School of Resources, Environment & Society

FORESTRY • GEOGRAPHY • HUMAN ECOLOGY • RESOURCE & ENVIRONMENTAL MANAGEMENT

Yearbook 2002

THE AUSTRALIAN NATIONAL UNIVERSITY

Contents

Printed on Recycled Paper

Foreword

SCHOOL OF RESOURCES, ENVIRONMENT & SOCIETY

ANU's School of Resources, Environment and Society 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. SRES' strengths lie both in traditional disciplinary programs 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.

SRES' 2002 Yearbook summarises our degree programs and profiles the work of our staff and Honours and graduate students. In 2002, the SRES community comprised around 20 academic and 11 support staff, 18 research and visiting fellows, 80 graduate and 40 Honours students, some 200 undergraduates enrolled directly in our undergraduate degree programs, and many others who take the courses we offer. The Good Universities Guide and Graduate Destination Survey continue to record high levels of satisfaction and employment amongst our graduates, who work in diverse roles nationally and internationally.

SRES' foci in teaching and learning are represented by its four undergraduate Program areas - Forestry, Geography, Human Ecology, and Resource and Environmental Management - and by its related graduate coursework and research degree programs. At the undergraduate level, SRES offers BA, BSc, BSc(Forestry), BSc(Resource and Environmental Management) and associated joint degrees; at the graduate level, SRES offers programs leading to Graduate Certificate, Graduate Diploma, Masters and PhD degrees. These are summarised on page *v* of this Yearbook and detailed in SRES' Undergraduate and Graduate Handbooks, available in hardcopy and at our web site.

The research work of SRES staff and Honours students is diverse and wide-ranging, but united by its focus on addressing the challenges of sustainability. Most of SRES' research is conducted in partnership with national and State agencies, businesses, communities and landowners, ensuring its relevance and maximising the benefits of research outcomes. Within the ANU, SRES works closely with partner Schools, Centres and Departments – particularly in the Faculties of Science and Arts, and the National Institute for Environment – to achieve synergies and efficiencies.

SRES celebrated its first birthday in July 2002. During our first year, SRES staff maintained their high international and national profiles and productivity, publishing 5 books, 35 book chapters and journal papers, and 30 conference and research papers; they developed and delivered innovative new undergraduate courses, and attracted c$500K in new external grants to support both staff and student research. Around 20 Honours, 15 graduate students and 70 SRES-based undergraduates completed their degrees. SRES' achievements in 2001 are reviewed in the Head's report on p100 of this Yearbook.

If you're interested in working with SRES, in research or in collaborative learning, please contact us to discuss how we might progress our common interests in addressing the challenges of sustainability.

Professor Peter Kanowski
Head of SRES
July 2002

Prof. Tim Brown (Dean of Science), Prof. Peter Kanowski (Head of SRES), Dr. Mick Tanton (retiring SRES graduate program convenor) and Prof. Ian Chubb (Vice Chancellor) at the SRES first birthday celebration, 22 July 2002.

Essential Information

HOW TO CONTACT US

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ADMINISTRATIVE RESPONSIBILITIES

Head of School	Professor Peter Kanowski
School Administrator	Ms Zosha Smith
Undergraduate Program Convenors	
• Forestry	Dr Cris Brack
• Geography	Dr Richard Baker
• Human Ecology	Mr David Dumaresq
• Resource & Environmental Management	Dr John Field
Honours Convenors	
• Forestry	Dr John Field
• Geography	Mr Ken Johnson
• Human Ecology	Mr David Dumaresq
• Resource & Environmental Management	Dr Chris Tidemann
Sub-dean	Dr John Field
Graduate Program Convenors	
• Geographical Sciences	Dr Peter van Diermen
• Resource Management & Environmental Science	Dr Richard Greene

FOR 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 Programs in Resource Management & Environmental Science and Geographical Sciences

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/**

SRES Degree Programs

SRES offers a range of single and joint 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. Geography and Human Ecology - 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

3. 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

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. BSc(REM) / LLB

The five-year joint Bachelor of Science (Resource & Environmental Management) / Bachelor of Laws links these two complementary degrees, and is well suited to students wanting to develop careers in the emerging fields of environmental regulation.

6. 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 Certificate in
  - Forestry
- 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

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C.A. Hilliker. BSc(Botany), Grad.Dip(Management)
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Information Technologists

S.J. Leahy. BScHons(ANU), MIAG
K.H. Nissen. BEngineering(Auckland)
P.M. Steer

Administrative Staff

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M. Lewis. BComm(Accounting)
S.J. O'Reilly. BA, DipEd, AALIA
Z.M. Smith. BA(Modern Languages)
P. Thamsongsana (from 20.3.02)

SRES staff and student representatives at a School planning meeting, December 2001

Dr Richard Baker

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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. He was awarded the ANU Vice-Chancellor's award for teaching excellence in 1996 and 2002.

Research and teaching

My teaching at ANU has included coordinating the first year SRES course "Resources, Environment and Society" running "Independent Research Project" (an advanced 3rd year research based course) and co-teaching the 3rd year course "Environmental Politics, 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 Young, E. (eds) 2001. Working on Country: Contemporary Indigenous Management of Australia's Lands and Coastal Regions, Oxford Uni 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*, 35(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.

McGowan, B. 2002 Dust and Dreams: A regional history of mining and community in SE NSW 1850-1914. (PhD thesis).

Gullett, W. 2001 Environmental decision-making in a transboundary context: principles, challenges and opportunities for precautionary environmental impact assessment. (PhD thesis).

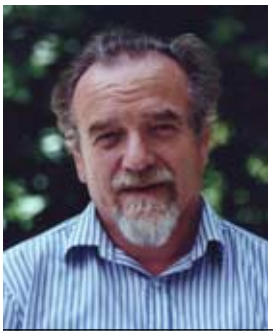
Cooper, D. 2000. An unequal coexistence: From 'station blacks' to "Aboriginal custodians' in the VRD, Northern Australia. (PhD thesis).

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

Woodhill, J. 1999. The Landcare paradox: sustaining rural Australia. (PhD thesis).

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

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



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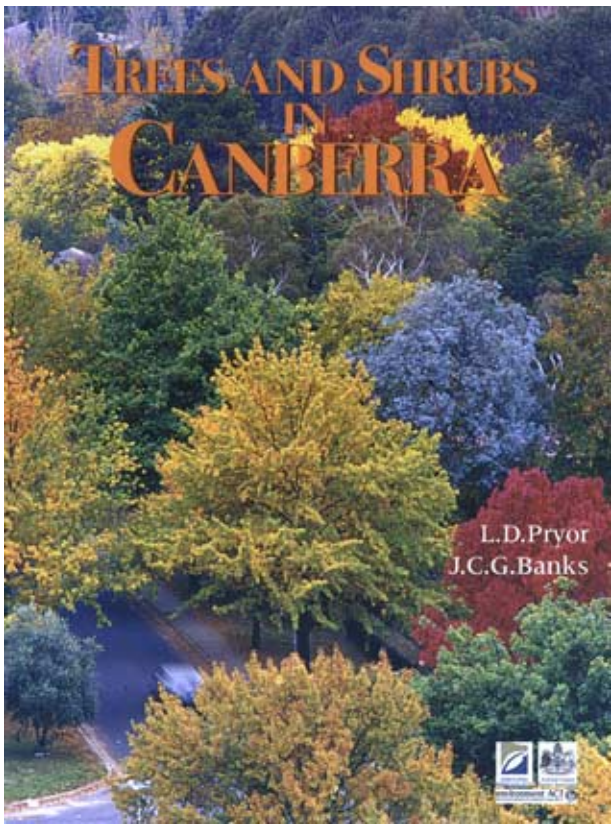
Career brief

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 and South 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 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

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

Eggerton, J.G., Banks, J.C.G. Gibson, A., Cunningham, R.B. and 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 Pulsford, I.F. 2000. Dendrochronology and the Australian Cypress Pines. Conference paper to *The Perfumed Pineries*, Coonabarabran, NSW 20-23 Nov. 2000

Cary, G.J. and Banks, G.J.C. 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*. Innes, J., Beniston, M and Verstraete, M. (eds). 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.* Grove, R. and Chappell, J. (eds). 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 Millenium*, Mendoza, Argentina 20-24 April 2000.

Banks, J.C.G., James, R. and Brack, C.L. 1999. Modelling Changes in Dimensions, Health Status and Arborcultural Implications for Urban Trees. *Urban Systems* 3(1):35-44

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 Germany and Canada before he joined ANU Forestry in 1996. His current research focuses on ecology and silviculture of native forests, carbon and nutrient 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 the outgoing chair of the Research Working Group on Native Forest Management, a member of the Cooperative Research Centre for Greenhouse Accounting, and member of the editorial board of Australian Forestry.

Research & teaching

My research interests 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 relatively easy to determine, and thus can be used in long-term ecosystem monitoring. We have demonstrated that soil organic carbon alone is not a good indicator for Australian forest soils, which contain substantial quantities of charcoal. Two PhD students are involved in this program. Sue Emmett investigates the relationship between native earthworms and soil parameters, and Chris O'Hara researches the relationships between organic matter and phosphorus supply.

Uneven-aged silviculture and the maintenance of structural diversity in managed forests is another research focus. Two PhD students, Chris McElhinny and Eddie Webber, are working on quantifying structural diversity and the dynamics of coarse woody debris, respectively. One MPhil student, Andrew Deane, examines historical changes in stand structures of Cypress pine forests. Philip Alcorn, an honours student, investigates *Eucalyptus obliqua* regeneration in gaps. 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 an MPhil student, Peter Deane, investigating private forest-owner attitudes and values.

Our research into the dynamics of mixed eucalypt-acacia plantations has demonstrated that mixed stands are more productive and accumulate more soil carbon than monospecific stands. David Forrester, PhD student, is now investigating how the synergisms between acacias and eucalypts work, and whether there are environmental limits at which competition may be stronger than the synergistic effects. Amber Pares, honours student, quantifies soil carbon sequestration in mixed versus monospecific stands.

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., Khanna ,P.K., Hopmans, P. and Weston, C. 2002. Is soil carbon a useful indicator of sustainable forest management? – A case study from native eucalypt forests of south-eastern Australia. *Forest Ecology and Management* (in press).

Bauhus, J., McElhinny, C. and Alcorn, P. 2002. Stand structure and tree growth in uneven-aged Spotted Gum (*Corymbia maculata* Hook.) forests: some implications for management. *Forestry* 75, No. 4 (in press)

Bartsch, N., Bauhus, J. and Vor, T. 2002. Effects of group selection and liming on nutrient cycling in an European beech forest on acidic soil. In: Dohrenbusch, A. and Bartsch, N. (eds) Forest Development - Succession, Environmental Stress and Forest Management. Springer Verlag, Berlin, 109-144 (in press).

Bauhus, J., Aubin, I., Messier C. and Connell, M. 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.

Khanna, P.K., Ludwig, B., Bauhus, J. and O'Hara, C. 2001. 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.

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

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

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

Winden, A. P. van. 2001. Aboveground interactions and productivity in mixed-species plantations of *Acacia mearnsii* and *Eucalyptus globulus*. (Honours thesis)

Forrester, D. 2000. Early coppice growth in thinned Silvertop ash forests. (Honours thesis)

Dr Cris Brack

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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, Natural Resources and Environment (Victoria), Forestry Tasmania, Private Forests Tasmania and others - 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. I am also a member of the CRC for Greenhouse Accounting; Chairman of the Research Working Group on Forest Measurement and Information Systems; and Chairman of the IUFRO Group 4.02.03 – Inventories on Successive Occasions.

During 2001 I focused my research on improving our ability to measure the multiple values of forests - especially biomass and carbon sequestration - on local, regional and national scales.

Selected publications & student theses

see also
http://sres.anu.edu.au/associated/mensuration/BRACKPUB.HTM

Brack, C.L. 2002. Pollution mitigation and carbon sequestration by an urban forest. *Environmental Pollution* 116(1): 195 – 200.

Brack, C.L. and Richards, G.P. 2002. Carbon accounting model for forests in Australia. *Environmental Pollution* 116 (1): 187 - 194.

Ozolins, A., Brack, C.L. and Freudenberger, D. 2001. Abundance and Decline of Isolated Trees in the Agricultural Landscape of Central West New South Wales, Australia. *Pacific Conservation Biology* 7(3): 195 – 203.

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

Brack, C.L. 2001. Risk and Uncertainty in a Forest Carbon Sequestration Project. Proceedings of the IEA Bioenergy Task 25/38 Conference *Carbon Accounting, emissions trading and COP6 negotiations related to bioenergy, wood products and carbon sequestration*. 28 - 30 March, 2001.

Penny, R., Brack, C, von Gadow, K. and Lund, G. 2001. Inventory and Forecasting Productive Capacity for Natural Forests. *Criteria and indicators for sustainable forest management* John Raison, Alan Brown and David Flinn (eds). CABI International Publishing, New York. pp 165 - 182.

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)

Ellis, P. 2001. The aerodynamic and combustion characteristics of Eucalypt bark - a firebrand study. (PhD thesis)

Payne, D. 2001. Modelling the effect of forest management on the carbon pools in a *Eucalyptus pilularis* (blackbutt) regrowth forest. (Honours thesis)

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

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

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

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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 his appointment in 1996, Geoff has been the lecturer in fire science and in environmental modeling and coordinator of the first year forestry field trip.

Research and teaching

I spent the latter half of 2001 on an outside studies program based at the USDA Forest Service Fire Science Laboratory at Missoula, Montana. There I worked on two projects with Dr Bob Keane, a research ecologist with the USDA Forest Service, and other researchers on his staff. The first involved implementing the Australian FIRESCAPE fire regime simulator in Glacier National Park, Montana. We made considerable progress toward our ultimate goal of comparing the Australian model with a model developed for northern Rocky Mountain ecosystems (FIRE-BGC). The second project was to complete the international landscape-fire-succession model (LFSM) comparison with researchers from GCTE (Global Change in Terrestrial Ecosystems) Task 2.2.2 (Relationships between global change and fire effects at the landscape scale) which is funded by the US National Centre for Environmental Analysis and Synthesis. We have produced data from comparing four very different LFSMs and are currently in the process of writing papers on methods for classifying LFSMs and on the results of the comparison experiments. The GCTE activity involved memorable workshops in Glacier National Park and Santa Barbara, California.

Other notable activities included my involvement in burning operations at a large silvicultural experiment in central Montana, and in ecological restoration research in Ponderosa pine communities. I am extremely grateful to the USDA Forest Service for the opportunity to work with researchers from their organization and to the people at the Missoula Fire Science Laboratory for their memorable hospitality. I thoroughly enjoyed traveling around the American west with my family. Other highlights were Yellowstone National Park, the Bob Marshall Wilderness, Driving "The Big Sur" between Santa Barbara and San Francisco, Christmas in the Washington Cascade Mountains, and Joshua Tree National Park.

I continued teaching courses in Fire and the Australian Environment, Modelling for Environmental Management, and First Year Field Studies. I have reported extensively on these over the last few years.

Selected publications & student theses

Cary, G.J. 2002. 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 Cary, G.J. 2002. 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.

Bradstock, R.A. and Cary, G.J. 2001. What governs fire regimes ? In: *Proceedings: Bushfire 2001. Australasian Bushfire Conference. 3-6 July 2001, Christchurch, New Zealand.*

Richards, R.M., Cary, G.J. and Bradstock, R.A. 2001. The sensitivity of snow gum to fire scarring in relation to Aboriginal landscape burning. ? In: *Proceedings: Bushfire 2001. Australasian Bushfire Conference. 3-6 July 2001, Christchurch, New Zealand.*

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.).

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

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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 convener 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

Dumaresq, D. & R. Greene. 2001 Soil Structure, Fungi, Fauna & Phosphorus in Sustainable Cropping Systems RIRDC 01/130. 36pp

Derrick, J.W. & Dumaresq, D. 1999 'Soil chemical properties under organic and conventional management in southern new South Wales' *Aust. J. Soil Res*., 37, 1047-55.

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

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

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

Carruthers, G. & Dumaresq, D. 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. & Dumaresq, D. 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. & Greene, R. 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.

Dumaresq, D. 1998 'Organic Industry Overview', in R. Neeson (ed)

Mr Robert Dyball

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Career brief

Robert grew up in London, England escaping (legally) to Australia in 1981. He worked for the NSW Tourism Commission in Sydney whilst enrolled at University of Sydney before moving to Canberra. As an arts student he majored in Philosophy and Human Ecology and pursued Honours in Human Ecology, graduating in 1998. A PhD candidate with the Centre for Resource and Environmental Studies (CRES) Robert has since 1999 been involved in lecturing in the Human Ecology Program. He co-lectures in Human Ecology, Sustainable Systems and Ecology and Social Change and convenes Urban Ecology. Robert has also recently worked as a consultant to the ACT Government's Department of Planning and Land Management (PALM) on urban sustainability issues. He has worked on urban water issues with the Asia Pacific Network and has been involved in a pilot study on materials stocks and flows analysis for Canberra and region - a joint project of the University of Canberra and the Nature and Society Forum.

Research and Teaching

My research explores how changes in the worldviews that dominate a society change the gross impact that the society has upon the ecosystem, which in turn has a range of consequences for that society. Noting the complex way in which cultural settings influence the perceived rationality of any action, I am interested in drawing out implications that this has for appropriate social learning in the context of enabling enduring quality survival for the society. I relate the three terms 'rationality' 'power' and 'praxis', which I see as aspects of the same overall phenomena structuring culture, and pursue the implications of this for ecological health.

My interest is in trying to understand the processes by which these related aspects of enduring social structure are retained, reproduced, transformed and forgotten or displaced in the cultural memory across time. To the extent that such an understanding points to some means of imparting direction to this process of cultural replication (notably, to foster a praxis that is more ecologically sensitive than currently dominant) I engage with social learning, social capital, social power and related literature. I approach these from a holistic perspective within a complex adaptive system's framework.

As a case study my research explores the dominant worldviews of one culture – that which emerges in the City of London - as it changes through time, and tries to assess the energetics and resource material flows that the praxis of the day engenders. In the modern context my focus is on the logic of an era of consumer capitalism with its open-ended utilitarian preference satisfaction and makes some assessment of its impact upon both wellbeing and the environment.

In addition to this research, I am an active member of the Human Ecology Forum, which is an informal weekly gathering of academics, students and other parties who meet to share ideas on a range of sustainability issues. In 2002 I helped obtain funding from the ANU's Institute of the Environment and the Institute of Social Sciences for The Human Ecology Forum to run a workshop entitled *Social Learning for Sustainability - issues in coordinating trans-disciplinary practice*. The workshop explored how ideas about sustainability are being enacted across sectors of the community in order to bring about social learning processes supportive of sustainable development. A major objective of the workshop was to encourage cross-disciplinary communication both within the social sciences and between the social and biophysical sciences. I am anticipating that a number of further research agendas and fruitful collaborations will now emerge.

Dr John Field

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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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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 current research supervision includes four Ph.D., three Masters, and one honours students. I also lecture in five undergraduate units in soil/land/regolith management. I am a member of the CRC for Landscape Environments and Mineral Exploration, and the national president of the Australian Association of Natural Resource Management.. I am also author of appox. 50 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., Eggleton, R.A. and Rengasamy, P. 2002. Relationships between clay mineralogy and hardsetting properties of soils in the Carnarvon Horticultural District of Western Australia. *Applied Clay Science*, 20: 211-223.

Greene, R.S.B., Valentin, C. and Esteves, M. 2001. Runoff and erosion processes. In Banded Vegetation Patterning in Arid and Semi-arid Environment-Ecological Processes and Consequences for Management. Valentin, C. Tongway, D. Seghieri, J. and d'Herbes, J.M. Springer-Verlag. *Ecological Studies* 149. (pp. 52-76).

Greene, R.S.B., Gatehouse, R., Scott, K.M., and Chen, X.Y. 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 Greene, R.S.B. 2001. The long-term effects of lime ($CaCO_3$), gypsum ($CaSO_4.2H_2O$), and tillage on the physical and chemical properties of a sodic red brown earth. *Australian Journal of Soil Research*, 39, 1307-1331.

Valzano, F.P., Greene, R.S.B., Murphy, B.W., Rengasamy, P. and Jawal, S.D. 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, 1333-1347.

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

Butterworth R., C.J. Wilson, C.J., Herron, N.F., Cunningham, R.B., and Greene, R.S.B. 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., Nettleton, W.D., Chartres, C.J., Leys, J.F., and Cunningham, R.B. 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 Muller, W.J. 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 J*ournal 20: 206-25.

Prof Neil Gunningham

Environmental Regulation, Management & Policy

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Career brief

Neil Gunningham obtained the degrees of LLB (Hons) and MA (Criminology) from the University of Sheffield, UK, and is a Barrister and Solicitor (ACT). He also holds a PhD from the ANU. Although initially trained in law, his subsequent post-graduate work was in interdisciplinary social science, and for the last ten years he has applied that training principally in the area of environment, with a focus on regulation. He joined SRES in January 2002. Previously he was Foundation Director of the Australian Centre for Environmental Law at the ANU, Visiting and Senior Fulbright Scholar at the Center for the Study of Law and Society, University of California, Berkeley, and Visiting Fellow at the Centre for the Analysis of Risk and Regulation at the London School of Economics. He is also a consultant to the Organisation for Economic Cooperation and Development (OECD), to the United Nations Environment Program (UNEP) and to various environmental regulatory agencies in Australia.

Research, teaching, & professional activities

My research and teaching interests focus on environmental regulation, management and policy. One strand of my research has been concerned to identify the contribution that broader, innovative forms of regulation can make to environmental law. This includes the potential roles of community participation, information based strategies, environmental partnerships and various forms of co-regulation. I have also sought to explain the interrelation between such mechanisms; and to identify the comparative advantage of different instruments in different institutional, economic and social contexts and to argue the case for developing an optimal regulatory mix.

Another research agenda is to explain why some business enterprises do far more to protect the environment than others, and to understand how regulation could best be designed to address such variability. For example, my work on the pulp and paper industry internationally suggests that improvements in environmental performance over time were associated with increasingly stringent demands from legal and social actors but that remaining variation is associated with 'corporate environmental management style' measured in terms of corporate attitudes, commitments and practices. This raises questions about how and why corporate environmental management styles arise, how they can be facilitated or encouraged by governments, regulators, environmental advocacy organisations or others, and about whether, and under what circumstances, such efforts are likely to succeed.

Most recently, I began researching the effectiveness of current regulatory, quasi-regulatory and other policy strategies for water quality management in urban catchments (including total/integrated catchment management), with a focus on the Swan-Canning river system in Western Australia. This forms part of an ARC Linkages Project in collaboration with a number of government agencies with responsibilities in that area

Recent Publications

Gunningham and Sinclair, *Leaders and Laggards: Next Generation Environmental Regulation*, Greenleaf UK, 2002 (208pp).

Gunningham & Johnstone, *Regulating Workplace Safety: Systems and Sanctions,* Oxford University Press, UK, 1999 (404pp).

Gunningham & Grabosky, *Smart Regulation: Designing Environmental Regulation*, Oxford University Press, UK, 1998, (492pp)

Gunningham & Young "Mixing Instruments and Institutional Arrangements for Optimal Biodiversity Conservation" in *Investing In Biological Diversity*, OECD, Paris, 1997, pp 141-165.

Gunningham & Sinclair "Integrative Regulation: A Principle-Based Approach to Environmental Policy" Journal of Law and Social Inquiry, vol 24, no 4, Fall, 1999, pp 853-896.

Gunningham & Sinclair "Environmental Management Systems, Regulation and the Pulp and Paper Industry: ISO 14001 in Practice" (1999) 16(1) Environmental Planning and Law Journal, pp 5-24.

Gunningham "Environmental Management Systems and Community Participation: Rethinking Chemical Industry Regulation" (1998) 16(2) UCLA *Journal of Environmental Law and Policy*, pp 319-439.

*Gunningham & Sinclair "New Generation Environmental Policy: Environmental Management Systems and Regulatory Reform" (1998) 22(3) *Melbourne University Law Review*, pp 592-616.

*Gunningham & Rees "Industry Self-Regulation" (1997) *Law & Policy*, Vol 17(4) pp 363-414.

*Gunningham & Young "Towards Optimal Environmental Policy: The case of biodiversity conservation" (1997) 24 (2) *Ecology Law Quarterly* 243-298.

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Career Brief

Sue Holzknecht trained in Anthropology and Sociology, Linguistics and Teaching English as a Second Language. For 12 years, she 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.

In 1993, Sue joined Graduate Program in Environmental Management and Development, National Centre for Development Studies, ANU as Academic and Research Skills adviser to graduate students. She then worked in ANU's Study Skills Centre for 3 years, as adviser to undergraduate and post-graduate students. Sue is now back in NCDS and in SRES part-time, working mainly with post graduate students.

Research and Teaching

In SRES, 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

Holzknecht, S., Bartlett, A., and Thom, A.C. 1999. Preparing Students for Graduate Study: To Hit the Ground Running, Asia Pacific Press, Canberra (Teachers' Manual and Student Workbook).

Many of SRES' new students on an introductory field class, March 2002

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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

James, R.N. 2001: Defining the product - Log Grades used in Australia. RIRDC publication 1/161. ISBN 0 642 58380 3, ISSN I 440 6845.

Turner B and James R, 2001: Derivation of indicative yields for major plantation species. Chapter 5, pp93-111, In Richards G.P. (ed) *Biomass Estimation: approaches for assessment of stocks and stock change*. National Carbon Accounting System, Technical Report 27, Australian National Greenhouse Office.

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

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

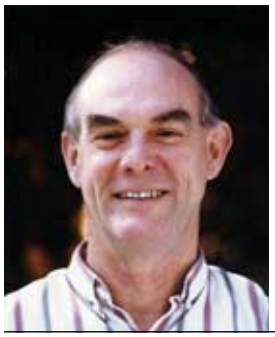
James, R.N. 1998. Planted forests - Factors to be considered in planning. In Chan et al. (eds) Proceedings of a conference *Planted forests in Sarawak*. Forest Department Sarawak.

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 James, R.N. 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: 41-47.

James, R.N. 1997. The effect of thinning regime on production of wood with ‚Äúmature‚Äù properties in plantation grown radiata pine in NZ. In NÈpveu, 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 James, R.N. 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 ‚Äòuser friendly,Äô 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.

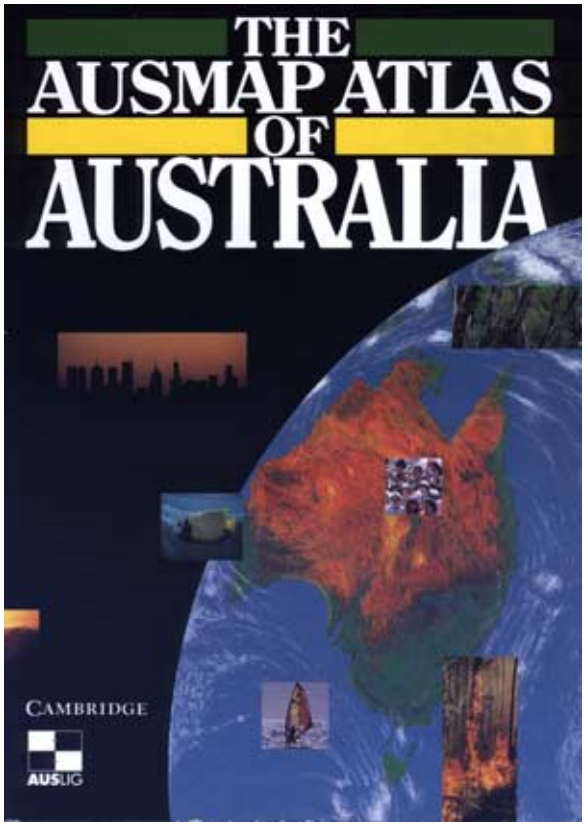
Johnson, K.M. 1994. Creating place and landscape. Chapter 3 in Stephen Dovers, *Australian environmental history*. Oxford University Press, Melbourne.

