THE AUSTRALIAN NATIONAL UNIVERSITY

SCHOOL OF RESOURCES, ENVIRONMENT & SOCIETY

YEARBOOK 2004

FACULTY OF SCIENCE

Cover:
SRES teaching and research 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 draws on both the natural and social sciences to address the challenges of sustainability.

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The School of Resources, Environment and Society (SRES) at The Australian National University (ANU) is a significant national and international centre for learning and research. Our focus is 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 draws on both the natural and social sciences to address the challenges of sustainability. This Yearbook introduces our staff and graduate students, their work over the past year, and overviews the School's teaching programs.

Our staff, students and graduates work together in undergraduate and graduate coursework programs that record high levels of satisfaction and employment, and in world-leading research, to help governments, businesses, communities and individuals meet the many challenges of working towards sustainability.

The School's activities in teaching and learning are organised around four undergraduate Program areas - Forestry, Geography, Human Ecology, and Resource and Environmental Management - and in 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 4 of this Yearbook and detailed in our Undergraduate and Graduate Program Handbooks, available both on our website **sres.anu.edu.au** and in hard copy from the SRES office.

The research work of SRES staff and students is diverse and wide-ranging, but united by its focus on addressing the challenges of sustainability. Most of our 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, Departments and Institutes to achieve synergies and efficiencies. These partners include: Schools and Departments within the Faculties of Science and Arts; the Centre for Resource and Environmental Studies; the National Centre for Development Studies; and the National Institute for Environment.

SRES celebrated its third birthday in July 2004. During our third year, our staff maintained their high international and national profiles and productivity, publishing 3 books, 60 book chapters and journal papers, and 35 conference and research papers. Our flagship undergraduate course SRES1001 *Resources, Environment and Society* won an Australian Award for University Teaching, and we implemented a new suite of integrated second year courses. SRES staff and students attracted nearly $750K in new external grants to support their research. Twenty three graduate students, 18 Honours, and 33 SRES-based undergraduates completed their degrees.

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. We look forward to working with you.

Professor Peter Kanowski

Head
School of Resources, Environment and Society
June 2004

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Prospective undergraduate students should see:

- The *Study@ANU* website **studyat.anu.edu.au**
- The *ANU Undergraduate Handbook* **www.anu.edu.au/sas/handbook**
- The ANU *Undergraduate Student Guide* **www.anu.edu.au/psi/publications/publications.html**
- The Faculty of Science website **science.anu.edu.au**
  - Faculty of Science *Faculty Guide* **www.anu.edu.au/psi/publications/publications.html**
- The Faculty of Arts website **arts.anu.edu.au**
  - Faculty of Arts *Faculty Guide* **www.anu.edu.au/psi/publications/publications.html**
- The SRES website **sres.anu.edu.au**
  - The *SRES Undergraduate Handbook* and *SRES Honours Handbook* **sres.anu.edu.au/publications/index.html#ughbook**
  - The Forestry, Geography, Human Ecology and Resource & Environmental Management Programs fact sheets **sres.anu.edu.au/publications/index.html#factsheets**

Prospective graduate students should see:

- The *Study@ANU* website **studyat.anu.edu.au**
- The ANU Graduate School website **www.anu.edu.au/graduate**
  - The Graduate School Research Student Prospectus **www.anu.edu.au/graduate/pubs/prospectus**
  - The Graduate School Coursework Student Prospectus **www.anu.edu.au/graduate/pubs/coursework_prospectus**
  - Graduate Coursework Guide **www.anu.edu.au/graduate/pubs/gcg**
  - The Graduate Studies in Environment (including Resource Management) website **www.anu.edu.au/graduate/studyfields/environment**
  - The Graduate Studies in Geographical Sciences website **www.anu.edu.au/graduate/studyfields/geography**
- The SRES website **sres.anu.edu.au**
  - The *SRES Graduate Programs Handbook* **sres.anu.edu.au/publications/index.html#pghbook**

Some of the School's new students on an introductory field class, March 2004

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 both on our website **sres.anu.edu.au** and in hard copy from the SRES office.

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,
  - a broadly-based education combined 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
- environmental history
- environmental policy and planning
- GIS applications
- 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
  - land management
  - regolith studies
  - soil conservation & land management
  - sustainable agriculture
  - vegetation management
  - wildlife science

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 (one semester of coursework)
- Graduate Diploma (one year of coursework)
- Master (One year of coursework and individual research)

In
- Environmental Sciences
- Forestry
- Geographical Sciences
- Resources, Environment and Society

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.

Please contact us for further information.

SRES in 2004

The School of Resources, Environment and Society (SRES) at The Australian National University (ANU) celebrated its third birthday in July 2004. This report summarises our achievements in SRES' third year, and our priorities for the year ahead.

The past year

SRES staff continued to focus on the University's core activities of research and teaching, both individually and in collaborative partnerships with our students and with colleagues within and outside the ANU.

Our research activities, measured against criteria such as publications output, numbers of research students, and success in attracting external funding, continued to strengthen. Our research activities continued to be conducted largely in partnership with local, national and international collaborators; amongst these were significant roles in both established Cooperative Research Centres (Greenhouse Accounting, Landscape Evolution and Mineral Exploration, Sustainable Production Forestry, and Vertebrate Pests) and in one new Centre (Bushfire). We thank all those research partners and supervisors from outside SRES who supported our research activities in various ways. In particular, SRES acknowledges the invaluable contributions of external supervisors to the success of the work of SRES research students.

SRES staff further revised the curricula for undergraduate and coursework graduate students, introducing a new suite of integrative courses. We continued to build collaboration with partners throughout the ANU. The quality, innovation and collaboration that typify our teaching were recognised when our foundation course SRES1001 *Resources, Environment and Society* won a prestigious Australian Award for University Teaching. SRES1001 was delivered jointly with the Faculty of Arts by Drs Richard Baker and Alastair Greig. They further demonstrated their commitment to education by directing part of the prize funds to the conversion of one of the School's teaching laboratories into a large, flexible teaching space that better meets the needs of contemporary modes of teaching and learning. As with research, many organizations and individuals from outside SRES made important contributions to our teaching program, in a variety of ways including course coordination, guest lectures, and hosting field visits. We particularly acknowledge the contributions of colleagues from CRES (notably Drs Sara Beavis and Steve Dovers, and Professor Ian White), from RSPAS (notably Drs Deirdre McKay and Bryant Allen, and Professor Geoff Hope), and from ANU's Emeritus Faculty (coordinated by Peter McCullagh) in convening and delivering SRES courses. Their contributions helped SRES enhance our research-led learning.

SRES students and research work benefited from the generosity of Neil Humphreys and Hazel Cutlack, who endowed the Curly Humphreys Honours Scholarship in Forest Operations. Their very generous endowment was stimulated by Mr Humphreys' distinguished career in forest operations; in recent years SRES students have benefited from his coordination of the undergraduate course on that topic. Alexandra Packer was the inaugural Curly Humphreys Scholar.

SRES staff and students continued to play strong roles in the activities and management of the ANU's National Institute for Environment (NIE). The NIE fosters collaboration and dialogue about the environment across the ANU. In conjunction with the Nature and Society Forum, the Australian National Sustainability Initiative was launched at SRES on 31 March 2004; speakers included Dr Hunter Lovins (founder, Natural Capitalism Inc), Dr Moss Cass (President, ANSI) and Professor Frank Fenner (ANSI Patron). SRES staff and students continued to work in various ways with the ACT Government and community to address the many challenges resulting from the January 2003 bushfires, as well as the challenges of sustainability in the ACT more generally. Amongst these endeavours, many SRES students were active in revegetation events co-organised by Greening Australia and ACT Forests.

Our third year saw sorrows as well as successes. We mourned – with his family and many others - the sudden loss in March 2004 of our colleague Dr John Banks, the longest-serving member of the School's staff. John's many contributions and legacies are acknowledged on pages 8 and 9. Similarly, we shared some of the sorrow of family and friends at the early death of one of our recent graduates, Trudy Brown. Our thoughts remain with their families.

SRES staff and students

In June 2004, SRES comprised 17 academic staff, 27 research and visiting fellows, 14 support staff, 77 graduate and 31 Honours students, and around 350 undergraduates enrolled in one or more of our courses

Particularly notable staff achievements in the past year included:

- Dr Richard Baker shared, with Dr Alastair Greig of the Faculty of Arts, an Australian Award for University Teaching, for their course SRES1001 *Resources, Environment & Society*;
- Dr John Field and John Marsh's work with Canberra College secondary chemistry students, under CSIRO's Researching with Scientists scheme, was widely acclaimed as one of that program's most successful initiatives;
- Dr Lorrae van Kerkhoff, who completed her PhD in SRES in 2003, was awarded a Fulbright Scholarship to work with colleagues Harvard University's John F Kennedy School of Government;
- Dr Janette Lindesay returned to SRES after her very successful secondment to the CRC Greenhouse Accounting as its Education Program Manager. She continued to oversee that role, and Dr Robyn Harris, appointed to the CRC to succeed Dr Lindesay, co-located to SRES;
- Drs (or soon to be Dr) Sandy Gilmour, Dominic Kain, Karen King and Wendy Merritt joined SRES as externally-funded postdoctoral fellows;
- Dr Janis Birkeland, Bob Newman, Professor Roger Sands, David Tongway and Chengliang Zhang joined SRES as Visiting Fellows for varying periods;
- Three books were published with significant SRES staff input: *Shades of Green: Business, Regulation & Environment* (Neil Gunningham and colleagues); *Australia Burning* (Geoff Cary, with David Lindenmayer and Steve Dovers of CRES); and *Towards whole-of-community engagement: a practical toolkit* (Heather Aslin, BRS, and Val Brown);

- SRES staff and students published around 60 refereed research papers or the equivalent in 2003 (see pages 116-118);
- Drs John Banks, Roger Heady and Professor Phil Evans' work on the wood anatomy of Wollemi Pine was selected as the cover feature for IAWA Journal;
- Dr Brendan Mackey was awarded a $220,000 research grant by the Wilderness Society, to develop new techniques and methods for biodiversity conservation evaluation and planning;
- Dr Richard Baker and Professor Peter Kanowski were awarded $100,000 by the Department of Agriculture, Fisheries and Forestry, to support a PhD project associated with the National Indigenous Forestry Strategy;
- David Dumaresq and Dr Brendan Mackey received Certifications of Commendation in the ANU 2003 Environmental Achievement Awards, for their achievements in teaching and outreach, respectively;
- Dr Brendan Mackey was invited to organise and chair a session on Wilderness, biodiversity conservation and protected areas at the World Conservation Union's 2003 World Parks Congress, Durban, South Africa;
- Dr Ryde James spent five months Outside Studies Program with the UN Food and Agricultural Organisation's Forestry Department headquarters in Rome, resulting in the forthcoming publication *The potential for fast-growing commercial forest plantations to supply high quality roundwood*, with Dr Alberto del Lungho;
- Dr Peter van Diermen led a consultancy team undertaking a major review of the small to medium enterprise sector in Cambodia;
- Professor Val Brown continued her roles as Chair of two ACT Government committees: the Community Development Fund, ACT Health Promotion Board; and Sustainability Monitoring Committee, Sustainability Expert Reference Group;
- Dr Malcolm Gill was one of the three panellists who conducted the Victorian Government's Inquiry into the 2003 Victorian bushfires;
- Professor Peter Kanowski was one of the three panel members who conducted the Council of Australian Governments' National Inquiry into Bushfire Mitigation and Management, and a member of the ACT Government's Non-Urban Land Study Steering Committee. He also chaired the International Partnership for Forestry Education, which secured development phase funding from the World Bank, and assumed the Convenorship of the University's National Institute for Environment in March 2004.

Student achievements

SRES students continued to achieve success in their own right and in collaboration with staff. Nine PhD students (Auro Almeida, Rico Cabangon, Zhi Huang, Leah Horowitz, Tom Measham, Chris O'Hara, Kate Semple, Kim van Niel, and Kusumadewi Sri Yulita) were awarded their degrees; 12 Masters' students by coursework and research completed their degrees; 18 Honours students completed their programs. The abstracts of their theses are presented on pages 98 – 115.

The achievements of outstanding undergraduate students were recognised through prizes and awards. Those awarded in 2003 were:

- ACTION Trust Honours Scholarships: Yvette Bettini and Dayani Gunwardana
- Australian Institute of Agricultural Science & Technology Prize: Eleanor Sobey
- Country Women's Association Honours Scholarship: Bronwyn Higgins
- Curly Humphreys Honours Scholarship in Forest Operations: Alexandra Packer
- Howlett Honours Prize in Geography: Yvette Bettini and Anne Hill
- Institute of Wood Science Prize: John Tabor
- Jacobs Medal for Outstanding Field Studies in Forestry: James Wilson
- State Forests NSW Prize in Forest Mensuration: Ben Wielinga;
- Schlich Memorial Trust Prize for Forestry: John Tabor
- WP Packard Prize in Geography: Hannah Hueneke

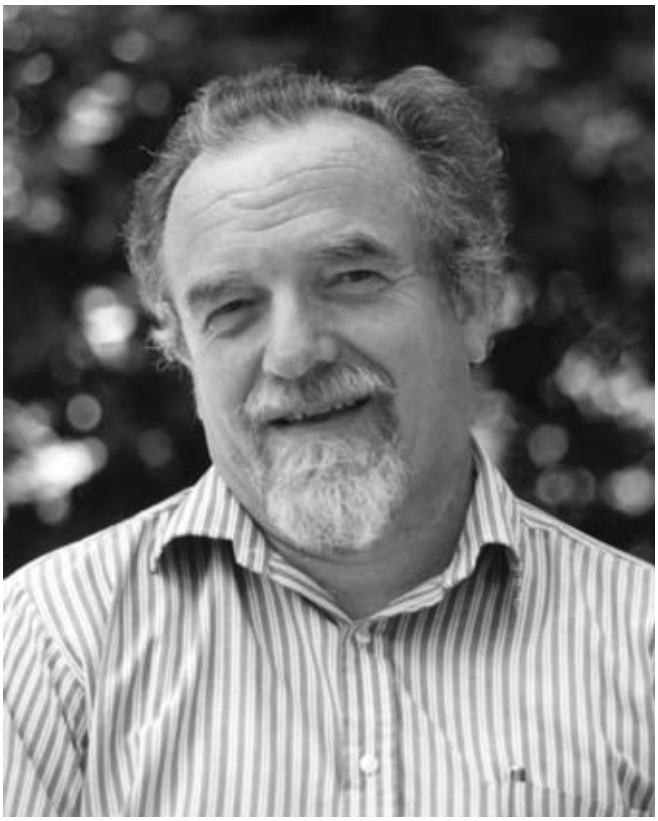
SRES PhD student David Forrester was awarded the Institute of Foresters' Wolf Crane Memorial Award for 2003, and SRES Honours student Andrew Ford was awarded one of two Rayonier Scholarships for outstanding forestry students in Australasia.

The year ahead

The coming year sees the ANU (along with other Australian universities) responding to, and operating in the context of, the Australian Government's new higher education legislation. This will pose significant challenges and opportunities for SRES staff and students. We are actively engaged in dialogue with our colleagues working in the environment and sustainability throughout the ANU, and in the University's review of research and teaching in the environment.

SRES will - consistent with the ANU, Faculty of Science, and National Institute for Environment strategic plans - continue to:

- Pursue research opportunities, particularly in collaboration with external partners in government and industry, and publish the results of this research;
- Further develop and deliver innovative, collaborative teaching within the School and throughout the University;
- Work with the National Institute for Environment and the Centre for Resource and Environmental Studies, in particular, to enhance research collaborations and opportunities for learning for ANU students;
- Engage with the wider community through various forms of outreach, including collaborative learning and research.



Dr John C.G. Banks

28.5.1942 – 22.3.2004

Dr John Banks contributed greatly to Australian forestry through a 35-year career at The Australian National University - almost the entire duration of his professional career. John came to ANU from north Queensland, where he was an inaugural student and student union president at the new Townsville University College (now James Cook University). He graduated in Forestry from the ANU in 1966, as one of the first graduands after the forestry degree was transferred from the former Australian Forestry School. He was appointed to the University's Department of Forestry initially as a Senior Technical Officer, and then Senior Tutor in 1969; John was promoted to Lecturer in 1978 and Senior Lecturer in 1992. He completed his ANU MSc, on taxonomy of *Eucalyptus viminalis*, in 1972, and his ANU PhD, on the use of dendrochronology to interpret dynamics of snow gum forests, in 1982.

John's theses characterised two of the principal strands of his academic work. The first of these, which he developed under Professor Lindsay Pryor's guidance, was in taxonomy and dendrology – the classification of trees. The second was in dendrochronology, the use of tree ring data to interpret historical patterns in trees and forests, and to draw inferences from these about past climatic and management regimes. The third principal strand of John's academic work, urban trees and treescapes, also built on his collaboration with Lindsay Pryor.

John became an authority in each of these areas. His dendrological knowledge, and its ecological application in interpreting patterns of variation in forested landscapes, was outstanding. His work on dendrochronology of Australian trees was renowned nationally and

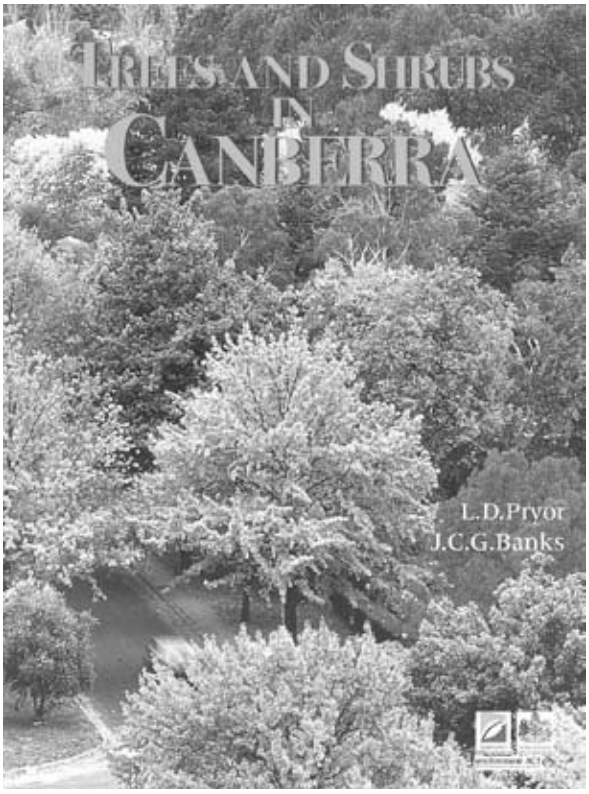
internationally, and informed both science and management. John assumed Pryor's mantle as the authority on Canberra's urban trees, and was Tree Advisor to the ACT Government at the time of his death.

John had enormous capacity to communicate this rich knowledge to others in a variety of ways – through his teaching and supervision of students, through his scientific writing, and through the media to lay audiences. His wisdom was evident in each of the arenas; his teaching and public communication were also characterised by great helpfulness and patience. John had a gift for helping others to learn. He also had the capacity to work with others to apply his knowledge in very practical ways, as his advisory work with on the ANU campus and across the ACT demonstrated to professionals, and to members of the ANU and ACT communities.

At the time of his death, John was flourishing: he was teaching 1st, 2nd and 3rd year undergraduates; supervising Honours and PhD students; working actively on research projects in each of his areas of interest; and was closely involved with many aspects of the ACT's recovery from the 2003 bushfires. He was relishing in each of these roles, as were those with whom he worked in each arena, despite suffering intermittent ill health as a legacy of major trauma and surgery, and extended convalescence, in 2000. John's commitment to his colleagues and students, as well as to his scientific work, was typified by his determination to continue full-time work despite these challenges to his health.

John's death leaves us all the poorer, but leaves us also with rich legacies of learning, knowledge and landscapes. We share the sorrow of his family – his wife Margaret and children Julian and Lynnette – at his untimely death, but also celebrate with them the many ways in which his work and legacies continue to enrich our lives.

Peter Kanowski



FOOTNOTE:
ANU and ACT colleagues are currently planning ways of honouring John's work and memory on the ANU campus and in the ACT's arboreta, and perhaps through a student scholarship. Please contact Cris Brack (02 6125 3535, email cris.brack@anu.edu.au) if you would like to discuss these ideas.

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Suzanne Feary	PhD
Karen Fisher	PhD
David Forrester	PhD
Martin Golman	PhD
Simon Gordon	PhD
Quintin Gravatt	PhD
Ingo Heinrich	PhD
Kevin Jeanes	PhD
Stuart Johnston	PhD
Stefan Kaufmann	PhD
Dana Kelly	PhD
Ernst Kemmerer	PhD
Karen King	PhD
Alex Lee	PhD
David Little	PhD
Kirsten Maclean	PhD
Rassoul Mahiny	PhD
Chris McElhinny	PhD
Angela Newey	PhD
Kate Park	PhD
Ida Resosudarmo	PhD
Jacqui Russell	PhD
Karim Sabetrafter	PhD
Jackie Schirmer	PhD
Sunil Sharma	PhD
Danny Siegenthaler	PhD
Catherine Simpson	PhD
Sanjeev Srivastava	PhD
Geraldine Teakle	PhD
Ha Thi Thu Tran	PhD
Rob Waterworth	PhD
Edward Webber	PhD
Wendy Welsh	PhD
Vanessa Wong	PhD

Masters Students

Don Bakat	MF
Van Ngoc Do	MF
Cheryl Edridge	MEnvSc
Baihua Fu	MEnvSc
William Marthy	MEnvSc
Van Thao Duong	MF
Rebecca Pagan	MF
Julia Pickworth	MEnvSc
Michael Poesi	MF
Michael Ryan	MF
Emma Soraya	MF
Karen Teo	MGeoSc
Georgina Usher	MEnvSc

Graduate Diploma Students

Sunit Adhikari	GDipSc
Jhuma Dewan	GDipREM
Simon Greenaway	GDipFor
Catherine Gross	GDipREM
Burder Kinley	GDipSc
Ahmad Maryudi	GDipSc
Sally McCarthy	GDipREM
Muhammad Muttaqin	GDipSc
Liping Rao	GDipSc
Alberto Valerio	GDipSc

Honours Students

Felicity Anderson
Suzie Bond
Gabrielle Breen
Melissa Burgess
Rachel Clarke
Alex Cribb
Janet Finn
Emily Flowers
Andrew Ford
Michelle Gilbert
Bronwyn Higgins
Mark Imber
Bradley Jackson
Lucinda Keane
Christine Kelly
Gayle Kennedy
Emily Kilham
Kate Lea-Perry
Jenna Leonard
Lindsay Morgan
Wing Sze Ng
Catriona Ockwell
Alexandra Packer
Kyra Peake
Jean Rivard
Alexandra Schatunowksi
Peter Somerville
John Tabor
Nick Travers
Anna van Dugteren
Meghan Whitbread

SRES STAFF & STUDENTS

Staff, students and visitors at SRES weekly morning tea, May 2004

NEW SRES FLEXIBLE TEACHING SPACE

SRES' new flexible teaching space for 100 students, funded partly by Richard Baker and Alastair Greig;
David Borthwick, Secretary of the Australian Department of Environment and Heritage, speaks to SRES students.

