, and continuing exploration of the potential role of trees in mitigating salinity and climate change; record levels of eucalypt plantation afforestation, reflecting government policy in this area; and continuing emphasis on the development and commercialisation of new forest product technologies.

Staff and students of the Department of Forestry continued to be active in these arenas and in others important for forests and forestry, nationally and internationally. Amongst the major achievements of 2000 were:

- the initiation and continuation of substantial collaborative research projects with national and State agency and industry partners. Those initiated in 2000 included projects in carbon accounting, community concerns about plantation expansion, fire ecology and behaviour, the history of Australian fine woodwork, log grade specifications, marketing of farm forestry products, participatory monitoring and evaluation, participatory natural resource management, and pest animal management;
- the appointment of Dr Phil Evans as Director of the ANU's Centre for Science and Engineering of Materials, and his development of that Centre's activities in research and coursework;
- the organisation and co-sponsorship or hosting of a number of major international and national conferences. Dr Marlène Buchy was a co-organiser of the international workshop, "Changing learning and education in forestry", in Vietnam in April; Dr John Dargavel was co-organiser of the Australian Forest History Society's "Perfumed Pineries" Conference in Coonabarabran in September; Dr Phil Evans organised, with the assistance of Peter Beutel and others of the forest products group, the 5th Pacific Rim Biobased Composites Symposium in Canberra in December, attended by some 200 delegates;
- the conduct of another successful Departmental research colloquium. The 3rd annual colloquium, "Socio-economic research for successful farm forestry", co-sponsored by the CRC for Sustainable Production Forestry and the Joint Venture Agroforestry Program, attracted some 150 participants from around Australia;
- the development of a graduate-level flexible-learning program in farm forestry, jointly with Charles Sturt University. The new "National Graduate Program in Farm Forestry" is supported by the Natural Heritage Trust, and is based on internet resources and delivery;
- continued development of the undergraduate programs, with the introduction of a range of new joint Forestry degrees, the implementation of new curriculum structures for the Forestry and REM degrees, and the associated introduction of a new field-intensive unit in each year of the Forestry degree.

Institutional change

The year 2000 also saw agreement of the most significant institutional change since the Department was established at the ANU in 1965, the merger of the Department with our partner Department of Geography and Human Ecology. The two Departments have been partners in a School structure – currently, with the Department of Geology and Centre for Resource and Environmental Studies, the School of Resource Management and Environmental Science – for the past decade. The decision by staff of both Departments to merge from mid-2001 reflects the convergence of factors within the ANU and externally.

Within the ANU, the Deputy Vice-Chancellor's Review of the Faculties suggested reducing the number of budget centres within the Faculties, and our capacity to deliver high quality learning and research continued to be challenged by the state of university funding and declining enrolments in the Resource and Environmental Management degree. Outside ANU, the emergence of salinity and environmental restoration as major themes on the national agenda emphasises the need and opportunities for graduates, research and outreach to address these challenges. Staff of both Departments agreed that it was more likely we would achieve ANU's potential in these areas of national (and international) importance if we did so from within one entity. The merger also allows us to

pursue a closer relationship with the Centre for Resource and Environmental Studies, whilst maintaining our links with Geology.

The new merged entity, the School of Resources, Environment and Society, is likely to formally come into existence in mid-2001. The degree programs offered by the two current Departments will not alter, although the curricula of both undergraduate and graduate degrees will evolve to reflect the strengths and synergies of the new School. While the change is not as profound as that which saw the Australian Forestry School incorporated into the ANU in 1965, it is significant, and equally necessary to allow nationally-focused tertiary-level forestry education to prosper in the current university environment.

Staff changes and circumstances

The most significant staff changes of 2000 were the departures of Judy Lejins, who provided general administrative and technical support, and of Kelly Wicks, Graduate Program Administrator, after 20 and 6 years in the Department, respectively. Jacqui Brack, Amanda Ozlins and Fern Lawley filled Kelly's role for the remainder of the year. Dr Siggi Schmid resigned his post as Postdoctoral Fellow in wood science to take up a Lectureship in his native Germany. We thank Judy, Kelly and Siggi for their important contributions to the Department.