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.

Peter chaired a number of scientific advisory groups under the Regional Forest Agreement process, and the NSW Southern Regional Forest Forum during its 4-year incarnation; he is currently co-facilitating community stakeholder workshops under the NSW Western Regional Assessment process. He is a member of the Crawford Fund Forestry Committee and of IIED's Asia-Pacific Regional Advisory Panel.

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, and I am just beginning – with colleagues in CSIRO, State Forests of NSW, and South Africa's CSIR and University of Stellenbosch – a major ACIAR-sponsored research project on hybrid eucalypts for marginal farmlands in Australia and South Africa. Other work has been conducted as commissioned studies for agencies such as AFFA, Environment Australia the International Institute for Environment and Development, and the World Bank.

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, PJ. 2001. Plantation forestry at the millennium. Chapter 8 in: GM Woodwell (Ed). *Forests in a full world*. Yale. 97-109.

Kanowski, PJ. 2001. Forestry education in a changing landscape. *International Forestry Review* 3: 175-183.

Williams, J. et al. 2001. *The contribution of mid- to low-rainfall forestry and agroforestry to greenhouse and natural resource management outcomes*. AGO and MDBC. 72 p. http://www.greenhouse.gov.au/land/gh_land/pubs/abs_lowrainfall.html

Kanowski, P.J. and Buchy, M. 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/staff/kanowski/abstracts/austimber_2000.html

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 Freeman, B. 2000. *Establishing comparability and equivalence amongst forest management certification schemes*. AFFA. 46 p. http://www.affa.gov.au/ Industry Development and Adjustment > Critical Elements

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 Freeman, B. 1999. International approaches to forest management certification and labelling of forest products: a review. AFFA. 47p. http://www.affa.gov.au/ > Industry Development and Adjustment > Forest Management Certification and Labelling of forest products

Kanowski, P.J. et al. 1999. International forest conservation: protected areas and beyond. Discussion Paper for IFF. Environment Australia. 52pp. http://www.environment.gov.au/library/pubs/pdf/forests.pdf

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. Regional Forest Agreements and future forest management. In: Outlook 97. 1: 225-235.

Kanowski, P.J. and Boshier, D.H. 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 worked on his PhD in the Geography and Human Ecology Department at ANU (submitted 2001). Since 1999, Shawn has been a lecturer in the Department of Geography & Human Ecology and in SRES, 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 topographic indices, the spatial variation of serrated tussock infestations, analyses of the geographic distributions of endemism in the Australian vascular flora, and non-geometric models of spatial sampling for use in geostatistical modelling.

The third year Applied GIS course introduces students to numerous cutting edge geocomputational tools and techniques. These are applied to real world problems around Jindabyne, NSW, ranging from spatial analysis of serrated tussock infestations to assisting with the future development of the Jindabyne township. This course is conducted 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 continues to be co-taught with Professor Wasson in 2002.

Selected Publications & student theses

Laffan, S.W. 2002. Using process models to improve spatial analysis, *International Journal of Geographic Information Science*, 16: 245-257.

Van Niel, K. and Laffan, S.W., in press. Gambling with randomness: The use of pseudo-random number generators in GIS, *International Journal of Geographic Information Science*.

Mackey, B. and Laffan, S.W. 2001. Case studies in GIS and environmental modelling. In Clarke, K.C., Parks, B.O. & Crane, M.P. (eds), *Geographic Information Systems and Environmental Modeling*, Prentice Hall, New Jersey, 306pp.

Crisp, M.D., Laffan, S.W., Linder, P. & Monro, A. 2001. Endemism in the Australian flora, *Journal of Biogeography*, 28: 183-198.

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. 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.

Whiteway, T.G. 2000. Fine Sediment and Pathogen Budgets for the Googong Catchment. (Honours thesis, co-supervised with Professor R. Wasson).

Doran, R.J., 2002. Simulating an outbreak of Foot and Mouth Disease via feral pigs in Queensland using Cellular Automata. (Honours thesis).

Wilkins, D. 2002. Timing of channel change and the effect of changing hydraulic geometry on sediment transport in the Numeralla River. (Honours thesis).

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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. After gaining civil commercial pilot's and flight navigator's licences he flew with ADASTRA on mineral exploration and mapping projects. He went on to take 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. This led to him to form a company to carry out environmental and exploration services for larger organisations. 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 an 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 focused 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. 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.

Lees, B.G. and Hafner S. 2000. The Separation of Natural from Cultural Spatial Patterns in an Area of Intensive Agriculture using GIS and Artificial Intelligence.' In *GIS and Geocomputatio'*, Atkinson, P. and Martin, D. (eds). Taylor & Francis, London. 188-205.

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

Lees, B.G. 2002. Australian Geography and GIS. *Australian Geographical Studies*, 40(1): 33-47.

Pearson, D. 1998. The Analysis of Biodiversity using GIS Modelling. (PhD thesis)

Gallant, J. 2000. Modelling Terrain Attributes. (PhD thesis).

Benger, S. 2001. Methane Budgets for Australian Wetland Types. (PhD thesis)

Laffan, S. 2002. Data-driven Models for Predicting Mineral Grade: Weipa. (PhD thesis).

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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 NiÒo 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 amalso active in supervising postgraduate students. At postgraduate level I teach a Masters course on understanding climatic variability and change.

Selected publications

Mackey, B.G., D.B. Lindenmayer, A.M. Gill, M.A. McCarthy and Lindesay, J.A. 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 Ansell, T.J. 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 Bridgman, H.A. (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*, Hobbs, J.E., Lindesay, J.A. and Bridgman, H.A. (eds), John Wiley and Sons, Chichester, 161-206.

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

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

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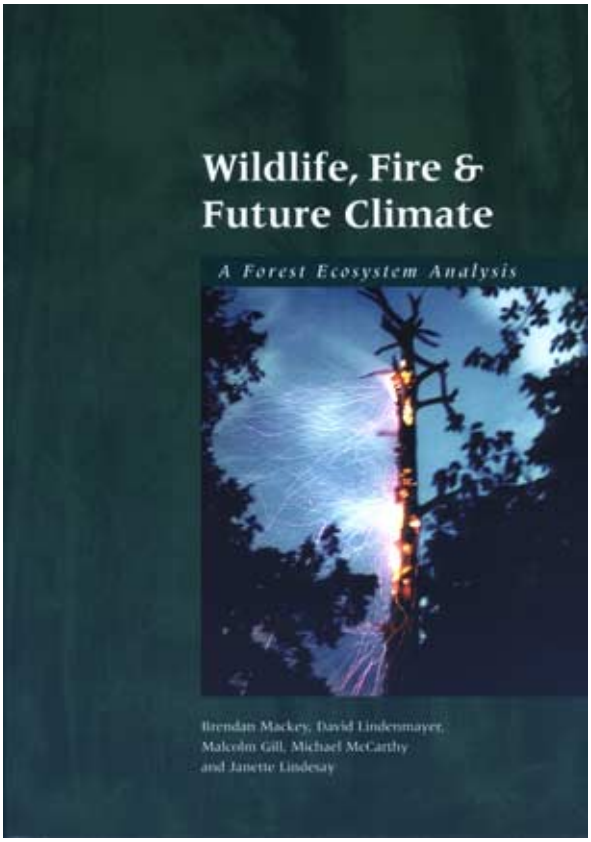
Career Brief

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 serving as Director of the international Earth Charter education program (www.earthcharter.org), and is Project Leader (Ecosystem Vulnerability to Change) in the CRC for Greenhouse Accounting (www.greenhouse.crc.org.au/crc/research/cyclechange_b3.htm).

Research, teaching, professional practice & outreach

The main theme of my research is *Ecological Integrity*. A major focus of my research involves investigations into 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. Also, 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 landscape-wide, temporally dynamic, multi-agent based, simulation models of carbon and water fluxes.



I am involved with a number of international academic, professional and outreach activities, including: I am the Associate Editor for *Environmental Conservation*, an international journal of environmental science published by Cambridge University Press; I am a member of the IUCN Commission on Environmental Law (CEL); I am an inaugural member of Catholic Earthcare Australia, the environmental advisory body of the Bishops' Committee for Justice, Development, Ecology and Peace; and I am Chair of the Expert Scientific Committee advising the State Government of Queensland on conservation planning in Cape York Peninsula, Queensland.

Selected papers & student theses

Mackey, B., Lindenmayer, D., Gill, M., McCarthy, M. and Lindesday, J. 2002. *Wildlife, Fire and Future Climate: a Forest Ecosystem Analysis*. CSIRO Publishing.

Mackey B.G. and D.H. Lindenmayer. 2001. Towards a hierarchical framework for modelling the spatial distribution of animals. *Journal of Biogeography* 28: 1147-1166.

Mackey, B.G., Mullen, I., Sims, R., Baldwin ,K., Gallant, J. and McKenney, D.W. 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 Nix, H.A.. 1999. *The role of wilderness in nature conservation*. Commonwealth Government of Australia http://www.environment.gov.au/heritage/anlr/assets/rolewild.pdf

Wood, S. 2001. The Carbon Status of Managed Eucalyptus Forests: a Case Study in the Kioloa Study Area. (Honours thesis).

Yung, En Chee 1999. A Comparative Carbon Inventory of a Native Forest and a Pine Plantation. (Honours thesis. University Medal).

Payne, K. 1998. Genetic Algorithms, Remote Sensing and Vegetation Modeling. (PhD thesis).

Lesslie, R. 1997. A Spatial Analysis of Human Interference in Terrestrial Environments at Landscape Scales. (PhD thesis).

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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, firewood plantations, 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 McAleer, M. J. (eds). 1999. *Modelling Change in Integrated Economic and Environmental Systems*, John Wiley & Sons, Chichester.

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

Dr Chris Tidemann

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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 School 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 Tidemann, C.R. 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 Tidemann, C.R. 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 Jamieson, G. 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* 10:77-83.

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.

WWW

http://sres.anu.edu.au/associated/batatlas/index.html
http://sres.anu.edu.au/associated/myna/index.html

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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, Turner, B. and Foley, W J. 2002. The use of high spectral resolution remote sensing to determine leaf palatability of eucalypt trees for arboreal marsupials. *International Journal of Applied Earth Observation and Geoinformation.* Vol 3 (4) 327-335.

Chikumbo, O., Spencer, R.D., Turner, B.J. and Davey, S. 2001. Planning and monitoring of forest sustainability: an Australian perspective. Australian Forestry 64(1): 1-7.

Dury, S.J. and Turner, B.J. 2001. Nutrient estimation of eucalypt foliage from hyperspectral data. Proc., 2001 IEEE International Geoscience and Remote Sensing Conf., Sydney. On CD. Vol II: 774-776.

Dury, S.J., Turner, B.J. and Foley, W.J. 2001. Can hyperspectral data be used to map koala and possum habitat*? Proc., 2001 IEEE International Geoscience and Remote Sensing Conf.*, Sydney. On CD. Vol IV:1648-1650.

Dury, S.J., Jia, X. and Turner, B.J. 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 Turner, B.J. 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.

Wood, G.B., Turner, B.J. and Brack, C.L. (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 Kanowski, P. 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.

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).

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 population, resources and development. I also coordinate two field schools to Southeast Asia. Every year I teach an intensive three weeks course in Bali for ANU students. Also, 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. 2002. SMEs and Regional Labour Markets: major trends Since 1997, in Harvie, C. and Boon-Chye Lee (eds), *Studies of Small and Medium Enterprises in East Asia*, Volume 1: Small and Medium Enterprises in East Asia, Cheltenham, UK, Edward Elgar.

van Diermen, P. and Azmat, G. 2001. Cottage and Small Firm "Presence" in Indonesia manufacturing between 1975-1996, *Small Business Economics*, 16:157-166.

Azmat, G. and van Diermen, P. 2001. Some Determinants of Small Firms 'Presence' in Indonesia, *Applied Economics Letters*, 8: 471-474.

van Diermen, P. (ed.) 2001. SME Policies in Indonesia: Towards a new Agenda. Occasional Paper Series on SME Development No.1, April. Manila: The Asian Development Bank.

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

van Diermen, P. 1998. 'Global patterns of production and Industrial Organization of Small Family Businesses in Jakarta', in *Malaysia Journal of Tropical Geography*, 29, 1:39-52.

van Diermen, P. 1997. *Small Business in Indonesia*. London: Ashgate.

van Diermen, P. 1997. 'Labor Remuneration in Jakarta's Small Enterprises: Exploitative or Equitable?' *World Development*, 25, 12:2129-2141.

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

Dr Anna Carr

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Career brief

Post-doctoral fellow, CRES & SRES

Research

My research interests lead me to consider the interrelationships between science, environment, epistemology and society with special reference to ecological restoration and environmental stewardship.

In 2000 I started an ARC Post-Doctoral Fellowship entitled: *Community science; improving theory, policy and practice*. This project will contribute to conversations about how scientific practice is translated into public environmental discourse. Of particular interest to me is the way that science has sought to separate professionals and amateurs and to privilege experts over everyday citizens. My work is based on the following assumptions and starting points:

a) It stresses the importance of working across disciplinary and geographic boundaries in an effort to foster collaborative solutions to environmental messes. By this I do not necessarily mean compromise, but the facilitation of dialogue and exchange between agency and community scientists.

b) It examines the practice of scientism and seeks to challenge those elements of techno-scientific rationality, which have colonized other knowledge spaces and delegitimised others' ways of knowing.

c) It emphasises the importance of practicing environmental stewardship in specific places, of developing a sense of place, a politics of belonging and a bioregional affiliation with territory as opposed to functional or utilitarian relationships with the environment.

d) It acknowledges the possibility of "the world's independent sense of humour" (Haraway 1991) whilst sharing many of the post-modern and constructivist epistemological underpinning's of feminist science studies.

e) It affirms indigenous science as that which belongs to a landscape and it respects indigenous scientists as those who draw upon the knowledge of their country through cultural and spiritual practices as well as through techno-scientific practice.

f) It is firmly predicated on notions of inclusivity and participatory research design. It does not hide behind narrow positivist distinctions, which seek to separate the 'subjects' of research from those who conduct it, and my work also recognises the myth of value neutrality in 'objectivity'.

Selected publications

Carr, A. 2002. *Grass roots and green-tape: principles and practices of environmental stewardship.* Federation Press: Sydney.

Carr, A. 1997. Innovation of diffusion: information exchange and landholder groups. 1997. Centre for Resource and Environmental Studies, The Australian National University: Canberra. (Resource Management and Environmental Studies No. 15) pp 1-69.

Carr, A.J.L. and Wilkinson, R. 1997. Scientists and farmers working together: a convergence of knowledge and roles. Paper presented to the 2nd Australian Pacific Extension Conference. *Managing change: building knowledge and skills. Australasia Pacific Extension Network*: Albury, NSW 18-21 November 1997. pp 1-10.

Carr, A. 1996. Innovation of diffusion: landcare and information exchange. *Rural Society* 5(2/3):56-66.

Carr, A. 1995. Catchment management and multi-stakeholder groups. Paper prepared for *Localinks* a national conference on local environmental action in Melbourne, 10-12 May 1995. pp 1-11.

Carr, A. 1995. Collaborative strategies for rural environments. Invited paper for *Survival, health and well-being into the 21st century*: a national symposium sponsored by the Nature and Society Forum in Canberra, 29 November - 1 December 1995. pp 1-14.

Carr, A. 1994. Grass-roots and green-tape: community-based environmental groups in Australia (PhD thesis submitted to The Australian National University). pp 1-497.

Dr Roger Heady

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Wood Anatomy, Electron Microscopy

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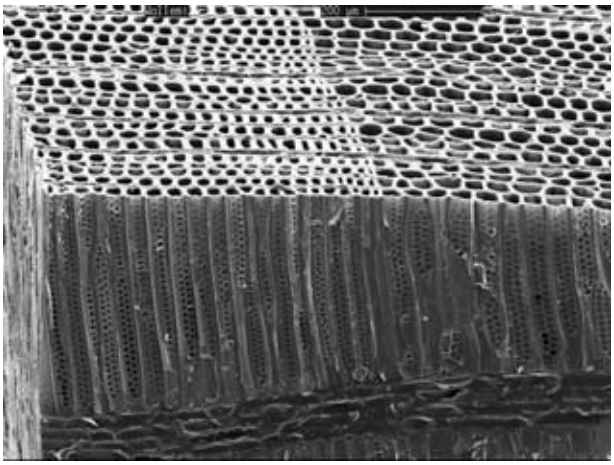
Career brief

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 Active 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 School Research Associate in the School of Resources, Environment and Society.

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 Cypress pine and Wollemi pine.

During the past year I assisted several post-graduate Forestry students with research involving electron microscopy. In November I collected wood samples of *Actinostrobus* from its native habitat in Western Australia. Data and images from these samples have already been used for wood anatomy description in this genus. I presented a paper entitled "An illustrated history of the microstructure of the Aranucaraceane" at the Fifth national Conference on Australia's Forest History held in Hobart in February 2002. For a period of one month from March 23 2002, I had an exhibition of Electron microscopy images on show at the Canberra School of Art. The exhibition was given coverage in the Sydney Daily Telegraph and the Canberra Times newspapers. In May, 202 I presented a seminar entitled "The wood anatomy of Wollemi Pine" at the Mount Tomah (NSW) Botanic Gardens.

Selected publications

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

Ride, W.D.L., Pridmore, P.A., Barwick, R.E., Wells, R.T. and Heady, R.D. 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 Digby Race

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Career brief

Digby joined ANU Forestry in January 1998, and has over 12 years of community and farm forestry experience in Australia and internationally. 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, Environment Australia, Greening Australia Ltd., Joint Venture Agroforestry Program, and the United Nation's Food & Agriculture Organisation (FAO).

Digby is a member of the National Farm Forestry Forum, and is regularly invited to speak at regional, national and international forums on various aspects of community and farm forestry development. He has published over 50 research reports, refereed and conference papers, and other texts on various aspects of community and farm forestry. He also contributes to course development, post-graduate teaching, 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 8002) - 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 Professor 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 Anna Carr and guest lecturers.

Some of Digby's recent research projects have included:
Project Manager – *'Farm Forestry: Linking biodiversity to business solutions',* conducted with Dr David Freudenberger, CSIRO Sustainable Ecosystems, Sept.2001-Oct.2002. Commissioned by Environment Australia;

Principal Researcher – *'Innovative use of farm vegetation: Australian experiences of making farm vegetation pay'*. Jun.2001-Mar.2002. RIRDC Project ANU-49A, final report available at the Rural Industries R&D Corporation's website www.rirdc.gov.au. Commissioned by the Joint Venture Agroforestry Program;

Co-Project Manager - '*Development of Evaluation Skills at the Regional Level for Commercial Farm Forestry*', conducted with URS Corporation, 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;

Selected publications

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

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 Race, D. 2000. *Global survey and analytical framework for forestry out-grower arrangements*. Final Report submitted to the Food and Agricultural Organisation (FAO) of the United Nations, Rome, Italy. ANU Forestry: Canberra, ACT. 54 pp. (PDF version - 238kb).

Race, D. and Buchy, M. 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 Curtis, A. 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 Booth, B. 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 Robins, L. 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 Race, D. 1998 Lessons from recent evaluations of natural resource management programs in Australia. *Australian Journal of Environmental Management*, 5 (2): 109-119.

Dr Paul Rutherford

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Environmental regulation & policy, political theory & science studies

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Career brief

Paul has worked with a range of government agencies, non-governmental organizations and universities on environmental and resource policy since 1983. He completed a Bachelor of Arts in science and technology studies at Deakin University in 1985, and a PhD in political science with the Research School of Social Sciences at the ANU in 2000.

His policy work has covered areas including energy, transport, salinity and water quality management, industrial waste regulation, and national environment protection policy. From 1993 to 1997 he taught environmental policy and politics, political theory, public policy and Australian politics at the University of Sydney and at the ANU.

From 1997 to 2002 Paul was a manager with the Environment Protection Authority chemicals and waste program, where he played a key role in regulatory reform of hazardous wastes management both nationally and in NSW. During this time he was also a member of the National Environment Protection Council project team responsible for the development of the National Environment Protection Measure (NEPM) on Controlled Waste and the NSW representative on the national Implementation Working Group for the NEPM.

Research and teaching

My main work is with an ARC research project led by Professor Neil Gunningham that is examining new approaches to the regulation of water pollution in urban catchments, as well as developing regulatory theory more generally. The project is co-sponsored by Western Australian government environment protection and water management agencies.

I am also working on an evaluation of the implementation of the Controlled Waste NEPM and the influence of this on the approach taken by the Australian States to hazardous waste regulation, as well as the broader implications of the NEPM processes for institutional change in Commonwealth-State environmental protection arrangements.

The focus of my PhD work was on theories of environmental risk, ecological modernisation and ecological governmentality, and the implications of these for traditional notions of political agency and power. I am developing this research further, in particular investigating the role of ecology as a 'regulatory science' shaping governmental programs for managing the environment. This work draws on 'govenmentality studies' and 'actor network theory'.

Selected Publications

Rutherford, P. 2000. Ecologica, ciencia natural y biopolitica (trans. F. Vazquezy & V. Valencia) Revista Mexicana de Sociologica, v.63 (3) pp: 147-165.

Rutherford, P. 1999, Ecological Modernisation and Ecological Risk, in *Discourses of the Environment*, E. Darier, (ed.), Blackwell Publishers, Oxford, pp: 95-118.

Rutherford, P. 1999, 'The Entry of Life into History', in Discourses of the Environment, E. Darier, (ed.), Blackwell Publishers, Oxford, pp: 37-62.

Rutherford, P. 1997. Policing Nature: Ecology, Natural Science and Biopolitics, in *Foucault: The Legacy,* C. O'Farrell, (ed.), Queensland University of Technology, Kelvin Grove, Qld., pp: 546-562.

Rutherford, P. 1994. The Administration of Life: Ecological Discourse as "Intellectual Machinery of Government", *Australian Journal of Communication*, 21 (3): 40-55.

Rutherford, P. 1993. Foucault's Notion of Biopolitics: Implications for Environmental Politics in *Ecopolitics IV: Interactions and Actions*, I. Thomas (ed.), Royal Melbourne Institute of Technology pp: G7-G15.

Fowler, R. and Rutherford, P. 1991. The Feds are coming! - A federal EPA for Australia? *Legal Service Bulletin*, 16(4): 165-167

Rutherford, P. 1991. The Relationship between the Federal and State EPAs - Replacing Red Tape with Green, *Environmental Defender's Office*, Sydney, pp: 109-114.

Ferris, P. and Rutherford, P. 1990. 'Mobility in a Clean Environment: A new commitment to Australia's railways, in P. James, (ed.) *Technocratic Dreaming: Fast Trains and Japanese Designer Cities*, Left Book Club, pp. 204-217.

Rutherford, P. 1990. The Web of Environmental Concerns, in P. James (ed.) *Technocratic Dreaming: Fast Trains and Japanese Designer Cities*, Left Book Club, pp: 19-27.

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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 fourteen 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 quarterly market reports on forest products and inputs for Australian forest growers. The market reports are primary for small-scale growers.

By June 2002, market reports have been completed on 20 topics such as: consumption of sawnwood and wood based panels; salinity credits; 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://sres.anu.edu.au/associated/marketreport/index.html.

Selected publications

Dargavel, J., Conley, K., Proctor, W., Ferguson, I. and Bhati, U.N.. 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 Evans, P.D. 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 Bhati, U.N. 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 Stanford, L. 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 Tran, Y. 1995. *Trees on Farms: Survey of Trees on Australian Farms*, 1993-94, ABARE Research Report 95.7, Canberra.

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

Bhati, U.N. and Rose, R. 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 Stephens, M. 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 Bhati, U.N. 1991. *Pricing and Allocation of Logs in Australia*, ABARE Discussion Paper 91.7, AGPS, Canberra.

Emeritus Professor Valerie A. Brown

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Career brief

Val Brown holds an undergraduate degree in the Biological Sciences with a major in Ecology, a graduate diploma in Adult Learning, and the inaugural PhD in ANU's Human Sciences. Her thesis examined the potential for integrating the Arts and Sciences in exploring environmental issues. During 1984-89 she established the Health Advancement Services of the ACT, and has since worked in projects to link public health and environmental governance in Australia, Malaysia, Fiji, and China. She has introduced teaching programs linking Health and Environment to the University of Canberra, Tribhuvan University Nepal, and the University of Western Sydney; and established research units on local environmental governance as Visiting Fellow at the Centre for Resource and Environmental Studies ANU 1989-1995, and as Foundation professor of Environmental Health at the University of Western Sydney 1996-2002. In 1999 she was appointed an Officer of the Order of Australia for international and national advocacy for, and contributions to, sustainable development.

Research

Her research applies integrative methods to exploring the potential for locally sustainable responses to global social and environmental pressures. Past research programs have addressed the capacity for achieving integrated environmental management in the Local Government sector, the community sector, and the environmental sciences. Her current projects include principles for collaborative engagement for the Murray-Darling Basin; an interactive knowledge management framework for sustainable development in the local government sector; the introduction of sustainable development principles into the national Public Health post-graduate curriculum; and Indigenous communities' environmental health workforce development.

Lawrence Issa

Selected publications

Nicholson, R., Stephenson. P., Brown, Valerie. A. and Mitchell, K. 2002. Common Ground and Common Sense: a commmunity-based environmental health action handbook. Department of Health and Ageing, Canberra 220pp.

Brown, Valerie A. Stephenson. P., Nicholson, R., and Smith, J. 2001. Grass Roots and Common Ground: community-based environmental health action planning. Department of Health and Aged Care, Canberra 106pp.

Brown, Valerie A., Love, D., Griffiths, R., Powell, J., Murphy, A., and Walsmley, A. 2000. Western Sydney Regional State of the Environment Report 2000. Western Sydney Regional Organisation of Councils, Blacktown, 250pp.

Brown, Valerie A. 1996. Managing for Local Sustainability: policies, problem solving, people and place. National Office of Local Government, Canberra. 314pp.

Brown, Valerie A., Smith, D.I., Weissman, R., and Handmer, J. 1995. Risks and Opportunities: managing environmental conflict and change. Earthscan, London . 213pp.

Brown, Valerie A. 1995. Landcare languages: talking to each other about living with the land. National Landcare Program, Department of Primary Industry. Canberra. 215pp.

Brown, Valerie A. 1995. Turning the tide: integrated local area management for Australia's coastal zone. Department of Environment, Sport and Territories, Canberra, 175pp (second printing).

Brown, Valerie A. 1994. Acting Globally: the environmental management needs of local government. National Office of Local Government, Canberra 90pp.

Brown, V.A., Orr, L., and Smith, D.I. 1992. Acting locally: meeting the environmental information needs of Local Government. Department of the Arts, Sport, the Environment and Territories, Canberra, 95 pp.

Group of Experts on Environmental Concerns (V.A. Brown, Australian member) 1991 Sustainable Development. An imperative for environmental protection. Commonwealth Secretariat, London. 136 pp.