Dr Richard Baker

Geography Program Convenor

Reader
Environmental Policy and Planning, Indigenous Resource Management Issues, Environmental Education, University Teaching Methods

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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 and was a National Finalist in the 2002 Australian Teaching Awards. The first SRES course that he coordinates won a 2003 National Teaching award.

Research, Teaching & Professional Activities

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 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.

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

Selected Publications

Baker, R.M. 2003 Yanyuwa classical burning regimes, Indigenous science and cross-cultural communication, pages 198-204 in Australia burning: fire ecology, policy and management issues CSIRO publishing, Collingwood Victoria ISBN 0 643 0 06926 7

Robinson, C, Liddle, L. and Baker, R.M 2003 Journeys through an Australian Sacred landscape, with, *Museum International*, 218: 74-77

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.

Selected Student Theses

Horowitz, L 2003 Stranger in one's own home: A micropolitical ecological analysis of the engagements of a Kanak community with a multinational nickel mining project in New Caledonia (PhD thesis)

Measham, T 2003 Learning and change in rural regions: understanding influences of sense of place (PhD thesis)

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)

Scroope, S. 2003 Indigenous protected areas (Honours thesis)

Cozens, Z. 2003 Aboriginal participation in resource management on the NSW South Coast. (Honours thesis).

Hill, A 2003, Social economies in the Southern Tablelands of NSW. (Honours thesis).

Duus 2002 Dispute resolution in environmental management. (Honours thesis).

Blanch. L. 2001 Good cops, bad cops: contemporary alliances of the Australian environment movement. (Honours thesis).

McMaster, K 2000. Interpretation for summer recreation in the Kosciuszko Area. (Honours thesis).

Arkle, P 2000 Physical impact of tourism on the Kosciuszko summit. (Honours thesis).

Dr Cris Brack

Forestry Program Convenor

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Forest Inventory, Forest Mensuration, Carbon Sequestration and Accounting, Forest Modelling, Forest Planning, Urban Forestry

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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 extensive research and consultancy work throughout Australia as well as Malaysia, PNG, Germany and USA.

Research, Teaching & Professional Activities

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 for native, urban and planted forests as well as the enhancement of teaching and learning techniques.

I regularly collaborate with Federal and State agencies - including the Australian Greenhouse Office, Bureau of Resource Sciences, National Forest Inventory, Canberra Urban Parks and Places, Department of Sustainability 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; past 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 2003 my research continued to focus on improving our ability to measure and report on the multiple values of forests - especially biomass and carbon sequestration. I was also appointed as a member of the *Expert, Independent Advisory Panel* to monitor the annual performance of the Department of Sustainability and Environment.

Selected Publications

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

J.L. Kesteven, J.L., Brack, C.L. and Furby, S.L. (2003) Using remote sensing and a spatial plant productivity model to assess biomass change. In: Advances in Forest Inventory for Sustainable Forest Management and Biodiversity Monitoring. P. Corona, Michael Köhl and Marco Marchetti (Eds). Kluwer Academic Publishers, Dordrecht. p 33 - 56. ISNB 1-4020-1715-4.

Brack, C.L. (2003) Modern Forest Inventory: Is there a need to go to the field any more? Proceedings of the Joint Australian and New Zealand Institute of Forestry Conference " Australasian Forestry - A Strategic Vision", 27 April - 1 May 2002. Queenstown, New Zealand. P 144 - 156.

Banks, J.C.G. and Brack, C.L. (2003) Canberra's Urban Forest: Evolution and planning for future landscapes. *Urban Forestry* & *Urban Greening* 1(3): 151 - 160.

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.

Brack, C.L. (2002) Comparing total tree volume and growth on similar stands of differing tenure. In *Biomass Estimation: Approaches for Assessment of Stocks and Change*. G.P. Richards (Ed). National Carbon Accounting System Technical Report no 27: 91 - 142.

Brack, C.L. (2002) Forecasting Carbon Sequestration from Individual Eucalypt Plantations. In *Biomass Estimation: Approaches for Assessment of Stocks and Change*. G.P. Richards (Ed). National Carbon Accounting System Technical Report no 27: 105 - 116.

Brack, C.L. and Richards, G. (2002) Development of a National Forest Model. In *Biomass Estimation: Approaches for Assessment of Stocks and Change*. G.P. Richards (Ed). National Carbon Accounting System Technical Report no 27: 133 - 139.

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.

Selected Student Theses

Ho, A. 2002. Particulate pollution capture and retention by *Eucalyptus elata* (Dehnh) in the ACT. (Honours thesis).

Titheradge, S. 2002. Tree crown dieback of *Fraxinus oxycarpa* cv Raywood in Canberra's urban forest. (Honours thesis).

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

Getting into the tree crowns: urban forestry and biomass studies

Dr Geoff Cary

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Fire Science

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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 modelling and coordinator of the first year forestry field trip.

Research, Teaching & Professional Activities

SRES has expanded its offerings in the areas of fire science and management. Fire weather, behaviour, prediction and suppression are major components of a new second year course called Fire, Flood and Drought. A new third year course, Fire in the Australian Environment, deals with fire ecology, mapping and modelling fire regimes, Aboriginal fire regimes, sensitivity of fire regimes to natural and management drivers including prescribed burning, and ongoing research from the Bushfire Cooperative Research Centre. I am also contributing a module on modelling net primary productivity and dynamics of the terrestrial carbon cycle in Landscape Ecology.

Our project on Optimal Solutions for the Sustainable Management of Bushfire Risk in the Bushfire CRC is making good progress. Group members include Dr Ross Bradstock (NSW Department of Environment and Conservation), Dr Rod Weber (ADFA/UNSW), Karen King (recently appointed BF CRC Postdoctoral Fellow) and Dr Malcolm Gill (Visiting Fellow, SRES). We have contributed to conferences in South Africa and the USA, have coordinated model research on the comparison of sensitivity of area burned in landscape-fire-succession models to alternate management actions (undertaken at the US National Centre for Ecological Analysis and Synthesis), and we hosted a visit by Dr Bob Keane from the USDA Forest Service's Missoula Fire Sciences Laboratory.

Precribed fire for fuel reduction in urban bushland

2003 also saw the publication of Australia Burning: Fire Ecology, Policy and Management Issues (Eds. Cary, G., Lindenmayer, D. & Dovers, S., CSIRO Publishing), a book based on the ANU Fire Forum held in February 2003. I also coordinated a one-day symposium on Landscape Fires and Global Change at the International Association of Landscape Ecology World Congress held in Darwin.

Selected Publications

Cary, G., Lindenmayer, D., Dovers, S. (Eds.) (2003) Australia Burning: Fire Ecology, Policy and Management Issues, 268 pages. CSIRO Publishing, Melbourne. (See also Chapters 8, 12, 36 & 38).

Keane, R.E., Cary, G.J. and Parsons, R. (2003) Using simulation to map fire regimes: An evaluation of approaches, strategies and limitations. *International Journal of Wildland Fire 12, 309-322.*

Cary, G.J. (2003) Sensitivity of fire regimes to climate change. Climate Impacts on Australia's Natural Resources: Current & Future Challenges (Standing Committee on Natural Resource Management), pp. 33-35.

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.).

Selected Student Theses

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

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

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

Nguyen, M. 2002. Effects of Fire on Hydrological Processes. (Honours Thesis).

Almeida, A. 2003. Application of a process-based model for predicting and explaining growth in Eucalyptus plantations. (PhD thesis, under examination).

King, K. 2003. Simulating the effects of anthropogenic burning on patterns of biodiversity. (PhD thesis, under examination).

Mr David Dumaresq

Convener, Human Ecology Program

Senior Lecturer
Human Ecology, Agroecology, Sustainable Systems, Transdisciplinary Studies

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Career Brief

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

Research, Teaching & Professional Activities

My research and teaching is based around three main areas.

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 farmer's ecological behaviour and its relationship to the development of regulatory frameworks for national and international sustainable 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.

Selected Publications

Dumaresq, D & Greene, R. 2001 Soil Structure, Fauna and Phosphorus in Sustainable Cropping Systems. *RIRDC* 01/130. 44p

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

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. & 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.

Mr Robert Dyball

Lecturer
Human Ecology, social learning and change, complex adaptive systems

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Career Brief

Robert grew up in London, England escaping to Australia in 1981. In Sydney he worked for the NSW Tourism Commission and completed first year Philosophy and Anthropology at the University of Sydney. In 1994 he transferred to Canberra and the ANU, majoring in Philosophy and Human Ecology and graduating with Honours in Human Ecology 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 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 materials stocks and flows analysis of Canberra and region - a joint project of the University of Canberra and the Nature and Society Forum.

Research, Teaching & Professional Activities

Current research is on the dynamics of change in human-ecological systems over the very long term, using the rise of the City of London as a case study. I am exploring the extent to which complex adaptive system models are useful aids to understanding patterns of change in such systems.

I am also editing and writing a book *Social Learning for Sustainability*: *Beyond Boundaries* with Meg Keen and Val Brown. This book explores the learning processes needed to accompany the complex social and biophysical changes integral to the transition to sustainability. Through the lens of social learning at the individual, group, community, society and planetary scales, the book draws on a wide range of disciplines and professions in a transdisciplinary approach to linking theory and practice.

Sustainable urban development: O'Connor wetlands

Dr John Field

Science Faculty Student Adviser, Resource and Environmental Management Program Convenor

Senior Lecturer
Earth Sciences, Farm Forestry, Soil Formation and Management, Regolith and Landscape Evolution, Sustainable Land Management

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Career Brief

I grew up in Sydney and was educated at Sydney Boys High, and then the UNSW where I studied pedology, geomorphology and geology, completing a 4 year concurrent Honours in Science in 1973. I moved to UNE at Armidale and wrote a PhD on the hydro-bio-geochemistry of small rural catchments. After 6 years' teaching in the Faculty of Natural Resources at UNE, I joined CRA (now RTZ) Exploration in Canberra as an in-house geomorphologist / consultant in their Research Group. In 1986, I joined the then ANU Forestry Department to teach soils to forestry and resource management students. I own and manage a grazing property on which I am practising what I preach by planting trees to demonstrate the integration and viability of agroforestry and farm forestry while maintaining successful cattle, sheep and goat enterprises. I continue to act as a consultant and advisor to the landcare, agricultural, forestry, mining and land development industries. I am also very interested in student services at ANU and advise students on degrees, courses and careers as student adviser to the School.

Research, Teaching & Professional Activities

Soils and landscapes, and any aspect of their formation, evolution and management is a fair summary of my research interests. In this context, I was a founding member of CARS (Centre for Australian Regolith Studies) and then CRC LEME Mk I and Mk II (Landscape Environment and Mineral Exploration) and continue to work with them in soils, regolith and landscape evolution research and applications.

My fundamental interest in agriculture and forestry is the critical relationship that exists between plants (trees) and soil - the ways in which soil controls the growth of plants, but also the effects that trees have on the formation and evolution of soils and regolith. Other biotic factors are also important to the formation and evolution of soils, regolith and landscapes and these are also the subjects of my research and that of the postgraduates I supervise.

I have a continuing interest in multipurpose and sustainable utilisation of trees in agricultural and forest land management, planning and development. To this end I lead a major RIRDC funded project on "The Management of Privately Owned Dry Sclerophyll Forests". I am also interested in the "intangible values" of privately owned forestry and farm forestry including environmental services, capital value of land and aesthetic values.

Courses I coordinate, or in which I teach, include: Global Change, Australian Soils and Vegetation, Agroecology and Soil Management, Regolith, Soil Resources, Land and Catchment Management and Farm Forestry. Each of these courses is also offered at the graduate level and some are offered in professional, short course and in web based format.

Selected Publications

Newham, L., Buller, C., Barnett, P. and Field, J.B. 2001. *Land-use change assessment tools*. Report to Environment ACT, Canberra

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.

Field, J.B. and G. R. Anderson, 2003. Biological Agents in Regolith Processes: Case study on the Southern Tablelands, NSW.CRC LEME Conference, Canberra, November

Field, J.B. 2004. Geomorphology and the Biota. ANZGG Conference, Mt Buffalo, Victoria, February.

Selected Student Theses

Walker, M.J. 2004. A Property Valuation Framework for the Southern Tablelands. Hons thesis, SRES, ANU, Canberra

King, C.A. 2002. Evaluating the tangible and intangible values of privately owned dry sclerophyll forest, Southern Tablelands, New South Wales. Hons thesis, SRES, 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.

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.

Dr Richard Greene

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Soil and Land Management

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Career Brief

Richard grew up in Perth, Western Australia, with an architect father, and was a keen member of the army reserve and swimmer at Perth's beaches during his university studies. 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 Lecturer in Soil and Land Management in the School of Resources, Environment and Society.

Research, Teaching & Professional Activities

Research and consulting experience includes:

Rehabilitation of degraded lands: as a Senior Research Scientist with the CSIRO Division of Sustainable Ecosystems, responsible for supervising investigations into methods of rehabilitating degraded rangelands, and later with the ANU involved with evaluation of rehabilitation techniques used to prevent erosion in alpine and sub-alpine areas.

Development of sustainable cropping enterprises: examples include: (i) potato production in high rainfall areas, (ii) cotton production under irrigation in semi-arid areas, and (iii) dryland cereal production under conventional and organic systems of agriculture.

Minesite rehabilitation: at Woodlawn mine co-supervision of research projects investigating (i) methods to stabilise the rock dump, and (ii) effects of acid mine drainage on bioreactors.

Research on aeolian dust implications: as a member of the Cooperative Research Centre for Landscape Environments and Mineral Exploration (CRCLEME), responsible for investigating how aeolian dust accessions can (i) be detrimental to mineral exploration by masking underlying ore deposits, and (ii) contribute to environmental problems of erosion and salinity.

Carbon sequestration: with other staff from the CRC for Greenhouse Accounting, supervising two PhD students researching the effects of land management on carbon sequestration.

Other Experience

- Consultancies with TRANSGRID on erosion evaluation and EMBRAPA (Brazilian federal research organisation) on management of hardsetting soils.
- Author of approximately 50 refereed publications in clay colloid chemistry, amelioration of soil structure, rehabilitation of degraded lands, and the development of sustainable cropping systems.
- Invited keynote speaker at international conferences on vegetation patterning, erosion processes and management of hardsetting soils.
- Currently federal president Australian Association of Natural Resource Management and member of the McKell Medal Committee for Landcare.
- Funding from competitive research grants from the NSCP, RIRDC, HRDC, ARC.

My current research supervision includes seven PhDs and three honours students. I also lecture in four undergraduate courses in soil/land/regolith management.

Selected Publications

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., 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.* (Eds. C. Valentin, D. Tongway, J. Seghieri and J.M. d'Herbes), Springer-Verlag. *Ecological Studies* 149. (pp. 52-76).

Greene, R.S.B., Gatehouse, R., Scott, K.M., and Chen, X.Y. (2001). Symposium report: 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 (CaCO3), gypsum (CaSO4.2H2O), 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.* (Ed. R.Lal). Marcel Dekker, Inc.

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.

Johnston, S.W. Greene, R.S.B., Banks, J.C.G., and Good, R.B. (2003) Function and sustainability of Australian alpine ecosystems: studies in the tall alpine herbfield community, Kosciuszko National Park, NSW, Australia. In *Ecological and Earth Sciences in Mountain Areas* (Eds L. Taylor, K. Martin, D. Hik, and A. Ryall). 226-234.

Mays, M.D., Nettleton, W.D., Greene, R.S.B., and Mason, J.A. (2003). Dispersibility of glacial loess in particle size analysis, USA. *Australian Journal of Soil Research*, 41, 229-244.

Mason, J.A., Jacobs, P.M., Greene, R.S.B., and Nettleton, W.D. (2003). Sedimentary aggregates in the Peoria loess of Nebraska, U.S.A. *Catena*, 53, 377-397.

Little, S.A., Hocking, P.J., and Greene, R.S.B. (2004). A preliminary study of the role of cover crops in improving soil fertility and yield for potato production. *Communications in Soil Science and Plant Nutrition.* 35, 471-494.

Greene, R.S.B., and Hairsine, P. (2004). Elementary processes of soil-water interaction and thresholds in soil surface dynamics: a review. *Earth Surface Processes and Landforms* Special Issue. 'Soil Surface Characteristics: dynamics and impact on soil erosion' (Eds Auzet A.-V., Poesen J., Valentin C) (In press).

Selected Student Theses

Tate, S.E. (2003). Characterisation of aeolian materials in the Girilambone Region, north-western Lachlan Foldbelt, NSW. (ANU honours thesis, unpublished).

Webb, J. (2003). The role of shrink-swell soils: an investigation of the Fowlers Gap patterned ground. (ANU honours thesis, unpublished).

Professor Neil Gunningham

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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 recent 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.

Selected Publications

Books:

Gunningham, N Kagan R and Thornton, D (2003). *Shades of Green*: *Business, Regulation and Environment*, Stanford University Press, USA.

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

Gunningham, N. and Johnstone, R. (1999). *Regulating Workplace Safety*: *Systems and Sanctions*, Oxford University Press, UK.

Gunningham, N. & Grabosky, P. (1998) *Smart Regulation*: *Designing Environmental Regulation*, Oxford University Press, UK.

Articles:

Gunningham, N. (2003) "Voluntary and Negotiated Agreements in Agriculture: Towards a Partnership Approach to Resource Management" *Australasian Journal of Natural Resources Law and Policy* vol 8. No 1, 1-28.

Gunningham, N. & Sinclair, D. (2002) "Partnerships, Management Systems and the Search for Innovative Regulation in the Vehicle Body Shop Industry" (2002) *Business Strategy and Environment*, 11, 236-253.

Gunningham, N. (2002) "Regulating Small and Medium Sized Enterprises" *Journal of Environmental Law*, Vol 14 (1), pp1-32,

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

Dr Ryde James

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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 & Professional Activities

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.

A newly established stand of *Eucalyptus globulus* in Western Australia. Since 1996 the proportion of new plantation forest which has been established in hardwoods has increased markedly.

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 Cris Brack and the late Dr John Banks. 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

Turner B and James R, 2002: 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.

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.

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 'mature' properties in plantation grown radiata pine in NZ. In Népveu, G. (Ed), *Connection between silviculture and wood quality through modelling approaches and simulation softwares*. Conference held under the auspices of IUFRO WP S5. 01-04, South Africa, August 1996.

Turner, B.J. and 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.

Mr Ken Johnson

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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 & Professional Activities

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

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

Selected Publications

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

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

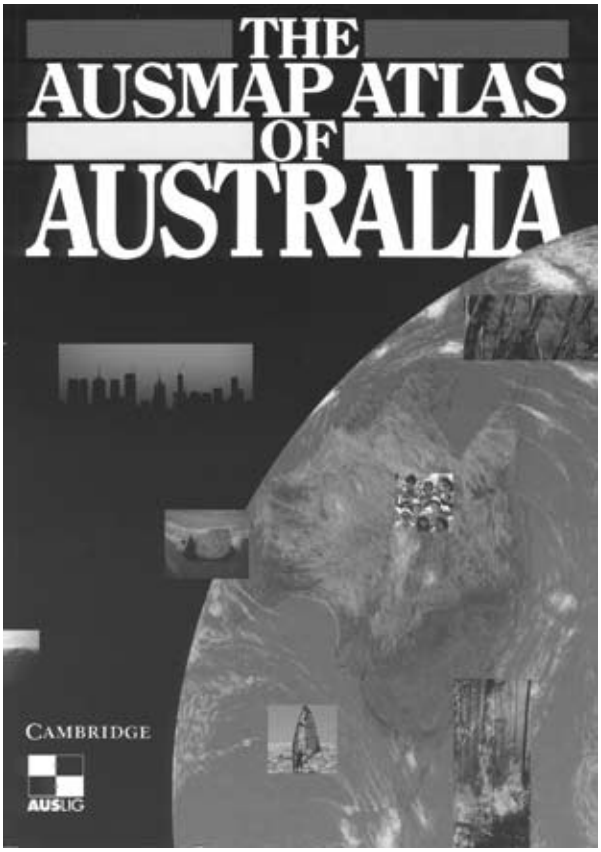
Johnson K.M. and H.C. Garnett. 1970. *The economics of containerisation*. Allen and Unwin, London

Selected Student Theses

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

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



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 helpful background for a forestry academic with administrative responsibilities. 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. He is also Convenor of ANU's National Institute for Environment.

Peter was a member of the panel conducting the Council of Australian Governments' National Inquiry into Bushfires in 2003/2004, and has been Interim Chair of the International Partnership for Forestry Education initiative since July 2003. He was a member of the Steering Committee for the ACT's post-bushfire Non-Urban Land Use Study in 2003, and has chaired or co-facilitated a number of community engagement processes about forest conservation and management, including the Southern Regional Forest Forum and the NSW Western Regional Assessment community fora.

Research, Teaching & Professional Activities

My research and teaching interests and activities cover both forest and environmental 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. I am also managing a major ACIAR-sponsored research project on hybrid eucalypts for marginal farmlands in Australia and South Africa, in collaboration with ANU's Dr Dominic Kain and colleagues from CSIRO, State Forests of NSW, South Africa's CSIR and the University of Stellenbosch. Other work has been conducted as commissioned studies for agencies such as the Australian Departments of Environment & Heritage and of Agriculture, Fisheries and Forestry, the International Institute for Environment and Development, and the World Bank.