More generally, both general and academic staff continued to feel the pressures of increasing workloads, reflecting both the high level of research and teaching in the Department, the continuing diminution of support centrally, and the corresponding transfer of responsibilities to Departments. While the Department has been able to respond to many of these pressures and needs by securing the services of talented casual staff, the overall situation remains that described in last year's report, viz. one in which the Department's performance continues to depend disproportionately on the goodwill of staff and on their willingness to perform far beyond the levels specified in their job descriptions. I again thank my colleagues for their commitment to the Department and its mission. I thank particularly those who played significant administrative roles in 2000, principally Drs Mick Tanton (RMES Graduate Program Convenor) and John Field (Sub-Dean and Honours co-Convenor), and Zosha Smith (Departmental Administrator) and John Kane (Departmental business management).

At the end of 2000, the Department comprised 14 academic staff, 11 research and visiting fellows, and 8 full-time general staff.

Visiting fellows and scholars

The Department both welcomed and farewelled, as usual, a number of Visiting Fellows, whose presence enriched and enlivened the Department. Those in 2000 were Drs David Boshier (Oxford University), Dachang Lui (Centre for International Forestry Research), Peter Marshall (University of British Columbia), Helga von Miegroet (Utah State University), and Barbara Thomas (University of Alberta). We again hosted Neil Humphreys, Director of the Forest Technology Program, as Forestry Professional Visiting Fellow.

The Department also hosted Ms Jessy, of the Rubber Research Institute of India, on a short-term training program in soils, and numerous groups of international visitors on study tours.

Student issues and achievements

Undergraduate enrolments in forestry recovered to their pre-1999 level of some 25 new admissions, consequent to the vigorous recruitment efforts described in last year's report. Comparable recruitment efforts in 2000 appear to have delivered similar enrolments for 2001, and increased the quality of applicants. However, enrolments in the Resource and Environmental Science degree continued to decline significantly, and will be the focus of renewed efforts in 2001.

In 2000, there were a total of 115 students enrolled in the Forestry degrees, 95 in the REM degree, and 70 graduate students (including Honours) based in Forestry. There were 10 students in the 2000 Honours cohort; 6 of them – Scott Channing, Amanda Engel, David Forrester, Rochelle Richards, Oliver Story, and Rachael Webb - were awarded a 1st class degree. Drs Digby Race, Frank Valzano and Margaret Yonga were awarded a PhD.

There was a very strong cohort of applicants for PhD admission in 2001. A disappointment we shared with our colleagues elsewhere at ANU was the very limited number of scholarships available to support outstanding

applicants for graduate study. For example, none of the three outstanding (with 1st class Honours and/or university prizes) international applicants for PhD scholarships were successful in their applications for support; only three strong Australian applicants were successful in gaining PhD scholarships. We support strongly the current review of ANU's graduate scholarship policy.

Students continued to play active roles in the Department and externally. Many students again contributed to our recruiting activities, which were led by Rachel Hayes, a recent graduate. Chris Golding and Gayle Kennedy represented ANU Forestry at the International Forestry Students Symposium in Scotland.

We congratulate those who were awarded academic and scholarships in 2000: David Forrester, on the award of the Schlich Medal and the Institute of Wood Science Prize; Andrew Crisp, on the award of the MR Jacobs Prize for Silviculture; Tijmen Klootwijk, on the award of the Institute of Foresters of Australia's Jacobs Medal for Field Studies; Amy Ho and Tony Hunn, on the joint award of the State Forests NSW Prize for Mensuration; the award of the State Forests NSW Scholarship and of the Forestry Tasmania Honours Scholarship were still outstanding at the time of writing. Chris Golding was the only Australian awardee of a Rayonier Scholarship. Regrettably, the Timber Industry Prize, previously supported by Boral Ltd and its predecessors, was no longer offered. We thank those organisations which continue to offer academic awards and scholarships.