Brown, V.A. (ed.) 1989 A sustainable healthy future: towards an ecology of health. Commission For the Future and Latrobe University, Melbourne. 115 pp.

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. 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 SRES 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.

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 covered 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.

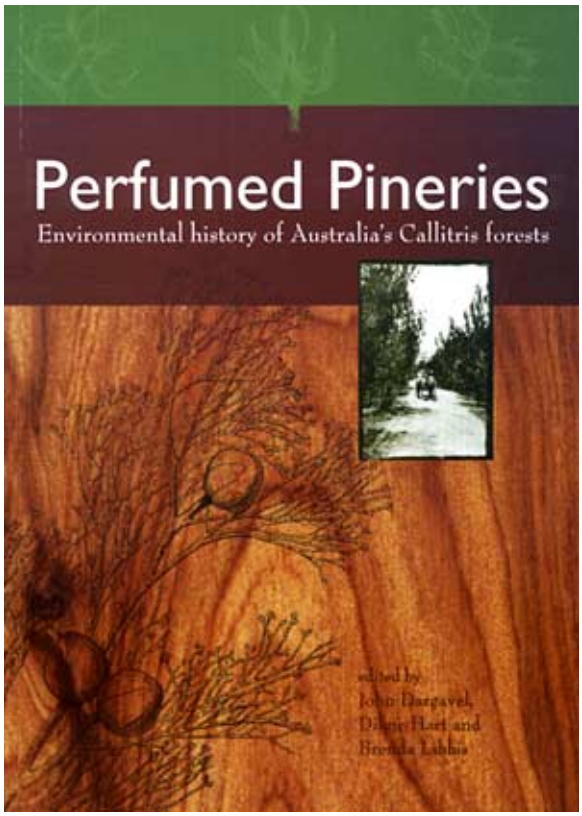
The national forest history conference was held in Tasmania in February 2002. I wrote a play for this, which was performed by local people in Geeveston. It is called 'Hard work to starve' and covers labour dispute in southern Tasmanian sawmills in 1921-22.

Selected publications

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

Dargavel, J., Proctor, W. and Kanowski, P. 2000. Conflict and agreement in Australian forests. in Luca Tacconi (ed) *Biodiversity and Ecological Economics: Participation, Values, and Resource Managemen*t. 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.



Dr Ross Florence

Visiting Fellow
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 Allen, J. (eds), ANZIF Conference, Christchurch, N.Z. pp.173-181.

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.

Adam Gerrand

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Forest Policy Development, Planning & Implementation, Plantation Silviculture

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Career brief

Adam Gerrand began his forestry career with a NSW Forestry Commission traineeship in 1982 while undertaking his undergraduate degree in forestry at ANU. After completing his degree Adam worked for two years with the NSW Forestry Commission on native forest and pine plantation operations. In 1988 Adam moved to Tasmania to undertake plantation research, including a 5 year project to develop thinning and pruning regimes aimed at developing appropriate silvicultural and management prescriptions for eucalypt plantations. In 1994 Adam completed an MSc. at Oxford University with a thesis on community forestry that led to work on the Nepal – Australia Community Forestry Project in 1996. Returning to Tasmania, Adam had responsibility for preparation of policy prescriptions and management plans for State forest.

From 1997 to 2001 Adam worked as the Principal Forest Officer for the Department of Forests in Vanuatu where he was involved in both national policy development and practical implementation. Since returning to Australia Adam has been a Visiting Fellow at ANU doing research and analysis leading to publications resulting from Vanuatu policy work and providing assistance with students work programmes.

Research and teaching

Adam's main research interests follow his interest in improving forestry's contribution to national development. This spans the range from local action such as community forestry through to national forest policy. In recent years his work has focussed on forest policy implementation through planning, legislative development and enforcement. Several recent projects illustrate this:

I provided technical input and oversaw FAO consultants work on comprehensive review of Vanuatu's forestry legislation leading to a new Forestry Act developed through wide consultation involving over 80 key stakeholders. Key features of the new Act include a better system for determining rights and access to forest resources, while recognising the importance of customary land tenure.

As part of an ACIAR funded project team developing improved planning methods for sustainable management of timber stocks in PNG forests, I am currently involved with developing improved forest inventory and planning techniques, training, analysis and reporting.

In 2002 Adam started work with the Bureau of Rural Sciences, and is on the organising committee for a joint ANU-BRS national conference on forestry plantations to be held in August 2002.

Selected publications & student theses

Brack, C., Bragg, C., Frakes, I., Gerrand, A., Keenan, R., Vanclay, J., (2002). Review of forest inventory and mapping systems for forest planning in PNG. ACIAR Project FST 98-118, Planning methods for sustainable management of PNG forests.

Gerrand, A. M. and Bartlett, A.B. (2001). Managing change: Lessons learned from the development and implementation of Vanuatu's National Forest Policy. 16th Commonwealth Forestry Conference, "Forests in a changing landscape", 18-25 April 2001, Fremantle, Western Australia, Commonwealth Forestry Association.

Gerrand, A. M. and W. A. Neilsen (2000). Comparing square and rectangular spacings in Eucalyptus nitens using a Scotch Plaid design. Forest Ecology and Management 129: 1-6.

Neilsen, W. A. and Gerrand, A. M. (1999). Growth and branching habit of Eucalyptus nitens at different spacing and the effect on final crop selection. Forest Ecology and Management 123: 217-229.

Orr, S. and Gerrand, A. M. (1998). Management Decision Classification: a system for zoning land managed by Forestry Tasmania. Tasforests 10: 1-14.

Gerrand, A.M., Medhurst, J. and Neilsen, W.A. (1997) Thinning and pruning eucalypt plantations for sawlog production in Tasmania. Tasforests 9: 15-34.

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. She returned to the ANU in 1982 as a PhD 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 Gibson, A. 2002. Relationships between growth, specific leaf area and water use in six populations of *Eucalyptus microtheca* from two climates grown in controlled conditions. *Australian Forestry* 4:75-79

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

Franks, P.J., Gibson, A. and Bachelard, E.P. 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).

Tough trees: River Redgum, Tennant Creek

Dr A Malcolm Gill

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Fire Ecology, Fire Management, Fire Weather

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Career brief

After an undergraduate degree in agriculture Dr Gill completed MSc and PhD degrees in forest ecology at the same university, the University of Melbourne. Two years were then spent at the Harvard Forest of Harvard University in USA, studying North temperate tree growth, and a further two and a half years at Fairchild Tropical Garden in Miami, Florida studying tropical tree growth. For the past 30 years his research interests have largely concerned the inter-related topics of fire ecology, fire weather, fire behaviour and fire management.

Research

Over the past few years Dr Gill's research has been mainly concerned with point-based, and patch-based, models of fire occurrence. These relate nicely to ecological effects of fires in the landscape including biodiversity. A major project of recent years was with colleagues from the Department of Geography and CRES. This involved a study of the interactions between trees, fires, hollow-dwelling animals and climate change in Central Victoria. The latest project has been on the fire created patchiness of tropical savannas of the Northern Territory.

Selected publications

Gill, A.M. (2000). *Fire-pulses in the heart of Australia: fire regimes and fire management in Central Australia*. Report to Environment Australia, August 2000, 50p.

Bradstock, R.A. and Gill, A.M. (2001). Living with fire and biodiversity at the urban edge: in search of a sustainable solution to the human protection problem in southern Australia. *Journal of Mediterranean Ecology* **2**, 179-195.

Gill, A.M. (2001). A transdisciplinary view of fire occurrence and behaviour. In: G. Pearce and L. Lester (eds) *Bushfire 2001. Proceedings of the Australasian Bushfire Conference, Christchurch, New Zealand*. Pp. 1-12. Rotorua, New Zealand.

Gill, A.M. (2001). Economically destructive fires and biodiversity conservation: an Australian perspective. *Biological Conservation* **15**, 1558-1560.

McCarthy, M.A., Gill, A.M. and Bradstock, R.A. (2001). Theoretical fire interval distributions. *Int. J. Wildland Fire* **10**, 73-77.

McCarthy, M.A., Possingham, H.P. and Gill, A.M. (2001). Using stochastic dynamic programming to determine optimal fire management of *Banksia ornata*. *J.Appl. Ecol*. **38**, 585-592.

Bradstock,R.A., Williams, J.E. and Gill, A.M. (eds) (2002) *Flammable Australia: The Fire Regimes and Biodiversity of a Continent*. Cambridge University Press.

Mackey, B., Lindenmayer, D.B., Gill, A.M., McCarthy, M.A. and Lindesay, J. (2002). *Wildlife, Fire and Future Climates*. CSIRO Publishing, Melbourne.

Mr Neil Humphreys

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Management Systems, Forest Operations and Farm-based Plantations

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Career brief

Neil's (Curly) career started in 1950 as a forestry trainee with the Forestry Commission of NSW. Following graduation from the University of Sydney he worked on the North Coast of NSW and later in the Marketing Division in Sydney. His interest centred on forest harvesting. In 1979 he was employed by Australian Newsprint Mills (ANM) at Albury to manage the greenfield newsprint mill's wood supply which used fully mechanised harvesting systems. He later managed the Forest Management Division of ANM in Tasmania before moving to Malaysia to develop forest plantations for Fletcher Challenge. Since 1999 he has been program director of the Forest Technology Program and Senior Fellow at the University of Melbourne. He also became Visiting Fellow at the Australian National University where he now lectures in Forest Operations.

Research and Teaching

My experience has centred on forest operations and during the last twenty-five years I have concentrated on industrial forestry.

Thus my involvement at ANU as a Visiting Fellow brings with it a culture which is commercial rather than academic. This juxtaposes two cultures - one that emphasises the importance of money and management structures with one that emphasises research and teaching.

Universally, the interface of cultures generates a hive of activity, mostly for the good. Where the various cultures have mutual understanding and respect, the interaction is positive and exciting.

I accepted the School's invitation to be a visiting fellow because I believe that forestry and society gain considerably through the positive interaction of academia and business.

Dr Robert Coutts, a highly respected wood scientist who, until recently was with CSIRO, put it so well when he said, "In this day and age of information technology, facts are easy to come by, but real knowledge is gained only from exposure and experience." My contribution to forestry is now directed to transferring some of my experience to those studying at ANU.

Dr Janet Koop

School Visiting Researcher
Micro-Processes within Patterned Landscapes

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Career brief

Janet graduated BA DipEd in the School of Biological Sciences at Macquarie University in 1979, when she joined the NSW Department of School Education. She enjoyed her teaching career in Primary/Infants schools around Sydney, where she was involved in the development of school-based Science and Language curricula as well as in a variety of music activities. Planning for retirement, Janet returned to Macquarie to follow latent interests. Further studies in Physical Geography complemented her earlier studies in Biology and led to a PhD thesis titled *Microtopography, soil water repellence and the role of fire in sandstone-derived soils of the Sydney Basin, Australia*. During her post-graduate studies Janet was involved as a tutor in introductory Earth Science and Soils courses.

Research and teaching

Janet's research interests are in the micro-processes that operate within landscape elements where self-organization is established at a scale of usually less than one metre. Her work to date has involved detailed investigation into the causes and the spatial distribution (in three dimensions) of soil water repellence on sandstone-derived soils in natural bushland and into the effects on landscape function of the changes which occur during and after fires of different intensities. In the dry sclerophyll bushland where she conducted her study, Janet found that the coincidence of soil water repellence, cluster-roots (proteoid roots), cryptogams and soil crusts with surface microrelief promotes water harvesting and the concentration of nutrients. These processes, together with the plant-environment interaction that occurs where resources become concentrated, operate in positive feedback loops that maintain the organization of the landscape, provide safe sites for obligate re-seeders and rapidly restore landscape function after fire.

Using a multi-disciplinary approach which involves geomorphology, soil micromorphology, hill-slope hydrology and ecology, Janet is interested in continuing research that will develop the understanding of geo-ecological systems and that may contribute to the design of methods for monitoring the response and resilience of landscape function where landscapes are periodically disturbed by fire.

Selected publications

Janet Koop was then known as Janet Eddy

Eddy, J., Humphreys, G.S., Hart, D.M., Mitchell, P.B. and Fanning, P.C. 1999. Vegetation arcs and litter dams: similarities and differences. *Catena*, 37: 57-73.

Eddy, J. 1996. Litter dams and microterraces - persistent microrelief features after wildfire on hillslopes in the Sydney Basin, Australia. ASSSI and NZSSS National Soils Conference, 1-4 July 1996 - Vol. 3, Poster papers. pp. 65-66.

Eddy, J., Hart, D.M., Humphreys, G.S. 1996. Spatial sequence of soil crusts within litter dams and microterraces in the Pilliga State Forests, N.S.W. *ASSSI and NZSSS National Soils Conference, 1-4 July 1996 - Vol. 3, Poster papers*. pp. 67-68.

Eddy, J., Humphreys, G.S., Hart, D.M., Mitchell, P.B. and Fanning, P.C. 1996. Vegetation arcs and litter dams: similarities and differences. *Banded vegetation patterning in arid and semi-arid environments; ecological processes and consequences for management. SAvanna in the Long Term (SALT) Symposium, Paris, April 2-5, 1996*. pp. 95-96. (Also presented orally).

Eddy, J., Humphreys, G.S., Mitchell, P.B. 1996. Litter dams and microterraces - an overview. *ASSSI and NZSSS National Soils Conference, 1-4 July 1996 - Vol. 2, Oral papers*. pp. 67-68.

Hart, D.M., Humphreys, G.S., Eddy, J. and Mitchell, P.B. 1996. Origin of a Kurosol formed under mallee in the Pilliga State Forests, New South Wales, Australia. *ASSSI and NZSSS National Soils Conference, 1-4 July 1996 - Vol. 2, Oral papers*. pp. 117-118.

Hart, D.M., Humphreys, G.S., Mitchell, P.B., Hesse, P.P., Norris, E.H. and Eddy, J. 1996. The relationship between the soil and the underlying substrate in a section of the Pilliga State Forests, New South Wales, Australia. *ASSSI and NZSSS National Soils Conference, 1-4 July 1996 - Vol. 3, Poster papers*. pp. 101-102.

Dr Edward Linacre

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Climatology

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Career brief

Edward Linacre obtained physics degrees from Edinburgh (M.A) & London (B.Sc., M.Sc., PhD.) and had an early career in UK involving physics applied to radar and problems of the steel, coal and chemical-engineering industries. He joined CSIRO in 1960 and became a Principal Research Scientist, studying physics aspects of irrigation agriculture, especially water evaporation rates. They depend on the climate, and climate estimation became a preoccupation. In 1969 he was appointed inaugural Associate Professor of Climatology at the new Macquarie University. There followed 17 years of research and teaching, pioneering distance-teaching of the subject. There were lecture tours in several countries, notably Brazil, Bali, the Philippines and China. Retired in 1986 to complete his second book, which was eventually published in 1992. That year he escaped Sydney to Canberra and became a Visiting Fellow in the Geography Department at ANU. There he has given numerous lectures in the introductory climatology course etc, revised his first book, a textbook on climatology, and published more research papers, as well as being consulted by other researchers.

Research

Climate has many aspects, as indicated in the following list of Linacre's more significant publications. On his starting in Sydney, there was an initial interest in the meteorology of air pollution, and also in the newly emerging field of environmental studies (the latter involved being a member of the team which carried out the first Environmental Impact Study in Australia.) However, the main emphasis subsequently has been on the estimation of key climatic variables such as temperature, radiation, winds and evaporation rates, using the minimum of input data. Lack of direct measurements in practice means that such estimates are often needed in building computer models of climate change, air pollution patterns, agricultural productivity, past environments, and so on.

Selected publications

Linacre, E. and Geerts, B. 2002. Estimating the annual mean screen temperature empirically. *Journal of Theoretical and Applied Climatology*. 71: 43-61.

Linacre, E. and. Geerts, B. 1997. "Climates & Weather Explained" (Routledge, London) 432pp.

Linacre, E. 1994. Estimating US Class A pan evaporation from few climate data. *Water International* 19: 5-14.

Linacre, E. 1993. A three-resistance model of crop and forest evaporation. *Journal of Theoretical. And Applied Climatology* 48: 41-8.

Linacre, E. 1992. Data-sparse estimation of lake evaporation using a simplified Penman equation. *Agriculture & Forestry Meteorology*. 64, 237-56.

Linacre, E. 1992. *Climate Data & Resources*. (Routledge, London) 366pp.

Linacre, E. 1990. The effect of rain on attendance at Sydney's Easter Show. *Australian Meteorological Magazine*38: 65-7.

Dr Catherine M. Pickering

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Career brief

Dr Pickering has had a long association with the ANU. She completed a first class honours degree in science in the old Botany Department. Her Doctorate in Philosophy examined the reproductive ecology of alpine plants, again at the ANU. During the final stages of her PhD Dr Pickering was appointed as a Lecturer in Genetics for two years in the Division of Biochemistry and Molecular Biology at the ANU. She has also been a visiting fellow at the ANU's Ecosystem Dynamics Group in the Research School of Biological Sciences, and the Division of Biochemistry and Molecular Biology. From the ANU she took up a research fellow position in the Unites States working on a National Science Foundation project in community ecology examining diversity maintenance in variable environments. In May 1996 she returned to Australia when she was appointed as a Lecturer in Environmental Biology in the School of Environmental and Applied Sciences, Faculty of Environmental Sciences at Griffith University. In January 2001 she was promoted to Senior Lecturer. Dr Pickering is the leader of the Mountain Tourism Subprogram in the Cooperative Research Centre for Sustainable Tourism. This is an interdisciplinary research group examining issues in the sustainability of tourism.

Research

Since being appointed at Griffith University, Dr Pickering has become involved in research into the impact of tourism on natural systems and in particular with sustainable mountain tourism. The goal of the subprogram she heads up at Griffith is to enhance the environmental, economic and social sustainability of mountain tourism in Australia. The subprogram includes research by academics, research staff and postgraduate students at Griffith University, University of Canberra, La Trobe University and University of Tasmania. The work has covered topics from the economic value of the Australian Alps National Parks, to the environmental impact of human waste in mountain environments.

The research team she heads up at Griffith University has examined issues such as the impacts of snow manipulation on vegetation, regulation of summer tourism, recovery of vegetation from disturbance, spread of weeds in the Australian Alps, sustainability of camping and trampling in mountain environments and management of ecotourism. She has also maintained a research program into the impacts of climate change on vegetation, recovery of vegetation from grazing, resource allocation in plants, insect-plant relationships, weed ecology, and her original area of research in reproductive ecology. This has involved testing theories about plant reproduction including gender differentiation in hermaphrodites, sex selection theory in dioecious plants, fertilisation and resource limitation of seed production, relationship between plant size and flowering, gender, timing of maternal investment, and effect of pollinator limitation using Australian alpine plants as models.

Dr Pickering has also collaborated with other scientists on projects including the access to genetic resources and gene patenting (with Dr C. Lawson, ANU), plant-animal interactions (with Prof. R. Drew, Griffith University) community ecology (with Dr N. Huntly and Dr P. Chesson), systematics (with Dr P.G. Ladd, formally ANU), and plant breeding (with Prof. A. Delves, formally ANU).

Dr Pickering is currently a member of the Ecological Society of Australia, Australian Institute of Alpine Studies and International Centre for Ecotourism Research, Griffith University.

Selected publications

Buckley, R. Weaver, D. and Pickering, C.M. (eds.) In Prep. *Nature Tourism and the Environment*. Common Ground, Melbourne.

Pickering, C.M. and Hill, W. Accepted. Ecological change as a result of tourism: snow manipulation in the Australian Alps. In: Buckley, R. Weaver, D. and Pickering, C.M. (eds.) *Nature Tourism and the Environment*. Common Ground, Melbourne.

Pickering, C.M., Johnston, S., Green, K. and Enders, G. Accepted. People on the roof: Impacts of tourism on the alpine area of Mt Kosciuszko. In: Buckley, R. Weaver, D. and Pickering, C.M. (eds.) *Nature Tourism and the Environment*. Common Ground, Melbourne.

Kelly, C., Pickering, C.M. and Buckley, R.C. In Press. Impacts of tourism on threatened plants in Australia. Ecological Restoration and Management.

Pickering, C.M., Green, K. and Bridle, K. (eds.). 2002. Research on Australia's High Country 1999-2001. Mountain Tourism Report. Cooperative Research Centre for Sustainable Tourism. p 129.

Lawson, C. and Pickering, C. 2002. Controlling access to genetic resources under the *Environment Protection and Biodiversity Conservation Act* 1999 requires an assessment of the effects of the *Patents Act* 1990. *Australian Intellectual Property Journal*. 13: 109-120.

Pickering, C.M. and Hill, W. 2002. Reproductive ecology and the effect of altitude on sex ratios in the dioecious herb, *Aciphylla simplicifolia* (Apieaceae). *Australian Journal of Botany*. 50: 1-12.

Green, K. and Pickering, C.M. 2002. A scenario for mammal and bird diversity in the Australian Snowy Mountains in relation to climate change. In: C. Körner & E.M. Spehn (eds.). *Mountain Biodiversity: A Global Assessment*. Parthenon Publishing, London pp. 241-249.

Worboys, G and Pickering, C.M. (2002). *Managing the Kosciuszko Alpine Area: Conservation milestones and future challenges*. Mountain Tourism Research Report No. 2. Cooperative Research Centre for Sustainable Tourism. p 47.

Hill, W. and Pickering, C.M. (2002). *Regulation of summer tourism in mountain conservation reserves in Australia*. Mountain Tourism Research Report No. 2. Cooperative Research Centre for Sustainable Tourism. p 43.

Pickering, C.M. 2001. Size and sex of floral displays affect insect visitation rates in the dioecious Australian alpine herb, Aciphylla glacialis. Nordic Journal of Botany. 21: 401-409.

Johnston, F.M. and Pickering, C.M. 2001. Alien plants in the Australian Alps. Mountain Research and Development. 21 (3): 284-291.

Lawson, C. and Pickering, C. 2001. The conflict for patented genetic materials under the Convention on Biological Diversity and the Agreement on Trade Related Aspects of Intellectual Property Rights. Australian Intellectual Property Journal. 12(2): 103-116.

Lawson, C. and Pickering, C.M. 2000. Patenting genetic materials – failing to reflect the value of variation in DNA, RNA and amino acids. Australian Intellectual Property Journal. 11: 69-82.

Pickering, C.M. 2000. Sex specific differences in floral display and resource allocation in Australian alpine dioecious Aciphylla glacialis. Australian Journal of Botany. 48: 81-91.

Buckley, R.C., Pickering, C.M. and Warnken, J., 2000. Environmental management for alpine tourism and resorts in Australia. *In:* Goode, P. M., Price, M. F. and Zimmerman, F. M. (eds.), *Tourism and Development in Mountain Regions*. CABI Publishing. pp. 27-46.

Pickering, C.M. and Armstrong, T. 2000. *Climate Change and the Plant Communities of the Kosciuszko Alpine Zone in the Australian Alps.* Mountain Tourism Research Report No. 1. Joint publication of the Cooperative Research Centre for Sustainable Tourism and the Australian Institute of Alpine Studies. p 23.

Dr Gary Richards

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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 assist in developing 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 co-authored the national evaluation of the Commonwealth Government's 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 focus on 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. Current research interests focus on the development of GIS-based carbon budget models to both inventory and assess of carbon budget implications of given forest management and planning scenarios.

Selected publications

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

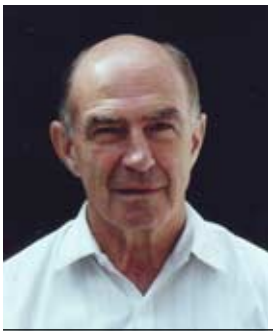
Richards, G.P. (ed.) 2001. *Biomass Estimation: Approaches for Assessment of Stocks and Change.* National Carbon Accounting System Technical Report No. 27. Australian Greenhouse Office, Canberra.

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 (50pp), Australian Greenhouse Office, Canberra.

Richards, G.P. and Evans, D.W. 2000. *CAMFor User Manual v 3.35.* National Carbon Accounting System Technical Report No. 26 (47pp), Australian Greenhouse Office, Canberra.

Richards, G.P. and Evans, D.W. 2000. *CAMAg* National Carbon Accounting System (electronic model) Australian Greenhouse Office, Canberra.

Richards, G.P. and Evans, D.W. 2000. *GRC3* National Carbon Accounting System (electronic model) Australian Greenhouse Office, Canberra.



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 school interests.

Research & other interests

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

Selected publications

Kalinganire, A., Harwood, C.E., Slee, M. and Simons, A.J. 2001. Pollination and fruit-set of *Grevillea robusta* in western Kenya. *Austral Ecology* 26: 637-648.

Slee, M.U. 1997. *Study of Flowering and Hybridization in Blue Mallee*. Final report. Project ANU 19A. Rural Industries Research and Development Corporation, Canberra.

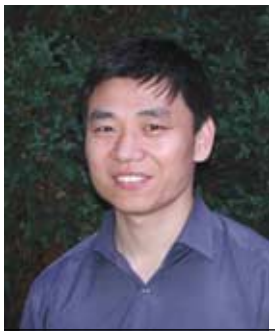
Slee, M.U. 1996. *Eucalypt Oil Production - Establishment of a Breeding Program*. Final report Project ANU 10A, Rural Industries Research and Development Corporation, Canberra.

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 Slee, M.U. 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.

Eucalyptus polybractia plantation, West Wyalong, NSW.



Mr Wenhua Xiang

Visiting Fellow

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Career brief

Wenhua was born in China. He qualified as an undergraduate student of forestry at Central-South Forestry University (CSFU) in 1984 and obtained Bachelor degree in 1988. After completion of master degree study of forest ecology, he started his career of teaching and research at CSFU in 1991. During the past 10 years, he has joined in a research group of long-term located research on subtropical forests in China. He also participated in research programs of integrated socioeconomic approaches into restoring degraded forestland and monitoring impact of market changes on land use system with regards to agroforestry management. Now he is resuming his PhD study in China, focusing on influence of management on structure, function and processes in Chinese fir plantations.

Research & other interests

I have a broader interest in forest ecosystem management. My research centers on study of structure and function in subtropical forest, in particular productivity, nutrient cycling and hydrological processes. This will provide a basis for sustainable forest management. Since forest management cannot be isolated from socioeconomic aspects, I take a considerable interest in forest policy, such as tenure, market, local community participation and empowerment of local community via training. I have tried to transplant the understanding of my research into training. The encouraging study at ANU is renewing and broadening my knowledge of forestry.

Selected publications

Xiang, W.H. and Tian, D.L. 2002. Study on nutrient cycling in Masson Pine stands of different age classes: *Acta Phytoecol Sinica.*26(1) :

Xiang, W.H., Tian, D.L., Yan, W.D et al. 2002. Nutrient elements distribution and cycling in the second rotation Chinese fir plantation at fast-growing stage: *Scientia Silvae Sinicae* 38 (2):

Xiang, W.H, Tian, D.L. and Yan W.D. 2001. Intermediate thinning effect on biomass dynamic of Masson Pine stands with variant densities: Journal of CSFU 21 (1):

Xu, G.Z., Xiang, W.H. et al. 2000. Impact of market changes on land use systems: response of communities and farmers with regard to forest and trees management: FORSPA/FAO field document No.16

Xiang, W.H., Zeng, G.Z. et al. 1998. Assessment of household's output and input in forest and benefit distribution of forest: Forest Economics

Xiang, W.H. and Tian, D.L. 1998. Economic benefit analysis of the growth process of young and half-matured slash pine plantations with different densities: Journal of CSFU 18 (3)

Liu, Q. and Xiang, W.H. 1998. Studies of nutrient elements cycling and density effect in slash pine plantations, *Scientia Silvae Sinicae*, 34 (3):

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Xiang, W.H., Lin, B. et al. 1997. The changes pattern of leaf area index (LAI) in Chinese fir plantations: *Scientia Silvae Sinicae* 33 (2):

Xiang, W.H., Tian ,D.L. et al. 1997. Studies of the amount of litter and nutrient return in slash pine plantations with different density: *Scientia Silvae Sinicae* 33 (2)

Dr Andrew Young

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Population genetics, ecology, conservation biology

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Career brief

Andrew graduated with BSc and, MSc Hons in Botany from Auckland University in 1988. He taught for a year in the Botany Department at Auckland University before undertaking a PhD in genetics at Carleton University in Ottawa, Canada. After graduating in 1993, Andrew took up a postdoctoral fellowship in population genetics at CSIRO Plant Industry in Canberra, and was appointed as a Research Scientist there in 1996. He is now a Senior Research Scientist and leader of the Conservation Biology Group.