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

Selected Publications

Burley, J and Kanowski, PJ. in press. Breeding strategies for temperate hardwoods. *Forestry* 78(2).

Kanowski, PJ and Borralho, NMG. 2004. Economic returns from tree breeding. In: J Burley (Ed). *Encyclopedia of Forest Sciences*. Elsevier.

Kanowski, PJ. 2003. Multiple values, partial use and restrained yield: where to from here for Australian forestry, 30 years on? In: J Dargavel (Ed). Win lose or draw: the fight for the forests. http://cres.anu.edu.au/fffweb

Kanowski, PJ. 2003. Challenges to enhancing the contributions of planted forests to sustainable forest management. Paper to UNFF Experts Meeting – *Planted Forests*. http://www.maf.govt.nz/mafnet/unff-planted-forestry-meeting/index.htm

Schirmer, J and PJ Kanowski. 2002. Changing ownership and management of State forest plantations: the Australian experience. Paper to DWAF/DfID/FAO/IIED Conference, *Changing ownership and management of state forest plantations*, Capetown, South Africa, 6-8 November 2002.

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

Kanowski, PJ., Sinclair, D. and Freeman, B. 2000. *Establishing comparability and equivalence amongst forest management certification schemes*. AFFA. 46 p.

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, PJ., 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, PJ. et al. 1999. International forest conservation: protected areas and beyond. Discussion Paper for IFF. Environment Australia. 52pp.

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

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

Kanowski, PJ. 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.

Dr Brian Lees

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Geomorphology

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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 subsequently took a first-class honours degree in geomorphology from the University of Sydney. From 1977 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 in 1985. 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, is on the editorial board of GEOINFORMATICA and has just completed a term on the editorial board of 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 & Professional Activities

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 work in adapting inductive and data driven modelling techniques to the predictive mapping of land cover and land degradation. My students and I 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. They have been very successful. My research activity continues to be the development and application of tools to carry out integrated analysis of global data. Recently, 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 I have made a number of significant conceptual advances in this, including developing the spatial analysis of spectral data. My teaching is intimately linked with this research.

Selected Publications

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 & J. Han (eds). Taylor & Francis, London. ISBN: 0415233690.

Lees, B.G. 2001. Embedding knowledge in data, Proc, *Geocomputation* 2001, Brisbane, CD. ISBN:1864995637.

Lees, B.G. 2001. Review: Advances in Remote Sensing and GIS analysis, *International Journal of Geographic Information Science*, v15; 197-199.

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

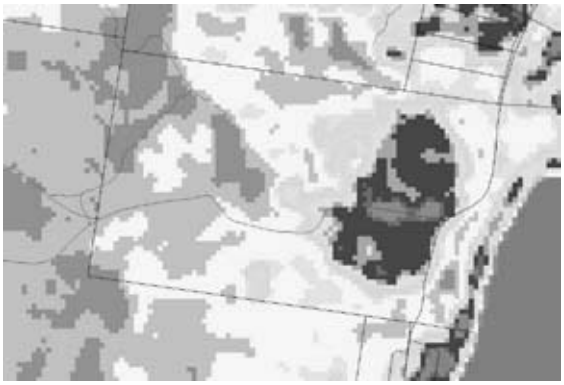
Selected Student Theses

Shawn Laffan BSc (hons)(ANU). 'Data-driven models for predicting mineral grade: Weipa.' (2001).

Simon Benger BSc(hons)(Newcastle),MSc(Toronto). 'Methane budgets for Australian wetland types.' (2001).

Diane Pearson BSc,MSc(Edinburgh). 'The analysis of biodiversity using GIS modelling.' (1998).

Kimberley Patrow van Neil BSc, MSc (Utah). 'Reconciling Geographical and Ecological Paradigms in modelling species distribution'. (2003).



Spatial analysis of remotely sensed data using a local G* statistic at ANU Fieldstation, Kioloa

Dr Janette Lindesay

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Career Brief

Janette grew up in Swaziland and South Africa, and 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. She was instrumental in developing and coordinating the multi-national, multi-disciplinary SAFARI-92 biomass burning research program in southern Africa in 1992.

Janette came to the ANU in 1993 to teach climatology in the Department of Geography. She was seconded to the Cooperative Research Centre for Greenhouse Accounting for the period 2001-2003, in the position of Education Manager. She has retained that administrative position on her return to SRES, where she is currently focusing on atmospheric science and climatology teaching and research.

Research, Teaching & Professional Activities

My principal research interests are in climatic variability during the period of instrumental record, characterising the nature and degree of variability and also investigating climate impacts. Much of my research has focussed on the El Niño Southern Oscillation phenomenon; I am currently studying low-frequency fluctuations in ENSO. I am also interested in applications of Global Climate Models in the study of climatic variation and its impacts.

My experience in multi-disciplinary biomass burning research in southern Africa and my interest in climate variability impacts have led to my current involvement in studying climatological aspects of bushfires in Australia. 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.

In my undergraduate courses in atmospheric science and climatology, and in my contributions to other undergraduate courses, 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. The importance of understanding atmospheric and climatic processes and incorporating that understanding in policy formulation and decision making in natural resource management is a theme in much of my teaching and research.

After coordinating the Geography Honours program for several years I am now SRES Honours Coordinator, and am also active in supervising postgraduate students. At postgraduate level I teach a Masters course on understanding climatic variability and change. In my role as Education Manager in the Cooperative Research Centre for Greenhouse Accounting I have developed and coordinated a number of professional short courses on aspects of carbon accounting.

I have contributed to the ACT Region State of the Environment reporting process for the last 10 years, and served for two years as President of the Canberra branch of the Australian Meteorological and Oceanographic Society. I am a member of three professional meteorological societies, and am on the editorial boards of two international atmospheric science journals.

Selected Publications

Lindesay, J.A. 2003. Climate and drought in Australia, in *Drought in Australia*: *People*, *Policy and Place*, Botterill, L.C. and Fisher, M. (eds), CSIRO Publishing, Melbourne.

Lindesay, J.A. 2003. Fire and climate in Australia, in *Australia Burning*: *Fire Ecology*, *Policy and Management Issues*, Cary, G., Lindenmeyer, D. and Dovers, S. (eds), CSIRO Publishing, Melbourne.

Allan, R.J., Reason, C.J., Lindesay, J.A. and Ansell, T.J. 2003. Protracted ENSO episodes and their impacts in the Indian Ocean region, *Deep-Sea Research II*, 50: 2331-2347.

Mackey, B.G., Lindenmayer, D.B., Gill, A.M., McCarthy, M.A. and Lindesay, J.A. 2002. *Wildlife*, *Fire and Future Climate*: *a Forest Ecosystem Analysis*, CSIRO Publishing, Melbourne, 196pp.

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.

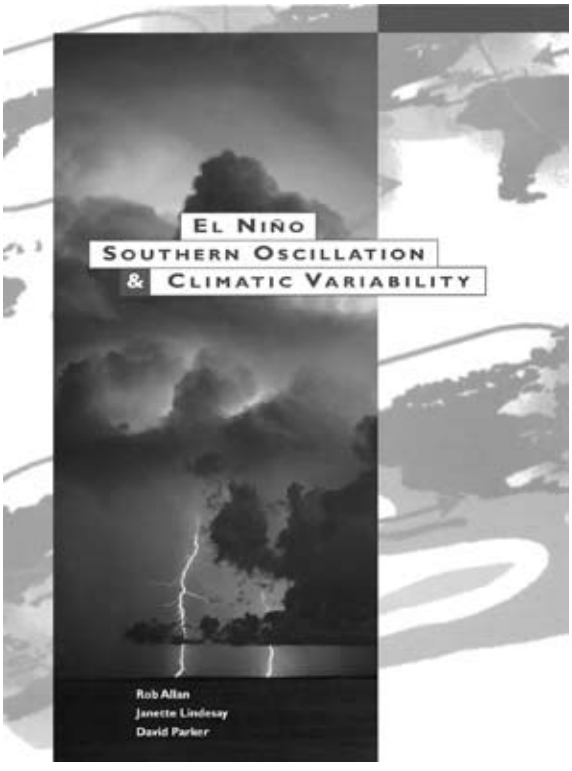
Hobbs, J.E., Lindesay, J.A. and Bridgman, H.A. (eds). 1998. *Climates of the Southern Continents*: *Present*, *Past and Future*, John Wiley and Sons, Chichester, 297 pp.

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 Niño Southern Oscillation and Climatic Variability*, CSIRO Publishing, Melbourne, 405pp.



Dr Brendan Mackey

Reader
Terrestrial Ecology, Biogeography, Landscape Ecology, Global Change Science

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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.

Research, Teaching & Professional Activities

My research is concerned with investigating the scientific basis of *Ecological Integrity*, particularly with respect to landscape-level processes. A major focus involves research into human impacts on the terrestrial carbon cycle and the implications for biomass production and the food chain. I have research interests in biodiversity conservation evaluation and planning inclusive of large (continental) scale processes. I also undertake research into the connections between ecology and sustainability. I am a member of the CRC for Greenhouse Accounting (www.greenhouse.crc.org.au). I am involved in a major collaborative research project called "Wild Country" aimed at identifying priorities for biodiversity conservation and planning on a landscape-wide basis. I currently serve as chair of the International Earth Charter Education Advisory Committee. I am a member of the IUCN (World Conservation Union) Environmental Law Commission and co-chair its Specialist Ethics Group. I teach the following undergraduate courses: Introduction to Global Change; Introduction to Greenhouse; Landscape Ecology.

Selected Publications

Mackey B.G. and Su W. (in press, 2004). Dynamic Landscape Models for Tropical Rainforests. In. *Tropical Rainforests: Past, Present, and Future*. Edited by Eldredge Bermingham, Christopher Dick, and Craig Moritz. The University of Chicago Press, Chicago.

Mackey B.G., Lindenmayer D.B., Gill A.M., McCarthy A.M. and Lindesay J.A. (2002). *Wildlife, fire and future climate: a forest ecosystem analysis*. CSIRO Publishing.

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

Mackey B.G. and Laffan S. (2002). Case studies in GIS and environmental modeling. Chapter 10 In. *Geographic Information Systems and Environmental Modeling*. Edited by Keith C. Clarke, Brad E. Parks and Michael P. Crane. Prentice Hall.

Selected Student Theses

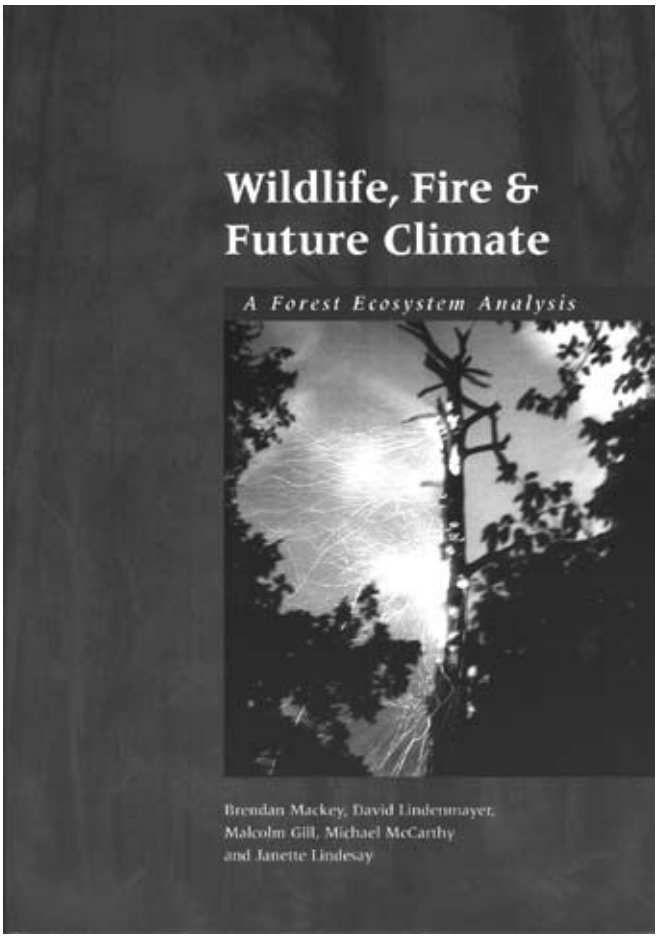
Panghas, Ninna. (2003). Ecological restoration of Philippine *Diptocarp* forest. (PhD thesis).

Nunan, Donna. 2001. Frogs and farm. (PhD thesis).

Payne, Karen. 1998. Genetic algorithms, remote sensing and vegetation modelling. (PhD thesis).

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

Nelder, John. 1996. Vegetation modelling in Cape York. (PhD thesis).



Dr Mahen S. Mahendrarajah

Senior Lecturer
Natural Resource and Environmental Economics, and Forestry Economics

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Career Brief

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

Research, Teaching & Professional Activities

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 both undergraduate and graduate courses in 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 reclamation of imperata infested lands in the Philippines, the impact of economic reform on deforestation in Vietnam, bioenergy potential of camphor laurel in New South Wales, firewood plantation in Nepal, and property rights in community forest management.

Selected Publications

Rasiah, V., Armour, J. D., Yamamoto, T., Mahendrarajah, S., and D. H. Heiner. 2003. Nitrate dynamics in shallow groundwater and the potential for transport to off-site water bodies. *Water, Air, and Soil Pollution* 147: 183-202

Wilman, E. and S. Mahendrarajah. 2002. Carbon Offsets. *Land Economics* 78(3): 405-416.

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

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

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

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

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

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

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

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

Natural resources and rural poor

Dr Chris Tidemann

Senior Lecturer
Wildlife Ecology and Conservation, Conservation through Sustainable Use, Management of Feral Species, Animal Welfare, Community Engagement

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Career Brief

Chris graduated from Adelaide University with a BSc in 1969 and a Diploma of Education in 1970 and from ANU with a PhD in Zoology in 1987. From 1971-1986 Chris was curator of the Zoology Museum at ANU and he has been on the academic staff of the School since 1987.

Research, Teaching & Professional Activities

Chris has pursued a lifelong interest in wildlife biology and management in Indonesia, Papua New Guinea and many parts of Australia. His research in these areas has involved collaboration with rural communities; his most recent work has involved assisting communities and local governments to manage wildlife in urban areas. Chris teaches undergraduates and graduates in wildlife monitoring, conservation and management. Chris was a member of the ACT Flora and Fauna Committee from 1999-February 2004 and is a member of three of the World Conservation Union's Specialist Groups: Bats; Sustainable Use of Wildlife; Invasive Species.

Selected Publications

Tidemann, C.R. and Nelson, J.E. (2004) Long-distance movements of the grey-headed flying-fox (*Pteropus poliocephalus*). Journal of Zoology (London) 263: 1-6.

Tidemann, C. R. (2002). Sustainable management of the Grey-headed Flying-fox, *Pteropus poliocephalus*. Pp 122-127 In: Managing the Grey-headed Flying-fox as a Threatened Species in New South Wales. P. Eby and D. Lunney (eds). Royal Zoological Society of New South Wales: Mosman.

Tidemann, C. R., Vardon, M.J., Loughland, R.A. and Brocklehurst, P.J. (1999). Dry season camps of flying-foxes (*Pteropus* spp.) in Kakadu World Heritage Area, north Australia. Journal of Zoology 247, 155-163.

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

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.

Tidemann, C. R. (1993). Reproduction in the bats *Vespadelus vulturnus*, *V. regulus* and *V. darlingtoni* (Microchiroptera: Vespertilionidae) in coastal south-eastern Australia. Australian Journal of Zoology 41: 21-35.

Tidemann, C.R., Kitchener, D.J., Zann, R,B. and Thornton, I.W.B. (1990). Recolonisation of the Krakatau Islands and adjacent areas of West Java, Indonesia, by bats (Chiroptera) 1883-1986. Philosophical Transactions of the Royal Society of London B 328: 123-130.

Scheich, H., Langner, G., Tidemann, C., Coles, R. and Guppy, A. (1986). Electroreception and electrolocation in the platypus. Nature 319: 401-402.

http://sres.anu.edu.au/associated/myna

Dr Peter van Diermen

Geographical Sciences Graduate Program Convenor

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Development Studies, Economic Geography, Small Business Policy

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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, Teaching & Professional Activities

My research is in the field of economic geography and 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. Recently (2002) I helped re-write Sri Lanka's and Cambodia's national policy for SMEs and in 2003 undertook an extensive review of all ADB's SME policies since 1990.

Selected Publications

Overton, J. and van Diermen, P. 2003. Using Quantitative Techniques, in Regina Scheyvens and Donovan Storey (eds.), Development Fieldwork: A Practical Guide, London: Sage Publications. ISBN 0761948902.

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.

Mr Alexander (Sandy) Gilmore

Research Fellow
The incorporation of ecosystem ecology into community ecology, landscape ecology, evolutionary ecology and land use and management

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Career Brief

Sandy grew up in Victoria with a mix of rural, country town and city addresses. He had a life-long interest in wildlife that translated into a degree in zoology in particular ecology at Monash, which continued as an ongoing professional interest in animals and plants and aspects of the physical environment. Sandy worked at the Museum of Victoria, Conservation Forests and Lands Victoria in wildlife inventory roles, NSW Nat. Parks and Wildlife Service in a scientific input to management role, developed a rainforest nursery, a tropical fruit farm in the Northern Rivers and was in the vanguard of environmental consultants, before returning to do a Ph.D. to synthesize the insights he had developed over the years on the mechanisms structuring trophic assemblages of species (guilds).

Research, Teaching & Professional Activities

I am investigating processes related to the distribution of individual plants and animals in particular co-existing species and the consequences of their spatial and temporal patterns for the structure and evolution of communities and ecosystem functions. The application of this research to the maintenance of ecosystem functions integrated communities and their evolutionary potential as they relate to sustainable land use and management.

I encourage students to sensitively perceive natural patterns and infer the processes leading to those patterns and thereby gain the capacity to get direct inspiration from nature about What is important in ecological research? and How to best implement such research? unfettered by cultural, ideological, commercial and disciplinary agendas.

Selected Publications

Gilmore AM (1999) Fauna and Rainforest Fragmentation - Developing Improved Conservation Planning pp. 29-66 In Horton, S. (Ed.) Rainforest Remnants - A Decade of Growth. NSW Nat. Parks & Wildl. Serv., Lismore.

Gilmore AM and Parnaby HE (1994) Vertebrate Fauna of Conservation Concern in north-east NSW forests. North East Forests Biodiversity Study Report No. 3e, NSW National Parks and Wildlife Service

Gilmore AM, Meggs RA and Nelson JL (1991) A Bibliography for Research, Development and Management of Forest Vertebrates. Silvicultural Systems Project Technical Report No. 7. Dept. of Conservation and Environment, Victoria

Gilmore AM (1990) Plantation Forestry: Conservation Impacts on Terrestrial Vertebrate Fauna pp 377-388 In Dargavel, J. and Semple, N. (Eds.) Prospects for Australian Plantations. Centre for Resources and Environmental Studies, Australian National University.

Gilmore AM (1985) The influence of vegetation structure on the density of co-existing insectivorous birds pp 21-31 In Keast, A.J., Recher, H.G., Ford, H. and Saunders, D. (Eds.) Birds of Eucalyptus Forests and Woodlands; Ecology, Conservation and Management. Surrey Beatty & Sons and RAOU, Sydney

Dr Roger Heady

School Research Associate
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. Roger 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, he 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.

Research, Teaching & Professional Activities

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 conducted the Forest Products (FSTY 3016) practical classes in wood identification. I am currently involved in writing a paper on the wood anatomy of the Western Australian conifer *Actinostrobus*.

Selected Publications

Heady, R.D., J.G. Banks and P.D. Evans. 2002. Wood Anatomy of Wollemi Pine (*Wollemia nobilis*, Araucariaceae). *IAWA Journal* 23(4): 339-357.

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

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

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

Dr Dominic Kain

Postdoctoral Fellow
Forest Genetics and Tree Breeding

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Career Brief

Dominic completed a forestry degree with honours at the Australian National University in 1997. His honours research investigated the quantitative genetics of wood characteristics, and early selection, in *Pinus radiata*. His PhD research, at ANU and North Carolina State University, USA, examined the genetics and breeding strategy of wood and growth traits in the *Pinus elliottii* x *Pinus caribaea* hybrid, in collaboration with the Queensland Forestry Research Institute. Dominic completed his PhD in early 2003, and currently was a Geneticist with the CRC for Sustainable Production Forestry in Hobart, based at the ANU. He is now a Postdoctoral fellow supported by the Australian Council for International Agriculture Research.

Research, Teaching & Professional Activities

My primary responsibility as CRC Geneticist is to produce research papers for publication, sourced from my PhD and current research. My current research involves mathematical modelling of the genetic causes of inter-species forest tree hybrid performance, in collaboration with staff from the ANU Supercomputer Facility.

In October 2003, I began a 2.25-year collaborative project involving ANU, the CSIRO and its South African equivalent, the CSIR. This project is funded by the Australian Centre for International Agricultural Research (ACIAR), and aims to develop high performance eucalypts and eucalypt hybrids for marginal lands in south and eastern South Africa and south-eastern Australia. Eucalypt hybrids, for example *E.grandis* x *E. camaldulensis*, often outperform both parental species in environments intermediate between those typical of the parents. My role in the project is to analyse data from eucalypt hybrid trials in South Africa – possibly the most extensive set of eucalypt hybrid trials in the world – to develop knowledge of the genetic mechanisms underlying hybrid performance. This knowledge will be used to develop efficient breeding strategies for future improvement of existing hybrids, and of novel hybrids generated by CSIRO and CSIR in another component of the same project. During this project I will have the opportunity to apply some of the analytical methods developed during my PhD research.

Dominic has made teaching contributions to forest genetics courses at the ANU and in South Africa, and attends and presents at conferences in the fields of quantitative genetics, wood quality improvement and hybrid breeding.

Selected Publications

Kain, D.P. (2003). Genetic parameters and improvement strategies for the *Pinus elliottii* var. *elliottii* × *Pinus caribaea* var. *hondurensis* hybrid in Queensland, Australia. PhD thesis, Australian National University, 460p.

Shepherd, M., Cross, M., Dieters, M.J., Harding, K., Kain, D. and Henry, R. (2003). Genetic architecture of physical wood properties in a tropical pine hybrid from QTL analysis. Canadian Journal of Forest Research (in press.)