Teaching and learning

One focus of teaching and learning in 2000 were the adaptation of undergraduate units to the new ANU curriculum structure, in which each semester comprises four rather than three units. Both staff and students found the transition difficult, and concerns remain on both sides about the quality of student learning in the reduced time allocated to each unit. The issues are particularly difficult for the laboratory and field-based learning around which much of our teaching is based. More positively, the structural changes allowed us to incorporate the major field courses in each year into the standard degree structure, thus making them available to non-Forestry students and providing a more formal structure for field-based learning. This was particularly helpful in the development of the first-year introductory unit, Australia's Forests, around the very successful Laurel Hill field course led by Dr Geoff Cary. Both field classes and classroom-based teaching and learning benefited considerably from the contributions of many external parties.

A second focus was consolidation of the concept of a National Graduate Program in Farm Forestry, the securing of support from the Natural Heritage Trust for its initiation, and the development of electronic learning resources to deliver the Program off-campus. The introduction of the Program in 2001 is the culmination of four years of discussion with colleagues at Charles Sturt University's Faculty of Science and Agriculture, and builds on the pioneering work of Drs Cris Brack and Chris Trevitt, a former member of the Department, in the development of www-based learning resources for on-campus delivery. Dr Digby Race's efforts were instrumental in securing external funding for the Program, as were Chris McElhinny's in assisting staff to access the ANU's new electronic delivery software. We thank our colleagues elsewhere at ANU, including the Pro-Vice Chancellor (Academic) and CEDAM staff, for their assistance in implementing the initiative.

A third focus was provided by Dr Marlène Buchy's leading role in co-organising the international workshop, "Changing learning and education in forestry", in Vietnam in April 2000. Dr Geoff Cary also participated in the workshop, which ANU Forestry co-sponsored with the assistance of the Crawford Forestry Fund. The workshop provided both a focus and a stimulus for the emphasis in our undergraduate and graduate programs on enhancing student learning.

Research and consultancy

The Department's research and consultancy activities consolidated somewhat in 2000. Principal foci were biocomposite materials (Dr Phil Evans and colleagues), biomass energy (Dr Sinniah Mahendrarajah), carbon accounting (Drs Cris Brack, Brian Turner and colleagues), farm forestry policy and practice (Drs Digby Race, John Field and colleagues), forest fire ecology and modelling (Dr Geoff Cary and associates), hyperspectral remote sensing (Drs Brian Turner and Steve Dury), log specifications and markets (Drs UN Bhati and Ryde James), native forest dynamics and management (Dr Jürgen Bauhus

and colleagues), participatory resource management and evaluation (Drs Marlène Buchy and Digby Race), and wildlife biology and management (Drs Chris Tidemann, Mick Tanton and colleagues). There were lower levels of, but nevertheless significant, activities in dendrochronology and in urban forestry (Dr John Banks and colleagues), and in aspects of forest policy and of forest genetics (Professor Peter Kanowski and colleagues).

Staff and students of the Department were active participants in the Cooperative Research Centres for Greenhouse Accounting, Landscape Evolution and Mineral Exploration, Pest Animals, and Sustainable Production Forestry. Staff continued to be successful in attracting research funding from a variety of external partners, although we enjoyed little success with the ARC programs. The many forms of collaboration with external partners continued to be a distinguishing feature of our research activities, and we thank those partners for their support.

Outreach

Outreach activities in 2000 focused on student recruitment, as discussed in last year's report, and on maintenance of our Alumni and Friends network. Graduates of our predecessor Australian Forestry School held its first national reunion in April; this enormously successful event attracted some 400 alumni and partners, and was supported in various ways by ANU Forestry.