Research & other interests

My research addresses plant population genetics and ecology. I am particularly interested in how genetic processes interact with demography to influence population viability, particularly in fragmented populations. Project areas include basic research on effects of genetically controlled self-incompatibility systems on mate availability, the role of inbreeding in determining the viability of fragmented populations, genetics and ecology of rare and endangered species, provenance studies of common shrubs and trees for restoration and ecological risk assessment of GMOs. My research employs a broad range of techniques including the use of molecular genetic markers, demographic monitoring, growth experiments and simulation modeling

Selected publications

Young, A., Boyle, T. and Brown, A.H.D. 1996. The population genetic consequences of habitat fragmentation for plants. *Trends in Ecology and Evolution,* 11: 413-418.

Young A.G. and Brown, A.H.D. 1998. Comparative analysis of the mating system of the rare woodland shrub *Daviesia suaveolens* and its common congener *D. mimosoides*. *Heredity*, 80:374-381.

Young, A.G. Brown, A.H.D. and Zich, F.C. 1999.Genetic structure of fragmented populations of the endangered grassland daisy *Rutidosis leptorrhynchoides*. *Conservation Biology,* 13:256-265.

Young, A.G. and Brown, A.H.D. 1999. Paternal bottlenecks in fragmented populations of the endangered grassland daisy *Rutidosis leptorrhynchoides Genetical Research*, 73:111-117.

Young, A.G. and Murray, B.G. 2000. Genetic bottlenecks and dysgenic gene flow in re-established populations of the endangered grassland daisy *Rutidosis leptorrhynchoides*. *Australian Journal of Botany,* 48:409-416.

Buza L., Young, A. and Thrall. P.H. .2000. Genetic erosion, inbreeding and reduced fitness in fragmented populations of the tetraploid pea *Swainsona recta. Biological Conservation*.93: 177-186.

Schmidt-Adam, G. Young, A.G. and Murray, B.G.M. 2000. Low outcrossing rates and shift in pollinators in New Zealand Pohutukawa (*Metrosideros excelsa*) (Myrtaceae). *American Journal of Botany* 87:1265-1272.

Young, A.G., Millar. C., Gregory, E.A. and Langston, A. 2000. Sporophytic self-incompatibility in diploid and tetraploid races of *Rutidosis leptorrhynchoides*. *Australian Journal of Botany.* 48:667-672.

Young, A.G., Brown, A.H.D., Murray, B.G., Thrall, P.H. and Miller, C.H. 2000. Genetic erosion, restricted mating and reduced viability in fragmented populations of the endangered grassland herb: *Rutidosis leptorrhynchoides*. In: A.G.Young and G.M. Clarke (eds) Genetics, *Demography and Viability of Fragmented Populations*. Cambridge University Press. Pp.335-359.

Brown, A.H.D. and Young, A.G. 2000. Genetic diversity in tetraploid populations of the endangered daisy *Rutidosis leptorrhynchoides* and implications for its conservation. *Heredity*. 85:122-129.

Young, A., Boyle, T. and Boshier, D. (eds) (2000*) Forest Conservation Genetics: Principles and Practice*, CSIRO Publishing. Pp352.

Young, A. and Clarke, G. (eds) (2000*) Genetics, Demography and the Viability of Fragmented Populations*, Cambridge University Press. Pp421.

Young, A.G., Schmidt-Adam, G, and Murray, B.G. 2001. High genetic variation and limited differentiation in remnant stands of the pohutukawa (*Metrosideros excelsa* Sol. Ex Gaertn., Myrtaceae). *New Zealand Journal of Botany* 39:133-140.

Murray B.G. and Young, A.G. 2001. High cytogenetic variation in the endangered daisy *Rutidosis leptorrhynchoides*. *Annals of Botany* 87:83-90.

B.J. Costin, J.W. Morgan & A.G. Young. 2001. Reproductive success does not decline in fragmented populations of *Leucochrysum albicans* subsp. *albicans* var. *tricolor* (Asteraceae). *Biological Conservation*. 98:273-284

Hoebee, S.E., and Young, A.G. 2001. Low neighbourhood size and high interpopulation differentiation in the endangered shrub *Grevillea iaspicula* McGillivray (Proteaceae). *Heredity* 86:489-496.

Young, A.G., Hill, J.H., Murray, B.G. and Peakall, R. 2002. Mating system, genetic diversity and clonal structure in the alpine herb *Rutidosis leiolepis* F. Muell. (Aasteraceae). *Biological Conservation* 106:71-78.

Wells, G.P. and Young, A.G. In press. Effects of seed dispersal and clonality on spatial genetic structure in four populations of *Rutidosis leptorrhynchoides* with differing levels of correlated paternity. *Genetical Research.*

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Career Brief

Piers joined the ANU 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 is also the first aid officer for field services and the Geography Building.

Ms Debbie Claridge

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Forest Ecology & Wildlife, GIS, Design & Web

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Career brief

Debbie supports technical and teaching support in a range of areas within the School. 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 is in the School's Public Relations. Aside from being the principal School photographer, she also designs many scientific posters, pamphlets, brochures and displays, (eg. ANZIF, Science Festival Careers, Exhibitions and ANU Open Day), as well as the School's in-house Yearbook. I also take part as Webmaster in the design and development of our online Web site.

Research & teaching

I have a Bachelor's degree in Applied Science, majoring in Vegetation/Wildlife Management and Biometry (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, when I took a 12 month-posting to the United States (in the Pacific Northwest), 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 at SRES, I continue to pursue diverse interests in the ecology/ diversity of Australian mammals and mycophagy and of hypogeous fungi species distribution.
As a result of these interests, 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) using ArcGIS in the courses *Resource Management*, *Ecological Measurement* and *Forest Planning*.

Selected publications

Claridge, A.W., Jumponnen, A.M., Trappe, J.M., Lebel, T. and Claridge, D.L. 2002. Ecological relationships among hypogeous fungi and trees: Inferences from associations analysis integrated with habitat modelling. Submitted to *Mycologica.*

Claridge, A.W., Trappe, J.M. and Claridge, D.L. 2001. Mycophagy by the swamp wallaby (*Wallabia bicolor*). *Wildlife Research* 28, 643-645.

Claridge, A.W., Trappe, J.M., Cork, S.J. and 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 Tidemann, C.R. 2001. *Biodiversity 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 Tidemann, C.R. 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 Claridge, D.L. 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).

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

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".

My focus is now on visual communication in print media, primarily cartographic illustration as well as photography and creating graphics for 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 Hedenstroem, S. 1995. Forestry education and information technology at ANU: tools, toys or a turn-up for the books? Proceedings of IFA Conference *Applications of New Technologies in Forestry*. Ballarat, Victoria, 18-21 April 1995, Bren and IFA Inc, Canberra. p 169 - 178.

Production, layout, maps & illustrations

Mackey, B., Nix, H., Hitchcock, P. 2001. *The Natural Heritage Significance of Cape York Peninsula, ANUTECH Pty Ltd,* Commissioned by the Queensland Environmental Protection Agency.

Full Report	ISBN 0-7315-3336-4
Executive Summary	ISBN 0-7315-3338-0
Compact Disk	ISBN 0-7315-3337-2

http://www.env.qld.gov.au/environment/environment/capeyork/

Maps & Illustrations

Campbell, J. 2002. *Invisible Invaders*: S*mallpox and Other Diseases in Aboriginal Australia 1780-1880,* Melbourne University Press, ISBN: 0-522-84939-3

Kleinert, S. and Neale, M(Eds). 2001. *The Oxford Companion to Aboriginal Art and Culture*, Oxford University Press, ISBN: 0195506499

Mackey, B., Lindenmayer. D., Gill, M., McCarthy, M. & Lindesay, J. 2002. *Wildlife, Fire and Future Climate: A Forest Ecosystem Analysis,* CSIRO PUBLISHING, ISBN: 0643067566.

Mr Steve Leahy

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Career brief

Steve is one of that scary breed of computer-literate environmental scientists who would haven taken over the world, if they hadn't objected to living in a concrete bunker beneath Lake Geneva. He'd already spent enough time in a concrete bunker while working for BRS.

His only interest is improving the IT literacy of SRES staff and students, thereby making his job easier. And making computers do what he expects....

Amongst his interests are shaming people into learning how to use their computers properly; bullying said computers into behaving themselves; non-linear editing of digital video; administering the ever-growing series of SRES web-sites; 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; recycling most of his previous yearbook entry; and writing about himself somewhat facetiously in the third-person. *tlhIngan vIbe'*

Mr Mark Lewis

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Career brief

Mark joined the School in May 2001 as 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 School. He has a degree in accounting from the University of Canberra and is currently studying the CPA Australia Program.

Mr John Marsh

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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).

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.
More recently I have attended a number of OH&S courses and am now the new Health and Safety Representative for SRES.

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

GIS Consultant in CRES (Tuesdays and Thursdays): http://cres.anu.edu.au/people/nissen.html

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 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

O'Reilly, S. 1970. Reader education: readers' advisor's program. *Australian Academic and Research Libraries*. 1(1) 16-20.

O'Reilly, S. 1972. The 1972 reader education program in the General Studies Library of the Australian National University. LAA UCLS Seminar on Reader Education at University of Tasmania, Hobart, Nov, 1972. 29-Dec 1. Papers (unpublished), 66-73.

Ms Zosha Smith

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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.

Mr Probyn Steer

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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.

Ms Panit Thamsongsana

Student Programs Administrator

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Career brief

Panit graduated from Middle Tennessee State University, U.S.A. in 1981, majoring in general stenography. Since then she has worked continuously in a variety of administrative areas. Her longest post (from 1984-2002) has been in the School of Chemistry at Australian Defence Force Academy, University of New South Wales.

Panit joined School of Resources Environment and Society in April 2002 as the Student Programs Administrator. She is responsible for the administration of the School's graduate, undergraduate and non-degree programs. She provides support to staff, program convenors and students and also manages the School front office.

Hidayat Alhamid

PhD scholar
Indigenous forest management in West Papua: a comaparative study

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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 if indigenous forest management, namely management practices and social construction behind these practices. This study will also examine the impact of external influences in indigenous forest management and the forest in a case study site near Manokwari, of West Papua. This work is supported by AusAID.

K.M.A. Bandara

Master of Philosophy scholar
Genetic improvement of *E. grandis* to increase the value of solid wood products

E. grandis is one the most commercialized tree species grown throughout the world. *E. grandis* has been favoured because its fast growth, superior form and the wood properties suitable for different uses. Currently, majority of the *E. grandis* plantations are been established for the wood pulp, fuel wood production. However, this species could be used for high value solid wood products such as construction, joinery and furniture timber.

This project aim is to understand the genetic variation of the wood and growth traits of *E. grandis* in three breeding populations in Australia and Sri Lanka, estimate the genetic parameters of those traits and then develop the appropriate breeding strategies for solid wood products. The project is Collaborated with CSIRO Forestry and Forestry products and funded by Australian Center for International Agricultural Research (ACIAR).

Nicolette Burford de Olivereia

PhD scholar
Enviro-political identities expressed in the talk of young people from riverine forest communities in Pará, Brazil, and their relevance to forest and land reform processes

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This research examines how dialogue on land and environmental, when conceived as a social learning process, integrates the development of the self with broader spheres of development within local, national and international communities. Through an analysis of Brazilian caboclo youths' talk, I investigate how participation in the creation and validation of discourses on subjects central to local livelihoods, can promote self-development, community development and environmental sustainability. I explore how the individual's participation in policy and law reform processes can help ensure these processes will result in more equitable, socially just and environmentally sound outcomes. The research hopes to inform on the scope for designing policies that will promote development processes (e.g. forest and land-use policy processes) that are participatory, inter-active, and steered by dialogue.

Rico Cabangon

PhD scholar
Flexural viscoelastic properties of wood-wool cement board

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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 strength and creep behaviour. Ultimately, we aim to develop practical solutions that will improve the strength and minimise the creep of WWCB used in buildings in the Philippines.

Major findings so far have shown that, board constituents, structure, and environment influence the creep and physical properties of WWCB. In terms of the effect of board constituents, Portland cement showed superior strength and creep properties than Pozzolan cement but irrespective of cement type, boards containing a high wood/cement ratio exhibited a high modulus of rupture (MOR). On the other hand, boards containing low amounts of wood exhibited high modulus of elasticity (MOE) and creep resistance. The addition of calcium chloride significantly improved strength but was not effective in reducing creep.

The strength and creep properties of WWCBs 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.
Relative humidity (RH) and temperature also play an important role in the strength and creep properties of WWCBs. At constant RH and temperature, MOE and MOR of boards were adversely affected by temperature to a greater extent than RH, while the negative affect of RH on creep was more pronounced than the effect of temperature. The creep resistance of boards was further reduced under cyclic RH and temperature but the former induced greater creep than the latter. In order to minimise creep in WWCBs under changing RH, different kinds of surface coatings were used to protect the board from adsorbing moisture. Surface coatings improved the physical and mechano-sorptive creep behaviour of the boards. A good linear relationship (r2=0.84) was found between the moisture excluding efficiency (MEE) of the various coatings and relative creep. Such relationship indicates that coatings with a MEE value of about 30 percent can reduce relative creep of boards to less than 2. Moreover, the relationship is a simple method of choosing a type of coat in improving creep properties under adsorption rather than undergoing the tedious and time demanding creep test. It therefore appears that the application of moisture excluding finishes to WWCBs is a practical solution to the problem of creep of this type of panel product when used in load-bearing situations.

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://sres.anu.edu.au/associated/fpt/nwfp/woodwool/woodwoolphil.html.

Recent Publications

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Cabangon, R.J., D.A. Eusebio, F.P.Soriano, R.B. Cunningham and P.D. Evans. 2000. The effect of post-harvest storage on the suitability of *Acacia mangium* for wood-wool cement board manufacture. Proceedings of the Fifth Pacific–Rim Bio-Based Composites Symposium. pp. 48-56.

Cabangon, R.J., D.A. Eusebio, F.P. Soriano, R.B. Cunningham and P.D. Evans. *Acacia mangium* and *Eucalyptus pellita* differ in their response to the accelerator used in the manufacture of wood-wool cement boards. *FPRDI Journal*. In press.

Paul Carlile

PhD scholar
Surface and sub-surface modeling of hydrology and salt distribution within the Little River catchment, NSW

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This study looks at improved prediction of catchment hydrology by appropriately disaggregating and connecting surface and sub-surface components. It specifically involves the development of a rainfall-runoff, recharge-discharge model that operates at the management scale in an ungauged catchment. Regionalisation and scale are also being investigated with the aim of using catchment attributes to parameterize a conceptual rainfall runoff model. Disaggregation and of large catchments at the surface and sub-surface prior to parameterisation is suggested as a way to describe spatially the recharge-discharge characteristics of a catchment.

This work is being done with the aim of producing a catchment hydrology model, which uses available physical data, and has been shown to accurately conceptualize the hydrological processes present in the catchment. The final model will be significant for a number of reasons. Firstly the model aims to provide effective management options for salinity through distribution at the management scale. Secondly the use of catchment attributes to structure conceptual models and parameterise them over appropriate spatial scales reduces our reliance on calibrated parameter values. Finally a combined physical-conceptual approach will allow the model to be applied in ungauged catchments. Paul has previously conducted research in hydrology, remote sensing and GIS.

This doctoral research is supported by the Department of Land and Water Conservation and the Center for Resource and Environment Studies, ANU, and is conducted in association with the Integrated Catchment Management Centre (iCAM).

David Carpenter

PhD scholar
Increasing the social-ecological resilience of Asian farming systems in transition.

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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.

Auro Campi de Almeida

PhD scholar

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

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The 3-PG forest growth model has been calibrated for *Eucaluptus 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.

Andrew Deane

Master of Philosophy scholar

Changing stand structures and the consequences of silviculture in White Cypress forests

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This study is investigating the effects of silviculture on stand structures in White Cypress forests in NSW. It uses current forest strip assessments in combination with a retrospective analysis of past strip assessments (circa 1919, 1932 and 1949, and re-sampling the same strips), to characterize stand structures at particular points in time. Results from these assessments will be collated to quantify progressive changes in stand structure since forest management commenced.

Structural changes and stand development will be aligned with records of silvicultural treatments, and analyzed to determine the separate and cumulative effects of various treatments on stand structures.

Peter Deane

Master of Philosophy scholar

Values, knowledge and practices surrounding the use of native forests by private landowners in the South-east of New South Wales

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This research focuses on the inter-relationship between private (family) landowners and the native forest that can be found on their properties, in the Bega Valley and Bombala Local Government Areas of South-east New South Wales. There are two specific questions this research focuses on: (1) exploring how landowners use and value their native forest; and, (2) investigating the inter-relationship between native forests and landowners day-to-day lived reality. Largely, the research approach is an example of applied, exploratory (social) science and adopts a pragmatic paradigm within a critical realist framework. Research practice involves combining qualitative and quantitative methods of data collection and analysis. Specific methods of data collection used are self-administered mail (survey) questionnaire, personal (semi-structured) interviews and direct observation. Specific methods of data manipulation used are content and statistical analysis. The research draws upon empirical studies emerging from forestry and environmental science, as well as theory from sociology and social psychology. This research is funded by South-east New South Wales Forestry, an organisation promoting forest management on private property in the South-east of New South Wales.

Bruce Doran

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

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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 modelling 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. I have completed the fieldwork component of my project. This involved conducting surveys and social disorder assessments in the Central Business District (CBD) of Wollongong. Preliminary results indicate that there are links between the public's fear of crime, social disorder and the actual occurrence of crime. I have made a number of links with members of the Wollongong City Council, the NSW Police Service and members of the business community in the CBD. These links will hopefully prove useful in terms of implementing the research.

John Dore

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

John.Dore@anu.edu.au

In 2002 John is writing up his PhD research on Mekong Regionalisms and Governance, from a base at the Social Research Institute of Chiang Mai University. John's field work has focused on the 6 countries of Cambodia, China, Lao PDR, Myanmar, Thailand and Vietnam. He has been studying emerging regional governance processes led by either States or civil society.

Rory Eames

PhD scholar

Designing third party involvement into regulatory and policy regimes for water quality management in urban catchments. A case study of integrated catchment management design in Western Australia

(ARC Linkages Project 'Regulatory Design for Water Quality Management in Urban Catchments)

The role of third party groups (primarily community and public interest groups, and Non-Government Organisation's) in the management of natural resource and environmental health issues is being increasingly investigated as an integral part of a substantial reconfiguration of the regulatory state. The current shift from the command and control nature of the centrally regulated environmental management and monitoring paradigm in Australia to a pluralistic, voluntarism driven approach to partnerships in environmental management has highlighted the deficit of information and knowledge of the roles played by, or potentially filled by third parties.

As the emphasis on voluntarism and cooperation between government regulators, industry managers, and environmental and community groups receives increasing amounts of mutual attention and support, the mechanisms and processes whereby third parties are legitimately involved in environmental management decision making processes have become much more important and valuable in the design of effective, positive and lasting environmental outcomes. However, despite the increasing prominence and importance of third party involvement in environmental actions, much of the knowledge base for developing useful frameworks from which to work from is lacking, and there continues to be very little working knowledge of what works, when, and why.

By using the context of water quality management, and the case study of the Swan-Canning Catchment in Western Australia, this research aims to address some of the theoretical and practical gaps in the knowledge base of third party involvement in environmental regulation. The role of the third parties in Integrated Catchment Management and Total Catchment Management (ICM and TCM respectively) will be used to generate an analysis and evaluation of existing initiatives, and the development a conceptual framework and organisational design principles which facilitate the legitimate and ongoing involvement of third parties in environmental regulation. This analysis will be used to contribute to the broader aspect of the development of regulatory design for water quality management in urban catchments.

Sue Emmett

PhD scholar

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

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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.

Houshang Farabi

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

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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. Are view 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 through changing 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.

Karen Fisher

PhD scholar
Water distribution and equity in a developing country context

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The management of water resources has become a highly contentious and politically important issue. The imperative for economic growth, and allocation of resources to meet this end, is in competition with the imperative of ensuring sustainable management of natural resources. In developing countries, inadequate institutional arrangements, poor infrastructure, rapid population growth and urban sprawl often exacerbate problems of water resource management. The growing demand placed on water resources in developing regions places increased pressure on watersheds and increases competition amongst communities and sectors for access and use. However, rather than addressing socio-economic, demographic and economic factors that have lead to changes in patterns of demand, attention is more frequently given to issues of supply. The research will consider, amongst other things, how environmental, political and socio-economic impediments to the provision of water for multiple uses can be overcome, and the influence of privatisation on water distribution and allocation.

David Forrester

PhD scholar
Dynamics of mixed species plantations

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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 and the CRC for Greenhouse Accounting is gratefully acknowledged.

Simon Gordon

PhD scholar

Design and evaluation of economic instruments for environmental management of the Swan River System

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The Swan River system in Western Australia faces a considerable number of environmental challenges. Most significant of these is the continued decline in water quality within the system as a result of increasing pollution from urban, industrial and agricultural sources.

This study aims to design and evaluate a number of economic instruments that could be potentially used in harmony with regulatory instruments to reduce the level of water pollution in the Swan River system.

It is intended that particular focus will be placed on economic instruments that are capable of addressing both point source and diffuse source pollutants.

This study will contribute to the outputs of a larger ARC funded project to be undertaken by SRES in collaboration with a number of Western Australian environmental agencies.

Ingo Heinrich

PhD scholar

Dendroclimatology of the Australian Red Cedar in Eastern Australian Rainforests

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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

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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.

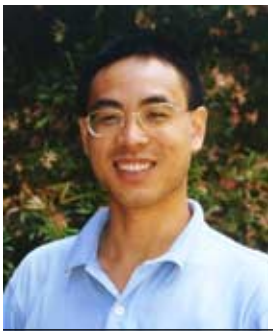
Kanak have historically been marginalised by the colonial administration, deprived of any power to make decisions concerning the use of their lands or other natural resources. However, in a contemporary world increasingly intolerant of human rights abuses, metropolitan France can no longer repress protests 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:

1. 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)?
2. Who is opposed to it, and why?
3. 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?



Zhi Huang

PhD scholar
Combining artificial intelligence models for multisource predictive forest mapping

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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
Soil characteristics and processes critical to the sustainability of alpine grasslands

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The tall alpine herbfield community in the alpine area of Kosciuszko National Park NSW, is a limited and biologically significant climatic climax ecosystem. However, past grazing practices and the current impacts of tourism, exacerbated by the harsh climate, have resulted in extensive vegetation degradation and subsequent soil erosion of the alpine humus soils. These phenomena have occurred over large areas of the tall alpine herbfields. These disturbances have also produced ecosystem states different from that of the natural climax state. The objective of this study 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 transition model for alpine herbfield ecosystems is to be developed to help in the understanding of ecosystem function and help management.

Dominic Kain

PhD scholar
Inheritance of wood properties in slash x caribbean pine hybrids

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Artificial interspecific hybrids comprise an increasing proportion of the world,s plantation forests each year - yet in most taxa, the genetic basis of their often outstanding performance remains a mystery. Without basic genetic information, reliable genetic improvement of hybrids must proceed using expensive, conservative breeding strategies. My research investigates the genetic basis of important wood quality and growth characteristics in the *Pinus elliottii* (slash pine) x *Pinus caribaea var. hondurensis* (Caribbean pine) hybrid - an important plantation taxon in Queensland and elsewhere. In collaboration with geneticists at North Carolina State University, USA, I analysed a unique pure species and hybrid progeny test made available by the Queensland Forestry Research Institute (QFRI), using both conventional and novel genetic models suitable for interspecific hybrid populations. The results evidence the primary importance of additive and possibly additive-related epistatic gene action, and additive gene effects, in the pure species and hybrid populations. This allows the use of simplified, low-cost strategies for hybrid breeding, which increase several-fold the efficiency and speed at which the wood properties of fast-growing, short-rotation hybrid pine can be improved to an acceptable level for structural timber markets. Other outcomes of the research include prescriptions for early selection, and the identification of reliable, non-destructive methods for rapid screening for wood properties on standing trees. The results are now being applied by industry to identify and deploy elite genotypes; they provide medium- to long-term benefits to industry through accelerated genetic improvement of wood quality and value. The research makes a broader contribution as the first quantitative genetic study to characterise gene action in an interspecific pine hybrid. The research is supported by the Forest and Wood Products Research and Development Corporation, the QFRI and the CRC for Sustainable Production Forestry.

Dana Kelly

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

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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

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This study investigates 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 ëoptimal thinning regimeí is developing a system of equations that describe growth response following thinning, and how the response changes with sites of different quality. In eucalypts the thinning response was found to vary with stand age, site quality, and thinning intensity (or frequency and proportion removed). For a given age, the growth response is largely determined by the intensity of previous thinning events. It was therefore necessary to describe thinning response with a system of equations that vary with time, space and harvesting intensity.

Using experimental data from blackbutt thinning trials, an empirical model has been developed to show the relationship between optimal basal area production and stocking, and how this relationship changes with time. In this analysis, time and stocking were treated as ëresourcesí that needed to be efficiently allocated to maximise wood production. The most efficient allocation of these resources defined a ëProduction Possibility Frontierí which could be visualised as a three dimensional surface. Marginal analysis of this surface produced an optimal thinning sequence that maximises both wood volume and value. This work provides a new approach to finding optimal thinning regimes from thinning trials, and gives new insight to understanding the relationship between stand density and growth. The remaining challenge for this thesis is to understand how this relationship changes with site quality.

Karen King

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

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Prescribed burning is widely practised throughout Australian ecosystems. The key short-term objective of this activity is usually to maintain fuel levels at an acceptable level to reduce the risk of damage resulting from large wildfires to property, fire sensitive vegetation, and other values. The long-term implications of such burning practices for biodiversity, ecosystem processes and sustainability remain largely untested. This study aims to investigate through the development of landscape-level simulation modelling approaches, the long-term effects of alternate burning practices on ecosystem dynamics. The model will incorporate a landscape-level fire regime simulator with a dynamic vegetation model. The nominated study area is located in the south-west of Tasmania. A range of management burning strategies will be investigated using this model to determine the most appropriate fire management regime with respect to its effectiveness in wildfire mitigation and maintaining ecosystem values. It is envisaged that this study will provide recommendations regarding strategies that optimise fuel management from both these perspectives.