Kain, D.P., Dieters, M.J. and Li, B. (2004). Genetic parameters and breeding strategy for wood and growth traits in slash × Caribbean pine F1 hybrids. Silvae Genetica (submitted).

Kain, D., Dieters, M.J. and Harding, K.J. (2004). Early selection and rapid field screening for wood density and spiral grain in subtropical pines. Canadian Journal of Forest Research (submitted).

Ms Karen King

Postdoctoral Fellow
Fire ecology, landscape simulation modelling

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Career Brief

In 1991 Karen graduated with a Bachelor of Applied Science in Medical Laboratory Science from the University of Canberra. She worked as a Technical Officer with the Developmental Physiology Group at the John Curtin School of Medical Research, ANU from 1991-2000. Karen graduated with a Graduate Diploma in Resource and Environmental Science at the ANU in 2000. In February, 2004, she completed a PhD at the ANU titled '*Simulating the effects of anthropogenic burning on patterns of* biodiversity'.

Research, Teaching & Professional Activities

I commenced a Postdoctoral Fellow position with the Bushfire CRC Research Group B1.2 in February 2004. This work involves using computer simulation modelling to investigate the parameters contributing to the 'risk' of bushfires in a diversity of Australian ecosystems containing a range of human and biodiversity assets. The sensitivity of these parameters to a variety of management strategies will be explored, and principles pertaining to each simulated ecosystem will be identified.

Dr Wendy Merritt

Postdoctoral Fellow
Environmental modelling, forest inventory, water resources

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Career Brief

After completing a Bachelor of Science degree in Natural Resource Management at the University of Western Australia, Wendy Merritt undertook her PhD at the Centre for Resource and Environmental Studies at the Australian National University. Wendy's thesis involved the development and testing of biophysical models for assessing land and water resource management options in rural catchments in northern Thailand. On completing her PhD, she worked for 13 months as a Post Doctoral Fellow at the Department of Forest Resource Management at the University of British Columbia in Vancouver, before travelling around Canada for approximately three months. Research conducted at UBC involved the development of hydrologic models of the Okanagan Basin, a major horticultural and agricultural centre in British Columbia, and application of the models under scenarios of climate change. Wendy has been employed as a Post Doctoral Fellow at SRES since October 2003.

Research, Teaching & Professional Activities

My research interests are in the broad field of resource assessment and modelling, particularly water and forest resources. Currently, I am working on a project funded by the Department of Sustainability and Environment (DSE) in Victoria. The objectives of the research are to review the State-wide Forest Resource Inventory (SFRI) implemented by DSE and to develop approaches for estimating the extent of inaccuracies in the SFRI resource estimates and gauging the sensitivity of scheduled

yields to these inaccuracies. I am also the principal investigator on a consultancy for Environment Canada. This work involves estimating some of the uncertainties associated with climate change impact assessments, focussing on the sensitivity of a hydrology model to changes in climate inputs.

Selected Publications

Cohen, S., and Neale, T. [Eds.] 2003. *Expanding the dialog on climate change and water management in the Okanagan Basin, British Columbia*. Interim Report, Environment Canada and University of British Columbia, 150 pp.

Cohen, S., Neilsen, D., Smith, S., Neale, T., Taylor, B., Barton, M. Merritt, W.S., Alila, Y., Shepherd, P., McNeill, R., Tansey, J., and Carmichael, J. Learning with local help: expanding the dialogue on climate change and water management in the Okanagan region, British Columbia, Canada. *Climatic Change*, (submitted)

Croke, B.F.W., Merritt, W.S., Brack, C., and Jakeman, A.J. 2003. Forests, catchment hydrology and catchment management. Workshop on '*Modelling Forests from Leaves to* Landscapes', University of Melbourne, Australia, December 1-3.

Croke, B.F.W., Merritt, W.S., and Jakeman, A.J. A dynamic model for predicting hydrologic response to land cover changes in gauged and ungauged catchments. *Journal of Hydrology*, (in press).

Letcher, R. A., Jakeman, A. J., McKee, L. J., Merritt, W.S., Eyre, B. D., and Baginska, B. 1999. *Review of techniques to estimate catchment exports*. Technical Report, NSW EPA.

Letcher, R.A., Croke, B.F.W., Jakeman, A.J., Merritt, W.S., and Perez, P. 2002 IWRAM: an integrated modeling toolbox for considering impacts of development. *Proceedings International Environmental Modelling and Simulation Society* (*iEMSs*) *Conference*, Lugano Switzerland 24-27 June 2002, vol 1, pp. 97-102.

Merritt, W.S., Croke, B.F.W., and Jakeman, A.J. 2001. *Tools for assessing the nutrient and sediment components of water quality: a review*. Prepared for the Sydney Catchment Authority, July 2001.

Merritt, W.S., Letcher, R.A., and Jakeman, A.J. 2003. A review of erosion and sediment transport models. *Environmental Modelling and Software*, 18: 761-799.

Merritt, W.S., Alila, Y., Barton, M., Taylor, B., and Cohen, S. 2003. Exploring impacts of climate change on the hydrology of the Okanagan Basin. *Proceedings of the 56th Canadian Water Resources Association Annual Conference*, 11-13 June, Vancouver, Canada.

Merritt, W.S., Croke, B.F.W., Jakeman, A.J., Perez, P., and Letcher, R.A. 2004. A biophysical toolkit for assessment and management of land and water resources in rural catchments in northern Thailand. *Ecological Modelling*, 171: 279-300.

Merritt, W.S., Croke, B.F.W., and Jakeman, A.J. Sensitivity Testing of a Model for Exploring Water Resources Utilisation and Management Options, *Environmental Modelling and Software* (accepted).

Perez, P., Ardlie, N., Kuneepong, P., Dietrich, C., and Merritt, W.S. 2002. CATCHCROP: Modelling crop yield and water demand for an Integrated Catchment Assessment in northern Thailand. *Environmental Modelling and Software*, 17: 251-259.

Schreider, S.Yu., Jakeman, A.J., Gallant, J., and Merritt, W.S. 2002. Prediction of monthly discharge in ungauged catchments under agricultural land use in the Upper Ping Basin, Northern Thailand. *Mathematics and Computers in Simulation*, 59: 19-33.

Dr Digby Race

Lecturer and Research Fellow
Community and Farm forestry

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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 Australian Centre for International Agricultural Research (ACIAR), Department of Agriculture, Fisheries and Forestry (DAFF), 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 authored/co-authored over 60 publications (including research reports, journal articles and conference papers), on various aspects of community forestry, farm forestry and environmental management. He also contributes to course development, post-graduate teaching, and supervision of post-graduate research at SRES.

Research, Teaching & Professional Activities

My 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 Prof Peter Kanowski, as part of the 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 Ms Jacki Schirmer and guest lecturers.

Some of my recent research and consulting projects have included:

Project Manager – '*Monitoring and Evaluation of Farm Forestry Support*', conducted with Dr Martin Andrew, URS Corporation, Feb.2000-Mar.2003. Commissioned by Greening Australia Ltd. and AFFA;

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;

Consultant – '*Evaluation of Bushcare Support*', conducted with Dr Jenny Andrew, RPM Pty. Ltd. and Dr Anna Carr, Mar.-Jun.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;

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

Race, D. and Freudenberger, D. (2003) Farm Forestry for Green and Gold: Australian experiences of linking biodiversity to commercial forestry. SRES, CSIRO and CRC for Sustainable Production Forestry: pp. 83.

Race, D., Pagan, R. and Deane, P. (2003) Community Forestry: A complex task that needs a cautious path. In: Euan G. Mason and Chris J. Perley (eds.) Proceedings of the Joint Australia and New Zealand Institute of Forestry Conference. Queenstown, New Zealand: 27 April – 1 May, 2003. 178-187.

Race, D. (2002) Has extension changed to match Australia's dynamic forestry landscape? Rural Society, 12 (2): 148-159.

Race, D. (2002) Forestry extension: Ideas for a learning and growing sector. Australian Forest Grower, 24 (summer): 1-6.

Race, D. and Desmond, H. (2002) Forestry out-grower schemes: A review from selected countries. Journal of Sustainable Forestry, 15 (4): 79-98.

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.

Selected Student Theses

Petheram, L. (2003) What is a Good Forest? Ex-forest worker perspectives from the Wombat State Forest. Honours thesis (1st Class). School of Resources, Environment and Society, ANU.

Jayatilake, H.W.K. (2004) Tea smallholders in Sri Lanka: Finding a balance between livelihood needs and forest conservation. Major Research Essay – Master of Forestry. School of Resources, Environment and Society, ANU.

Mr Darren Sinclair

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Career Brief

Darren completed a Bachelor of Science (Hons) at the University of Sydney in 1990, majoring in biochemistry. He then worked for the then Commonwealth Department of Industry, Science and Technology for six years. During that time he had responsibility for developing environmental policy from an industry perspective, including the creation of a national scheme to phase out the use of ozone depleting gases in industry, and representing Australia at international climate change negotiations (pre-Kyoto). In particular, he was involved in the development of the policy of 'joint implementation', the precursor to an international carbon-trading scheme. In 1995 and 1996 Darren completed a Masters of Environmental Law at The Australian National University, and subsequently took up a position as Senior Research Associate at the Australian Centre for Environmental Law, in the Faculty of Law at the Australian National University. In that capacity, he worked on a number of environmental regulation and policy research projects, and was a consultant to several government agencies and industry associations. He has been a Senior Research Associate at SRES since mid 2003.

Research, Teaching & Professional Activities

I am currently involved in two Australian Research Council funded research projects, the first, looking at policy and regulatory options for reducing point source and non-point source water pollution in the Swan-Canning River catchment (in conjunction with the Western Australian Department of Environment and Water Corporation, and the second, investigating safety, health and environmental regulation in the mining sector (in conjunction with the National Occupational Health and Safety Commission).

Selected Publications

Books, reports and chapters:

Gunningham, N. and Sinclair, D. (2002) Leaders and Laggards: Next Generation Environmental Regulation, Greenleaf, UK.

Gunningham, N and Sinclair, D. (2002) Environmental Partnerships: Combining Sustainability and Commercial Advantage in the Agricultural Sector, Rural Industries Research Development Corporation, Canberra

Kanowski, P., Sinclair, D. and Freeman, B. (2000) Establishing Comparability and Equivalence amongst Forest Management Certification Schemes, Agriculture, Fisheries and Forestry – Australia, Canberra.

Kanowski, P., Sinclair, D. and Freeman, B. (1999) International Approaches to Forest Management Certification and Labelling of Forest Products: A Review, Agriculture, Fisheries and Forestry – Australia, Canberra.

Gunningham, N. and Sinclair, D. (1999) Chapter 10 in Hutter, B. (ed) *A Reader in Environmental Law*, Oxford University Press, UK.

Gunningham, N. and Sinclair, D. (1998) Chapters 2, 3 (with Grabosky, P.) and 6 in Gunningham, N. and Grabosky, P. Smart Regulation: Designing Environmental Regulation, Oxford University Press, UK.

Gunningham, N., Sinclair, D. and Burritt, P. (1998) On-the-spot Fines and the Prevention of Injury and Disease: The Experience in Australian Workplaces, National Occupational Health and Safety Commission, Canberra.

Gunningham, N and Sinclair, D. (1997) Barriers and Motivators to the Adoption of Cleaner Production Practices, Environment Australia, Canberra

Articles:

Gunningham, N. and Sinclair, D. (forthcoming 2004) "Curbing non-point pollution: Lessons for the Swan-Canning" Environmental and Planning Law Journal.

Gunningham, N. and Sinclair, D. (2004) "Non-point pollution, voluntarism and policy failure: Lessons for the Swan-Canning" Environmental and Planning Law Journal, Vol 21, No 2.

Gunningham, N. and Sinclair, D. (2002) "Partnerships, Management Systems and the Search for Innovative Regulation in the Vehicle Body Shop Industry" Business Strategy and Environment, Vol 11.

Gunningham, N. and Sinclair, D. (1999) "Integrative Regulation: A Principle-Based Approach to Environmental Policy" Law and Social Inquiry, Vol 24, No 4.

Gunningham, N. and Sinclair, D. (1999) "Regulatory Pluralism: Designing Environmental Policy Mixes" Law & Policy, Vol 21, No 1.

Gunningham, N. and Sinclair, D. (1999) "Next Generation Environmental Policy" Melbourne University Law Review, Vol 22, No 3.

Sinclair, D. (1997) "Self-regulation Versus Command and Control? Beyond False Dichotomies" Law & Policy, Vol 19, no 4.

Professor Jürgen Bauhus

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Silviculture, forest dynamics, nutrient cycling

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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, dynamics of mixed-species stands, structural diversity and coarse woody debris. 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 a member of the Cooperative Research Centre for Greenhouse Accounting, and member of the editorial board of Australian Forestry. In mid 2003 Jürgen took up a professorship and the Chair of Silviculture at Freiburg University, Germany.

Research, Teaching & Professional Activities

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. 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 mono-specific 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.

Selected Publications

Mackensen , J. and Bauhus, J. 2003. Decay of coarse woody debris of *Pinus radiata*, Eucalyptus regnans and Eucalyptus maculata in south-eastern Australia: Comparing density loss with respiration rates. *Soil Biology and Biochemistry* 35, 177-186

Forrester, D., Bauhus, J. and Connell, M. 2003. Competition in thinned Silvertop Ash (Eucalyptus sieberi L. Johnson) stands from early coppice growth. *Forest Ecology and Management* 174, 459-475

Mackensen, J., Bauhus, J. and Webber, E. 2003. Decomposition rates of coarse woody debris - A review with particular emphasis on Australian tree species. *Australian Journal of Botany* 51, 27-37

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* 171, 57-72.

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, 451-456.

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.

Ludwig B., Khanna P.K., Bauhus J. and Hopmans P. 2002. Near infrared spectroscopy of forest soils to determine chemical and biological properties related to soil sustainability. *Forest Ecology and Management* 171, 121-132.

Campbell, J. J., Messier, C. and Bauhus, J. 2002. Does soil heterogeneity and compaction in ingrowth-cores affect growth and morphology of black spruce fine-roots? *Communications in Soil Science and Plant Analysis* 33, 1027-1037.

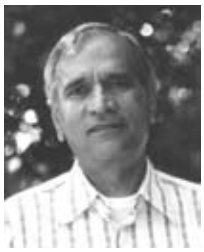
Bauhus, J., Aubin, I., Messier C. and Connell, M. 2001. Composition, structure, light attenuation and nutrient content of understorey vegetation in a Silvertop Ash (*Eucalyptus sieberi*) regrowth stands 6 years after thinning and fertilisation. *Forest Ecology* & *Management* 144, 275-286.

Selected Student Theses

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 U.N. Bhati



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Career Brief

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

About fifteen 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, Teaching & Professional Activities

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 primarily for small-scale growers.

By March 2004, twenty-seven market reports have been completed. They covered topics such as: Australia's competitors in the Japanese woodchip import market; market for forest products in India; stumpage trends in Western Australia; cabinet timbers; exports of Australian forest products; trends in log prices in Tasmania; stumpage prices over the next 10, 20, 30... years; 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 websites have published these reports. They are available on the ANU Forestry website: http://sres.anu.edu.au/associated/marketreport/index.html.

Selected Publications

Bhati, U.N. Market report for Australia's small-scale cabinet timber growers. In Suh, J., Smorfitt, D.B., Harrison, S.R. and Herbohn, J.L., Eds. (2004) *Marketing of Farm-grown Timber in Tropical North Queensland*, Cooperative Research Centre for Tropical Rainforest Ecology and Management, Cairns.

Bhati, U.N., Kanowski, P. and Ragg, W. 2002. ANU Forestry Market Report Project: Looking to the Future. In Wettenhall, D. (ed.), *Private Forestry – Sustainable, Accountable and Profitable*, Proceedings of Australian Forest Growers 2002 National Conference, 13–16 October 2002, Albany, Western Australia, stream session paper number 271.

Bhati, U.N. 2001. The ANU Market Report Project. In Herbohn, J., Harrison, S., Herbohn, K. and Smorfitt, D. (eds) *Developing Policies to Encourage Small-Scale Forestry*, IUFRO Research Group, Proceedings from International Symposium, Kuranda, Australia, 9–13 January 2000, pp. 27–29.

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. *Pakistan: Economic Profiles in South Asia*, Australia South Asia Research Centre, Research School of Pacific and Asian Studies, Australian National University, Canberra, March.

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 J. Whitham. 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.

Dr Janis Birkeland

Visiting Fellow
Sustainable systems, ecological design, construction and urban planning

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Career Brief

Dr Birkeland qualified and practiced as an artist (BA Bennington, 1966), architect (MA University of California, Berkeley, 1972), lawyer (JD University of California, Hastings, 1979), and city and regional planner (PhD University of Tasmania, 1993). She worked consecutively as an advocacy planner, architect, urban designer, city planner and attorney in San Francisco (1969–80). In 1981 she moved to Tasmania, joined the Green movement, raised children and did her PhD in environmental planning, management and governance. She taught architecture in Tasmania and then at the University of Canberra (1992 –2000), where she later started a suite of postgraduate courses in sustainable systems. She also served as senior environmental education officer for Environment Australia. In 2002, she published *Design for Sustainability: a Sourcebook of Integrated Eco-logical Solutions*. She is a director of the Sustainability Science Team, a Canberra-based consultancy.

Research, Teaching & Professional Activities

Visiting Fellow in SRES, where she is developing postgraduate and professional development courses in sustainable systems.

Selected Publications

Birkeland J 2002, Design for Sustainability; a sourcebook of eco-logical solutions, (Earthscan UK).

Birkeland J. and J. Schooneveldt 2003, Mapping Regional Metabolism: A Decision-Support Tool for Natural Resource Management, Land and Water Australia (first published as a report in 2002) Canberra, Act.

Birkeland J. and J. Schooneveldt 2002, ACT Sustainability Audit: A material Flows Analysis of the Residential Sector of Canberra, ACT Planning and Land Management Authority, Canberra.

Dr Ross Bradstock

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Fire science and management, plant ecology

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Career Brief

Ross graduated with a B.Sc.(Hons) and PhD from the University of Sydney. He has worked as a research scientist with the NSW National Parks and Wildlife Service (currently NSW DEC) for over 20 years.

Research, Teaching & Professional Activities

Ross is on the Editorial Advisory Committee for the Australian Journal of Botany and the International Journal of Wildland Fire. He has given lectures on fire science and plant ecology at the University of Wollongong, ANU, University of Western Sydney, University of New South Wales and Macquarie University. In 2004, Ross was a visiting course convenor for SRES3008 *Fire in the Australian Environment* with Dr Geoff Cary.

Ross is leader of the Bushfire CRC Project B.1.2. that includes Dr Geoff Cary, Dr Rod Weber (ADFA), Dr Malcolm Gill and Karen King, and is based in SRES. The project will develop optimal solutions for the sustainable management of bushfire risk in a range of ecosystems. Ross' other research interests include plant species and community dynamics in mesic and semi-arid shrublands; investigation of heat related germination cues in seeds of a broad range of species; soil heating patterns in relation to fire and fuel characteristics; spatial modelling of risk of extinction of plant and animal populations; spatial modelling of bushfire risks posed to human assets; modelling of the sensitivity of fire interval and intensity in relation to ignition rates and weather; and the use of remote sensing to measure and model fire severity patterns.

Selected Publications

Bradstock, R.A. (2003). Protection of people and property: towards an integrated risk management model. In *Australia Burning: Fire Ecology, policy and Management Issues* (eds. G. Cary, D. Lindenmayer and S. Dovers) pp. 119-123, CSIRO Publishing, Melbourne.

Bradstock, R.A. and Kenny, B.J. (2003). Application of plant functional traits to fire management in a conservation reserve in south-eastern Australia. *Journal of Vegetation Science* 14, 345-354.

Bradstock, R.A. and Cohn, J.S. (2002). Demographic characteristics of mallee pine (*Callitris verrucosa*) in fire-prone mallee communities of central New South Wales. *Australian Journal of Botany* 50, 653-665.

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, Cambridge

Bradstock, R.A. and Cohn, J.S. (2002) Fire regimes and biodiversity in semi-arid mallee ecosysgtems. In *Flammable Australia*: *The Fire Regimes and Biodiversity of a Continent*, (Eds. R.A. Bradstock, J.E. Williams and A.M. Gill). pp. 238-258. Cambridge University Press, Cambridge.

Bradstock, R.A. and Cary G. (2001). What governs fire regimes? In "*Bushfire 2001*" pp. 182-189. Proceedings of the Australasian Bushfire Conference, July 2001, Christchurch NZ.

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 insouthern Australia. *Journal of Mediterranean Ecology* 2: 179-195.

Selected Student Theses

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

King, K. 2003. Simulating the effects of anthropogenic burning on patterns of biodiversity. (PhD thesis, under examination).

Emeritus Professor Valerie A. Brown

Visiting Fellow, SRES and CRES (jointly)
Local sustainability, sustainability decision-making, sustainability indicators, sustainability and health

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Career Brief

Val Brown holds an undergraduate degree in Ecology from Queensland University, a Graduate Diploma in Adult Learning from the University of Canberra, a Master of Education Degree in Integrative Studies from Endicott College, USA and the inaugural PhD in ANU's Human Sciences Program, thesis topic "Holism in the University Curriculum". During 1979-84 she helped established the B.App.Sc.(Health Education) now B.Ed (Community Development) at the University of Canberra. From1984-89 she established and directed 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, including the National Local Government Environmental Research Network at CRES 1989-95. She has introduced teaching programs linking Environment and Health to the Tribhuvan University, Nepal, and the University of Western Sydney. Foundation Professor of Environmental Health at the University of Western Sydney 1996-2002, she is now Emeritus Professor from that University and Visiting Fellow and Director, Local Sustainability Project, at the School of Resources, Environment and Society, Australian National University. In 1999 she was appointed an Officer of the Order of Australia for international and national contributions to public health and environmental health, and advocacy for and contributions to, sustainable development.

Research, Teaching & Professional Activities

My research applies integrative methods to exploring the construction of knowledge in generating locally sustainable responses to global social and environmental pressures. Past research programs have addressed the capacity for achieving integrative decision-making in the Local Government sector, the community sector, public health, and the environmental sciences, respectively. My 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.