Staff continued to play various professional and public roles, locally, nationally and internationally. These included Dr John Banks' menbership of ANU and ACT committees associated with urban trees, Dr Bauhus' chairing of the Standing Committee on Forestry's Research Working Group 4, Dr Cris Brack's chairing of the Standing Committee on Forestry's Research Working Group 2, Dr Geoff Cary's Co-Leadership of the Global Change in Terrestrial Ecosystems Task 2.2.2, Professor Peter Kanowski's chairing of the NSW Southern Forest Forum, Dr Sinniah Mahendrarajah's membership of the ACT Board of Secondary School Studies Panel on Agriculture, Dr Chris Tidemann's membership of various IUCN specialist groups, and Dr Brian Turner's chairing of the Australian universities' Spectroradiometer Consortium. Many academic and general staff also continued to be involved in partnership arrangements with colleagues at the PNG University of Technology's Department of Forestry, under the auspices of the AusAID PNG Forestry Human Resource Development Project managed by Anutech.

Conclusions

As in previous years, academic and general staff of the Department continued to perform at a very high level in 2000. Whilst our efforts enjoyed the support of the Deans of Science, we felt that the University Executive and Council were increasingly removed from the impacts of their decisions on staff and students in the Faculties. We are heartened by the prospects for change associated with the appointment of Professor Ian Chubb as ANU's Vice-Chancellor from January 2001.

The Department's decision to merge with our partners in Geography and Human Ecology is intended to establish a broader, more flexible and more robust base for the ANU Forestry programs. We look forward to working with our Geography and Human Ecology colleagues, and our many external partners, to give effect to this intent in 2001 and beyond.

Professor Peter Kanowski
Head, Department of Forestry
February 2001

Department of Geography & Human Ecology - Overview 2000

Looking at the Department of Geography and Human Ecology at the end of the millennium, one is struck by the degree of change which has taken place in just the last decade. Geography is now one of the major users of IT in the Faculty, second only to Computer Science in the Faculties and on a par with Engineering. Geography has gone from being a very descriptive discipline to, at the ANU, a very quantitative one. The department has also gone from having a very low international profile, to having one of the highest in Australia. Much of this is the result of the steady implementation of the strategic plan developed by departmental staff in 1994.

In the 1994 strategic plan the Department saw its long-term goal as being part of a larger school, incorporating the current departments of Geography and Forestry. This is well on the way to being achieved in 2001. Another important goal was to increase our national and international reputation for excellence. With four of our staff now editors for major journals, two as presidents/ councillors of national societies, and three on important international committees, we have certainly raised our profile significantly. Two of our staff were invited to act as senior editors of UNESCO benchmark publications, and several are on the planning committees for international conferences over the next few years. We have achieved many of the goals we identified in 1994, but we have suffered considerably from something we did not foresee. Over the same period, since 1994, we have lost both our geomorphologist and our Chair, without replacement. Whilst the financial imperatives which precluded their replacement are clear, this is a significant impact on a small department. The subsequent losses this year, albeit on leave without pay, of our climatologist and urban human ecologist have further reduced both our offerings to students and our earning capacity.

Given the serious financial pressures the Department, and the Faculty, are under, increasing attention was given to generating outside funds. Some staff have been very successful in this. In addition, we are working hard to increase student numbers, both at the undergraduate and graduate levels. We have developed a new masters stream in Geographical Sciences to take advantage of overseas interests in some of our offerings, and we continue to offer short courses in GIS. Despite forecasts of the department running into deficit, we will instead generate a surplus and contribute to paying off the Faculty debt. Whilst this has necessitated running the department on a tight financial rein, we have worked hard to reduce the impact of this on students.

It would be easy to be gloomy given some of these events, but the Department is forging ahead. Many staff are building their units onto the internet and we are, through provision of our own server and support services, well ahead of most departments in this activity. With negotiations with overseas departments underway, we should soon be one of the front-runners in internet learning using shared resources with similar small departments overseas.

Dr Brian Lees
Head, Department of Geography and Human Ecology
February 2001