Rassoul Mahiny

PhD scholar

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

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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 the 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 modelled through remote sensing and GIS. 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 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 score 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

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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:

1. to develop an index which can be used to measure structural diversity;
2. 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
Constructing a sense of place and it's role in environmental management

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This research is concerned with studying the life influences and processes involved in shaping people's sense of place. It explores this topic in a case study of the Atherton Tablelands, north Queensland. The study was commenced in March 2000 and has progressed through the stages of literature review, pilot study and the first major period of field work. It includes a literature review to introduce the concept of place and consider important questions for developing the concept and it's role in natural resource management. The methodology is qualitative and inductive, using in depth interviews to explore a series of key themes. Progress so far has found that the way people come to be in place, whether they were born and raised there or came later in life, is a major influence on the way they understand place. The interviews have revealed that when people move to a new place, initial influences on developing a sense of it are the most powerful determinants, even for participants who remain in that place for some time. The implications this has for changing the way people engage with nature has considerable relevance for natural resource management.

Angela Newey

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

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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

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

Kate Park

PhD scholar
The influence of land management factors on bird assemblages using riparian land in an agricultural system: a scale analysis

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Increasingly within Australian agricultural landscapes, the important role of streamside vegetation as habitat for terrestrial wildlife is being recognised. However maintenance of riparian habitat has focused on land management at the local scale, with little attention to the influence of management practices within adjacent upland ecosystems. This research aims to investigate the influence on bird assemblages of land management factors across multiple spatial scales. Bird species utilising riparian land within farmland on the Southern Tablelands of NSW will be investigated. The influence of a variety of land management practices operating at scales ranging from the riparian vegetation itself, to the entire catchment will be explored. It is anticipated that these results will provide a greater understanding of the relationship between riparian and terrestrial ecosystems, and thus provide recommendations regarding the conservation of riparian habitat for birds within agricultural systems.

Jeewook (Jason) Rim

PhD scholar
Exclusive Bus Lane and its Impacts on the Urban Transport System: A case of City of Seoul

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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.

Jacqui Russell

PhD scholar
Development of critical human ecology as a research methodology

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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'.

Karim Sabetraftar

PhD scholar
The hydrological flux of carbon and how it can be spatially analysed using GIS and Environmental modeling

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I hold a BSc degree (1992) and a MSc degree (1994) in Environmental Sciences from Tehran University, Iran.
In my MSc thesis I studied the physico-chemical and polluting impacts of water fern Azolla (*A filiculoides*) on Anzali Wetland, in the southwestern Caspian lowland of northern Iran. In this thesis, I recommended possible methods for dealing with the problem of Azolla in Anzali Wetland.

The main focus of my PhD is the hydrological flux of carbon and how this can be spatially analysed using GIS and environmental modeling. I am particularly interested in the impact on these fluxes of human land use. My reasons for selecting this topic are my personal interest in natural habitats, and the experiences I gained in my MSc research into wetlands in Iran and also my previous work which I have done during 1995-1999 where I participated in a study titled *The Conservation and Ecosystem Recovery Project of Anzali Wetland* in Iran.

Jacki Schirmer

PhD scholar
Social Reactions to Plantations: a Comparative Study

Jacki.Schirmer@anu.edu.au

The study aims to evaluate to 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.

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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*.

Sanjeev Srivastava

PhD scholar
Testing spatial model for predicting fish abundance and distribution

Sanjeev.Srivastava@anu.edu.au

The project will explore the validity of different conventional and intelligence-based model to predict the fish distribution and abundance from the ad hoc or bad dataset of occurrence points. The natural history collections across the world holds useful information on fish occurrence over a wide temporal range; this information can be used to predict the distribution pattern of fish and to notice the change in their distribution pattern at different spatial scale. Since the information in the natural history collections and other such database are not result of well designed sampling and are collected opportunistically, to extrapolate such data the multivariate analysis is regarded as unreliable and the intelligence based system is found more useful. The applicability of the intelligence-based model will be tested at different spatial scale.

Recent Publications

Srivastava, Sanjeev Kr., U.K. Sarkar and A.G. Ponniah. 2001. "Arrangement of Habitat Inventory Information on GIS Platform to Identity Optimum and Degraded Areas of Endangered Fish Tor putitora Habitat". *Proceeding of First International Symposium on GIS in Fishery Sciences*. Tom Nishida, Patricia J Kailola and Chuck E. Hollingworth Eds. (Seattle, Washington, USA; 02-04 March 1999) pp 302-314.

Srivastava, Sanjeev Kr, U.K. Sarkar and R.S. Patiyal. 2002. Method of Fishing in the stream of Kumaon Himalayan Region of India. *Journal of Asian Fisheries Science*, Philippines (In Press).

Sunil Sharma

PhD scholar
Optimising multi-objective land sssessment problem using combinatory methods and GIS in a catchment

Sunil.Sharma@anu.edu.au

A land unit offers several land use options and produces its own impacts on the health and sustainability of the surrounding land in a catchment. Inevitably, the growing demand of the land for fulfilling the developmental needs of the human beings coupled with a greater awareness of environmental, economic and social issues has led to increasing complexity in decision-making on land allocation. In order to deal with the problem, the Spatial Decision Support System has been used to assist the decision maker in selecting the best alternative from among the number of feasible alternatives. The main aim of the proposed research is to enhance the land use decision-making capabilities through applying GIS tool and different combinatory methods in Spatial Decision Support System (SDSS) for optimising the multi-objective land assessment problem in a catchment. The applicability of three different approximation algorithms for multi-objective land assessment will be assessed and compared.

Doug Somerville

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

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This study aims 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 apiaries using state forest documentation of resources assessed 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 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 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.

Lorrae van Kerkhoff

PhD scholar
To make a difference: science, action, and integration environmental research

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"Integration" is the latest buzzword in environmental research--it seems everyone wants to be integrating their work, either with other researchers, policy-makers, industry, business, or community groups. Integration is seen as key to ensuring that environmental research makes a difference in how natural resources are managed, rather than collecting dust on academic shelves. But what is integration? How can it be done well?

In this study I have looked at how the idea of integration has been applied in two environment sector Cooperative Research Centres. The research has shown that integration is many things to many people, which can lead to confusion and frustration. In particular, integration may be appropriate at different stages of the research process, or simply overlooked at some stages while incorporated in others.

I propose that integrated research is usefully viewed as a roughly temporal process over six stages: recognition of problems and relevant people; problem-framing; joint work; "solutions" and actions. Currently, most researchers tend to implement integration with respect to one or two of these, but an ideal approach will incorporate some understanding of integration into every stage. The way this is implemented in research practice will depend on circumstances, but consideration of the whole process, rather than the parts, will help generate a broader perspective of the how integrated research may be done, and when it may or may not be appropriate.

While thinking of integrated research as linear process clarifies some issues, it obscures others. One under-recognised problem is that of "bootstrapping"--how do you recognise who to involve in integrated research, without some idea of the actions that may need to be taken? I suggest this connection can be understood using the concept of trajectories. By seeing research as a trajectory that needs to be interwoven with others' trajectories, integrated research can be developed more strategically. By exploring where research partners want to be in the future, new opportunities for integrated research can be identified in the present.

To conclude, this thesis posits the concept of four-dimensional research as a way of understanding how integrated research is different from, but connected to, conventional models of science. Four-dimensional research extrapolates from individual science (one dimensional), to science based on the interaction of scientists (two dimensional), to science incorporating social context (three dimensions), to science occurring across contexts through time (four dimensions). While scientific conventions are rooted in the first and second, and fields such as the sociology of science have significantly developed the third, the fourth, temporal dimension is an area ripe for further study.

Kimberly Patraw Van Niel

PhD scholar

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

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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

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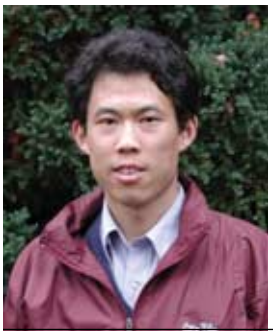
This study is aimed at defining the decay dynamics of coarse woody debris (CWD) in different forest types along a latitudinal gradient. The quantity of carbon (C) stored in different decay classes, and the movement of the CWD between the different decay classes, is of major importance when accounting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



Junqi Chen

Master of Forestry scholar

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Soil degradation and desertification, due to irrational land use and unsustainable farming practices, are the major environmental problems in the northern part of China. My Master of Forestry work aims to improve my understanding of the theories of pedology, agroecology and farm forestry, which will lay a solid foundation for my future work in China. I am not only interested in the technical aspects of addressing the above environmental problems, including degraded land rehabilitation, organic agriculture and agroforestry system, but also in the relevant policies.

Cheryl Edridge

Master of Environmental Science scholar

Cheryl.Edridge@anu.edu.au

I joined the School in year 2000 when I enrolled for the graduate diploma in Resource and Environmental Management. This was entry into a new field for me as I had just completed a combined degree in Visual Arts and Asian Studies. Right now I am completing the coursework component of a Masters in Environmental Science that I hope will provide me with some management tools so I can work in a related field after I complete the degree early in 2003. At the moment I'm interested in soil and water issues focussing on the region of the Yellow River in China, but for the major research essay I will try to find a topic has more local relevance.

Larysa Halas

Master of Geographical Sciences scholar
Multidimensional spatial modeling of geoprocesses using virtual GIS

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The application of virtual environment technology as a medium for geographic visualization poses both significant potential - in geospatial data representation, manipulation, and analysis - and several challenges associated with specific kinds of information depicted, the methods of representation of this information, and the problems to which this information is applied.

Geovisualization facilitates tasks in urban planning, natural resource management, geosciences education, and environment exploration, including for military actions. It makes possible representation, exploration and analysis of non-visible, abstract geospatial data. Involvement of virtual environment and geovisualization in GIScience enables to transfer its current focus from individual information analysis to group research and collaborative decision-making.

The essential base of successful visual representation methods is full involvement of human sensory and cognitive systems developed for interaction with the real world. Emphasis of geospatial information representation methods development is on creating multidimensional dynamic navigable displays with balanced realistic and abstract features.

Multidimensional surface processes modeling enables not only models' better perception and understanding but also helps to evaluate them, represent uncertainty areas and models' reliability. There are many GIS programs that incorporate 3 D geospatial data modeling, among them - GRASS 5.0 (Geographic Resources Analysis Support System) – free experimental software that comprises of 350 programs and tools for data representation, manipulation, analysis and image processing and offers significant potential in surface and hydrologic processes modelling and analysis.

Farzaneh Kazemi

Master of Science scholar

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The aim of this research is to provide a framework for the assessment of the abstraction and generalization of data which can become a seamless geographic database. A seamless database would facilitate continuous revision, efficient spatial data management and information access. A major issue is the retention of detail and quality for derivative mapping (250K to small-scale map products).

Felicity Maher

Master of Environmental Science scholar
Can business effectively contribute to the challenge of moving toward environmental sustainability

Felicity.Maher@anu.edu.au

I am researching the role of business in achieving environmental sustainability. In particular I have examined win-win approaches which deliver environmental benefits as well as financial benefits to the company. I have also reviewed the positions taken on sustainability with organisations which range from sustainability-promoting, through opportunity seekers to non-sustainability promoting which describes those organisations which deliberately obstruct sustainability measures or are oblivious to the concept. I have also looked at the role of government and consumers in supporting a sustainability evolution in the business sector.

John Mosoro

Master of Environmental Science scholar
The role of Environment auditing as a regulatory tool in sustainable forest management practice in Papua New Guinea: Principles and Applications

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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 application of environmental auditing in forest industry and subsequently the forest dependant communities. Furthermore, to determine whether environmental auditing is an effective tool to help and maintain compliance with current environmental regulatory requirements.

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 forest-dependent communities throughout PNG. Many factors play a role in the environmental management practices of the forest industries and consequently the forest-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.

Rebecca Pagan

Master of Forestry scholar

Exploring principles and approaches for developing community forestry in australia: a regional case study

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Forestry generally is being redefined to meet a broad range of economic, environmental and social expectations. Important to this is the increasing need for an approach to forestry which contributes to the social capital of surrounding communities through the participation of the community in helping to shape its development. Previously in Australia, forestry development has tended to occur in a relatively fragmented way with the many approaches to forestry – industrial plantations, public native forests, private farm forestry, being viewed as independent entities. Community Forestry, as being developed in other countries, offers a potential framework for integrating the many approaches to forestry in Australia within a regional setting that also ensures a strong focus on social capital building.

This study is part of a wider project to provide foundation research for developing community forestry in Australia. Drawing on an international review of the 'key ingredients' needed for successful community forests, this study will explore the potential for development of these ingredients in a selected case study region. This will involve initial consultation with community 'leaders' to assess both the level of interest in, and capacity to develop community forests. Following from this a small workshop will be conducted to explore the principles and practicalities of developing a community forest within the specific regional setting.

Kazushi Suzuki

Master of Geographical Sciences scholar

Kazushi.Suzuki@anu.edu.au

My interest in my current studies originates from a period during which I worked in Kuala Lumpur, Malaysia. Prior to the 1997 financial crisis, the country was in the middle of construction boom; although many Malaysians were positive about the benefits of development, they and I could also see the environment impacts of rapid development. This experience stimulated my thinking about environmental issues. My particular interest is how GIS could help urban planning to minimize the environmental impact of development, especially in the Asian region.

Wiene Andriyana

Graduate Diploma REM scholar

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In 2002, I'm doing my Graduate Diploma in Resources and Environmental Management, and in 2003 I plan continue to do my Master of Forestry. My particular interest is in forest biometrics (inventory and modelling) and, as I'm from Indonesia, its application to tropical rain forests. My previous work (2000) has investigated modelling of forest products of Mangifera foetida in Riau, Sumatra, by combining inventory techniques and multivariate analysis. My plans for future research are to model the possible optimum yield from a particular tropical forest area; such models can be used as a tool to minimize the impact of logging and maximize the viability of the residual forest, when their outcomes are given effect through government policy for regulation of forest management in Indonesia.

Simon Angombe

Graduate Diploma REM scholar

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I worked in the department of forestry. My main task was to coordinate forest measurement, forest information dissemination and volume functions development.

Currently there is no established tree growth model in Namibia. This is one of my task in the directorate to provide those information as well as improving on the existing volume functions to be more accurate. My main interest is more on forest modeling and applied GIS. This will enable to apply this knowledge effectively in the solutions of forest resource problems. The use of GIS will improve on inventory techniques and control, growth and yield studies, operations research, improving of existing vegetation maps, etc.

Dave Hodgkin

Graduate Diploma REM scholar

Dave.Hodgkin@anu.edu.au

I am currently undertaking REM Graduate Diploma coursework part-time hoping to roll this into the coursework component of a SRES Masters focused on Human Ecology

My background includes a range of positions within the Housing Industry. After initially training as a furniture maker at Canberra School of Arts, I went on to become a licensed Builder, focused on the environmental impact of

housing. I then worked for the Master Builders Association where I set-up and managed the ACT Energy Advisory Service as part of the ACT Greenhouse Strategy. I currently work part-time as an Environmental Building Consultant, designing and evaluating Energy Efficient Housing. Recent years have included extensive experience working cross-culturally on AusAID and World Bank projects in East Timor and with Warlpiri people in the Tanami Desert.

My areas of interest include, the ecology of housing, Indigenous Housing, Sustainability and timber usage in construction, and Community Participation in Housing Development. My primary career goal is to be doing something obsessively interesting that I can't possibly imagine now!

Meena Kunwar

Graduate Diploma REM scholar

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I did my bachelor's degree in forestry and general science from my country, Nepal. I have five years working experience is in the field of community forestry in different part of Nepal, with Natural Resource Management and Sector Assistance Program (NARMSAP).

From my experience, life without daily interaction with natural resources is impossible in the country like Nepal, where more than 90 % of the population directly depends on natural resources for energy, agriculture and other minor forest products. As a result, sustainable natural resource management is very important. However, in the context of rapid depletion and increased pressure on natural resources, sustainable natural resources management becomes challenging. Effective public participation is one of the inevitable factors for sustainability, but appropriate technologies are also very important to obtain maximum benefit from the available resources. Hence, combining the people and resource management technologies can give better result; my interest is to explore the best ways for making balance between optimum utilization of the available resources and sustainable resource management. I will finish Masters in Environmental Science in year 2004.

Emma Soraya

Graduate Diploma Science scholar

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I joined SRES in 2002 second semester and now I am doing my Graduate Diploma in Science leading to Master of Forestry. I am an assistant lecturer in biometrics in Faculty of Forestry, Gadjah Mada University, Yogyakarta, Indonesia. In SRES, I want principally to improve my knowledge on modelling. My future research will focus on quantifying non-timber forest products and their utilisation, as forests are more than just timber.

Karma Thinley

Graduate Diploma REM scholar

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Upon completion of Bachelor of Agricultural Sciences from the University of Melbourne, Australia in 1996, I was employed in the Department of Forestry Services, Ministry of Agriculture, Bhutan. I was initially assigned on a Forestry Development Project in eastern part of Bhutan, which was supported by the World Bank. My interest lies in the field of participatory resources management, particularly on policy and planning aspects. During my tenure in eastern Bhutan, I was involved with field implementation of social forestry programs and activities. It also gave me an opportunity to directly interact with the rural people in Bhutan.

In the course of my two years study program here at ANU, I am intending to undertake further research on the institutional aspects of community based resource management. In particular, the policy, planning and resource tenureship aspects and their relevance to community based resource management.

Philip Alcorn

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The effect of gap size and within-gap position on the growth of *Eucalyptus obliqua* seedlings

Clearfelling is the current silvicultural technique prescribed for timber production from wet *Eucalyptus obliqua* mixed forest in Tasmania. There is growing public concern over the aesthetics and ecological sustainability of this technique.

With the need for an alternative silvicultural system, group selection harvesting that removes clusters of canopy trees creating gaps, has been proposed. However the minimum gap size required to successfully regenerate *E. obliqua* is unknown and the growth, architectural and physiological response of seedling to the diverse light conditions in gap environments has not been investigated.

This study aims to elucidate the effect of gap size and within-gap position on the growth, morphology and physiology of planted *E. obliqua* seedlings. The study also looks at the importance of light availability on the early growth of seedlings, the shade tolerance of *E. obliqua* and the spatial heterogeneity of light in canopy gaps. Finally some initial predictions on minimum gap size requirements will be made.

Maria Arnold

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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 management predictive capacity given projected changes in land use and environmental conditions.

Tom Chevalier

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An investigation of the effectiveness of public-private partnerships in implementing sustainability criteria in the residential housing sector in the ACT

My research is concerned with evaluating the potential for partnerships - between government, industry and communities - in implementing sustainable development in the residential housing sector in the ACT. The study will:

- take the City Edge project (a multi-dwelling redevelopment in O'Connor, ACT) as a case study of a recent development initiative implementing sustainable development objectives through a partnership between a private developer, a government agency and a community-based environment group;
- identify more general criteria for the design, implementation and evaluation of future partnerships in the ACT development sector; and
- consider the broader potential and pitfalls of government-industry-community partnerships in enhancing the networks of local governance in a way that supports sustainable urban development.

Zoë Cozens

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Communicating with Kooris: Involving Aboriginal people in marine area and resource management

Aboriginal people have unique interests in marine areas and resources that need to be accommodated in marine area and resource management. Currently the Aboriginal peoples of New South Wales (NSW) interests in marine areas and resources are not adequately accommodated in marine resource management. It is vital for Aboriginal peoples' interests in marine areas and resource be accommodated in marine resource management for:

- Sustainable management;
- The maintenance of cultural diversity and cultural heritage;
- The achievement of greater social justice; and
- The promotion of Aboriginal self determination.

A case study approach is being used to investigate the interests of the Aboriginal people of the far south coast of NSW (from Wallaga Lake in the north to Eden in the south) in marine areas and marine resources. In my honours project, I aim to develop some recommendations that could be used by marine resource management agencies to put in place processes that would better facilitate the involvement of Aboriginal people in marine resource management. I also intend to develop some practical advice for Aboriginal communities about how they may advance their interests in marine resource management.

Ruth Doran

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Simulating an outbreak of Foot and Mouth Disease via feral pigs in Queensland using Cellular Automata

The aim of this project is to model an outbreak of Foot and Mouth Disease (FMD) via feral pigs in QLD using Cellular Automata (CA). The research question is "how would an outbreak of FMD via feral pigs spread through time and space?"

Foot and Mouth Disease is considered the most economically devastating livestock disease worldwide. Thus, an outbreak could have severe consequences for domestic and export livestock markets as well as for Australia's economy as a whole.

Cellular Automata are models of physical systems in which space and time are discrete and interactions are local. Cellular Automata are based on the assumption that a set of simple rules which operate on local scale, but that apply globally, underlie complex systems. The aim when using CA is to search for spatial patterns. Therefore, CA have great potential to model a hypothetical outbreak of FMD in Australia.

Several different scenarios will be taken into account such as the windborne spread of FMD, the influence that seasons may have on an outbreak as well as the lag between introduction and the implementation of control measures. The project has potential to be highly relevant to the development of contingency plans for an outbreak of FMD in Australia.

Kathryn Edwards

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Atmospheric Factors Affecting Fire Season Severity in South Eastern Australia

This research will attempt to gain a better understanding of the atmospheric processes that contribute to severe fire weather seasons in South Eastern Australia. Attention will be given to the variations in patterns of fire season severity between areas in Tasmania and Victoria, and NSW.

Both a qualitative and quantitative analyses of the general circulation patterns for each of the severe fire seasons, as well as a comparison with seasons that are more benign in each of the study areas will be carried out. This will enable the identification of important synoptic-scale features that are predominant for both severe and less extreme fire seasons. Secondly, the analysis will attempt to relate these surface synoptic conditions to the larger scales of atmospheric circulation operating at different levels. These include interactions between sea surface temperatures (SSTs) and atmospheric circulation parameters that operate at multiple scales. Some of the mechanisms that will be examined for their effects on fire weather are, anomalies in (anti) cyclone formation and blocking in the Australian region, the El Niño Southern Oscillation (ENSO), the Interdecadal Pacific Oscillation (IPO), the Indian Ocean Dipole (IOD), and the Antarctic Circumpolar Wave (ACW). All of these mechanisms have been shown to have some control over climate variability in the Australian region.

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The role of public participation in planning in the ACT

My thesis focuses on the planning sector in the ACT and the recent trends that are emerging from local governance in Australia to work towards a more ethical and sustainable future. This study will:

- review the planning process in Canberra and provide a summary of how planning decisions are made;
- investigate the influence of participatory processes (such as formal representative committees, resident protest and community organisations) in planning outcomes; and,
- consider new forms of public participation that may be suitable for Canberra (especially deliberative democratic processes and citizen forums).

This case study is especially interesting in light of debate around the role of the government, representative democracy in Australia, and citizens' vocal disappointment in chosen representatives.

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Establish distribution and characteristics of dry sclerophyll forests using hyperspectral imagery

The project involves mapping the extent of dry sclerophyll forest at a structural and species level using remotely sensed imagery at selected sites within the Southern Tablelands. More specifically, hyperspectral satellite data will be analysed in an attempt to predict forest stand characteristics (eg. vitality) from biochemical indicators, for example nitrogen concentration of tree crowns. It is anticipated that this will result in the development of forest stand criteria that are applicable to a range of forest types.

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Small-Footprint Airborne Lidar Remote Sensing: Recovery of a Single *Eucalyptus* Tree Profile

Forestry applications of lidar remote sensing is a growing area in Australia since its launch in 1998. Lidar is an active remote sensing that promises to both increase the accuracy of biophysical measurements and extend spatial analysis into the third dimension. Lidar sensors directly measure the three-dimensional distribution of vegetation canopies as well as sub-canopy topography, thus providing high-resolution topographic maps and highly accurate estimates of vegetation height, cover, and canopy structure. Objectives of my study are 1) to assess the ability of small-footprint airborne lidar to recover a single tree profile (*Eucalyptus pilularis*); 2) to examine the relationship between lidar points and structural distribution of tree components (i.e. foliage, branches and trunk); and 3) to examine the significance between the lidar returns and the tree physiognomy of *E.pilularis*.

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The Potential of People and Place to Sustain Diverse Economies

This thesis examines the diverse range of economic activities that sustain communities in the Southern Highlands of New South Wales and explores the ways in which people are living as 'multiple economic subjects', that is participating in both mainstream (wage and salary earning) and community economic activities.

The term 'community economy' encompasses a broad range of economic transactions. It refers in part to the local exchange of goods and services where profit is not necessarily the primary motive (for example barter schemes). Secondly, it encompasses local business or community organizations seeking to generate income in alternative ways/ additional to the mainstream economy (for example small market stalls and hobby farmers). Thirdly, community economies can include volunteer work and neighbourhood/home production (for example home-schooling).

As subjects in the global market economy, people are increasingly pressured to accumulate wealth and to adopt a greedy and insular approach to resource consumption. There-in lies the potential to become slaves to an ideology and fooled by an illusion which cannot sustain our planet, environmentally, socially or politically. Perhaps for this reason, local participants in the global market place are becoming increasingly disillusioned with and disenfranchised from the current mainstream economic language (capitalism). Capitalist theory is inadequate in describing and including community based economies and still argues a clear distinction between the economic and social realms. Despite this there is a growing movement of post-capitalist thought and evidence at the grassroots that people are inhabiting a new discourse or economic language in which multiple economies are recognized and valued. This thesis embraces a broader definition of the economy in which non-capitalist activities and subjects are seen as equally viable and economic difference and diversity is viewed an asset.

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Particulate pollution capture by the River Peppermint (*Eucalyptus elata*)

Urban forestry is established upon aboriculture, ornamental horticulture and forest management. The right tree planted in the right place has the ability to provide important services to urban areas including microclimate regulation, noise reduction and air filtration. Interest and recognition in the ability of tree leaves to remove pollutants from the air has grown considerably in recent times. At present there are few quantitative studies on pollution capture by trees in Australia. The objectives of this research were to critically analyse the relevant literature, identify the particulates captured on the river peppermint (*Eucalyptus elata* Denhn.) planted along the section of Northbourne Avenue, a major thoroughfare, between Rudd and Gould streets; and to quantify the relative amount of soot particles captured on each of these trees. This research provides an insight into the potential of *Eucalyptus elata* to capture particulate pollution and also points to the most efficient street tree arrangement which maximises particulate pollution capture.

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Leadership, Participation and Sustainability: a framework for Greenhouse policy formulation

There are strong thematic links among the fields of organisational management/leadership/learning organisations, participatory resource management, and the requirements for resource management institutions.

My honours thesis explores these themes in search of a framework for dealing with issues regarding humans and complexity.

Greenhouse policy is a classic example of the issues involved in resource management, being characterised by multiple stakeholder involvement, with differing agendas among stakeholders, relevance to all sectors of the economy, being overseen by many different areas and levels of government, global effects from local actions, diffuse sources of emissions, long time periods between action and impact, large distances between action and impact, with consequent externalisation of effects/impacts, scientific uncertainty combined with risks of dramatic impacts, inter-linkage among the climate change and other agendas (such as salinity, biodiversity, forestry, agricultural productivity, etc), and global policy responses requiring local implementation, to mention just a few.

Consequently, it is a suitably complex field in which to examine these other fields that seek to grapple with conflicting agendas, multiple stakeholders and complex issues, ie Leadership and Participation.

The aim of the thesis is to expose a framework for policy development that will provide a sound policy outcome that deals appropriately with the high levels of complexity, is adaptable to the continual change occurring in the wider agenda, and achieves broad and ongoing commitment among stakeholders.

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Tangible and intangible values of dry sclerophyll forests in the Southern Tablelands, NSW

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.