Selected Publications

Brown, Valerie A. Thinking globally and acting locally: Environmental health practice and climate change. *Environmental Health* 4. 1 2002, p5-13

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. Planners and the Planet: Reshaping the people/planet relationship: do planners have a role? *Australian Planner* 38 3 2001 67- 73

Brown, Valerie A Monitoring Changing Environments in Environmental Health in *Environmental Health*, 1.1 2001, p21-34

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.

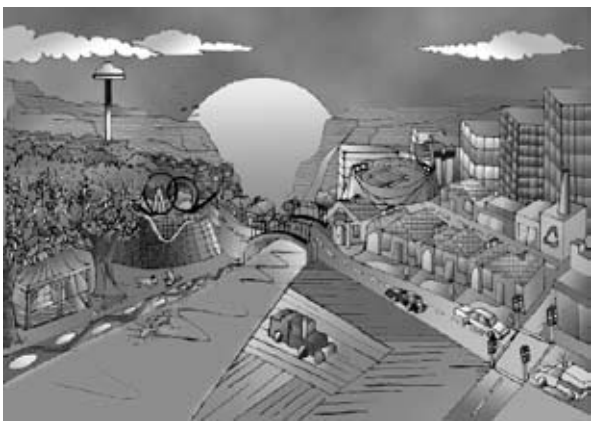
Brown, Valerie A. 1995. *Turning the tide*: *integrated local area management for Australia's coastal zone*. Department of Environment, Sport and Territories, Canberra, 175pp (second printing).

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.



Lawrence Issa

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 the School of Resources, Environment and Society and the Centre for Resource and Environmental Studies. He is President of the Australian Forest History Society.

Research, Teaching & Professional Activities

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.

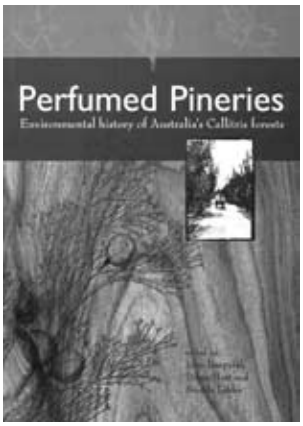
The national forest history conference was held in Tasmania in February 2002. I wrote a play for this, which was performed by local people in Geeveston. It is called 'Hard work to starve' and covers labour dispute in southern Tasmanian sawmills in 1921-22.

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* Management. Earthscan Publications, UK and USA: 101-15.

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



Professor Philip Evans

Director of Centre for Advanced Wood Processing at UBC

Adjunct Professor
Surface modification of wood, relationships between structure and function and properties of wood and wood composites

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Career Brief

Phil took a first class honours degree in Wood Science from the University of Wales (Bangor). He obtained a PhD, also from the University of Wales, in 1984. He worked as a postdoctoral fellow at Abertay University Dundee, Scotland, before joining the ANU as a Lecturer in 1986. He was promoted to Senior Lecturer in 1992 and Reader in 1998. In 2000 year he was appointed as Director of ANU's Centre for Science and Engineering of Materials. Phil took up his current position as Professor and Director of the Centre for Advanced Wood Processing at UBC (Canada's national centre for education extension and research for advanced wood processing industries) in November 2001. He was appointed as an Adjunct Professor at ANU in 2002.

Mankind faces many significant challenges over the coming century arising from its profligate use of natural resources and unwise choices in the conversion of natural resources into materials or products that are incompatible with or deleterious to natural systems. The development of advanced wood and biobased composites materials that can more effectively compete with plastics, metals and ceramics, materials that cannot be produced on a sustainable basis, can make a positive contribution to rectifying some of the damage to the environment that is now self evident. Developing advanced bio-based materials with similar cost and performance characteristics as plastics, metals and ceramics is, however, a tremendous challenge. Surface modification of wood is a cost effective way of upgrading some characteristics in which wood is deficient, ie UV resistance, and has been one of my major research areas todate. A greater understanding of the relationship between the structure of wood and wood composites and their function and properties could lead to the development of new biocomposites with enhanced mechanical properties, and this is an area I'm currently exploring with colleagues in the Department of Applied Mathematics in RSPhysSE. My research interests and continuing involvement in the teaching of forest products in SRES maintain my link with ANU. At UBC my position as Director of the Centre for Advanced Wood Processing involves a great variety of tasks mainly focussed at assisting the Canadian forest products industry to make the transition from a commodity-based industry to one that concentrates on value and quality.

Selected Publications

Evans, P.D., Donnelly, C., Cunningham, R.B. 2003. Checking of CCA-treated radiate pine decking timber exposed to natural weathering. Forest Products Journal. 53(4):1-6.

Evans, P.D. 2003. Emerging Technologies in Wood Protection. Forest Products Journal. 53(1):14-22.

Cabangon, R. J., Cunningham, R.B., and Evans, P.D. 2002. Manual Strand Orientation as a Means of Improving the Flexural Properties of Wood-Wool Cement Boards in the Philippines. For. Prod. J. 52(4):53-59.

Heady, R.D., Banks, J.G., and Evans, P.D. 2002. Wood Anatomy of Wollemi Pine (Wollemia Nobilis, Araucariaceae). IAWA Journal. 23 (4) 2002: 339-357.

Evans, P.D., N.L. Owen, S. Schmid, S. and R.D. Webster. 2002. Weathering and photostability of benzoylated wood. Polymer Degradation and Stability. 76:291-303.

Semple, K.E., Cunningham, R.B., and Evans, P.D. 2002. The Suitablity of Five Western Australian Mallee Eucalypt Species for Wood-Cement Composites. Industrial Crops and Products Journal. 16 (2002) 89-100.

Kiguchi, M., P.D. Evans, J. Ekstedt, R.S. Williams and Y. Kataoka. 2001. Improvement of the durability of clear coatings by grafting of UV-absorbers on to wood. Surface Coatings International Part B: Coatings Transactions. 84(B4):243-336

Evans, P.D. (2001). Wood Products: Weathering. 6pp. In: The Encyclopedia of Materials Science and Technology. Buschow, K.H.T., Cahn, R.W., Flemings, M.C., Iischner, B., Kramer, E.J., Mahajen, S. (Eds.). Elsevier Science, Oxford.

Heady, R.D., Evans, P.D. 2000. Callitroid (callitrisoid) thickening in Callitris. International Association Wood Anatomists Journal 21(3): 293-319.

Evans, P.D., Wingate-Hill, R., Barry, S.C. 2000. The effects of different kerfing and center-boring treatments on the checking of ACQ treated pine posts exposed to the weather. Forest Products Journal 50(2): 59-64.

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

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

Semple, K., Evans, P.D., Cunningham, R.B. 2000. Compatibility of 8 temperate Australian Eucalyptus species with Portland cement. Holz Roh u- Werkstoff 58(5): 315-316.

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

Selected Student Theses

Ramos, M. 2001. M.Sc. Improving the gluing of eucalypt timber by plasma modification of wood surfaces.

Ximenes, F. 2000. M.Sc. Preservation of wood using oxy-aluminium compounds.

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

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, Teaching & Professional Activities

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 this 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 Ann Gibson

Visiting Fellow
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, Teaching & Professional Activities

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

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.

Selected Student Theses

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

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

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

Dr A. Malcolm Gill

Visiting Fellow
Fire ecology, fire weather, fire behaviour and fire management

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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 Botanical Garden in Miami, Florida studying tropical tree growth. Appointed in 1971 to the staff of CSIRO Plant Industry, he has spent over 30 years on matters relating to bushfires in the Australian landscape.

Research, Teaching & Professional Activities

My research interests have largely concerned the inter-related topics of fire ecology, fire weather, fire behaviour and fire management. Over the past few years my research has been mainly concerned with point-based, and patch-based, models of fire occurrence. These models relate nicely to ecological effects of fires in the landscape including biodiversity. Supplementing this has been an involvement with the ACT Bush Fire Council.

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 Ken Groves

Visiting Fellow
Forest analyses for industrial uses, wood harvesting and processing, marketing forest and wood products

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Career Brief

From 1952 to 1963 Ken worked as a Harvesting and Sawmill Manager in Rhodesia (now Zimbabwe) during which time, apart from his normal duties, he was co-opted to a three-man research team investigating the relationships between silvicultural treatments in pine plantations and the volumetric and grade recovery of sawn timber.

From 1963 to 1967 he was in charge of research into hardwood logging and timber supply economics with the Forestry and Timber Bureau in Australia. During this time, he was also responsible for investigating occupational health and safety in the harvesting and sawmilling sectors.

From 1967-1989, he lectured at the ANU Department of Forestry in Forest Harvesting and Engineering but subsequently, and additionally, at various times, in Wood Science; Wood Conversion and Utilisation; and Production Economics. During his tenure at ANU he conducted numerous research and consultancy projects, including supervising over 20 postgraduate and fellowship research programs. In 1989, he worked in Malawi for two years as a Forest and Wood Production Economist.

In 1992 he joined Margules Groome Pöyry (now Jaakko Pöyry Consulting) as a Senior Consultant and from then until April 1999 worked continuously in a range of projects with major emphases on resource analyses for specified end uses; feasibility studies of various wood conversion processes; and in marketing, strategic development and investment programs.

He has been a free-lance consultant since April 1999 and a Visiting Fellow in the School of Resources, Environment and Society at the Australian National University since 2002. He has further developed a useful role in providing the link between growing wood and harvesting and processing.

Research, Teaching & Professional Activities

He has written, or helped to write as part of a team, over 100 consultancy reports for private, government and international bodies entailing field work in many countries including Australia, Malawi, Italy, Norway, Bangladesh, Malaysia, the Philippines, Papua New Guinea, Solomon Islands, Vanuatu, Fiji, Laos and Vietnam.

He has recently completed an investigation of "Sawmilling practices for regrowth and plantation hardwood in the Eastern States of Australia" for the Forest and Wood Products Research and Development Corporation.

Selected Publications

Balfas J, Groves K W, and Evans P D, 1993: Bonding surface modified karri (*Eucalyptus diversicolor*) and jarrah (*E. marginata*) with resorcinol formaldehyde, Holz als Roh- und Werkstoff 5 pp 253-259.

Groves K W, 1990: "Seasoning and Preservation", Ch 22 in Trees for Rural Australia, ed Cremer K, Inkata Press.

Alexiou P N and Groves K W, 1990: Effect of pre-steaming on moisture gradients, drying stresses and sets, and face checking in regrowth blackbutt (*Eucalyptus pilularis* Sm.), Wood Sc. Tech.

Groves K W and Chivuya A, 1989: "Fuelwood Evaluation" Ch 16 in Trees for the Tropics, ed Boland D, Australian Centre for International Agricultural Research.

Wingate-Hill R and Groves KW 1988: Compression dewatering of green wood, APPITA 41(2).

Groves K W, Pearn G J and Cunningham R B 1987: Predicting logging truck travel times and estimating costs of log haulage using models, Aust. For. 50(1).

Groves K W and Banana A Y, 1987: The effect of weathering on the microstructure of radiata pine, Jour. Inst. Wood Sc. 10(5).

Wingate-Hill R and Groves KW, Compression dewatering of green wood, 41st Annual APPITA General Conference.

Dr Hartmut Holzknecht

School Ressearch Associate
Social anthropology, Melanesia, land and other natural resource use and tenure systems, community and rural development, socio-economic persistence and change

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Career Brief

Hartmut Holzknecht grew up in Papua New Guinea and is a Papua New Guinea citizen. He did his secondary and tertiary education in Australia and completed a PhD in Social Anthropology at The Australian National University in Canberra. He speaks a number of local Papua New Guinea languages as well as the national *lingua franca*, Melanesian *Tok Pisin*, German and some French. Hartmut has excellent communication, training and liaison skills that are critical at a number of different levels across the whole range of his activities and involvements.

Hartmut Holzknecht is a social anthropologist with major interests in natural and human resource management issues, in resource use and tenure systems and property relations, in socio-cultural, socio-economic and socio-political persistence and change, in community and rural development issues and in the nexus between human societies and natural resource management. Main area of focus is the Melanesian region of the southwest Pacific.

Research, Teaching & Professional Activities

As both an academic and an applied anthropologist for almost 30 years, Hartmut has been involved in a wide range of activities - mostly focussed in Papua New Guinea and the southwest Pacific - in research, teaching, training, publications and writings, administration, private enterprise, consulting and project work. He has been an active and widely-known consultant in Papua New Guinea and the South Pacific (at a number of levels in government and non-government engagements, in private enterprise, in aid organizations and multilateral institutions). He continues all these activities as and when required.

Dr. Holzknecht has also worked in private enterprise (as managing director of a large group of companies in Papua New Guinea; member on a number of boards and committees, including an agricultural cooperative), in the public service (provincial planner then First Assistant Secretary, Policy, Planning & Coordination in a Papua New Guinea provincial government) and in working in various activities which find ways of getting a wide range of appropriate information and support services to the general public and assisting people to get systems and processes to work more to their and their communities' benefit.

While attached to SRES, Dr. Holzknecht is also supervising graduate students up to PhD level. He is currently preparing a multi-year research programme, 'Land in Melanesia: Foundations for Governance, Security and Economic Growth in Papua New Guinea, Vanuatu and Solomon Islands'.

Selected Publications

Holzknecht, H. A. 2003 Customary Land Tenure Systems: Resilient, Appropriate and Productive. Pp. 18 - 23 in T. Curtin, H. Holzknecht & P. Larmour, Land Registration in Papua New Guinea: Competing Perspectives. *Discussion Paper 2003/1*. Canberra: State, Society and Governance in Melanesia, Research School of Pacific and Asian Studies, The Australian National University.

Holzknecht, H. A. 2003 "Customary Land Issues affecting Peri-Urban areas in Melanesia". Keynote presentation to the Colloquium on Peri-Urban Customary Land Issues in Papua New Guinea. Melanesian Land Studies Centre, PNG University of Technology, Lae, Papua New Guinea.

Holzknecht, H. A. 2003 Report II: Social and Community Issues in Middle Ramu and Approaches to Development Options. Report for ACIAR Project FST 98-118. Canberra: Bureau of Rural Sciences.

Holzknecht, H. A. 2002 Land, people and governance: Conflicts and resolutions in the South Pacific. Pp. 8 - 12 in Development Bulletin, Vol. 60 (Dec. 2002; Theme: 'South Pacific Futures'). Canberra: Development Studies Network.

Holzknecht, H. A. 2002 Afterword / Las Tok: Why? What? When? Where? How? Who/By whom? Pp. 257 - 269 in N. Sullivan ed. Culture and Progress. The Melanesian Philosophy of Land and Development in Papua New Guinea. (Papers from the Divine Word June 2001 Land Symposium). Madang: DWU Press.

Holzknecht, H. A. 2002 Invited participant, South Pacific Land Tenure Conflict Symposium. The University of the South Pacific, Suva, Fiji. Two presentations: "Regional Contribution: Papua New Guinea' and 'Opportunities, Potentials and Problems in Customary Land Tenure in Forestry-related and other Developments in the South Pacific' (also session chair, discussant and facilitator). [see http://www.usp.ac.fj/landmgmt/symposium/pacificnetworklinks.htm]

Holzknecht, H. A. 2002 Historical Aspects of State Dealings with regard to Registration of Customary Land [June; unpublished]

Holzknecht, H. A. 2002 Land, People and Governance: Conflicts and Resolutions in the South Pacific. Paper presented at the Foundation for Development Cooperation's Development Research Symposium: 'South Pacific Futures'. Brisbane, 22 - 24 July, 2002.

Holzknecht, H. A. 1999 Customary Property Rights and Economic Development in Papua New Guinea. Pp. 139 -164 (Ch. 5) in T. van Meijl & F. von Benda-Beckmann, eds., Property Rights and Economic Development: Land and Natural Resources in Southeast Asia and Oceania. London: Kegan Paul International.

Holzknecht, H. A. 1999 Past, Present and Future: Building on Papua New Guinea's Customary Strengths in Resource Management. Pp. 29-31 in *Development Bulletin*, Vol. 50 (Oct. 1999; Theme: 'Development: Papua New Guinea perspectives'). Canberra: Development Studies Network.

Holzknecht, H. A. 1999 Papua New Guinea's Rainforests: Policy, Practice, Stakeholders and Resource Management. Pp. 107 - 120 in Environment Papua New Guinea, Collected Papers Series, Volume 1. J. Rivers, F. L. Bein and P. Siaguru, eds. Lae: Environmental Research and Management Centre, Papua New Guinea University of Technology and New Delhi: UBS Publishers' Distributors.

Holzknecht, H. A. 1999 Starke Traditionen. Landbesitz und Landrechte in Papua-Neuguinea. Chapter 6 [pp.67-86] in "Unser Land - Unsere Seele". Pazifikstaaten und Ihre Landrechte, G. Vanselow, editor. Pazifik-Informationsstelle. Neuendettelsau: Pazifik Netzwerke e.V.

Holzknecht, H. A. 1998 Arentz, F., B. Brunton, A. Carothers, L. Cortesi, H. Holzknecht and C. LaFranchi, Sustaining Papua New Guinea's Natural Heritage. An Analysis of the Papua New Guinea National Forest Plan. Boroko: WWF South Pacific Program and Gerehu: Greenpeace Pacific.

Holzknecht, H. A. 1997 Problems of articulation and representation in resource development: The case of forestry in Papua New Guinea. *Anthropological Forum*, 7(4): 549-573. (Original paper read at the ASAO [Association of Social Anthropologists in Oceania] Meeting,

Hawaii, February 1996.
Holzknecht, H. A. 1997 Morobe Province, 1978-1991, pp. 199-227 in R. May and A. Regan with A. Ley (eds.), Political Decentralization in a New State: the Experience of Provincial Government in Papua New Guinea. Bathurst: Crawford House Press.
Holzknecht, H. A. 1997 *Pro Bono Publico*? Conservation and Appropriate Resource Management Strategies in Papua New Guinea. Ch. 17 (pp. 368-390) in C. Filer (ed.), The Political Economy of Forest Management in Papua New Guinea. NRI Monograph 32. Boroko: Papua New Guinea National Research Institute and London: International Institute for Environment and Development.
Holzknecht, H. A. 1997 Two Sides of the Coin: The Case of Forestry, Chapter 5 (pp. 94-104) in S. Toft (ed.), Compensation for Resource Development in Papua New Guinea, Monograph No. 6. Boroko: Law Reform Commission of Papua New Guinea, and NCDS Pacific Policy Paper 24. Canberra: Resource Management in Asia-Pacific, and National Centre for Development Studies, The Australian National University.
Holzknecht, H. A. 1995 Papua New Guinea Land Tenure, Land Use and Biodiversity Conservation, Chapter 5 [pp. 59-68] in N. Sekhran and S. Miller (ed.), Papua New Guinea Country Study on Biological Diversity. A Report to the United Nations Environment Program. Waigani, Papua New Guinea: Dept. of Environment and Conservation, Conservation Resource Centre, and Nairobi, Kenya: Africa Centre for Resources and Environment [ACRE].
Holzknecht, H. A. (ed.) 1994 Training Materials for Land Group Facilitation. Hohola: Forest Management and Planning Project [PNG Forest Authority, Groome Poyry Ltd., World Bank].
Holzknecht, H. A. (ed.) 1994 Manual on Land Group Incorporation, Boroko (PNG): Forest Management and Planning Project, Landowner Involvement Component, *Working Paper 4*.
Brown, M. and Holzknecht, H. A. 1993 An Assessment of Institutional and Social Conservation Issues in Papua New Guinea. In J. Alcorn and B. Beehler eds., PNG Conservation Needs Assessment, Volumes 1 & 2. Waigani: Dept. of Environment and Conservation, Government of Papua New Guinea and Washington: Biodiversity Support Program.

Mr Neil Humphreys

Visiting Fellow
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, Teaching & Professional Activities

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 Edward Linacre

Visiting Fellow
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 then 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, Teaching & Professional Activities

Climate has many aspects, as indicated in the following list of my more significant publications. On my 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. (in press). Evaporation trends. *Theor. Appl. Climatol.*

Linacre, E. and Geerts, B. 2002. Estimating the annual mean screen temperature empirically. *Theor. Appl. Climatol.* 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. *Theor. Appl. Climatol.* 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* Magazine38: 65-7.

Mr Bob Newman

Visiting Fellow
Forest history and forest policy

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Career Brief

Bob Newman who is a Registered Professional Forester, graduated in Forest Science at the Melbourne University following attendance at the Australian Forestry School, Canberra, the precursor to ANU Forestry.

He also graduated in Business Administration at the Hemingway Robertson Institute in Melbourne. After graduating he held forest management positions in private industry in Tasmania and Victoria. With his initial background at the CSIRO Division of Forest Products in South Melbourne, he then pursued a career for some 10 years in sawmilling, veneer production and timber presentation, and timber marketing.

Since the 1970's he has been consulting with a wide spectrum of forestry and forest products briefs, both domestically and internationally and continues to do so.

His contribution to date for organisations supporting the forestry profession has been wide and includes Vice-President, Chairman and Fellow of the Commonwealth Forestry Association, President of the Association of Consulting Foresters of Australia and he has had a 50 year membership in the Institute of Foresters of Australia. He has had a long interest in Australian Forest Growers Inc and was Hon National Secretary for some 7 years.

He comes to the ANU to carry out research in two fields of interest: forest history in Australia with emphasis on the private sector contribution during the past twenty years, and also with the hope of contributing to the development of useful forest policy to ensure sustainable forest management continues as a major factor in the Australian economy.

Dr Gary Richards

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Greenhouse

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Career Brief

After completing his bachelor's degree in 1983 Gary was a founding partner in a small forest 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 then Forestry Department at ANU, 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 Advisor to the Australian Greenhouse Office in regard to carbon accounting for land based sources and sinks. Gary is currently the Director and Principal Scientist for the development of the National Carbon Accounting System.

Gary is also an active participant with the Intergovernmental Panel on Climate Change (IPCC), recently completing a role as Coordinating Lead Author on the development of definitions and methodologies for accounting of greenhouse gases from forest degradation and devegetation of other vegetation types. Gary is currently working with the IPCC revision to the current international accounting guidelines.

Research, Teaching & Professional Activities

My work within government has seen 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 modeling and decision making. My current research interests focus on the development of GIS-based carbon budget models to both inventory and assessment of carbon budget implications of given forest management and other land use 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.

Richards G.P., J.O. Skjemstad, R.S. Swift and W. McDonald (2003) *What are the Current Impediments and Research Needs to Improving Soil Carbon Measurement*. OECD Conference on Soil Carbon Indicators (Ottawa, 2002).

Brack, C.L., and Richards, G.P (2002) *Carbon Accounting Model for Forests in Australia*, J. Environment and Pollution 116:187-194.

Richards, G.P (2002) *The FullCAM Carbon Accounting Model:Development, Calibration and Implementation* (Proceedings of the Workshop carbon accounting and emissions trading realted to bioenergy, wood products and carbon sequestration IEA Task 38 Greenhouse Gas Balances of Biomass and Bioenergy Systems)

Paul, K.I. Polglase, P.J. Richards G.P. (2002) *Modelling carbon sequestration following afforestation or reforestation: Preliminary simulations using GRC3* (Proceedings IEA Task 38 Greenhouse Gas Balances of Biomass and Bioenergy Systems)

Paul, K.I. Polglase and P.J. Richards G.P.(2003a) *Predicting Change in Soil Carbon following Afforestation or Reforestation*. Forestry Ecology and Management:177 (2003) 485-501

Paul, K.I. Polglase and P.J. Richards G.P. (2003b). *Sensitivity Analysis of Predicted Change in Soil Carbon following Afforestation and analysis of controlling factors by linking a C accounting model (CAMFor) to models of forest growth (3PG), litter decomposition (GENDEC) and soil C turnover (Roth C)*. Ecological Modelling, 164 (2003) 137-152

Cacetta, P.A., Bryant, G., Campbell, N.A., Chia, J.,Furby, S., Kiiven, H.J, Richards, G.R., Wallace, J. and Wu, X. (2003) *Notes on Mapping and Monitoring Forest Change in AustraliaUsing Remote Sensing and Other Data*. 30th International Symposium of Remote Sensing and the Environment, Hawaii, October 2003.

Richards, G.P. *The Expanding Role of Remote Sensing in Greenhouse Gas Accounting*. 30th International Symposium of Remote Sensing and the Environment, Hawaii, October 2003.

Karjalainen, T., Richards, G.P., et. al., (2003) *Definitions and Methodological Options to Inventory Emissions from Direct Human-Induced Degradation of Forests and Devegetation of Other Vegetation Types*. Intergovernmental Panel on Climate Change Report(IPCC). Published by the Institute for Global Environmental Strategies (IGES) for the IPCC, Japan 32pp.

Lowell, K, Woodgate, P., Jones, S., and Richards, G. (2003) *Continuous Improvement of the National Carbon Accounting System Land Cover Change Mapping*. National Carbon Accounting System Technical Report No. 39, Australian Greenhouse Office, Canberra, 28pp.

Dr Mike Slee

Visiting Fellow
Tree breeding, plantation silviculture, tropical forestry, new crops

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Career Brief

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

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

Research, Teaching & Professional Activities

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* varhondurensis. *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.

Euclyptus polbractea plantation, West Wyalong, NSW

Dr Robin Tennant-Wood

Visiting Fellow
Environmental politics and philosophy; waste management; sustainability; socio-political constructs of ecology; bioethics

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Career Brief

Coming from a professional background in education as a secondary teacher, and a long-time involvement in politics and environmentalism, Robin joined the ANU in 1999 – the year she also won a seat as a Councillor on the Snowy River Shire Council on a platform of issues relating to sustainable local development, including restoring environmental flows to the Snowy River. She was appointed Chair of the South East Waste Board at the end of 1999, a position she held until the end of 2001 and during that same period was a member of the NSW Waste Policy Body. Now resident in Canberra, Robin is currently a member of the ACT Chief Minister's Sustainability Expert Reference Group and is Secretary of the Canberra and South East Region Environment Centre Management Committee. Having completed her PhD in political science, she joined SRES as a Visiting Fellow in 2003 to research waste management policy and sustainability in the context of political ecology.

Research, Teaching & Professional Activities

My research work is largely influenced by my practical involvement in policy development at local level, with a specific focus on waste management. This necessitates a strongly interdisciplinary approach, combining the social sciences with ecology in analysing specific aspects of eco-governance. I maintain that such industry terms as 'zero waste' and 'waste hierarchy' are 2-dimensional and have no sustainable basis for application until and unless they are grounded in sound, empirical research and to that end I am involved in plans to establish a centre for Australian waste-related research. My doctoral research examined the relationship between green politics and the environment movement, and the dynamics that drive paradigmatic change in eco-political thought using the case study of the campaign to save the Snowy River. Having held a seat in local government and chaired a statutory government authority, my working knowledge of environmental issues in the south-east region, and the socio-political and economic influences on the management of these issues, provides an added dimension to my academic work. This year I am convening the Independent Research Project at SRES and also provide research work for the Democratic Audit of Australia project at RSSS.

Selected Publications

Tennant-Wood, R. 2004. "Silent Partners: the fluid relationship between women and dammed rivers. The case of the Snowy River", chapter in Lahiri-Dutt, K.(ed), *Fluid bonds*: *Views on gender and water*, Stree, Calcutta (in press)

Tennant-Wood, R. 2004. "From wasteland to wetland: creating a community ecological resource in regional NSW", *Local Environment*, Nov.2004 (forthcoming)

Tennant-Wood, R. 2003. "Going for Zero: a comparative critical analysis of zero waste events in southern New South Wales", *Australasian Journal of Environmental Management* Vol.10 No.1

Tennant-Wood, R. 2002. "Social sustainability through local environment policy", paper presented to Resource NSW Soils and Sustainability Forum, February 2002

Tennant-Wood, R. 2002. "Local Green Governance: the value of community leadership and a sense of place" *Ecopolitics Journal*, Vol.1, No.3

Beavis, S.G. & Tennant-Wood, R. 2001. "Waste minimisation in schools: mapping successful pathways" – paper presented to Waste Educate 2001 Conference, Brisbane, Nov.2001, *Waste Educate 2001*: *Maintaining the Momentum* pp 33-37

Beavis, S.G. & Tennant-Wood, R. 2001. *Waste minimisation in schools*: *a report on Mumbulla School*, *Rutherglen Primary School*, *Penola College and Cobden Technical School*: *a report to the South East Waste Board*. Research report, South East Waste Board, September 2001

Tennant-Wood, R. 2001, "Taking out the garbage: waste as a social construct", paper presented to Wastebusters and Organics Conferences, Ashburton NZ, May 2001

Tennant-Wood, R. 2001. "The sociology of waste", Keynote address to *mêtis* Symposium, Australian Academy of Science, Canberra, May 2001

Robin Tennant-Wood is a member of the ACT Chief Minister's Sustainability Expert Reference Group (along with - among others - fellow SRES academic Val Brown and former CRES Director Bob Wasson)

Mr David Tongway

Visiting Fellow
Landscape ecology, soil science, restoration ecology, training

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Career Brief

David Tongway grew up in Bendigo, cental Victoria, obtaining a diploma of Applied Chemistry from the Bendigo Technical College, formerly the Bendigo School of Mines. He spent nearly 3 years as a Patent Examiner, specialising in polymers before taking a position with CSIRO in the Deniliquin Regional Laboratory. He initially ran the analytical services laboratory, but became interested in soil science. A range of CSIRO soil scientists in areas such as micro-morphology, chemistry, physics, pedology, land system mapping and biology mentored David. He put this knowledge to work in devising rapid assessment procedures for soil productive potential in rangelands. He acquired international status in this work and was promoted to Principal Research Scientist in 1994. He won the Chief's prize for Research Influence and Effect in 1997, the ACMER prize for contributions the environmental wing of the Minerals industry and the CSE prize for a lifetime contribution to science in 2003. He retired in 2003 after 38 years with CSIRO, but maintains professional contacts there as well as with Industry.

Research, Teaching & Professional Activities

David Tongway has presented guest lectures at Universities of Queensland, Western Australia, Murdoch, Canberra as well as the ANU. He is a consultant to the UN Security Council in regard to the ecological damages caused by the invasion of Kuwait by Iraq, and acts a consultant to the rehabilitation industry.

Selected Publications

Tongway, David J., John A. Ludwig, and Walter G. Whitford. 1989. Mulga log mounds: fertile patches in the semi-arid woodlands of eastern Australia. Australian Journal of Ecology 14: 263-68.

Tongway, David J., and E. L. Smith. 1989. Soil surface features as indicators of rangeland site productivity. Australian Rangeland Journal 11, no. 1: 15-20.

Tongway, David J. 1990. Soil and landscape processes in the restoration of rangelands. Australian Rangeland Journal 12, no. 1: 54-7.

Tongway, David J., and John A. Ludwig. 1990. Vegetation and soil patterning in semi-arid mulga lands of Eastern Australia. Australian Journal of Ecology 15: 23-34.

Tongway, David J. 1995. Monitoring soil productive potential. Environmental Monitoring and Assessment 37: 303-18.

Tongway, David J., and Norman L. Hindley. 1995. Manual for Soil Condition Assessment of Tropical Grasslands . 60 p. Canberra: CSIRO Division of Wildlife and Ecology.

Tongway, David J., and John A. Ludwig. 1996. Rehabilitation of semiarid landscapes in Australia. I. Restoring productive soil patches. Restoration Ecology 4: 388-97.

Ludwig, J., Tongway, D., Freudenberger, D., Noble, J and Hodgkinson, K. (eds) (1997) Landscape Ecology Function and Management: Principles from Australia's Rangelands, CSIRO, Melbourne.

Tongway, David J., and Darren Murphy. 1999. Principles for designed landscapes and monitoring of ecosystem development in rangelands affected by mining. Proceedings of the International Rangeland Congress 6th v. 2: 945-49.

Ludwig, J.A , Wiens, J. A. and Tongway, David J. 2000. A Scaling Rule for Landscape Patches and how it applies to conserving Soil Resources in Savannas. Ecosystems. 3: 84-97.

Tongway, David J., Valentin, Christian and Seghieri, Josiane. 2001. Banded Vegetation Patterning in Arid and Semi-arid Environments: Ecological Processes and Consequences for Management. Ecological Studies No. 149, Springer Verlag, New York, 243pp.

Tongway, David J and Ludwig, John. A. 2002. Australian semi-arid lands and savannas. In Martin R Perrow and Anthony J Davy (Eds) Handbook of Ecological Restoration, Vol. 2 Cambridge University Press, Cambridge

Tongway, D.J.; Sparrow, A.D.; Friedel, M.H. 2003. Degradation and recovery processes in arid grazing lands of central Australia. Part 1: soil and land resources. J Arid Environ. 56; 301-326

Dr Brian J Turner

Visiting Fellow
Native forest management, remote sensing

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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 the position of Reader in Forest Management. He retired at the end of 2002 but remains an active member of the staff, supervising honours and graduate students, and conducting research and consultancies.

Research, Teaching & Professional Activities

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.

I am currently involved in an RIRDC-funded project to determine the extent and condition of privately-owned dry schlerophyll forests on the tablelands of eastern Australia and develop a decision support system to help owners enhance their value.

I am also a Lead Author in the production of a manual, entitled *Good Practice Guidance for Land-Use, Land-use Change and Forestry*, to assist countries in the estimation of national carbon stocks and their change, as directed by the Intergovernmental Panel on Climate Change.

Selected Publications

Turner, B.J. 2003. Why sustainable yield can be anything you want it to be (almost): good practice in its calculation. In: Mason, E.G. and Perley, C.J. (Eds.) *Joint Australia and New Zealand Institute of Forestry Conference Proceedings April-May 2003, Queenstown, NZ*. Ministry of Agriculture & Forestry, Wellington, NZ: 157-165.

Turner, B.J., Chikumbo, O., and Davey, S.M. 2002. Optimization modeling of sustainable forest management at the regional level: an Australian example. *Ecological Modelling* 153(1-2): 157-179.

Huang, Z., Jia, X., Turner, B.J. and Foley, W.J. 2002. Use of HYMAP data to estimate sideroxylonal-A concentration of eucalypt foliage. *Proc., 2002 IEEE International Geoscience and Remote Sensing Conf., Sydney*. On CD. Vol III:1652-1654.

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.

Selected Student Theses

Ingwesen, F. 2000. "Sundry Nameless Ranges": the Landscape Ecology of the Naas-Gudgenby Catchment. (PhD thesis)

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).

Mr Chengliang Zhang

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Water and soil conservation, drought-resistant afforestation, sustainable development and forest site and resources evaluation

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Career Brief

Chengliang is a graduate student in the Forest College of Shanxi Agriculture University. In 1987 he graduated with Bachelor Agriculture in water and soil conservation from Beijing Forestry University. Since 1987 he has been working as an Engineer Shanxi Academy of Forestry. For 2 years he worked in Ethiopia as Forestry Expert in Integrated Agriculture Development Planning Project in North Dry Area.

Chengliang is a member of Chinese Forestry Society, the Chinese Ecological Society, the Shanxi Forestry Society and Vice-secretary-general of Ecological Society of Shanxi Province.

The main research projects Chengliang has been involved in since the mid 1980s include an Environment Monitoring Program for the World Bank, Development Models and Technological Strategies of Sustainable Forestry, Drought-resistant Afforestation Technology, all in Shanxi Province of China.

Selected Publications

Chengliang Zhang. 1992. Prediction about Soil Nutrient at Mt. Tai Hang in Shanxi Province.Shanxi Forestry Science and Technology. No.3

Wu Kangsheng,LV and Zhang. 1993. Study on Tree Density of Man-made Chinese Pine Forest During Middle Age at West Part of Mt. Tai Hang. Forestry Science, No.9

Chengliang Zhang. 1996. Establish and Application of Forest Site Resources Database of Mt. Tai Hang. Shanxi Forestry Science and Technology. No.3

Wu Kangsheng and Chengliang Zhang. 1991. Analysis of Relativity Between Weather Element and Annual Growing of Man-made Chinese Pine at Limestone Mountain Area: Beijing Forestry University Journal, No.3

Chengliang Zhang. 1991. Study on Site Evaluation and Matching species with the Site in the South and Middle of Mt. Tai Hang. Shanxi Forestry Science and Technology. No.2

Mr Piers Bairstow

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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 Jane Bryan

Research Assistant

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Career Brief

After completing her science degree in geography at the ANU in 2003, Jane began working as a research assistant at SRES. In this position Jane assists Dr Brendan Mackey with research on the WildCountry project. This project aims to create a new, integrated approach for conserving biological diversity in Australia at a continental scale, with a particular focus on ecological connectivity and off-reserve management. Jane contributes to this project by using ArcGIS as well as her familiarity with various spatial data directories to compile and analyse the digital GIS data sets used in the study.

Ms Debbie Claridge

Senior Technical Officer
Forest Ecology & Wildlife, GIS,
Web & Design

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Career Brief

Debbie supports teaching and research in a range of areas within the School. Debbie has a Bachelor's degree in Applied Science, majoring in Vegetation/Wildlife Management and Biometry (University of Canberra) and she also completed a course in Herpetology at the Sydney Technical College in order to further her interest in forest-dwelling frogs. 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 the genetic improvement of forest products such as *Eucalyptus* and *Melaleuca* (tea-tree) oils, and has been involved in experimental design of glasshouse-based experiments.

Debbie's research skills were further enhanced, when she took a 12 month-posting to the United States (in the Pacific Northwest), where she participated in a study examining the distribution and abundance of frogs, newts and salamanders in Douglas Fir forests. She also had substantial involvement in research on the ecology of Douglas Fir Beetles. Her other research involvement included work on mycophagy (fungus-eating) Flying Squirrels, the primary prey of the Northern Spotted Owl. Since returning from the United States, and beyond her role at SRES, she continues to pursue diverse interests in the ecology/ diversity of Australian mammals and mycophagy and of hypogeous fungal species distribution.

As a result of these interests, Debbie provides teaching assistance to students in the course *Biodiversity Assessment* including implementation of this course's on-line teaching. She's involved in class preparation and teaching students the operation and practical application of Geographic Information Systems (GIS) using ArcGIS in other courses.

Debbie's other major contribution is to the School's Public Relations. Aside from being the School's principal photographer, she 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. She also takes part as support webmaster in the design and development of our on-line Website, and design of many of our restricted on-line teaching sites.

Selected Publications

Jumponnen, A.M., Claridge, A.W., Trappe, J.M., Lebel, T. and Claridge, D.L. (2004). Ecological relationships among hypogeous fungi and trees: Inferences from associations analysis integrated with habitat modeling. ***Mycologia*** 96(3): 510-525.

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.

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.

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.

Mr Mauro Davanzo

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Transport, Field Equipment, Technical Support

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Career Brief

Mauro joined the Department of Forestry in August 1991, after working for the Australian Defence Force Academy in supplies and transport. He has over 18 years' experience in vehicle management and supply related services.

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

Mr Clive Hilliker

Senior Drafting Officer
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.

Prior to 1997 much of his time was spent demonstrating aspects of plant physiology and web design. Concurrently he 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"
- CRC for Greenhouse Accounting half day presentation Murramarang Resort, South Durras, NSW, 2004 "Designing Effective Posters and Graphics".

Now his focus is 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. Clive continues to find means to visually communicate scientific information in ways that both clarify and reinforce the messages and underpinning logic of the work.

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

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
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Maps & Illustrations

Campbell, J. 2002. *Invisible Invaders: Smallpox and Other Diseases in Aboriginal Australia* 1780-1880, Melbourne University Press, ISBN: 0-522-84939-3
Cary, G., Lindenmayer, D.B. and Dovers, S. (Editors). 2003, *Australia Burning*. CSIRO Publishing, Melbourne.
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Dovers, S. & Wild River, S. (Eds), 2003. *Managing Australia's Environment*, The Federation Press, ISBN 1 86287 447 6
Kleinert, S. and Neale, M(Eds). 2001. *The Oxford Companion to Aboriginal Art and Culture*, Oxford University Press, ISBN: 0195506499
Lindenmayer, D., Claridge, A., Hazell, D., Michael, D., Crane, M., MacGregor, C., Cunningham, R. 2003, *Wildlife on Farms*, CSIRO Publishing, ISBN 0-643-06866-X.
Mackey, B., Lindenmayer, D., Gill, M., McCarthy, M. & Lindesay, J. 2002. *Wildlife, Fire and Future Climate: a Forest Ecosystem Analysis*, CSIRO Publishing, ISBN: 0643067566.

Dr Susanne Holzknecht

Academic Skills Advisor

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Career Brief

Sue trained in Anthropology and Sociology (University of Qld), Linguistics, and Teaching English as a Second Language (UPNG) and her PhD is in Linguistics (ANU). For 12 years Sue lectured at the Papua New Guinea University of Technology, Lae in Language and Communication Studies, specialising in teaching English for Accountancy, Forestry, Land Management, Agriculture and Engineering. From 1993 to 1998, she worked in the National Centre for Development Studies, ANU, as lecturer in Academic and Research Skills in the EMD Program. Then she spent 3 years in the ANU's Study Skills Centre (now Academic Skills and Learning Centre), and in 2001, re-joined NCDS part-time, and began in SRES as part-time Academic Skills Advisor to graduate students and from mid-2003 Sue has been located in SRES.

Research, Teaching & Professional Activities

In SRES, I assist graduate students to further their skills in academic reading, writing, doing research, and giving presentations at a graduate level. I hold weekly classes in academic skills topics, and am available for individual consultations with students about matters of concern to them, in relation to their academic work.

My research interests include communicating effectively in environment, development and natural resource areas, and discovering new and better ways of motivating students to express themselves more effectively, and take ownership of their own work. I am also involved in recording and publishing the stories of migrants and refugees now living in Australia, with the aim of helping to break down the barriers being set up between people of different cultures and backgrounds.

Selected Publications

Bourke, M., Holzknecht, S. and Bartlett, A. (eds). 2002. Weaving a Double Cloth. Stories of Women from the Asia Pacific in Australia, Pandanus Press, Canberra.

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

Mr Steve Leahy

IT Sponsor (Faculty of Science) & Programmer
SRES Information Services

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Career Brief

Steve is one of those scary computer-literate environmental scientists who would have taken over the world, if they hadn't objected to living in an even newer concrete bunker somewhere off the coast of Madagascar (the bunker in Spitzbergen froze solid last January). 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 (this seems to be working, because over the past year he found some time for other things like improving the SRES IT infrastructure, and even doing some computer programming). And making computers do what he expects...

Amongst his interests are ensuring people learn how to use their computers properly; forcing said computers into behaving themselves; non-linear editing of digital video; simplifying the administration of the ever-growing series of SRES web-sites; occasionally making the acquaintance of a thesaurus; reading too much; 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

Finance Manager

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Career Brief

Mark joined the School in May 2001 as a finance officer after working in the Faculty of Science 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

Senior Technical Officer
Soil Chemistry

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Career Brief

John joined ANU Forestry Department in 1974 and currently occupies the position of Analyst in Charge of the Soil and Plant Analytical Facility. As Analyst in Charge he is responsible for servicing the needs of Academic, Graduate and Undergraduate demands for elemental analysis of soil water and plant material. He is also responsible for hands-on technical training associated with analytical chemistry and instrumentation. His other main role is associated with matters concerning OH&S, having completed the relevant training courses.

Selected Publications

Marsh, J. 1988. Analytical Methods Developed and Used by ANU Forestry.

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.

Current duties include the day to day operation of SRES PC and UNIX computers, management of IT purchasing, set-up and the operation of the SRES undergraduate laboratories.

Ms Zosha Smith

School Administrator

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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.

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. 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.

Mrs Sue Wigley

Admin Assistant

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Career Brief
Sue has twenty years experience working in Office Administration most recently with the School of Chemistry at, Australian Defence Force Academy, UNSW.

Mr Tim Wilson

IT Support

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Career Brief
Tim Wilson provides IT services for SRES.

His first position at the ANU was in 1998 as IT Support Officer for the (then) Department of Geography.

Prior to coming to SRES in 2002 Tim was the IT Manager for the Legal Workshop (A graduate arm of the ANU's Law Faculty) where he helped pioneer the implementation of WebCT, developed and maintained their website and created and managed their online booking system and student databases.

Tim studied Computer Systems Engineering at the Royal Melbourne Institute of Technology and Computer Science at Melbourne University specialising in Artificial Intelligence.