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Canberra's urban forest - a reflection of past political and social patterns

The city of Canberra provides a perfect example, for the exploration of issues relating to urban forestry. From the beginning, Canberra has been extensively planted with both exotic and native tree species under the guidance of influential people such as T.C Weston and L.D Pryor. The many trees that have been planted throughout Canberra, has led to a drastic transformation of a once, treeless plain into a characteristic urban forest. The urban forest, which is such a prominent part of the urban landscape, has provided a basis from which various titles of Canberra have been derived. The most common titles for Canberra have included; the 'garden city', the 'bush capital' and the 'city amongst the trees'. In recent years, the urban forest of Canberra has come under attack and is slowly changing, in accordance with various social, political and environmental factors.

In my honours study, I plan to examine what role political factors, social interactions and environmental influences have on the urban forest of Canberra and what this means in terms of the future sustainability of trees in the Canberra urban landscape.

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The role of decision making and farm management in land use change: a historical perspective of the Little River Catchment

This honours project is a case study of land use change in the Little River Catchment of central western New South Wales. It researches change and its outcomes at the farm scale, particularly for land use and catchment processes. It investigates farm management and decision making and how these interact with other processes to influence land use change. Of particular interest are: the situation and perceptions of the farmer; farm cropping systems; the links between land use change and catchment processes, especially in relation to salinity; and actual changes that have occurred. Interviews with farmers in the catchment are a key source of information on farm management and decision making. A historical perspective of change is gained by collating information from a variety of sources on change over space and time, from a literature review to spatial data analysis of changes in crop area and salt discharge salts. Finally the nature, history and outcomes of land use change are considered in terms of their role at both the farm and catchment scale and their implications for integrated catchment management.

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Variation in Rooting of Mini-cuttings of selected eucalypt hybrids

E. grandis is a commonly planted species for timber production in countries like Australia, South America and South Africa. Its ease of propagation, desirable timber properties and ability to hybridize with other species are some of the reasons as to why it is prefered.

A commercial nursery in Brazil (Riocel) successfully propagated *E. grandis* and its hybrids using the technique of 'mini cuttings'. This involves utilising the shoot tips of hydroponic hedge plants, grown in glasshouses, to propagate desired clones. The technique has economic and environmental benefits and has high rooting success.

This study aims to trial the technique in Australia, using ten different clones consisting of *E. grandis* x *E. globulus*, *E. grandis* x *E. pellita* and *E. globulus* x *E. urophylla*. It focuses on finding desired ranges of environmental factors that affect rooting ability (such as temperature, nutrient content) and testing effects of factors like artificial hormones and growth media on rooting ability and root quality.

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Impacts of Fire Management on catchment hydrology in the Upper Cotter Catchment, ACT

This project is a part of a larger initiative known as the 'Canberra Water Supply Catchment Project' and is supported by ECOWISE Environmental. The aim of the project is to quantify the effects of different fire management regimes on water yield in the Upper Cotter Catchment. Inferences on water quality can be made based on results from this research and previous hydrological research. The four fire management scenarios being modelled are:

- Absence of fire;
- Stochastic wildfire events;
- Prescribed burning; and
- A combination of stochastic wildfire events and prescribed burning.

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Ross River virus hazard modelling with a digital elevation model in Milton-Ulladulla, NSW

Ross River virus (RR) is active in Australia and is the causative agent of the continents leading arbovirus disease epidemic polyarthritis, also known as Ross River fever. The virus is transmitted by various mosquito species within Australia. Geographical information systems (GIS) and remote sensing technologies have been used extensively overseas to develop models to aid disease vector programs. These models are primarily based on disease vector-vegetation relationships. This project is aiming to develop a simple, minimal RR hazard model based on a digital elevation model. The model has potential for practical applications. The minimal model approach leads to it being cost effective and GIS user friendly. As a part of the study the relationship between RR vectors and impeded drainage will be investigated.

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Gully Erosion in the Ben Chifley Dam Catchment: A study of gully characteristics and their management implications

The Ben Chifley Dam Catchment is located in the Central Tablelands of NSW. Over the last decade there has been an increase in the frequency of blue-green algal blooms within the dam with diffuse nutrient sources considered to be a significant causal factor. These diffuse sources of nutrients can be associated with sediments eroding into waterways. One of the most significant sources of sediments within the catchment is from gully erosion. Runoff of nutrients from agricultural land is also enhanced as flow is channeled in gullies facilitating movement of nutrients into streams. My Honours project aims to identify those gullies that are actively contributing to this sedimentation. This will be an important step towards reducing soil loss in the catchment and algal growth within its streams and the Ben Chifley Dam.

The study will identify landscape and site specific soil characteristics that indicate active gully erosion on a catchment scale. Integrated spatial data analysis techniques, laboratory analysis of soil and field observations will be used.

The final outcome of the project is to be able to determine the most indicative characteristic, or set of characteristics, of active gully erosion. These characteristics can then be used to target management to reduce gully erosion within the catchment and be extended to other catchments.

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The waste freesociety? A study of the ACT's No Waste by 2010 Strategy

My research is looking at the development of the ACT's No Waste by 2010 strategy and the Canberra community's perceptions and values towards waste.

My research will be divided into two sections: the policy and community perceptions of waste. In terms of the community section I am aiming to find out what sort of

waste issues are at the forefront of people's minds, that is, their values, attitudes and perceptions towards waste.

The basic structure of my research is as follows:

- A literature of review on waste management, the need for minimising waste and attitude/perception literature;
- Giving a background to the strategy and the importance of 2002;
- Analysing all the reports and reviews of the strategy to date;
- Conducting semi-structured, qualitative interviews with employees of ACT NOWaste and perhaps a particular kind of household in the community (such as group houses who would be known to myself and therefore contacted through myself); and
- An integration of the information gathered from the above sources to determine how values and perceptions of waste can impact on waste management.

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Tree crown dieback of Claret Ash, *Fraxinus oxycarpa* Raywood in Canberra's urban forest

Claret Ash, *Fraxinus oxycarpa* Raywood is a popular ornamental tree widely planted in Canberra for its exquisite red autumn foliage. Many trees are today exhibiting crown dieback which takes several seasons to become apparent and eventually ends in tree death. The cause(s) of this dieback are unknown. They could be caused by an unknown pathogen or be related to site conditions.

This study aims to provide data on the speed with which the dieback advances through tree crowns, and to evaluate environmental factors with the dieback; e.g. tree age, the level of tree maintenance, inherent site parameters, and site disturbance.

The project focuses on Claret Ash street trees in four suburbs and uses data collected in the street tree survey of 1997-2000 and tree ring analyses to evaluate the duration and magnitude of tree growth decline and support this with oral histories from residents.

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Values of farm forestry

The values of tangible products that can be derived from farm forestry activities have, to varying degrees, be well documented. These include timber, fodder and land rehabilitation. My thesis is aimed at investigating other potential benefits from strategically revegetating largely cleared farmlands. There will be a particular focus on capital gains and environmental credits such as carbon, salinity and biodiversity credits. A critical consideration is how to economically value environmental credits when credit trading schemes either presently do not exist or are in their infancy in Australia.

The study area will be encompass rural properties in the Canberra region. Adjacent properties with similar historic land values will be compared to highlight how planned and strategic revegetation can increase property values. Taken in isolation, an intangle value usually would not create a significant incentive to expand farm forestry activities but this study intends to show that aggregating these intangible values can be an important financial motivation for promoting farm forestry in Australia.

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Timing of channel change and the effect of changing hydraulic geometry on sediment transport in the Numeralla River

Historical evidence and preliminary field research suggests that the Numeralla River has undergone substantial channel change in the post-European period. Supposedly associated with the change in channel plan form, there has been a change in channel bed form and transported sediment. The main aim of this study is to reconstruct the history of channel change in the valley, and to determine if the changes in hydraulic geometry are responsible for the changes in sediment transport.

Optically Stimulated Luminescence (OSL) is one of the few techniques capable of dating sediments deposited around European settlement. OSL will be used to date the sediments and to reconstruct the history of channel change. Changes in hydraulic geometry will be estimated from collected field data, and a conceptual model of the timing of channel change and changed sediment transport will be developed.

The outcome of the project is to provide a more precise chronology of recent channel change, and to better inform river management through a more complete understanding of the geomorphic processes associated with major channel change and increased sediment load.

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Bringing Birds Back to Cowra Shire

The objective of this project is to investigate the relationships between woodland birds and vegetation associations - and the reliability of rapid evaluation methods for assessing woodland health. The results will be used to develop guidelines for habitat reconstruction and to inform landholders in Cowra Shire, NSW, of the best ways to bring birds back into the degraded landscape of the Cowra region. Methods will involve seasonal bird abundance surveys, using large numbers of volunteer surveyors, and site appraisals to assess vegetation and other habitat features. Birds Australia and an ANU-Industry Collaborative Grant partly support this project.

Simon Benger

Remotely sensing changes in the vegetation of ephemeral wetlands

The ephemeral wetlands of semi-arid Australia provide important habitats for many species and play a significant role in the hydrological and biological regimes of these environments. As most inland wetlands owe their existence to unregulated cycles of flooding and drying, many wetlands are now being forced into decline through flow regulation associated with irrigation for large, highly productive agricultural enterprises. This decline usually manifests itself through reductions in the spatial extent of vegetation stands, transitional effects in the landscape and a deterioration in the physiological condition of individual plants. A time-series of Landsat TM and JERS-1 optical and radar imagery were used to investigate the potential for employing various vegetation species as remotely sensed indicators of wetland decline in the Macquarie Marshes of central western New South Wales. The research examined the utility of remotely sensed imagery for the mapping of semi-arid inland wetland vegetation and assessed its effectiveness in detecting changes in the physiological health of wetland vegetation due to alternations in the hydrological regime.

Four species, river red gum *Eucalyptus camaldulensus*, cumbungi reed *Typha orientalis*, common reed *Phragmites australis*, and water cooch *Paspaulum paspalodes* could be detected at sufficient spatial and spectral resolution to be mappable from satellite imagery. All of these species showed changes in spectral characteristics and radar response as a result of reduced flooding of the wetlands. Two of the species examined, cumbungi reed and common reed, worked well as indicators of short term changes in water availability by manifesting loss of spatial extent and reduction in NDVI. River red gum stands were excellent indicators of longer term decline due to their relative permanence in the landscape and longer response to changes in water availability, while the condition of water cooch pastures was also a good indicator of wetland condition. The development of these techniques offers good potential to facilitate monitoring of the physiological health of inland wetlands and assist in management decisions regarding flow regulation and flood control.

Automated vegetation classification proved to be very accurate in mapping both spatial extend and identity of vegetation types. Transitional landscapes which result from changes in the hydrological regime of the wetlands could also be clearly differentiated from their origins. Degradation of indicator communities also showed up well in the results, causing dramatic changes in NDVI response on a seasonal basis. Characteristic response patterns were revealed for all the indicator species examined, and suggest that NDVI based monitoring would be very effective in an environment where these indicators were present. Analysis of JERS-1 L-band radar imagery over the study area clearly showed that structure is a primary determinant of backscatter. Structural declines due to vegetation alteration were evident in terms of reduced radar returns, which are most significant in defining transitions from river red gum forests to river red gum woodlands and conversion of water cooch pastures through to mixed grassland and then chenopod dominated landscapes. Flood mapping and modelling from optical and radar imagery were also explored in the study and results showed that there is substantial potential for the use of automated flood mapping and modelling in inland wetland environments.

Anne Casson

Oil palm and resistance: the political ecology of the Indonesian oil palm sub-sector in an era of turbulent change

From 1967 through to 1997, oil palm was one of the fastest growing sub-sectors of the Indonesian economy. The area under oil palm increased 20-fold, to 2.5 million hectares, and crude palm oil (CPO) production increased at an average of 12 percent annually. This prolific growth has conferred important economic benefits upon some elements of Indonesian society, in terms of foreign exchange and employment.

However, despite these benefits oil palm expansion has become a source of concern to environmentalists because it has exacerbated deforestation and restricted local people's access to natural resources. In recent years, oil palm has consequently become a target of national and international NGO advocacy campaigns as its expansion is held largely responsible for the 1997/98 forest fires that affected more than five million hectares of forest and agricultural land in Kalimantan alone. Grassroots resistance against the oil palm sub-sector has also emerged in the current era of reformasi that has allowed for political change and greater democracy.

This study adopts a political ecology framework to examine three scales of resistance-grassroots, national

and international-to the oil palm sub-sector in Indonesia, particularly during the recent period of economic and political change (1997-2001). The thesis contends that there has been a disjunction between local community (grassroots) resistance, principally to the social impact of oil palm expansion, and international resistance, principally to the environmental impact of oil palm expansion. National NGOs tend to sympathize with the livelihood interests of grassroots actors, but are often enmeshed in the agendas of international NGOs who have attempted to exercise leverage over the political and economic forces driving oil palm expansion by targeting First World financial institutions and consumers of palm oil.

During the current era of economic and political change, international and national NGO resistance to the oil palm sub-sector has exerted only limited influence on the growth of the sub-sector. However, the recent period of economic and political change has contributed to a slowdown in oil palm expansion. Grassroots resistance to many years of exploitation and repression has also deterred investors from the sub-sector and contributed to the slowdown in area expansion. If grassroots resistance is to have a long-term impact, national and international NGO campaigns against the sub-sector need to be adapted to acknowledge the livelihood interests of grassroots actors. It is clear from this study that a better understanding of the political, economic and ecological forces driving or constraining the growth of the sub-sector is also needed if external actors are to influence more positive outcomes from further oil palm expansion in Indonesia.

Gae Gowae

Simulating the growth and yield of pometia species in Papua New Guinea

Modelling growth of individual tree species of commercial importance in the tropical rainforest of PNG has been hindered by lack of individual species data as well as the general assumption that individual species growth cannot be reliably estimated in such forest conditions. Pometia species is one of the species of great interest, both commercially and ecologically, that has lacked information on growth and yield for planning and management purposes.

Data collected from the PNG/1770 PSPs on the growth and yield study were used to develop a cohort model for predicting future growth of Pometia species for stand management. Linear least-squares methodology was used intensively for parameter estimation.

A cohort model was developed, by incorporating a simple competition index based on stand variables, to estimate the potential growth of Pometia species. Growth is defined as the mean periodic annual increment of basal area increment at stand level. Individual tree, distance-independent model, and combined species data were used for comparative purpose. The best cohort model was derived based on the separate Pometia data.

The analysis indicated that Pometia species grow faster than the average growth rate of the tree species in the lowland tropical forests of PNG. This suggested that any management decision based on the overall growth pattern would significantly undermine the potential of Pometia species as an important commercial species.

Model validation analysis based on the jackknife method of re-sampling, sensitivity analysis for model assumptions, and the prediction reliability of the model indicated that the model is adequate for planning purpose. The variables for parameter estimation conform with biological principles of tree growth and any bias in growth prediction would be of limited consequence.

Warwick Gullett

Environmental Decision-Making in a Transboundary Context: Principles, Challenges and Opportunities for precautionary Environmental Impact Assessment

This thesis examines opportunities to improve practice in environmental impact assessment (EIA) for projects or activities that have environmental implications for two or more countries. In particular, the thesis seeks to identify the most suitable legal framework in which to conduct EIA in a transboundary setting, and what opportunities exist to ensure that environmental effects of projects or activities which are distant in time or space, or remote in possibility, are effectively addressed in approval processes for such projects or activities. While drawing upon a number of theoretical debates, emphasis is given to two. These are the 'tragedy of the commons' and the 'precautionary principle'. The first, which emanates from concern in the late-1960s about competitive overexploitation of natural resources in the absence of forceful management regimes, offers a useful theoretical

framework to understand the dynamics of governance for regional environmental issues and provides guidance for determining the appropriate legal basis for transboundary EIA. The second provides the main focus of this study. Analysis is provided of the philosophical underpinnings of the precautionary principle in addition to analysis of existing means of applying it. The principle has merit as a component of the sustainable development concept and is applicable as a management approach for transboundary environmental issues that arise from, among other things, large-scale development projects or activities located in proximity to international borders. Opportunities to entrench the principle systematically in EIA practice are identified. A three-step method by which EIA processes could be modified to give effect to the principle is presented. First, the standard EIA trigger of environmental 'significance' must be broadened; secondly, project alternatives and uncertainties must be assessed; and thirdly, environmental uncertainty must have influence in decision-making. Two case studies are then presented to determine the efficacy of the proposed reform steps for actual development issues. These are the recently completed 16 km bridge and tunnel between Denmark and Sweden and the likely future issue of east coast offshore hydrocarbon extraction and transport adjacent to the Canada-United States border. Case study analysis also enables identification of further project-specific measures to advance precautionary decision-making in the context of project approval for developments with potential transboundary environmental implications. The aim is to improve the environmental and project approval aspects of decision-making for large-scale developments located in border regions.

Susan Hoebee

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

Grevillea iaspicula McGill. (Proteaceae) is an endangered Australian shrub that is geographically restricted and known from only eight small (< 250 individuals) populations. This study has taken an integrated approach to assess the viability of these populations. Specifically, this has involved an examination of the genetic structure and composition of the populations, patterns of intra-population mating and inter-population gene flow, and the exploration of how genetic and demographic processes interact to determine population persistence. This was achieved by using a combination of experimental field monitoring and genetic marker-based approaches (specifically, allozyme and microsatellite markers), along with the use of computer simulations that were parameterised with the results from the initial genetic investigations as well as basic population demographic data.

Controlled pollinations showed that the species has an effective gametophytic self-incompatibility system and this was confirmed by uniformly high multilocus outcrossing rates (tm = 0.96-1.00). Initial allozyme studies indicated that the populations maintain moderate to high allelic richness (A = 1.6-2.5), that mating within them was restricted (rp = 0.31-0.54), that they were substantially differentiated (FST = 0.20 ± 0.04 S.E.), and that gene flow was very low (Nm = 0.14). The development and subsequent use of six microsatellite markers confirmed these general trends. The results from paternity and parentage analysis, along with population assignment methods, directly supported these findings. Pollen immigration rates were between 13.6% and 33.1%, and the number of pollen donors contributing to open-pollinated seed arrays ranged from 1 to 12, with significant variance in reproductive success among paternal plants.

Negative inbreeding coefficients (allozymes: FIS = -0.15 to 0.07; microsatellites: FIS = -0.13 to -0.01) and uneven paternal contributions to open-pollinated seed arrays provided evidence of restricted mating within populations. This was probably a direct result of disassortative mating at the self-incompatibility locus, indicating that the number of incompatibility alleles in these small populations was low. Together these results suggest that effective population size is considerably smaller (approximately one third) than the number of reproductive individuals within populations.

This restricted effective population size may compromise the ability of frequency-dependent selection to maintain S-allele richness, resulting in further mate limitation. This interaction was explored using an individual-based, spatially explicit simulation model parameterised with the genetic data, and demographic data obtained from two years of population monitoring. The simulation results identified that low establishment rate of seedlings was the critical factor affecting long-term viability of G. iaspicula populations. The results were consistent with the indication of low allelic diversity at the S-locus, with estimates of S-allele richness ranging from only six to ten alleles within populations. Importantly, such low diversity at the S-locus was found to compound the effects of low establishment rate by reducing population persistence even further, indicating that interaction of genetic and demographic processes seriously compromises the viability of *G. iaspicula* populations. This result suggests that mate limitation, owing to self-incompatibility, may be a new element to consider in the extinction process for some species.

Francis Ingwersen

"Sundry nameless ranges": the landscape ecology of the Naas - Gudgenby catchment

An interpretation was developed, of the landscape ecology of the Naas - Gudgenby catchment in the Australian Capital Territory (ACT). Based on a classification of its vegetation in relation to geology, terrain, soils and climate, this was done in the context of processes of change in land use, the catchment's ecological comparability with the better known adjacent Monaro region, support for the sound future land use practices, and further ecological studies.

Study sites were stratified with respect to geology, altitude, aspect and partially, intensity of land use impact patterns. Floristic frequency and presence and absence data were analysed numerically using the Bray - Curtis association (or distance) measure and flexible (ß = -0.25) UPGMA* sorting. For timbered vegetation, a quantitative classification of canopy species by basal area, was combined with a frequency-based classification of understorey species. Gradient analysis models of these forest and woodland units, were generated using altitude and either aspect or a radiation index. When mapped using a grid-based geographic information system (GIS) these models, created slightly different maps for the same unit. Maps were created independently for the two dominant geological substrates and combined to create single vegetation unit maps. Where classification was based on a minimal number of sample points, only tentative models were produced, indicating where further work is necessary.

Whereas vegetation maps may imply informal use of these environmental attributes, formal analyses of the available data led to less differentiation between some types than expected. When maps were created for combined or higher level vegetation units, coverage patterns were less fragmented. Some units were distinguished by differences in slope angle, possibly associated with variation in radiation index or soil conditions. Differences were observed in the predicted ranges of some vegetation types on the two major geological substrates.

Treeless vegetation was also classified floristically. The vegetation units were grouped structurally as pasture/ grassland, shrubland and wetland. Pasture/grassland units were found to relate well to the structural categories defined by Moore (1954) for the Monaro region although there was not always close floristic similarity with other types previously defined in the region. The units defined were broadly related to altitude, regional characteristics and aspects of the land use history of the catchment. Mapping was not attempted because anthropogenic influence in secondary grassland and improved pastures often overrides environmental gradients. Native species were found to be a still significant, component of the, historically, less intensely utilised pasture lands.

Predictive mapping of anthropogenically modified forest and woodland vegetation in lowland areas was limited by their modern environmental range. This zone has undergone the greatest amount of structural and floristic change through conversion to pasture. Examination of aerial photography taken prior to the establishment of Namadgi National Park showed that the catchment vegetation and soils have undergone localised, severe modification, in areas that favoured pastoral land use; valley floors have been extensively cleared, while the colder, remoter valleys and the high ranges have been less affected by settlement.

To understand historical trends in vegetation, maps and records of land use, grazing and fertilising practice, were examined. Early survey maps of all land portions were examined for annotations on tree clearance and the dominant species present. Relative intensity of historical land use was gauged by the extent of fencing, erosion features and ringbarking of timber. Access to the adjacent Cotter Valley and the Snowy Mountains region for transhumant grazing was maintained until the early to mid twentieth century, requiring access through then, uncleared lands, increasing the likelihood of burning and exotic species introduction. Trends in sheep and cattle grazing in the catchment, immediately prior to the establishment of nature conservation as the dominant land use, were consistent with market related pressures and to some degree, regional environmental differences. Only moderate phosphatic fertiliser use was implied by data relating to the whole of the ACT, a partial explanation of the relatively high native floristic character of some former pasture lands.

Relatively frequent, low intensity burning was once widespread in lowland areas, consistent with the observation of early writers in the wider region. Infrequent, extensive fires have also been recorded, with major effects on forest structure. The ranges of two important seed dependent regenerators, E. delegatensis and Callitris endlicheri, are less extensive than predicted by the gradient models and GIS mapping. It is postulated that this may be due to pre-settlement fire patterns interacting with micro-climatic variation.

This study provides scientific support for the management of a large section of Namadgi National Park, a potential water catchment for the ACT and its neighbouring region. Both biodiversity conservation and rural production coexist in the catchment, close to major urban areas. Based on the assessment that the catchment is a well preserved, integrated land area, with ecosystems similar to those of the adjacent Monaro region with largely pastoral land use, a strategic policy scenario that considers the biologically diverse catchment in the context of a Biosphere Reserve is briefly outlined. This could integrate resource usage for predominantly urban people, in relation to biodiversity conservation, water resources and recreation, rural land use, social context and the recognition of indigenous land relationships.

Catherine Gatundu

Master of Environmental Science

Strengthening a community-based approach for resource management: opportunities for achieving sustainability in the Mt. Elgon ecosystem, Kenya

The natural Resources of the Mt Elgon ecosystem in Kenya are currently legally managed by central government agencies, as provided in the national policies. However, the government institutions have failed to ensure equitable use of natural resource in Mt Elgon or to manage the resources sustainably. As a result, poverty levels continue to escalate among resource-dependent local communities, as resource degradation continues unabated. This study examines the opportunities that exist for community based resource management in the Mt Elgon and the conditions necessary for such an approach to achieve ecological, economic and social sustainability.

The study analyses published and unpublished literature, interviews and case studies, to assess the effectiveness of the existing institutional and policy set-up in managing resource sustainability. It also assesses records of community dependence on the resources, as a way of gauging the resource value to the communities' livelihood. The analysis reveals that the existing policies do not allow stakeholder participation in resource management decision-making. In many cases, the policies criminalize community use of resources, although these uses are intrinsic to their culture and identity and are important contributors to their socio-economic wellbeing. A licensing system is used to grant access rights in the resources, with the heaviest users being from outside the local communities. However, government mechanisms to control illegal use of the resources are not adequate, leading to over-exploitation and degradation, leaving communities further impoverished.

There are an increasing number if initiatives around the world where central governments are developing some authority and power over resources to local communities. This study explores two such initiatives in Nepal and Vanuatu, which have contributed positively to poverty reduction and resource sustainability. There is also a considerable amount of support for community based natural resource management internationally through intergovernmental conventions and agreements. Borrowing from such international experiences, the study concluded that a decentralized community based resource management approach would be appropriate to achieve social, economic and ecological sustainability in the Mt Elgon.

Lei Luo

Master of Environmental Science

The architecture of a GIS netwerk application based on the wireless internet

The recent rapid development of mobile communication and wireless computer networks has given rise to a series of new services and applications over the wireless Internet. Quite noticeable among these new applications is the location-based service where the mobile user's location and personal profile are taken into account to ensure a user-tailored and timely service. GIS could play a crucial role in providing such a new model of service by integrating the geographical spatial analysis knowledge with wireless communication technologies. This paper discusses the related wireless and computer technologies as well as the GIS network data model and network analysis that can be employed in developing s realistic service for the mobile users. Application architecture is suggested together with much detailed algorithm designing. The paper also carefully considered how GPRS, WAP, Java and GIS Network analysis can be integrated to establish the technological architecture for more concrete development in future.

Linda Selg

Master of Environmental Science

Is irrigated agriculture consistent with "wise use" under the Ramsar Convention? A case study of irrigated cotton production and the Macquarie Marshes (NSW)

Australian wetland ecosystems are becoming increasingly degrading as a result of unsustainable land management practices. In this study, irrigated cotton production within a floodplain wetland environment is investigated, using the Macquarie River Valley as a case study, to determine whether irrigated cotton farming constitutes "wise use" under the Convention on Wetlands of International Importance.

The sustainability of the cotton industry was the subject of an independent audit in 1991. Since that time, the industry has made significant progress towards sustainability. As such, an assessment ten years later will provide a useful comparison of the industry's performance over this time. This study uses that assessment to determine how far the industry has progressed towards sustainability. Two data gathering techniques were used to answer this question:

- a literature review; and
- a survey of current opinion using email interviews to gauge the views of relevant stakeholders such as industry, government and conservation representation.

These two tools were selected as they provide an opportunity to gain different perspectives on similar issues. Published literature provides an important source of information on factual data and broadly accepted theory. The collection of survey data allows for more dynamic and emotive issues to be identified and studies. In combination, these two methods allow for the collection of factual material together with a range of opinions and beliefs. Collecting both forms of data ensure a broader understanding of the issues invlolved.

Both the literature review and survey identified water extraction and chemical use as the major impacts from cotton production on the surrounding environment. In addition, habitat modifications were also a factor, though not to the same extent as water and chemicals. Water extraction results in changes to timing, duration, frequency and volume of water reaching down stream wetland ecosystems. Chemical contamination results in species moralities, algal blooms and eutrophication. Both changes to water regimes and chemical contamination ultimately changes species composition and densities, radically altering these ecosystems.