He has a varied background in electronics engineering and IT support having worked both in industry and various academic IT roles at Melbourne University and the Australian National University.

Dr Robyn Harris

Education Officer, CRC for Greenhouse Accounting

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Career Brief

Robyn studied science and journalism at the University of Queensland, followed by the Postgraduate Diploma in Science Communication at the Australian National University and Questacon. After working on education programs within several international science and technology centres in Wales and New Zealand she returned to the Australian National University to complete a PhD in microbial biochemistry at the John Curtin School of Medical Research. Robyn has also managed the interactive science programs for visitors to Questacon.

In my role as Education Officer in the Cooperative Research Centre for Greenhouse Accounting I coordinate and assist with the development of postgraduate skills training programs and mentor postgraduates to ensure completion. I am also assisting with the development of an online Master of Contemporary Science in Greenhouse Science and Policy.

Selected Publications

Harris, R.M., Webb, D. C., Howitt, S. M. and Cox, G. B. (2001). *Characterisation of PitA and PitB from Escherichia coli*, Journal of Bacteriology 183:5008-5014.

Mr Eugene Wallensky

Executive Officer
Kioloa Coastal Campus

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Career Brief

Eugene is currently responsible for administrative oversight and day-to-day management of the ANU field station at Kioloa on the south coast of NSW.

His background is in Environmental Science and he completed his Masters Degree in *Coastal Geomorphology* at Kioloa in 1980. Subsequently he held positions as Head Technical Officer in Biogeography and Geomorphology in the Research School of Pacific and Asian Studies before taking over as Operations Manager in the Research School of Biological Sciences. His long-term association with the ANU provides him with a wide range of knowledge and contacts that enables him to carry out his present job effectively.

The focus for development of the Kioloa Coastal Campus is to provide all of the infrastructural requirements to establish the campus as a multi-faceted "learning centre". Construction of an auditorium/lecture theatre/performance space with additional meeting rooms and an IT commons is critical for the coastal campus to fulfil its potential.

SRES have provided a main campus base for Eugene and he is located in Room G225 of the Geography Building. Please feel free to visit him and to find out more about the Kioloa campus and the opportunities it can provide for you.

Selected Publications

Chappell, J.M., Rhodes, E.G., Thom, B.G., and Wallensky, E.P. (1982) Hydro-isostasy sea-level isobase for 5500 B.P. in North Queensland. *Marine Geology*, 49: 81-90.

Chappell, J.M., Chivas, A., Wallensky, E.P., Polach, H.A., and Aharon, P. (1983). Holocene palaeo-environmental changes, central to North Great Barrier Reef inner zone. *Journal of Australian Geology and Geophysics*, 8: 223-235.

Woodroffe, C.D., Chappell, J.M., Thom, B.G., and Wallensky, E.P. (1985). Geomorphology of the South Alligator tidal river and plains. In *Coastal and tidal wetlands of the Australian Monsoon region*. N.A.R.U. Mangrove Monograph No. 1, 3-15.

Woodroffe, C.D., Chappell, J.M., Thom, B.G., and Wallensky, E.P. (1985). Stratigraphy of the South Alligator River, Northern Territory. In *Coastal and tidal wetlands of the Australian Monsoon region*. N.A.R.U. Mangrove Monograph No. 1, 17-30.

Woodroffe, C.D., Chappell, J.M., Thom, B.G., and Wallensky, E.P. (1986). *Geomorphological dynamics and evolution of the South Alligator River and Plains, Northern Territory*. N.A.R.U. Monography No. 3.

Woodroffe, C.D., Thom, B.G., Chappell, J.M., Wallensky, E.P., Grindrod, J., and Head, J. (1987). Relative sea-level in the South Alligator River Region, North Australia, during the Holocene. *Search*, 18: 4, 198-200.

Woodroffe, C.D., Chappell, J.M., Thom, B.G., and Wallensky, E.P. (1989). Depositional model of a macro-tidal estuary ad floodplain, South Alligator River, Northern Australia. *Sedimentology*, 36: 737-756.

Woodroffe, C.D., McLean, R., Polach, H., and Wallensky, E.P. (1990). Sea-level and coral atolls: Late Holocene emergence in the Indian Ocean. *Geology*, 18: 1, 62-67.

Woodroffe, C.D., McLean, R., Polach, H., and Wallensky, E.P. (1990). Darwin's coral atoll: Geomorphology and recent development of the Cocos (Keeling) Islands, Indian Ocean. *National Geographic Research*, 6: 3, 262-275.

Woodroffe, C.D., Veeh, H., Falkland, A., McLean, R., and Wallensky, E.P. (1991). Last Interglacial reef and subsidence in the Cocos (Keeling) Islands, Indian Ocean. *Marine Geology*, 96: 137-143.

Smithers, S.G., Woodroffe, C.D., McLean, R.F. and Wallensky, E.P. (1993) Lagoonal sedimentation in the Cocos (Keeling) Islands, Indian Ocean. *Proceedings of the 7th International Coral Reef Symposium*, 1: 273-288.

Woodroffe, C.D., McLean, R., and Wallensky, E.P. (1994). Geomorphology of the Cocos (Keeling) Islands. Chapter 4: *Atoll. Research Bulletin*, No. 402. 33p.

Matsuda, S., Chappell, J.M., and Wallensky, E.P. (1995). Nonarticulated Coraline Algal Flora of present day coral reefs on Huon Peninsula. *Journal of Geography*, Tokyo, 104: 5, 719-724.

Nakomori, T., Chappell, J.M., and Wallensky, E.P. (1995). Living hermatypic coral assemblages at Huon peninsula, P.N.G. *Journal of Geography*, Tokyo, 104: 5, 743-754.

Croke, J.C., Magee, J.M., and Wallensky, E.P. (1999). The role of the Australian Monsoon in the western catchment of Lake Eyre, central Australia during the Last Interglacial. *Quaternary International*. 57/58, 71-80.

Panorama of Kioloa Coastal Campus. (http://kioloa-vfa.anu.edu.au/index.html)

iCAM Professor & Head

Professor Tony Jakeman

Director, Integrated Catchment Assessment and Management Centre

Professor, CRES

Integrated assessment, hydrological modelling and environmental education and training

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Career Brief

Tony Jakeman received his Bachelor of Science with first class honours in Pure and Applied Mathematics from the University of NSW in 1973. He was awarded the PhD in Applied Numerical Analysis from the ANU in 1976. After holding a short-term postdoctoral position in Statistics at the University of Florida, he returned to ANU in 1976 and joined the Centre for Resource and Environmental Studies. In 1997 he helped set up the Integrated Catchment Assessment and Management (iCAM) Centre, a continuing joint initiative of CRES and SRES.

Tony has been President of the Modelling and Simulation Society of Australia and New Zealand since 1987 and is Foundation President of the International Environmental Modelling and Software Society. He is on the Board of numerous academic journals and is Editor-in-Chief of Environmental Modelling and Software, an Elsevier journal. He has undertaken invited study leave at Stanford, Cambridge and Lancaster Universities, as well as at the University of Western Australia, CSIRO Land and Water and the UK Institute of Hydrology (Centre for Ecology and Hydrology).

Research, Teaching & Professional Activities

My research interests are hydrology, environmental systems modelling and integrated assessment of catchment issues to promote more sustainable outcomes. My work in iCAM focuses on developing the relevant disciplinary tools and their integration for this assessment. This problem-oriented work is facilitated by a project focus and networking with other research groups and industrial partners in Australia and internationally.

I have supervised over 30 postgraduate students, predominantly at the PhD level. I am also becoming more involved in the supervision of Honours students.

Selected Publications

Jakeman, A.J., Beck, M.B. and McAleer, M.J. (eds.) (1993) *Modelling Change in Environmental Systems*, Wiley Series on Principles and Techniques in the Environmental Sciences, 584pp. (Hardback). (Paperback version 1995).

Ghassemi, F., Jakeman, A.J. and Nix, H.A. (1995) *Salinisation of Land and Water Resources: human causes, extent, management and case studies*, CAB International and UNSW Press, 540 pp.

Mahendrarajah, S., Jakeman, A.J. and McAleer, M.J. (eds.) (1999) *Modelling Change in Economic-Environmental Systems* (Wiley).

Jakeman, A.J. and Hornberger, G.M. (1993) How much complexity is warranted in a rainfall-runoff model? *Water Resources Research*, 29(8): 2637-2649.

Post, D.A. and Jakeman, A.J. (1999). Predicting the daily streamflow of ungauged catchments in S.E. Australia by regionalising the parameters of a lumped conceptual rainfall-runoff model. *Ecological Modelling*, 123 91-104.

Croke, B.F.W. and Jakeman, A.J. (2001). Predictions in catchment hydrology: an Australian perspective. *Mar. Freshwater Res*, 52: 65-79.

Kokkonen, T.S. and Jakeman, A.J. (2001) Comparing metric and conceptual approaches in rainfall-runoff modelling. *Water Resources Research*, 37: 2345-2352.

Parker, P., Letcher, R. A., Jakeman, A. J. *et al.* (2002) Progress in integrated assessment and modelling. *Environmental Modelling and Software*, 17: 209-217.

Jakeman, A.J. and Letcher, R.A. (2003) Integrated Assessment and Modelling: Features, Principles and Examples for Catchment Management. *Environmental Modelling and Software*, *18*: *491-501.*

Kokkonen, T.S., Jakeman, A.J. and Young, P.C. (2003) Predicting daily flows in ungauged catchments- model regionalization from catchment descriptors at Coweeta. *Hydrological Processes*, 17: 2219-2238.

Merritt, W.S., Croke, B.F., Jakeman, A.J., Letcher, R.A. and Perez, P. A biophysical toolbox for assessment and management of land and water resources in rural catchments in Thailand. *Ecological Modelling*, 171: 279-300.

Kokkonen, T.S. and Jakeman, A.J. (2002) Structural effects of landscape and land use on streamflow response. Chapter 14 In *Environmental Foresight and Models: A Manifesto*, M.B. Beck (ed.), Elsevier, Amsterdam, pp.303-321.

Letcher, R.A. and Jakeman, A.J. (2002) Catchment Hydrology, In *Encyclopaedia of Environmetrics*, Volume 1, A.H. El-Shaarawi and W.W. Piergorsch (eds), Vol. 1, pp 281-290, Wiley.

Croke, B.F., Merritt, W.S. and Jakeman, A.J. (2004). A dynamic model for predicting hydrological response to land cover changes in gauged and ungauged catchments. *J. Hydrology*, 291:115-131.

Letcher, R.A., Croke, B.F. and Jakeman, A.J. Model development for integrated assessment of water allocation options. *Water Resources Research* 40(5):WO552.

Dr Barry Croke

Research Fellow
(Joint appointment with iCAM and CRES)
Streamflow and water quality modelling, with particular emphasis on predicting flow in ungauged catchments

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Career Brief

Barry Croke has a BSc in Theoretical Physics and a PhD in Astrophysics from UNSW. He was a post-doctoral fellow in the Physics Department at the University of Crete between April 1994 and September 1996. From September 1996 to June 1999, he was a post-doctoral fellow in the Environmental Research Laboratory at the Foundation for Research and Technology – Hellas, working in the fields of hydrology and atmospheric research. In August 1999 he joined iCAM as a visiting fellow, and since October 1999 he has been a joint iCAM/CRES research fellow.

Research, Teaching & Professional Activities

My research interests include development of models for prediction of streamflow and water quality. This includes prediction of flow at ungauged sites, which requires techniques for predicting hydrologic response based on catchment attributes such as topography and land use. This involves development of models suitable for such work, as well as exploring the relationships between model parameters and key catchment attributes. My work on modelling water quality has involved estimation of sediment, nutrient and pathogen exports. A key component of my research is understanding model response to uncertainty in parameter values and input data through sensitivity analysis. This is an important component of model development due to the sparse nature of environmental datasets.

Selected Publications

Croke, B.F.W. and A.J. Jakeman, 2004. A Catchment Moisture Deficit module for the IHACRES rainfall-runoff model, *Environmental Modelling and Software*. 19, 1-5.

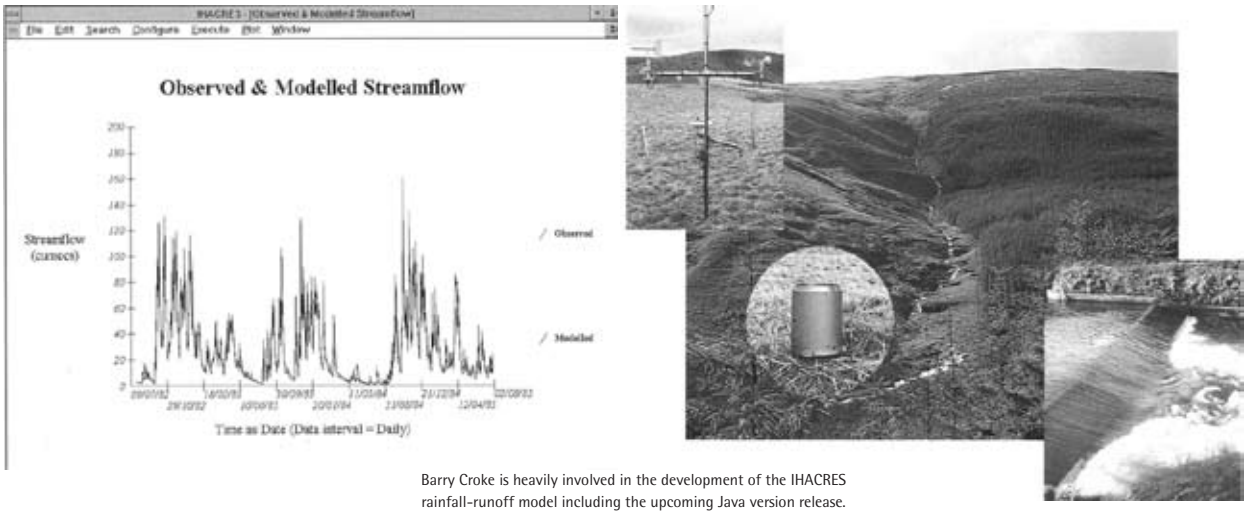
Littlewood, I.G., B.F.W. Croke, A.J. Jakeman and M. Sivapalan, 2003. The role of top-down modelling for Prediction in Ungauged Basins (PUB), *Hydrological Processes*, 17, 1673-1679.

Littlewood, I.G., Jakeman, A.J., Croke, B.F.W., Kokkonen, T.S. and Post, D.A. 2002. Unit hydrograph characterisation of flow regimes leading to streamflow estimation in ungauged catchments (regionalisation). In: P. Hubert, D. Schertzer, T. Takeuchi and S. Koide (eds), PUB Communications. *Kick-off meeting for the IAHS Decade for Prediction in Ungauged Basins, Brasilia*, 20-22 November 2002. Also available at http://www.cig.ensamp.fr/~iahs/index.html .

Croke, B.F.W., A.B. Smith and A.J. Jakeman (2002) A One-Parameter Groundwater Discharge Model Linked to the IHACRES Rainfall-Runoff Model. In: A. Rizzoli and A. Jakeman (eds), *Proceedings of the 1st Biennial Meeting of the International Environmental Modelling and Software Society*, University of Lugano, Switzerland, Vol I, 428-433.

Croke, B.F.W. and A.J. Jakeman, Predictions in Catchment Hydrology: an Australian Perspective, *Marine and Freshwater Research*, 52 (2001), 65-79.

Croke, B., N. Cleridou, A. Kolovos, I. Vardavas and J. Papamastorakis, Water resources in the desertification-threatened Messara-Valley of Crete: estimation of the annual water budget using a rainfall-runoff model, *Environmental Modelling and Software*, 15 (2000), 387-402.



Barry Croke is heavily involved in the development of the IHACRES rainfall-runoff model including the upcoming Java version release.

Dr Rebecca Letcher

Research Fellow, ICAM
Integrated catchment assessment, modelling and decision support

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Career Brief

Rebecca completed undergraduate degrees in Science and Economics at the Australian National University (ANU) in 1998, majoring in economics, econometrics and mathematics. Her honours year in mathematics focused on assessing the impacts of farm dams on stream flow yields in several catchments in the Macquarie River basin, Australia. While completing her undergraduate degrees she also worked as a Research Economist at ACTEW, on water pricing, regulation and forecasting.

She then went on to complete her PhD at the Centre for Resource and Environmental Studies, also at the ANU. Her PhD thesis was entitled 'Issues in Integrated Catchment Assessment and Management'. This work involved the development of an integrated (economic, hydrological) model for assessing water allocation options in the Namoi River Basin, Australia. She has also worked on several other integrated assessment projects, including IWRAM, a water resources project in northern Thailand, and an Environmental Trust funded project in the Ben Chifley Dam Catchment focusing on management of sediments and nutrients to the dam. She is currently working on a three-year project in the Namoi and Gwydir catchments funded by the Cotton Research and Development Corporation. This project will deliver decision support tools for assessing alternative water allocation options for both catchments.

Research, Teaching & Professional Activities

I am currently co-supervising several students at the ANU. I also help organise an undergraduate course in environmental modelling which is run through the Mathematics Department at the ANU. I have given lectures in a water resources course run through SRES.

In addition to these activities I am the Secretary of the International Environmental Modelling and Software Society (iEMSs). As part of this commitment I co-organised a session on Integrated Assessment at the first Biennial conference of the Society which was held in Lugano, Switzerland in 2002. In the last two years I have edited Special Issues of the journals Integrated Assessment and Environmental Modelling and Software, featuring papers from this conference and from a separate workshop convened by a European Union research group called MULINO.

In 2002, I completed a scoping report for the CRC for Catchment Hydrology, recommending approaches that the CRC could follow to integrate economic models with commonly available hydrological models for considering water allocation. I also sat on the Technical Advisory Group for Stage 2 of the Sustainable Water Allocation Program in the CRC for Catchment Hydrology.

Selected Publications

Cuddy, S. M., Letcher, R. A., Chiew, F. H. S., Nancarrow, B., and Jakeman, A. J. (in press). "A role for streamflow forecasting in managing risk associated with drought and other water crises." *Drought and Water Crises: Science, Technology, and Management Issues*, D. A. Wilhite, ed., Marcel Dekker, Inc, New York.

Hare, M., Letcher, R., and Jakeman, A. J. (2003). "Participatory Modelling in Natural Resource Management: A Comparison of Four Case Studies." *Integrated Assessment*, 4(2): 62-72.

Jakeman, A. J., and Letcher, R. A. (2003). "Integrated Assessment and Modelling: Features, Principles and Examples for Catchment Management." *Environmental Modelling and Software*, 18: 491-501.

Letcher, R., and Jakeman, A. J. (2003). "Application of an Adaptive Method for Integrated Assessment of Water Allocation Issues in the Namoi River Catchment, Australia." *Integrated Assessment*, 4(2): 73-89.

Letcher, R. A., Jakeman, A. J. and Croke, B. F. (2004). "Model Development for Integrated Assessment of Water Allocation Options." *Water Resources Research*, 40(5): W0552.

Letcher, R. A., and Jakeman, A. J. (2002). "Catchment Hydrology, *Encyclopedia of Environmetrics*, (eds.) El-Shaarawi, A. and Piegorsch, W.W., Wiley.

Letcher, R. A., and Jakeman, A. J. (in press). "Types of Environmental Models." *Encyclopedia of Life Support Systems*.

Letcher, R. A., Jakeman, A. J., Calfas, M., Linforth, S., Baginska, B., and Lawrence, I. (2002). "A comparison of catchment water quality models and direct estimation techniques." *Environmental Modelling and Software*, 17(1): 77-85.

Letcher, R. A., Schreider, S. Y., Jakeman, A. J., Neal, B. P., and Nathan, R. J. (2001). "Methods for analysis of trends in streamflow response due to changes in catchment condition." *Environmetrics*, 12: 613-630.

Merritt, W. S., Croke, B. F., Jakeman, A. J., Letcher, R. A., and Perez, P. (2004). "A biophysical toolbox for assessment and management of land and water resources in rural catchments in Northern Thailand." *Ecological Modelling*, 171: 279-300.

Merritt, W. S., Letcher, R. A., and Jakeman, A. J. (2003). "A review of erosion and sediment transport models." *Environmental Modelling and Software*, 18: 761-799.

Newham, L. T. H., Letcher, R. A., Jakeman, A. J., and Kobayashi, T. (in press). "A Framework for Integrated Hydrologic, Sediment and Nutrient Export Modelling for Catchment-Scale Management." *Environmental Modelling and Software*.

Parker, P., Letcher, R., and Jakeman, A. J. (2002). "Progress in integrated assessment and modeling." Environmental Modelling and Software, 17(3): 209-217.

Sadoddin, A., Letcher, R. A., and Jakeman, A. J. "A Bayesian Decision Network Approach for Salinity Management in the Little River Catchment, NSW." Proceedings of the International Congress on Modelling and Simulation MODSIM2003, Townsville Australia, pp. 953-958.

Schreider, S. Y., Jakeman, A. J., Letcher, R. A., Nathan, R. J., Neal, B., and Beavis, S. G. (2002). "Detecting changes in streamflow response to changes in non-climatic catchment condition: farm dam development in the Murray-Darling Basin, Australia." *Journal of Hydrology*, 262(1-4): 84-98.

Dr Lachlan Newham

Post Doctoral Fellow
Water quality modelling and spatial data analysis, environmental management

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Career Brief

Lachlan Newham has been employed as a Post Doctoral Fellow at iCAM since completing his a PhD at the Centre for Resource and Environmental Studies in 2002. Lachlan's PhD research was focused on developing and assessing modelling tools used to prioritise management for water quality improvement. Prior to undertaking his PhD studies Lachlan completed a BSc (Resource and Environmental Management) degree with Honours at the then School of Resources and Environmental Management.

Research, Teaching & Professional Activities

Lachlan's research interests are in the broad area of water quality assessment and management. He works on two closely related projects. The first is titled Management of Diffuse Pollutants in the Ben Chifley Dam Catchment, NSW. The aim of the project is to develop a decision support system to aid stakeholders identify and manage critical sources of diffuse nutrient inputs to the Ben Chifley Dam. The project is funded by the New South Wales Government through its Environmental Trust.