Based on the information collected in this study, cotton production and floodplain wetland ecosystems are in conflict as a result of water extraction practices, which have changed the natural hydrology of these systems. Water extraction is not only a problem for cotton producers, but is part of a much larger problem that related to the impact of irrigation as a whole in Australia. To a lesser extent, though still significant in its own right, chemical contamination and increased nutrient imputs also place cotton production in conflict with wetland function. As such, it is concluded that irrigated cotton production does not constitute wise use of wetland ecosystems.

A partial solution to the problem of water use is the introduction of the environmental flows – to ensure that aquatic environments receive a minimum quantity of water for environmental function. More work is needed in this area to improve understanding of wetland hydrology in order to provide the optimum volume of water to promote and maintain wetland functions.

Future trends in cotton production, such as increased water-use efficiency, development of drought tolerant varieties, improved integrated pest management and new genetically modified varieties may also help to improve the sustainability of cotton production over time. The use of piped water supply systems in conjunction with more efficient irrigation practices such as surface drip irrigation or large mobile irrigation machines could help to reduce the volume of water required for cotton production and therefore improve water efficiency. The implementation of winter water licences to reduce riverine flows during the summer months may help address the problem of seasonality of flows, particularly when combined with management of environmental allocations to ensure spring flooding.

Development of new genetically modified strains of cotton such as "Twingard" to further further pesticides use, mulching and composting to reduce herbicide and fertiliser imputs, and food sprays and refuge crops to promote beneficial predators all reduce the industry's reliance on chemicals.

However, while these may address some of the problems of cotton productio, the do not solve them all. Until these and other techniques are fully developed and implemented, aquatic ecosystems will continue to decline.

Esa Pyykkonen

Master of Environmental Science

Harvesting wheat residues for biomass energy: Potential implications for soil quality

Residues from cereal crops, if retained in the field, play an important role in maintaining good soil health, conserving much needed moisture and protecting the soil surface against erosion after the grain has been harvested. Thus, the potential development of a biomass energy industry that uses cereal residues as a fuel source, would likely compromise these benefits that residues provide for the soil. Biomass fuels are seen to be an environmentally friendly, sustainable source of energy, as they do not directly contribute to increasing atmospheric CO_2 levels. In Australia, agricultural residues, in particular cereal residues, are a large, readily available source of biomass for energy production. Their use would present farmers with an additional source of income in addition to removing excess amounts from the field. However, the removal of residues for fuel use may lead to a decline in soil quality, most importantly soil organic matter levels. Residues are the main source of soil organic matter, which is closely related to most physical, chemical and biological properties of the soil.

Field measurements on a wheat crop were carried out to determine the portion of total residue that is available to be removed after the grain has been harvested. The results showed that 40% of the total available residues could be harvested with current harvesting equipment, a total of over 16 million tonnes from the 1999-2000 wheat crop in Australia. The relation between grain yield and residue production was used to derive an equation, which can be used to calculate the removable residues based on grain yield. The gross energy content of the available residues in 1999-2000 was 292 PJ, from which a net energy value of between 190 and 239 PJ could be utilised through combustion. The quantities of various nutrients contained in the removable residues were found to be quite small with the possible exception of potassium.

In light of the benefits gained from conservation farming practices, including residue retention, the fragile nature of most soils in the Australian wheat belt could not sustain the removal of large amounts of residues. Residue harvesting would have negative implications for soil structure, biological activity, and nutrient availability, mostly as a result of reduced soil organic matter levels. The sustainability of agricultural production is seriously compromised due to such changes. Exceptions may occur where residue production is high and decomposition rates are low. Partial residue removal in these regions may improve seedling establishment and growth, while still retaining sufficient cover to maintain soil organic matter levels and protect against erosion. More research is required in Australia to determine the effects of residue removal on different soils, under different climatic conditions and management regimes, and should be a prerequisite for any plans to adopt large scale biomass energy production from cereal residues. The social and economic implications, among others, must also be considered if long term agricultural sustainability is to be achieved.

Eko Maiguo

Master of Forestry

Hoop pine and *Pinus* stand model

The User Guide gives an overview of the program and this should be used in conjunction with the Tutorial. There are five examples used in the tutorial: practice which should enable users to operate the program confidently.

The Hoop Pine and Pinus Stand Model is a simulative computer program that has been designed to facilitate the management of stands of Hoop Pine (Araucaria cunninghamii) and Pinus (Pinus caribaea) species in forest plantations. The outputs are financial returns and wood yields. Financial returns are simulated according to: interest rate, rotation length and costs, whereas the main variables influencing future yield are species and rotation length.

The default values used in the program do not represent values which apply to any particular situation thus great flexibility has been given for the users to enter their own data which will be used to produce the required output.

There are four stand types which are simulated using this model. While these four stand types are typical of silvicultural regimes used in forest plantations, they are intended to cover the whole range of silvicultural possibilities.

The program is appropriate to use for plantations up to 75 years. Beyond this rotation length the program will give constant yield results if no changes have been made to the discounted rate and costs.

Magdalene Nambakwen-Maihua

Master of Forestry

Integrated forestry in Papua New Guinea: a socially concious approach to forest development.

This paper reviews the past and existing trends in commercial forestry in Papua New Guinea (PNG) in terms of national economic development and the social welfare for the forest concession communities. The social issues identified have to a large extent been discussed concurrently with ecological and economic issues through work published by the International Institute on Environment and Conservation, Global Environment Facility and the United Nations Development Program. Howeverm this work has had little impact on the current legal framework and operational settings of the PNG Forest Authority, although some changes are starting to emerge.

Nevertheless, some work in relation to the recently developed PNGFA 'acquisition mechanism') Forest Management Agreement – FMA) appears promising. The FMA is not a negotiating channel through which participatory resource management os fostered, rather it is a mechanism for timber rights to be acquired and customary recipients are verified for payment of royalties. This paper explores the extent to which joint forest management arrangements with resource owners can compliment integrated forestry development. Joint management arrangements are a form of participatory resource management that usually involves recognition of contemporary management through negotiated agreements between the government and resource owners. These arrangements have the potential to combine nature-based tourism, bio-diversity conservation and development of non-timber forest products and services with conventional timber harvesting to produce sustainable incomes and improved livelihoods for local communities. Furthermore, it may provide a mechanism by which potential economic producers (example resins, herbs and nuts) and services (example Carbon sinks, biodiversity conservation, water catchment protection) can be developed within the PNG context.

Santa Maya Shrestha

Master of Forestry

Conflict management for sustainable development of community forests in Nepal

The development of community forestry in Nepal is a major initiative of the government, which seeks to markedly improve the socio-economic conditions of rural communities. Community forests are designed to give rural people greater access to local forest resources, on which the yare heavily dependant, to sustain their farming systems and household activities. Forests have long been an integral part of rural life and the socio-economic development of the wider community in Nepal.

The transfer of the management rights from the State to the local people for selected forest represents an important opportunity for the local communities to more explicitly influence how natural resources are managed and utilised. Forest user groups are the primary legal entity for managing community forests at the local level. Despite this positive initiative, the involvement of a wide range of stakeholders with diverse interests, the weakness in policy and practices, and the heterogeneous and heirarchical (and discriminatory) nature of Nepal's society – all constrain the effectiveness of community forestry. Furthermore, the poor management of the inevitable tradeoffs and tensions between the many stakeholders has often led to conflict, leading to some community forests falling a long way short of initial expectations.

Conflict over various issues has emerged in community forestry, with the most common types of conflict relating to:

- failure to give access rights to all people who depend on local forest resources,
- disputes over the geographical boundries of forests and other land users,
- unequal and discriminatory portioning of the benefits,
- unequal participation by stakeholders in key decision-making processes, and
- unfair distribution of workloads.

Conflict can also be a stimulus for positive change: it has been reported that it has improved the management of forests from a wide range of perspectives, and strengthened partnerships with communities and with outside stakeholders (mainly government). Nevertheless, poor management of conflict in Nepal's forestry sector is common, causing the breakdown of community cohesion and the competitive exploitation of scarce natural resources. These negative consequences of conflict simply add to the continuing decline of rural livelihoods and degradation of the surrounding environment.

This study reviews the main concept of conflicts over natural resource management and goes on to analyse the conflict specifically associated with community forestry in Nepal. It concludes by putting forward some suggestions that may improve how conflict is managed, so that community forestry will lead to genuine sustainable development – development that works for people and the environment.

Shyam S Shrestha

Master of Forestry

Agroforestry as a viable option for sustainable land sse in the Middle Hills in Nepal

Nepal faces an enormous challenge to increase and sustain agricultural productivity in the Middle Hills and still maintain a sustainable resource base of soil and trees. Likewise, the rapidly growing population in the hills of Nepal has increased demands for forest products. Agroforestry as a sustainable land use system is not only promoted on private farmland but also on government and community land to meet people's basic needs and to protect the environment. It also maintains and improves soil fertility and reduces soil erosion. Agroforestry is, therefore, a promising technique in achieving sustainability in land use of the local farmers in subsistence farming systems in the middle hills of Nepal. Perennial trees, shrubs and grasses as well as legumes can play important roles in achieving sustainable use of private land. In addition, sustainable soil and land management in agroforestry practices is achieved through nutrient cycling, organic nitrogen build up, soil conservation, and reducing pressure on natural forests.

Any program to support agroforestry must offer feasible options and encourage local farmers to select and experiment. Planting of fodder trees on farms is an important program and strategy to ensure a dependable supply of fodder to the livestock to compensate for the increasing demand for fodder. The farmers in the Middle Hills of Nepal are now showing high interest in agroforestry practices on their own private land. Therefore, an action-based research and development program that aims to increase soil fertility and reduce soil erosion through the use of different agroforestry systems and practices, especially Sloping Agricultural Land Technology (SALT) system, is proposed in this paper. Research activities related to multipurpose and nitrogen-fixing tree species would be especially important in the middle hills area. The program needs to be conducted using participatory methods to guarantee the maximum level of farmer's involvement in research and extension activities. Some constraints need to be overcome before full adoption of agroforestry practices by farmers is achieved. Constraints include lack of government policies and incentives, insecure land and tree tenure, uncertainty of crop yield, and unavailability of suitable multipurpose tree species. Similarly, small landholdings and a strong preference for cereal crops are also major constraints. Market access plays a significant role in farmer's decisions about agroforestry systems, but is lacking at present. However, appropriate management practices, such as selection of the right tree species that reduce the shading and competitive effects on the crops, may reduce some of these constraints.

Data regarding agroforestry programs collected from the Begnas Tal (Lake)- Rupa Tal (BTRT) Project (as a case study), Nepal-Australia Community Resource Management Project (for two Middle Hill districts), ICIMOD Nepal (SALT system), Department of Forest Research and Survey Centre, and personal experiences are used as the basis of this paper. The paper highlights the establishment of different agroforestry systems and practices on private land by local farmers for their livelihood, and sustainable development of on-farm agroforestry demonstrations on private land by local farmers for the soil and land improvement in the Middle Hill regions of Nepal. The central importance of tress for fodder and areas on which they can be planted are also discussed.

It is found that introducing agroforestry training to local farmers or users would certainly bring about benefits to improve the farmland. Thus, agroforestry, a multiple use concept of land management, is capable of meeting the present challenge of shortages of fuelwood, fodder, fibre, and timber, while assisting with unemployment, environmental degradation, and protection and the improvement of wastelands and agricultural land in the Middle Hills.

Surendra Lal Karna

Master of Forestry

The economics of firewood plantation in the Terai region of Nepal: an ex post social benefit-cost analysis of Sagarnath Forestry Development Project

The present study examines the economics of a firewood plantation project commenced in 1978 in the Terai region of Nepal. It was the first of a series of such projects initiated by His Majesty's Government of Nepal with ADB funding to alleviate the acute shortage of firewood in Nepal and is called Sagarnath Forestry Development project. Fire wood is the main source of energy and its demand has outstripped the supply from natural forests leading to severs forest degradation and land degradation. In Sagarnath project, a most degraded natural forest on the Central Terai was replaced by fast-growing species such as eucalypt, teak and sissoo after clearfelling the remaining forest.

This study is an ex post social benefit-cost analysis of this project covering the period from 1978 to 2000. It has used actual data collected from the project office and elsewhere

to carry out the analysis in real terms. It has incorporated the values of firewood and timber from cleared natural forests as well as that harvested from eucalypt stand. It has also taken into account the other values such as biodiversity and fodder values lost as a consequence of plantations. This study shows that the project has a positive net social benefit to Nepal. The study identifies the area of further research.

Muino Taquidir

Master of Forestry

Towards Forest Certification in Mozambique

The current situation of forest management and the possibility of implementation of forest certification in Mozambique are assessed in this paper. Mozambique still has considerable forest resources, with approximately 25% of the country's land covered by forests with high potential for wood production, and comprising about 22 million of m3 of commercial volume. There are markets for Mozambique's forest products in Asia, Europe and North America, and exports are increasing gradually, but the current management of these resources is considered unsustainable by the State agency responsible for control and management of the forest resources.

The government of Mozambique has been making efforts to improve this situation. The measures already taken include promulgation of a new Forest Law, which prescribes more disciplined regimes of forest exploitation and requires a forest management plan before any forest exploitation activity starts. However, these measures are not in themselves sufficient to achieve sustainable forest management (SFM). Additional measures suggested in the paper are urgent approval of the Forest Regulations associated to the Forest Law, development of national codes of forest practices, a detailed forest inventory to allow better management planning, and a clear structure of incentives and benefits for forest operators and local communities to ensure their involvement in sustainable forest management practices.

Another measure which can be implemented in Mozambique to promote SFM is forest certification - a market based mechanism fostered by international NGOs to improve the quality of forest management and provide market advantages for products coming from sustainably managed sources. The possibility of implementing forest certification has been the subject of recent discussions in Mozambique. The paper concludes that forest certification should be implemented because it can assist in establishing sound forest management practices, and because of increasing demand for certified forest products in international markets.

The principal actions necessary to implement forest certification in Mozambique are:

Implementation of more regulated regimes of forest management prescribed in the forest law, which requires shifting operations from a simple licence to a forest concession which requires preparation and observance of a management plan;

Development of a clear structure for equitable distribution of benefits from SFM among the government, private sector and local communities to encourage their full involvement in the process;

Establishment of a National Working Group for Certification, with equitable participation of all stakeholders;

Development of national standards for SFM compatible with the FSC principles and criteria, because FSC certification is recognised world-wide;

Dissemination of information about the advantages of forest certification throughout Mozambique's civil society.

Because the process of implementing forest certification may involve considerable cost, it would be advantageous for Mozambique to:

Find possible funds and support for development of national C&I for SFM through United Nations agencies, other donor agencies, and other institutions such as the Tropical Forest Fund, which are funding projects leading to SFM and forest certification;

Join ITTO to take advantage of this organisation's initiatives to support SFM initiatives;

Foster a better relationship with CIFOR to drawn on its technical and research support.

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.

Brett C. Brown

Marsupial roadkill on the Kosciuszko road in the australian alps: an investigation of factors influencing animal-vehicle collisions

Animal-vehicle collisions can cause serious injury or death to motorists and animals, as well as cause considerable economic loss. In the Kosciuszko National Park in New South Wales, animal mortality due to collisions with vehicles has been identified as being a major source of concern for the New South Wales National Parks and Wildlife Service. During the last 5 years, the NPWS has kept a database on animals killed on the three main roads within the Park, the Alpine Way, Guthega Road and Kosciuszko Road. The data has been collected every winter season, between the June to October long weekends for the years 1996 to 2000.

This study has investigated the factors which influence roadkill on the first 10 km of the Kosciuszko Road, from the Vehicle Entrance Station to Wilsons Valley. The species found to be the most at risk of roadkill on the Kosciuszko Road were Eastern Grey Kangaroos (Macropus giganteus), Common Wombats (Vombatus ursinus hirsutus), Swamp Wallabies (Wallabia bicolor) and Red-necked Wallabies (Macropus rufogriseus banksianus). The roadkill data showed that there were 55 Eastern Grey Kangaroos, 40 Common Wombats, 23 Swamp Wallabies and 13 Red-necked Wallabies killed during the 5 years of the study on this section of road. To supplement the roadkill data, spotlighting transects, faecal pellet counting on transects and sandtrapping were conducted to provide distributional and behavioural data. Additionally, trials to assess the attraction of salt for macropods were conducted in the Tidbinbilla Nature Reserve, in the Australian Capital Territory.

Analysis of the data showed that the locations of roadkill of Eastern Grey Kangaroos and Common Wombats were not uniform along the road. Swamp Wallaby and Red-necked Wallaby roadkill were both found to have a relatively uniform distribution. In addition, comparisons of the distributions of roadkill and animals observed during spotlighting were not the same. Analysis of the roadkill data also showed that roadkills were not significantly affected by either the fraction of the moon illuminated, or the number of barriers on the side of the road. However, traffic volume was found to have a significant effect on the number of animals killed. No bias was found in the number of male or female animals killed.

Observations made during spotlighting transects showed that macropods often exhibited a flight response when approached by a vehicle, with most animals hopping away from road to safety. In contrast, the Common Wombats observed during spotlighting transects, showed little or no flight response to the approach of an oncoming vehicle. Data collected during spotlighting transects showed that animals were more likely to be observed when there has been little rain the previous day, the wind speed is low, and there is little or no cloud cover. Faecal pellet counts showed a decrease in the number of macropod pellets with increasing distance from the road. Higher pellet counts near the road suggest that animals are attracted to the vegetation on the road verge, which places them at risk of an animal-vehicle collision. The results from the salt attraction trial at Tidbinbilla Nature Reserve suggested that the animals in the area were not attracted to the salt. This result is unexpected and further research is required to explain the findings.

The results from this study suggest that roadkill of Eastern Grey Kangaroos, Swamp Wallabies, Red-necked Wallabies and Common Wombats on the Kosciuszko Road are influenced by a variety of environmental and biological factors. This study has provided a better understanding of the factors causing roadkill, which will enable management practices to be developed to minimise roadkill on the Kosciuszko Road and on other roads throughout Australia.

Sonya Duus

Managing environmental conflicts in Australia: opportunities and limitations

This thesis investigates opportunities and limitations for managing environmental conflict in Australia. It is recognised that conflicts are an inevitable feature of a diverse and democratic society and can be immeasurably important for illuminating neglected issues and catalysing needed change. However, entrenched polarisation has been demonstrated to have negative consequences for people, the environment, and on the quality and stability of decision-making. Environmental conflicts in Australia persist, despite efforts to resolve them. It is thus timely to examine what are the on-going opportunities and limitations to effectively deal with competing voices in resource issues.

This research is grounded on a broad literature review of the theoretical and practical dimension of conflict and conflict management. Key themes identified from this review are used to critically examine the Southern NSW Regional Forest Agreement case study. Through the literature and case study investigations a range of issues emerge, pertaining to the nature of environmental conflict and operation of conflict management in Australia.

Australia's experience with managing environmental conflicts is somewhat different to that of other countries. There are examples of both adversarial and cooperative approaches to conflict management, with an increasing emphasis on incorporating stakeholder views in resource planning and decision-making as a means to prevent conflict. However, this study also reveals a plethora of theoretical, cultural, political and practical barriers that confront environmental management. Recognising such barriers, and incorporating the lessons from past attempts, will be vital to enhance future strategies.

Dealing effectively with environmental conflicts is a key component of natural resource management and will be a factor in building more sustainable societies. The findings from this research will help further investigations and will assist in equipping governments and communities to more effectively understand, constructively deal with, and in some cases prevent, conflict in the future.

Rory Eames

Organic farming and the sustainable agricultural paradigm in Australia

This thesis researches the relationship between the organic farming industry and the general desire for sustainable agricultural systems in Australia. The concepts of human ecology and political ecology are combined to develop a research approach and methodology that can investigate such large units of analysis in a meaningful way. The political ecology methodology developed to investigate the ideas of organic and sustainable agriculture at the farmer, industry, and philosophical level finds that the relationship between the organic and sustainable agriculture paradigms is characterised by differences in kind, purpose, and goals. These differences affect the use of both concepts by farmers.

Hugh Griffin

Climate Science and Policy. A case study of carbon sequestration and the Kyoto Protocol

A close interaction between science and policy in relation to environmental issues is crucial. A theoretical critique of science-policy interaction reveals that a linear model of science policy interaction is inadequate for environmental issues. Such issues are more adequately dealt with through theories such as transdisciplinarity, post-normal science and adaptive management. These theories envisage a closer inegration between science and policy that provides for more effective decision-making.

Climate change issues are characterised by uncertainty and complexity. A case study of science-policy interaction in relation to carbon sequestration and the Kyoto Protocol to the United Nations Framework Convention on Climate Change (the Protocol) is conucted using deep qualitiative research methods. This research reveals a close integration that exhibits characteristics of post-normal science, transdisciplinarity and adaptive management. The existence of environmental assessments through institutions such as the Intergovernmental Panel on Climate Change (IPCC) together with the wide participation of stakeholders are characteristics of these theories that are evident in relation to carbon sequestration.

However, the emphasis on carbon sequestration as a technical solution to the reduction of greenhouse gas emissions in recent negotiations regarding the Protocol indicates that the interaction between science and policy has not yet reached the theoretical ideal of post-normal science, adaptive management or transdisciplinarity.

A closer integration between science and policy can be achieved through:

- strengthening of communication and understanding between policy and science so that more robust solutions can be implemented;
- recognition and adaptation to the absence of objectivity for both scientists and policymakers; and
- creation and enhancement of institutions that explicitly link science and policy.

Fiona Hill

Big is Beautiful? Landcare networks in the rural landscape

In its first decade, Landcare has become a widely acclaimed 'success story'. However, the problems Landcare set out to address continue to deteriorate, and problems continue to emerge in program logic and implementation. The linking of groups through 'networks' is a trend encouraged by the Commonwealth, state and territory governments, in the hope of 'groups of groups' will improve efficiency in administration, planning and action. Specifically, this thesis explores whether Landcare networks have the ability to overcome the problems of Landcare. Through an investigation of the rationale behind Landcare this thesis demonstrates government influence is greater than theory suggests, and inherent in the program are problems in respect to communication, cooperation and coordination. These issues are explored through an in-depth case study of the Ovens Landcare Network, in North East Victoria. Drawing from documentary sources, observation and interviews, the thesis argues governments encourage and place too much emphasis upon Landcare networks when there is too little understanding of their capacities and constraints, their structures, aims and activities. Despite the strong capacities network structures offer, the constraints are in many instances those problems identified at the Landcare group level, and the same fundamental tensions between Landcare theory and implementation exist. The thesis concludes by answering the question: big is beautiful?

Matthew Holloway

The impact of dairy deregulation on farmers and farming regions

Dairying is the third largest rural industry in Australia after beef and wheat, doubling production over the last decade. It is currently one of Australia's leading industries in terms of value adding in addition to being a major regional employer.

On the 1st July 2000, the state governments abolished the controls over farm gate pricing and supply of fluid milk. The eradication of price controls that resulted from increasing commercial pressure and National Competition Policy created an open market for fluid milk in Australia. This was a significant removal of trade barriers, considering that dairying is one of the most protected agricultural industries in the world. As a direct consequence, many farmers suffered an overnight loss in income, threatening their ability to remain competitive and carry on in the new economic environment.

The aim of my research was to investigate the impact of the rationalisation of the industry. I intended to find what the current situation is for farmers and how far into the community deregulation has had an impact. To achieve this I felt it was important to gather an understanding of the history of dairying, with an emphasis on investigating factors leading to deregulation. In addition I conducted fieldwork, seeking out farmers and people within two farming regions in NSW, gathering their thoughts and ideas on deregulation.

From my research and fieldwork I have come to realise that the issues involved in the deregulation of the dairy industry are extremely complex. The history of dairying is marked with significant changes in technology and policy. Deregulation has been one of the biggest changes so far as before this the industry had considerable government protection and support. It was clear from the interviews and surveys that deregulation has caused, and continues to cause, much uncertainty, concern and anger within the dairy farming community. The sudden and substantial loss of income and the uncertainty of the market led to farmers becoming unsure of their future in the industry, while others were forced out. It is expected that farm numbers will continue to fall in both regions for various reasons, including the impacts brought on by deregulation, pressure for land and personal issues. Farmers have effectively become price takers and find themselves with little bargaining power.

It was clear from my research that confidence was returning to farmers in both regions, with those remaining looking to secure their future in the industry. From talking with farmers, it appears that many believe deregulation has been, and remains, difficult to deal with, but when put in perspective with floods, drought and disease, it is just one more challenge that has to be faced.

According to an ACCC report, consumers have been the main beneficiaries from deregulation. Although the large supermarket chains have apparently experienced a drop in margins, I believe they are profiteering through increased sales of milk and other products. I believe the restructuring of the dairy industry was not done to benefit the industry but simply to satisfy National Competition Policy. As a result, Australia is now the only country without government support for its dairy industry.

Clare Irwin

Facilitating the conservation of remnant native vegetation on private property
A case study of landholders' perceptions, priorities and needs in the southern mount lofty ranges

The conservation of remnant native vegetation (RNV) on private property is a particularly important and imperative issue for natural resource management in rural Australia. However, the provision of appropriate policies, programs and incentives is enormously challenging given the contrasting views of the role of vegetation in the rural landscape and the fact that RNV conservation provides both public and private benefits.

Imposing conservation solutions without an understanding and an appreciation of the perceptions, priorities and needs of landholders will only serve to frustrate landholders and lead to both ineffective and ecological agricultural outcomes. Thus, through an exploration of landholders' perceptions of RNV conservation, constraints to RNV conservation and how incentives may be used to overcome those constraints, this thesis provides and insight into the adoption of RNV conservation behaviour by landholders in the southern Mount Lofty Ranges (MLR). This thesis argues that the up-take and impact of incentives has not been maximised because incentives have largely failed to appreciate and respond to the complexity of factors that influence this behaviour.

Drawing from data gathered through qualitative research techniques, this thesis concludes that a complex mix of attitudes, perceptions and situational factors influence the adoption of RNV conservation behaviour in the southern MLR. It is suggested that those landholders with a positive conservation attitude and an intention to conserve RNV *will* adopt RNV conservation behaviour. However, this behaviour will only occur when situational constraints of money, time and technical knowledge are reduced or removed. In addition, the priority assigned to RNV conservation in relation to the many other competing demands is influenced by deeply held, highly personal values and beliefs and the perceived benefits and costs of RNV conservation.

The thesis concludes by providing suggestions as to how RNV conservation incentives could be better promoted and delivered to landholders, taking into account the broad range of factors that influence behaviour, in order to maximise their uptake.

Stefan Kaufman

Driving Motivations: Social capital and the cultural basis of environmental agency in carpooling at the ANU

Without a conceptual link between people's daily activities and the cultural dimensions of the human ecosystem, culture remains a 'black box' in planning and managing sustainability processes. Culture is important because some modern societies appear to insulate dominant parts of the population from the impacts of their actions through economic and cultural arrangements, while in contrast, other societies internalise impacts in their cultural assumptions and reliance on local socially embedded resources for daily activities (social capital). This thesis presents social capital as a conceptual approach and empirical methodology for investigating the link between daily life, the use of social resources and the long term reproduction of culture and its ecological relationships. This approach is developed through primary research investigating the decision to carpool or not in University parking permit holders at the ANU.

Investigation of social capital literature highlighted the value of defining social capital as socially derived agency for actual activities, where this agency and its outcomes is influenced by, and simultaneously, evolves, pre-existing social arrangements such as language, economics and culture. From this definition social capital is an 'in' to investigating actors' responses to the consequences of using socially embedded resources, and can be contrasted with responses to the consequences of using non-socially embedded resources such as the material products of modern culture. The approach thus provides a valuable link between the consequences of daily life and the cultural dimensions of human ecosystems.

Primary research set out to identify wether actor's decision to carpool or not was based on the availability of social resources or was derived from the products and requirements of participation in modern culture, relating this to the extent of actor's concern for the sustainability consequences of car use. It recorded measures of social capital resources for carpooling at the ANU, plus concern for the impacts of car use, and identified patterns of car use and carpooling in the sampled population.

Social capital resources were found to positively correlate with carpooling behaviour and actors concerns also positively correlated with carpooling, although neither explains a large amount of variation. Comparison with ACT and Australian transport behaviour statistics supports the interpretation that macro-culture work and lifestyle demands distort the use-value of social capital resources, encouraging individually rational but collectively unsustainable reliance on single occupant commuting. It

is concluded that environmentally sustainable behaviour must be rational in people's local experience, regardless of the sustainability benefits of a change, because the capacity for decision making today is linked to the cumulative and emergent results of past decisions. Consequently, environmental change promoting more sustainable transport choices must directly address structural barriers that make alternatives irrational, and simultaneously, be evolutionary in negotiating actors' relationships with existing structure, so as to lay the individually sustainable basis of a globally sustainable society.

Tijmen Klootwijk

Modeling crown rise in *Eucalyptus grandis* w. Hill ex maiden (flooded gum) on the northern coast of NSW

The area of short-rotation eucalypt plantations on the North Coast of New South Wales is rapidly expanding. The aim is to augment and/or replace traditional sources of high-value "defect-free" timber products from native forests, but this new resource is prone to a high incidence of knots and knot-related defects. Silvicultural intervention is required for economically viable production of clearwood within limited timeframes.

Recent studies have shown that "green pruning" can reduce the incidence of knots and thus improve the strength and appearance grade of recovered timber. Silviculture should be designed so as to schedule green pruning to remove branches just before they senesce, thus minimising the impact of their removal on productivity. This technique is known as "chasing the green crown". Scheduling of pruning to chase the green crown can be optimised with improved knowledge of crown rise, the aim of the present study.

This study of eucalypt plantations on the North Coast managed by State Forests of New South Wales demonstrates that crown rise in *E. grandis* sites aged between 1.4 and 7.2 years can be described by a well correlated regionally applicable model derived from field data on total height ($r^2 = 0.93$). This and two other linear regression functions are presented which can be applied in a simple "rule-of-thumb" way to predict the height to the live crown base. The two less well correlated, predictive models are derived from field data on diameter at breast height ($r^2 = 0.82$) and from readily available data on plantation age ($r^2 = 0.79$). These crown rise model functions form the basis for a proposed, easily applicable, regime for green pruning and "brashing" (removal of dead branches) of the *E. grandis* plantations. In this regime the required pruned height of 6m can be reached by chasing the green crown, optimally through removal in three lifts of 40%, 30% and 30% of the live crown length.

David Little

The subalpine inverted treeline: soil patterns and nutrient process

The inverted treeline marks the lower limit of tree growth in subalpine and montane valleys as a result of periodic low minimum temperatures. In Australia these woodland-grassland boundaries are especially extensive in response to the gentle topography, and the cold intolerance of the dominant subalpine eucalypts. Frost hollows have been present in southeast mainland Australia for thousands of years unaltered by human impacts. However, during the period from 1834 to 1958 grazing, with associated burning practices, dominated and resulted in the fragmentation of the inverted treeline. These boundaries are poorly documented.

This research specifically aimed to test Hedenstroem's (1993) findings of abrupt boundaries in soil calcium (Ca) and manganese (Mn) concentrations across an inverted treeline on a steep slope. Additionally the research aimed to increase the knowledge and understanding of the plant-soil interactions and processes that lead to the development of patterns of cation distribution in soil profiles under adjacent woodland and grassland ecosystems.

The results clearly showed that soil-profile and soil-surface patterns of Ca and Mn concentrations were strongly related to characteristic indicators of the woodland and grassland nutrient cycles. Different patterns of soil Ca and Mn were observed in the adjacent woodland and grassland ecosystems that correlated with litter depth and development between two trees of different sizes and ages, and in relation to the presence of grass tussocks in the grassland. The greatest variability in ecosystem processes was observed in litter depth and vegetative composition, in the chemistry of plant roots and in the soil profile chemistry. The characteristic differences in the woodland and grassland were especially evident when the surface soil concentrations of Ca and Mn were examined across the inverted treeline. The concentrations of Ca and Mn were strongly related to characteristic nutrient cycling processes despite a steep slope and indicate their value as soil signatures, that may be used to indicate the location of an inverted treeline prior to disturbance by grazing practices.

Tristram Miller

Interpretation and reconstruction of a disturbed inverted treeline at Long Plain in Kosciuszko National Park, New South Wales

Inverted treelines are characterised by a sharp contour-related transition zone where woodland trees grade abruptly into herbfields and grassland down-slope as a result of periodic tree-lethal temperatures inversions. In the Australian high country, inverted treelines are better developed than perhaps anywhere else in the world, making them a significant feature worthy of scientific study, rehabilitation and preservation.

During the grazing era (1834 to 1958) many of these treelines were highly fragmented and so it is now often difficult to determine the original treeline locations, thus reducing their scientific value. The original location of inverted treelines has been poorly documented and there is a clear need for further research to identify them. This will allow the successful effective monitoring of their recovery.

The aim of this study was to identify the pre-European inverted treeline at Long Plain in the northern end of Kosciuszko National Park, New South Wales. Four methods were tested to determine their suitability for treeline interpretation which included, satellite image analysis, aerial photograph interpretation, ground surveillance and soil nutrient concentrations. Remote sensing analysis provided a quick method but was less suitable as the resolution was often not fine enough to accurately identify the former treeline or locate E. lacrimans stands due to their sparse crowns. Additionally there was also some misclassification of non-treeline species. Aerial photograph interpretation supported by ground surveillance produced the most accurate result as the resolution allowed for detection of E. lacrimans and fallen timber. Surface soil nutrient concentrations were unsuitable for interpreting the inverted treeline on highly disturbed sites where presumably soil erosion and/or grazing had resulted in the loss of Ca and Mn surface soil signatures.

These data allowed the present day grassland at Long Plain to be re-classified with 62 km² as natural frost maintained grassland below the inverted treeline and 13.5 km² of anthropogenic grassland above the inverted treeline.

Amber Pares

Soil organic carbon sequestration in mixed and pure plantations of *Acacia* and *Eucalyptus*

In this study investigations were carried out to determine whether soil organic carbon (SOC) sequestration in eucalypt plantations could be increased through the inclusion of a nitrogen-fixing acacia species. Previous research conducted in the tropics on mixed eucalypt-acacia plantations demonstrated that above-ground carbon was higher in stands containing mixed-species than in respective mono-cultures. For the purpose of this research the amount of SOC stored in the top 30cm of soil, within an established ten year old plantation consisting of different mixtures of *Eucalyptus globulus* ssp. *pseudoglobulus* (Gippsland Blue Gum) and *Acacia mearnsii* (Black Wattle), was determined.

Research was undertaken in an established replacement series trial where species combinations were planted at 3 * 3.3 m density. The different combinations of species ranged from pure eucalypts (E100) to pure acacias (A100) and included species mixtures of E75:A25, E50:A50; E25:A75 (where the figure following the species code represents the percentage (contribution) of a species to tree numbers in the plantation trial). Samples were also collected from a fertilised mono-culture treatment (EFer100) of *Eucalyptus globulus* ssp. *pseudoglobulus* (100 kg N ha^{-1}) and from the surrounding native forest area (NFst), that represents ecosystem conditions prior to plantation establishment. Total organic C, and total N and P were determined at two soil depths (0-10cm and 10-30cm), across three micro-sites (trench, mound and flat) formed at site preparation during plantation establishment. SOC was highest in the 50:50 mixture between eucalypts and acacias. It was found that quantities of SOC were related to aboveground productivity, but not related to the percent acacia in mixtures. The mixtures E25:A75 and E50:A50 also stored significantly more soil C than the surrounding native forest. In addition, N fertilisation of pure eucalypt stands did not increase SOC when compared to the unfertilised stand. Our results indicate that inclusion of acacias in eucalypt plantations may provide a means to increasing SOC stocks through increased productivity, and compensate quickly for any SOC losses that may occur as a result of site preparation.

Shane Paton

The relationship between inbreeding and survival and growth in a family trial of *Pinus radiata* Guadalupe Island provenance

Relationships between inbreeding and the performance traits of survival, height and diameter at breast height (DBH) were investigated for a population of *Pinus radiata* D. Don of Guadalupe Island origin established as a family trial in NSW, Australia. The Guadalupe Island population has the highest levels of inbreeding known in the conifers, and the trial has reached 20 years of age. This presented a unique opportunity: few such studies, based material of such age, and from a population with such naturally low outcrossing rates, have been conducted.

The study comprised of three data sets: the first was of data collected previously, of estimates of outcrossing rates in seeds and height survival estimates at 1 year of age. The second set comprised the growth and survival data from measurements of height and diameter of all living trees represented in a trial in 2001. The third data set comprised microsatellite data from approximately 300 green needle samples, representing 18 families characterised by the earlier isozyme analysis ranging from highly inbreeding to highly outcrossing.

Simple regression analysis techniques were applied to the data assess the relationships between parameters of interest. The novel process employed in this study was the adjustment of the raw data for the confounding effects of general combining ability (GCA) and selfing depression in investigation on the relationship between outcrossing rate and growth at age 20. This was only made possible because the microsatellite analysis provided information of genotype at the level of the individual.

The value of being able to adjust for confounding effects was demonstrated very clearly by the results of this study. Adjustment of the data for both confounding effects revealed a linear relationship, consistent with theoretical expectation, between outcrossing rate at age 20 and the growth traits height and diameter. This result demonstrated unambiguously that there us a strong relationship between the level of inbreeding and growth in *P. radiata*. The other principle relationship was that between outcrossing rate and survival assessed at three life stages, with levels of inbreeding decreasing from seed to age 20. This result supports the theoretical expectation of inbred individuals being purged from the population over time.

Richard Reilly

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

This thesis examines the role of soil organic carbon (SOC) in the maintenance of soil structural stability in two northern NSW cane growing regions, the lower Tweed and lower Clarence river valleys. The regional sugar growing industry is proposing to change from a burnt cane regime to green cane harvesting involving trash removal for electrical cogeneration. Concern about the ongoing maintenance of cane soils under these proposals provided the impetus for this study. This research has two components, a study of sugar industry archive data, and a field study.

The archive data study consisted of the statistical analysis of nearly 200 soil test records dating back to 1978. Three main soil parameters, SOC, soil pH, and cation exchange capacity (CEC) were examined for trends and interactions. In the field study, paired-site sampling compared cane soils with an adjacent uncultivated soil using SOC levels, bulk density, and dry and wet aggregate stability tests as indicators of soil quality: Re-sampling of old cane blocks, depth profiling of SOC, analysis of inert soil carbon levels, and floodmud sampling were also carried out.

Low to high levels of SOC (0.6 to 5.5%) and low to medium CEC values (3 to 34 cmol/kg) in the archive data record confirmed the general fertility of these soils. SOC levels were higher in the Tweed than the Clarence, whilst CEC levels were very similar in both regions. Low soil pH was comprehensively found in the record, with the Tweed having the lowest mean pH_w of 4.8. Significant ($p < 0.05$) but weak positive trends over time were evident with respect to soil pH_w (Tweed and Clarence), and CEC (Tweed only). Significant ($p < 0.05$) weak negative trends over time with respect to SOC were evident in both regions.

With the exception of *SOC* and dry aggregate stability indicators in the Tweed, results from the field study paired-site sampling showed significant ($p < 0.05$) declines in cane soil SOC, bulk density and aggregate stability compared with the adjacent uncultivated soil in both regions. Data from paired-site sampling which also tested for the effects of age of continuous cane cultivation, were generally inconclusive. Results from soil profile testing confirmed the SOC depleting and mediating effects of cultivation. Soil re-sampling results suggested SOC decline in both regions at the rate of 1% SOC in 18 to 23 years.

SOC levels in floodmud were high enough to increase river flat soil SOC levels up to approximately one kilometre from main river channels. Results from an inert C pilot study on a range of study soils from both areas provided estimates that mean levels of inert carbon comprised 45% and 35% of total SOC in the Tweed and Clarence respectively.

These integrated findings from both the archive data and field studies highlight the vulnerability of these cane soils to compaction and further structural decline, particularly under regimes limiting organic matter addition to cane soils. Recommendations for sugar industry management in these regions include: (i) cessation of crop burning due to this current study and other research findings linking this practice with soil structure decline, (ii) development of strategies to minimise compaction in cane soils caused by soil structure collapse and farm machinery traffic, (iii) implementation of soil organic matter management strategies (eg: green manuring) to deal with the issue of structural decline in cane soils due to loss of organic matter, and (iv) implementation of an integrated soil testing program using a series of fixed test sites in each region to systematically monitor soil quality.

Michael Turner

Characterisation of Pore Structure in Deep Growth Materials

Understanding flow, displacement and mixing processes in natural porous media is fundamentally dependent upon the accurate characterisation of complex three dimensional (3-D) structure. To understand flow related processes an accurate description of this structure characterising inherent heterogeneities is necessary as different topology is directly responsible for the variation in fluid flow characteristics. Understanding of how fluid behaves in a porous media such as an unconsolidated regolith material is essential for the accurate prediction or modelling of fluid behaviour in the environment. This includes effective prediction of pollutant/solute migration relating to the distribution, entrainment and behaviour of pollutant/solute in groundwater, and the efficient implementation, assessment and management of groundwater and salinity issues such as extraction and remediation programs. This understanding is complicated by the dynamic nature of regolith materials which is related to the chemistry of the system, especially in the presence of clays. It has been shown previously that swelling flocculation or dispersion of clays in a medium is a response to the chemistry of the system, more specifically electrolyte levels of the fluid and ratios of adsorbed cations (Quirk 1994; 2001, Lebron *et al* 1999). The dynamic nature of such a system and the lack of knowledge that we currently have to describe these processes provides an invaluable opportunity to probe the unknowns of how the pore structure affects fluid flow.

Techniques which provide 3-D topological pore-scale information are needed for the accurate determination of bulk flow properties or for input as flow parameters. At present most 3-D imaging from which this information can be derived lacks either the required resolution or volume necessary to be effective.

This aim of this study is to use existing technology to develop and then evaluate a technique of characterising pore structure using gamma emission and micro x-ray computed tomography. Such a method has the potential to provide the data necessary to understand the fundamental processes that govern fluid flow in porous regolith materials and the dynamics of porous structure.

Five core sections were provided by the Bureau of Rural Sciences. These were 90mm diameter regolith cores obtained from below the water table in an undisturbed condition as part of the combined Gilmore Dryland Salinity Project. These samples all differed morphologically, mineralogically, and chemically and covered a typical cross-section of materials expected to be found in the deeper regolith. Sodium adsorption ratio (SAR) was determined on the pore fluids and experiments were conducted which measured hydraulic conductivity (K) as a function of dilution of the electrolyte concentration in the pore fluid, while maintaining a constant SAR ratio. These results showed a reduction in K as a function of dilution of the pore fluid.

3-D images of the major flow paths were identified by imaging a gamma source added to the pore fluid at selected times in the experimental process and generally showed a reduction in number and volume of conducting flow paths coinciding with the measured reduction in K. Volume of swelling clays and SAR were shown to have positive correlations to reduction in K. These materials were found to behave differently from previously studied regolith material (surface soil). It was concluded that the experimental technique employed to image heterogeneity was appropriate, as delineation of preferred flow paths, or heterogeneity, was achieved. A number of improvements are outlined to improve the methodology and application of the technique.

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

The carbon status of managed *Eucalyptus* forests: a case study in the Kioloa study area

Concern over rising atmospheric carbon dioxide (CO_2) concentrations and subsequent global climate change has prompted the need for nations to accurately assess stores and fluxes of carbon in forest ecosystems. The carbon sequestration potential and carbon storage capacity of forest ecosystems may be evaluated by investigating their carbon status, defined as the stock of extant carbon storage relative to maximum potential carbon storage capacity. The aim of this study was to determine the aboveground carbon status of a managed, *Eucalyptus*-dominated forested landscape in the Kioloa Study Area on the South Coast of New South Wales.

The aboveground carbon status was evaluated by comparing field surveyed estimates of aboveground extant carbon storage to maximum potential aboveground carbon storage estimates derived by a simulation model. Extant carbon storage in aboveground vegetation, coarse woody debris (CWD) and litter was estimated with established field survey methods for 19 plot locations within the Kioloa Study Area. The model integrated the 3PG model and the CASS model to simulate net primary productivity (NPP) and net ecosystem productivity (NEP) for mature, unlogged *Eucalyptus* forests at the landscape scale. Simulations included the effects of spatially distributed primary environmental regimes and model output comprised estimates of NPP and maximum potential carbon storage in aboveground components for the 19 field survey plot locations.

Mean extant carbon storage in aboveground vegetation, CWD and litter was 282 tC ha^{-1}, 48 tC ha^{-1} and 10 tC ha^{-1} respectively. Large trees made significant contributions to carbon storage in aboveground vegetation, and the magnitude of CWD carbon stocks highlighted the importance of including this often neglected forest component in carbon budgets. Model simulations and outputs were subject to inherent limitations and potential errors, which may be partly rectified with further model development and additional spatial information on environmental variables. Overall, the modelling procedure was deemed effective and emphasised the potential for landscape scale simulation models to assess carbon storage and carbon sequestration in forest ecosystems.

The carbon status of CWD and litter proved difficult to assess. Extant carbon storage in aboveground vegetation in the Kioloa Study Area was well below its maximum potential carbon storage capacity. This suggests that this forest ecosystem has a very high carbon sequestration potential. Investigation of reconstructed pre-harvest carbon storage revealed that removal of large trees through logging regimes is the main variable preventing carbon stocks reaching their maximum potential carbon storage capacity. These results imply that heavily managed (i.e. logged) *Eucalyptus* forest ecosystems may currently be sequestering CO_2 from the atmosphere, thereby potentially helping to mitigate the greenhouse effect and global climate change.

Head of School's Report - 2001

Annual Report

The establishment in mid-2001 of the ANU's School of Resources, Environment and Society represented an important advance for the ANU and for the School's founding partners, the former Departments of Forestry and Geography & Human Ecology. These former Departments had been working closely together since the late 1980s; in 1990, they formed SRES' progenitor, the School of Resource and Environmental Management.

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. SRES' strengths lie both in traditional disciplinary programs 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. SRES' foci in teaching and learning are represented by its four undergraduate Program areas - Forestry, Geography, Human Ecology, and Resource and Environmental Management - and by its related graduate coursework and research degree programs.

The establishment of SRES coincides with other significant structural changes at ANU, initiated by the Vice-Chancellor and intended to foster greater integration across the university. SRES is one important manifestation of these changes, and SRES staff are active in other new interdisciplinary initiatives across the ANU, such as the National Institute for Environment. In addition to their significant and successful endeavours in our core activities of research, teaching and learning, and outreach, summarised subsequently, SRES staff and students devoted considerable energy in 2001 to the creation of the new School and to enabling SRES to be more than simply the sum of its parts.

At the end of the 2001 academic year, SRES had some 20 academic staff, around 15 research and visiting fellows, 12 support staff, 45 graduate and 20 Honours students, some 250 undergraduates enrolled directly in our programs, and many others who take the courses we offer.

Outstanding achievements of 2001

The creation and establishment of SRES

The creation and establishment of SRES by our staff and students – from the exploration and agreement of the name of the new School and its strategic directions, through the formal launch by the Vice-Chancellor on 16 July 2001 and the coincident publication of our 2001 Yearbook, to the development of a common School-wide Honours program for 2002 – represent the outstanding collective achievement of 2001. The creation of SRES has not, in itself, generated more financial resources in the short term, but it has allowed us to make much more effective use of SRES' most valuable resource, viz. our staff and students, and existing financial resources, and has established the foundations for SRES to work towards its strategic goals.

Research and knowledge communication

SRES staff and students continued to create and communicate knowledge and understanding of peoples' relationship with the environment and use of its resources. Examples illustrating the quality and diversity of these achievements include:

- the publication of books such as "Working on country: contemporary indigenous management of Australia's land and coastal region" and "Perfumed pineries: environmental history of Australia's *Callitris* forests", of which Drs Richard Baker and John Dargavel were respective lead co-editors;
- demonstration by SRES researchers that it is possible to assess the concentration of important chemicals in tree canopies from aircraft-collected hyperspectral data, in particular chemicals that determine the quality of habitat for folivorous marsupials such as koalas and some possums;
- the award to Roland Wilson, a final year BScForestry student, of the Lightspan Academic Excellence Award for "The Witjuti grub" www page he developed as an assignment for the course FSTY3016 Forest Products;
- the generation by SRES staff of c$500K for research contracts and consultancies in 2001.

Teaching and learning

SRES staff continue to be at the forefront of innovation in teaching and learning. We continue to emphasize experiential and field-based learning, and to develop new internet-based learning resources and delivery pathways. These achievements were manifested in a number of ways in 2001, including:

- the award of ANU-wide iLearning funds to Drs Richard Baker (SRES) and Alistair Greig (Faculty of Arts) to support the delivery of the new joint foundation course, SRES1001 *Resources, Environment and Society*;
- the strong co-learning program for staff and graduate students developed under the auspices of the weekly *Human Ecology Forum*;
- the offering of four graduate courses related to farm forestry in distance mode, using www resources and technologies, and the development of similar courses in other subject areas; the development and offering

of a new undergraduate course, SRES3006 *Recycling & Renewable Materials*, under the auspices of the Centre for Science and Engineering of Materials;
- the development of new Independent Studies/ Research Project courses consistent with ANU's iLearning initiative;
- the academic development of the 2001 cohort of 20 Honours students, 7 of whom were awarded 1st class Honours.

Outreach and community activities

SRES staff and students continued to maintain a high profile in many university and community activities. Amongst these activities are:
- Dr Brian Lees' role as Chair of the Committee of Management of the ANU's Kioloa coastal campus;
- Dr Brendan Mackey's work nationally and internationally on behalf of the Earth Charter;
- Dr Geoff Cary's appointment to membership of the ACT Bushfire Council;
- the conception and the securing of funding to create the nationally-touring art exhibition *Rings of History*, resulting from Dr Phil Evans' collaboration with colleagues in the National Institute of the Arts' Wood Workshop and with Craft ACT. The exhibition displays pieces created by contemporary artists from the historic Dadswell wood collection;
- David Carpenter's (PhD student) and Stefan Kaufman's (Honours student) roles in the *ANU Green* initiative;
- management of the new Summer Scholarships program under the Bureau of Rural Sciences – ANU Memorandum of Understanding, which allowed five ANU students to work with BRS staff during the summer vacation.

SRES also continues to host a range of national fora and events, such as the annual ANU Forestry Research Colloquium and the biennial Jack Westoby Lecture. A significant development in 2001 was the endowment of the Jack Westoby Lecture series on an ongoing basis, through the generosity of Professor Mark Westoby and the Forest and Wood Products Research and Development Corporation, supported by the ANU Endowment for Excellence.

Staff study leave, departures and appointments

Three SRES staff spent significant periods abroad on external studies programs in 2001:
- Dr Jürgen Bauhus was appointed Guest Professor at the Institute of Silviculture and Forest Ecology, University of Göttingen, where he spent six months;
- Dr Geoff Cary was awarded significant funds to support his research comparing Australian and American landscape fire models, which he conducted with USA colleagues while based for six months at the USDA Forest Service Research Station in Missoula, Montana;
- Dr Brian Turner spent two months in the USA furthering work with colleagues there on remote sensing and forest planning.

2001 saw the departure of a number of School staff:
- Peter Beutel, whose senior technical position included support for Phil Evans' research and teaching, left in July to take up a position with ACT Forests. Peter came to ANU from the Queensland Department of Forestry in August 1989, and became a pivotal member of ANU Forestry's technical support team;
- Dr Marlène Buchy, Lecturer in Social Forestry, who joined the Department in 1997, has returned to Europe to take up a post at the Netherland's Institute of Social Sciences. Amongst Marlène's many important contributions to SRES' work were her research on *Women in Forestry* and on *Public Participation in Australian Forestry*; both documents can be downloaded from the SRES www site;
- Dr Phil Evans left in November to take up the Chair of Wood Science at the University of British Columbia. In his 15 years at ANU Forestry, Phil developed that Department's strongest research group and a high international profile;
- John Kane, who worked in both field services and financial administration for the Department of Forestry, left the Department in May;
- Dr Meg Keen, who had been on leave to work with Environment Australia, left SRES to take up a Senior Lectureship in NCDS;
- Nikki Sekavs, Adminstrative Assistant in Geography and Human Ecology, accepted a position in CRES in April;
- Helena Wolf, Departmental Administrator for Geography and Human Ecology since 1989, retired in April.

Staff who joined SRES in 2001 were:
- Dr Susan Rhind, who was appointed for one year as Lecturer in Landscape Ecology;
- Sue Holzknecht, who was appointed on a fractional basis as Academic Skills Advisor for graduate students;
- Mark Lewis, who was appointed on an acting basis as School Finance Manager;
- Anne Gilles, who was appointed on an acting basis as School Graduate Programs Administrator.

Visiting fellows

As usual, the School welcomed a number of Visiting Fellows, whose presence enriched and enlivened us. Those who joined us 2001 and their areas of activity were: Dr David Boshier (forest genetics); Adam Gerrand (forest policy and management), Dr Madan Gautam (agroforestry and social forestry) and Dr Nick Paltridge (biodiversity and farm forestry).

Student achievements

SRES students continued to achieve success in their own right and in collaboration with staff. 6 PhD students submitted their theses; 10 Masters' students by coursework and research completed their degrees; 20 Honours students completed their programs.

The achievements of outstanding undergraduate students were recognised through prizes and awards. Those awarded in 2001 were:

- ACTION Trust Scholarships - Sonya Duus and Richard Reilly
- Australian Institute of Agricultural Science & Technology Prize - Lucy Schapel
- Forestry Tasmania Scholarship – Aaron van Winden
- Howlett Prize - Hugh Griffin
- Institute of Wood Science Prize - Gayle Kennedy
- Jacobs Medal for Outstanding Field Studies - Semy Siakimotu
- MR Jacobs Prize in Silviculture - Philip Alcorn
- State Forest Prize in Forest Mensuration - Andrew O'Brien
- Schlich Memorial Trust Prize - Philip Alcorn
- WP Packard Prize 2001 - Ruth Doran

The success of undergraduate Forestry students in raising funds, and generosity of sponsors in supporting them, to attend international meetings was a notable feature of 2001. Fifteen 4th year students participated in the Commonwealth Forestry Conference in Fremantle, and two ANU representatives attended the annual International Forestry Students Society conference in the Czech Republic.

We thank the many sponsors – from the public and private sectors, and from professional associations, for their generous support for awards, prizes and student travel.

Conclusions

The creation and successful establishment of SRES demanded considerable efforts and goodwill on the part of staff and students in 2001. Thanks to their commitment, the new School has made a strong start towards our goal of linking the social and natural sciences to address the challenges of sustainability through research, teaching and learning, and community engagement.

Professor Peter Kanowski
Head, SRES
March 2002

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