The second project is titled Development of a Catchment Contaminant Cycle Model for Stakeholder Use. The aim of that project is to develop a new water quality model for application in large catchments. Various pollutants including sediment, salt and nutrients and their ecological impacts are modelled. The project is funded by Land and Water Australia and the Murray-Darling Basin Commission and is being undertaken in collaboration with CSIRO Land and Water.

Lachlan is the Treasurer of the Modelling and Simulation Society of Australia and New Zealand and an elected member of the ANU Sport and Recreation Association Council.

Selected Publications

L.T.H. Newham, R.A. Letcher, A.J. Jakeman and T. Kobayashi (2004) 'A Framework for Integrated Hydrologic, Sediment and Nutrient Export Modelling for Catchment-Scale Management', Environmental Modelling and Software, in press.

J.P. Norton, L.T.H. Newham and F.T. Andrews (2004) 'Sensitivity Analysis of a Network-Based, Catchment-Scale Water Quality Model' In iEMSs 2004 The International Environmental Modelling and Software Society Conference, Complexity and Integrated Resources Management, University of Osnabrück, Germany, 14-17 June 2004.

L.T.H. Newham, S.M. Cuddy, R.A. Vertessy and A.J. Jakeman (2004) 'Informing the Design of Catchment Contaminant Cycle Modelling – a Survey of End-User Needs', CSIRO Technical Report 11/04, CSIRO Land and Water, Canberra.

I.P. Prosser, C.J. Moran, H. Lu, J. Olley, R. DeRose, G. Cannon, B.F.W. Croke, A. Hughes, A.J. Jakeman, L.T.H. Newham, A. Scott and M. Weisse (2003) 'Basin-Wide Mapping of Sediment and Nutrient Exports in Dryland Regions of the Murray-Darling Basin', CSIRO Technical Report 33/03, CSIRO Land and Water, Canberra.

L.T.H. Newham, J.P. Norton, I.P. Prosser, B.F.W Croke and A.J. Jakeman (2003) 'Sensitivity Analysis for Assessing the Behaviour of a Landscape-Based Sediment Source and Transport Model', Environmental Modelling and Software, vol. 18, pp. 741-752.

L.T.H. Newham I.P. Prosser and A.J. Jakeman (2003) 'Testing Output Quantities and Spatial Patterns of a Catchment-Scale Stream Pollutant Model Against Collateral Studies' In D.A. Post (ed.) MODSIM 2003 International Congress on Modelling and Simulation, vol. 1, pp. 314-319, Modelling and Simulation Society of Australia and New Zealand.

I.P. Prosser, C.J. Moran, H. Lu, J. Olley, R. DeRose, G. Cannon, B.F.W. Croke, A. Hughes, A.J. Jakeman, L.T.H. Newham, A. Scott and M. Weisse (2003) 'Basin-Wide Mapping of Sediment and Nutrient Exports in Dryland Regions of the Murray-Darling Basin', CSIRO Technical Report 33/03, CSIRO Land and Water, Canberra.

B.F.W. Croke, L.T.H. Newham and I.P. Prosser (2002) 'Improving Hydrologic Parameterisation of a Landscape-Based Sediment Source and Transport Model', Third International Conference on Water Resources and Environment Research, 22-25 July 2002, Dresden University of Technology, Germany, pp 242-246.

L.T.H. Newham, R.A. Letcher, A.J. Jakeman, A.L. Heathwaite, C.J. Smith and D. Large (2002) 'Integrated Water Quality Modelling: Ben Chifley Dam Catchment, Australia', iEMSs 2002 Integrated Assessment and Decision Support Conference, 24-27 June 2002, Lugano, Switzerland, vol. 1, pp 275-280.

L.T.H. Newham, I.P. Prosser, J.P. Norton, B.F.W. Croke and A.J. Jakeman (2001) 'Techniques for Assessing the Performance of a Landscape-Based Sediment Source and Transport Model: Sensitivity Trials and Physical Methods', MODSIM 2001 International Congress on Modelling and Simulation, 10-13 December 2001, Canberra, pp. 149-154.

M. Littleboy, G. Piscopo, R. Beecham, P. Barnett and L.T.H. Newham (2001) 'Determining Depth to Watertable for the Eastern Murray-Darling Basin, Australia', MODSIM 2001 International Congress on Modelling and Simulation, 10-13 December 2001, Canberra, pp. 639-645.

L.T.H. Newham, B.F.W. Croke and A.J. Jakeman (2001) 'Design of Water Quality Monitoring Programs and Automatic Sampling Techniques', Third Australian Streams Management Conference, 27-29 August 2001, Brisbane, pp. 455-460.

L.T.H. Newham, C.D. Buller, P. Barnett and J.B. Field (2001) 'Land Use Change: Implications for Australian Capital Territory Water Use', Geospatial Information and Agriculture Conference, 17-19 July, Sydney, pp. 814-827.

L.T.H. Newham and J.B. Field (2001) 'GIS - Expensive Toys or Useful Tools? Case Studies in Landcare Resource Assessment and Planning', Geospatial Information and Agriculture Conference, 17-19 July, Sydney, pp. 36-47.

L.T.H. Newham, B.F.W. Croke and A.J. Jakeman (2000) 'Water Quantity Modelling within the Integrated Catchment Management System', Hydro 2000, 3rd International Hydrology and Water Resources Symposium of The Institution of Engineers Australia, 20-23 November 2000, Perth, Western Australia, pp. 1069-1074.

B.F.W Croke, L.T.H. Newham and A.J. Jakeman (2000) 'Integrated Catchment Management System - Water Quality Module', Hydro 2000, 3rd International Hydrology and Water Resources Symposium of The Institution of Engineers Australia, 20-23 November 2000, Perth, Western Australia, pp.779-784.

Professor John Norton

Dynamic Systems Modeller, iCAM/MSI
Environmental modelling, uncertainty handling and assessment in complex models of dynamical systems, identification and state estimation, postgraduate training

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Career Brief

BA in Mechanical Sciences, Cambridge, 1962 (MA 1966); DIC, PhD in Electrical Engineering, Imperial College, London 1967. Research Engineer, English-Electric-Leo Computers, London 1962-63. Research Fellow, UK Civil Service 1967-71. Lecturer/Senior Lecturer, Dept. of Electrical Eng., University of Tasmania 1971-79. Lecturer/Senior Lecturer/Reader/ Professor, Dept. of Electronic, Electrical & Computer Eng., University of Birmingham 1979-present (currently part-time). Dynamic Systems Modeller (Level E), ANU 2003.

Study leave Cambridge 1974, Warwick 1978, Newcastle NSW 1983, ANU 1992, 1997, 2000, 2002. Adjunct Professor, CRES, ANU 2002.

MIREE (Aust.) 1973-77, MIEAust. 1977-79, MIEE 1980, FIEE 1996, CEng.

Research, Teaching & Professional Activities

My research interests span identification of dynamical systems (particularly time-varying systems), state estimation; uncertainty handling, and their applications to environmental modelling, target tracking and guidance, gas-turbine modelling, process industries, automotive control and biomedicine. Current activity is concentrated on aerospace prediction and guidance problems in the UK and sensitivity assessment of simulation models for environmental applications at ANU. I was head of the Estimation and Control Group at Birmingham from its inception in 1985 to its absorption into the Research Centre for Communications and Interactive Systems in 2000. I have supervised over 20 PhD students working on topics in power systems, electric traction, digital communication, identification, target tracking and missile guidance, gas turbine modelling, and a range of environmental modelling areas. My 130 or so publications include An Introduction to Identification, Academic Press, 1986 (reprinted 1988). I have acted as consultant for Ferranti-Thompson Underwater Systems, British Gas, Defence Research Agency, Defford, Jaguar Cars Advanced Engineering,QinetiQ, Malvern and dstl, Farnborough.

I have been Editor for Adaptive Control of Int. J. of Adaptive Control & Signal Processing, and editorial board member of that journal, IMechE J. Systems & Control Eng. and Env. Modelling & Software. I am currently a member of the International Federation of Automatic Control Technical Committee on Modelling, Identification & Signal Processing.

Selected Publications

P. F. Weston and J. P. Norton (2003), Graded set-membership models, *Mathematical* & *Computer Modelling of Dynamical Systems*, 8, 3, 291-305.

D. G. Maksarov and J. P. Norton (2002), Computationally efficient algorithms for state estimation with ellipsoidal approximations, *Int. J. of Adaptive Control* & *Signal Processing* 16, 6, 411-434.

R. A. Best and J. P. Norton (2000), Predictive missile guidance, *AIAA J. of Guidance*, *Control* & *Dynamics* 23, 3, 539-546.

J. P. Norton (1999) Translation of bounds on time-domain behaviour of dynamical systems into parameter bounds for discrete-time rational transfer-function models, *Maths.* & *Computers in Simulation* 48, 4-6, 469-478.

P. F. Weston and J. P. Norton (1997) Detection and estimation of abrupt changes in input or state, *Int. J. of Control* 67, 5, 699-711.

D. Maksarov and J. P. Norton (1996) State bounding with ellipsoidal set description of the uncertainty, *Int. J. of Control* 65 5, 847-866.

J. P. Norton (1996) Roles for deterministic bounding in environmental modelling, *Ecological Modelling* 6,157-161.

J. P. Norton, T. Chen and A. J. Jakeman (1995) Estimation of unmodelled behaviour as time-varying model-input correction: application to rainfall evapotranspiration, *Environment International* 5 5,533-537.

S. M. Veres and J. P. Norton (1993) Predictive self-tuning control by parameter bounding and worst-case design, *Automatica* 29, 911-928.

S.M.Veres and J.P.Norton (1991) Structure selection for bounded-parameter models: consistency conditions and selection criterion, *IEEE Trans. on Autom. Control* AC-36, 474-481.

J.P.Norton and S. H. Mo (1990) Parameter bounding for time-varying systems, *Maths.* & *Computers in Simulation* 32, 527-534.

M.J.Chen and J.P.Norton (1987) Estimation technique for tracking rapid parameter changes, *Int. J. of Control* 45 4, 1387-1398.

J.P.Norton (1987) Identification and application of bounded-parameter models, Automatica 23 4, 497-507.

J.P.Norton (1980) Structural zeros in the modal matrix and its inverse, *IEEE Trans. on Autom. Control* AC-25 5, 980-981.

J.P.Norton (1980) Normal-mode identifiability analysis of linear compartmental systems in linear stages, *Math.Biosci.* 50, 95-115.

J.P.Norton (1975) Optimal smoothing in the identification of linear time-varying systems, *Proc. IEE* 122 6, 663-668.

Ms Jenifer Ticehurst

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Career Brief

After completing a BSc (Resource and Environmental Management) with Honours at the Australian National University in 1996 I worked as a technical officer in various locations on different research topics. Firstly at CSIRO (Division of Environmental Mechanics) I worked on research into the use of crop irrigation for treating sewerage waste water in the Griffith region of NSW. Next I worked on a project investigating the sustainability of various grazing systems, with regard to pasture biodiversity, water use and animal performance. Finally I was a technical officer at CSIRO (Division of Plant Industry) investigating wheat and rice breeding in southern New South Wales and new techniques that may improve the efficiency of screening processes.

I began my PhD in conjunction with CSIRO (Division of Land and Water) and CRES (Australian National University) in 2000. I investigated hillslope hydrology under various rainfall, topographic and soil conditions to increase the understanding of a hillslopes response to rainfall in southern New South Wales. The findings were used to assist in locating tree belt plantations to utilise excess water in our agricultural landscapes.

Research, Teaching & Professional Activities

I am currently working at iCAM on the groundwater modelling in the ACT, and will be starting a project exploring the sustainability of coastal lakes later this year.

Selected Publications

Ticehurst, J.L, B.F.W Croke and A.J. Jakeman (in press). Model design for hillslope hydrology with tree belts. *Mathematics and Computers in Simulation*.

Ellis, T., N. Potter, P. Hairsine, J. Brophy, J. Ticehurst, K. Hickel, D. Tongway, G. Caitcheon and R. Bartley (2003). Banded Agricultural systems: A design framework for agricultural systems to meet surface water management and targets. Rural Industries Research and Development Corporation Publication. No 03/ November 2003.

Ticehurst, J.L., B.F.C. Croke, J.M. Spate, and A.J. Jakeman, (2003), Development of a simple cascading bucket model for hillslope hydrology, MODSIM 2003: *Integrative modeling of biophysical, social, and economic systems for resource management solutions*, Modelling and Simulation Society of Australia and New Zealand Inc. Townsville, 14-17th July.

Ticehurst, J.L., H.P. Cresswell, and A.J. Jakeman (2003), Using a physically based model to conduct sensitivity analysis of subsurface lateral flow in south-east Australia, *Environmental modeling and software*, 18: 729-740.

Mr Ray Evans

Visiting Fellow, ICAM
Groundwater, Dryland Salinity, Integrated Water Management, Catchment Management

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Career Brief

Ray Evans has been prominent in the Australian groundwater and salinity management scene for over twenty years. His experience ranges broadly across groundwater systems, the hydrology of landscapes and their responses to land use change, and the nature of the interactions of groundwater and surface water systems.

He has provided high-level advice to Governments regarding salinity management, particularly in the Murray-Darling Basin, and has been a national figure in technical aspects of national groundwater management initiatives.

He was a key figure in the early description of the magnitude of the salinity problem in the Murray-Darling Basin, and the likely timeframe for responses to management options. He was a driving force behind the establishment of the National Groundwater Committee. He represented the Commonwealth Government as a technical expert on many groundwater issues.

Ray has over 28-years' experience in Australian hydrogeology and environmental geoscience. He has been heavily involved in groundwater and salinity issues in the Murray-Darling Basin for the past 20 years. This ranges across the hydrogeology of regional aquifer systems, fractured rock hydrogeology, hydrochemistry and isotope hydrology, dryland salinity, catchment management and landscape process studies. Ray specialises in broad regional solutions to natural resource problems. As well, he has extensive experience at the national groundwater policy level and with project and team management.

During his period of employment with BMR and AGSO, Ray was a Research Group Leader (at Senior Principal Research Scientist level) responsible for the strategic direction of the organisation's Groundwater Program. This involved a three-year period where Ray was Program Leader.

Ray was also a Senior Principal Research Scientist at the Bureau of Rural Sciences, in the Land and Water Sciences Division, responsible for the direction of the Groundwater Theme. He spent 11 months during this period as acting Chief of the Agriculture, Food and Social Sciences Division, a position that entailed his participation in the BRS Executive Board. As well, he was acting Chief of the Land and Water Sciences Division during other periods.

Ray is now director of a consulting company, Salient Solutions Australia Pty Ltd, which provides technical solutions for catchment-based groundwater and salinity problems. Salient Solutions works for a range of clients including: Government policy and regional operational groups, research agencies, semi-governmental and community-based catchment management organizations and Landcare groups.

The Federal Minister for the Environment and Heritage has appointed Ray to the Alligator Rivers Region Technical Committee, as part of the Government's response to a report from the World Heritage Committee. This committee is charged with reviewing the science related to the impacts of uranium mining on Kakadu National Park, and advising the Minister of its integrity and appropriateness.

During his commercial endeavour Ray has worked on a broad range of projects that range from high-level reviews of major State-based salinity programs, to national strategic programs aimed at achieving national consistency in approaches for dryland salinity, to projects aimed at defining sustainable yield approaches to groundwater management, and to more direct projects that work with local community groups and catchment managers aimed at influencing adoption of local scale natural resource management actions.

Selected Publications

Ray has produced/published over 80 refereed papers, conference papers, maps and unpublished reports (detailed list available). Ray has also produced many client reports as part of his commercial activities.

Dr Nigel Hall

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Integrated assessment, bioeconomic modelling, environmental economics and policy

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Career Brief

Dr Hall is a natural resource economist specialising in natural resource issues with 30 years' experience as a researcher and research manager, in ABARE, as a Consultant and at ANU. He has experience in research planning and management, policy analysis and in the modelling of bio-economic systems in collaboration with agronomists, hydrologists and other scientists.

Dr Hall grew up on a farm in Northumberland and studied agricultural science before specialising in economics at Newcastle University. He followed this with a postgraduate year at Oxford studying Agricultural Economics under Colin Clark. After working some years with the Bureau of Agricultural Economics, he was awarded a Public Service Board Scholarship to undertake a PhD at Newcastle University. On completion of the doctorate, he returned to Australia and the BAE. BAE and its successor ABARE have been key government research institutions influencing Australian Federal Government policies in agriculture and natural resources.

Research, Teaching & Professional Activities

My research interests include modelling the economics of water and salt management in Australia and overseas and the economics of greenhouse gas abatement through agricultural change. Current projects include providing the socio-economic modelling input to a study of salinity and land use in NSW. Thailand and Laos with the University of Technology, Sydney and working as part of an iCAM team with the New South Wales Department of Land and Water Conservation; in the development of farm, catchment and regional profiles, long term modelling and data management, for control of salinity in New South Wales.

Recent work includes:

Subcontracted as an expert on the Murray-Darling Basin Commission as an example of successful inter-jurisdictional water and salinity management to estimate costs of salinity for Haskoning BV acting for the International Fund for Saving the Aral Seal (IFAS).

Preparing a report on water institutions and use in each state of Australia for CSIRO Division of Sustainable Ecosystems (Dunlop, Hall, Watson, Gordon and Foran 2001)

Estimating water demand from irrigation for the Murray-Darling Basin Commission (Hall 1998).

Co-author of the study of the 'Impact of water on the Australian Economy' for the Australian Academy of Applied Science and Engineering (AATSE 1999).

Selected Publications

Hall, N., Greiner, R. and Yongvanit, S. 2003. 'Adapting Modelling Systems for Salinity Management of Farms and Catchments in Australia and Thailand, ' *Mathematics and Computers in Simulation*, (forthcoming).

Hall, N. and Watson, W. 2001. 'A conceptual framework for integrated catchment management of salinity', *Proceedings of MODSIM2001*, Canberra, 10-13 December.

Hall, N.H., 2001. 'Linear and quadratic models of the southern Murray-Darling basin', *Environment International*, 27, 219-23.

Dunlop, M., Hall, N., Watson, W., Gordon, L. and Foran, B. 2001. Water use in Australia, CSIRO Sustainable Ecosystems, Canberra.

Barr, N., Ridges, S., Anderson, N., Gray, I., Crockett, J., Watson, W. and Hall, N. 2000. Adjusting for catchment management, Murray-Darling Basin Commission, Dryland Technical Report No.2, Canberra.

White, N., Sutherst, R., Hall, N. and Whish-Wilson, P. 2001. "The vulnerability of the Australian beef industry to impacts of the cattle tick (Boophilus microplus) under climate change." (Accepted for publication) Abdalla, A. and Hall, N. 1999. Using management practices to reduce greenhouse gas emissions from Australian agriculture, ABARE Report to the Rural Industries Research and Development Corporation, Canberra.

AATSE.1999. Water and the Australian Economy, Australian Academy of Technological Sciences and Engineering, Melbourne.

Watson, W., Hall, N. and Hamblin, A. 1999. The costs of soil acidity, sodicity and salinity for Australia: preliminary estimates, CRC for Soils and Land Management, CRCSLM/CTT2/6/99, Adelaide.

Hall, N., Poulter, D. and Curtotti, R. 1994. ABARE Model of Irrigation Farming in the Southern Murray-Darling Basin, ABARE Research Report 94.4, Canberra.

Forthcoming completed reports for the TARGET project

Oliver, M., Hall, N. and Watson, W. 2002, Farm Economic Analysis: Little River Catchment, Integrated Catchment Assessment and Management (iCAM) Centre report prepared for the TARGET project, Australian National University, Canberra.

Oliver, M., Hall, N. and Watson, W. 2002, Farm Economic Analysis: Mid-Macquarie Landcare, Consultancy report prepared for Mid-Macquarie Landcare, Watson Agriculture Resources & Environmental Consulting, Canberra.

Oliver, M., Hall, N. and Watson, W. 2002, Farm Economic Analysis: Mid-Talbragar Catchment, Integrated Catchment Assessment and Management (iCAM) Centre report prepared for the TARGET project, Australian National University, Canberra.

Oliver, M., Hall, N. and Watson, W. 2002, Farm Economic Analysis: Warrangong Catchment, Integrated Catchment Assessment and Management (iCAM) Centre report prepared for the TARGET project, Australian National University, Canberra.

Hall, N. (2002) Plantation Forestry Economics for the Lachlan and Macquarie Catchments, Integrated Catchment Assessment and Management (iCAM) Centre report prepared for the TARGET project, Australian National University, Canberra.

Hall, N., Oliver, M. (2001) Scoping Report, Integrated Catchment Assessment and Management (iCAM) Centre report prepared for the TARGET project, Australian National University, Canberra.

Dr David Post

Visiting Fellow, iCAM
Hydrology, water quality

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Career Brief

February 1999 – Present : Research scientist, CSIRO Land and Water, examining the relationships between landscape attributes (especially landuse), and hydrologic response (including water quality) in tropical catchments, particularly in North Queensland.

July 1996 – January 1999 : Post-doctoral research fellow, Oregon State University, carrying out research into the factors influencing hydrologic response for a range of sites within the United States long-term ecological research (LTER) network.

April 1992 - June 1996 : Ph.D, Centre for Resource and Environmental Studies, Australian National University, ACT. 1997. *Identification of relationships between catchment-scale hydrologic response and landscape attributes.*

April 1990 - April 1992 : Experimental Scientist, CSIRO Division of Atmospheric Research, carrying out research into the coupling of ocean and atmospheric general circulation models (GCM's).

December 1988 – December 1989 : B.Sc (Hons.), University of Newcastle, NSW. 1990. *A preliminary study of fog and rainwater quality in the Barrington Tops and New England regions of NSW.*

Research, Teaching & Professional Activities

Projects that I am currently involved in include:

Reducing Sediment and Nutrient Export from Grazed Lands in the Burdekin Catchment for Sustainable Beef Production - funded by Meat and Livestock Australia (MLA).

Ecological Monitoring of the Townsville Field Training Area (TFTA) - funded by the Department of Defence (DoD).

Increasing Sugarcane Productivity through Development of Integrated Surface Drainage Systems for low lying Canelands - funded by the Sugar Research Development Corporation (SRDC).

How do changing Agroforestry Landscape Mosaics in SE Asia Impact of Watershed Functions? - funded by the Australian Centre for International Agricultural Research (ACIAR).

Selected Publications

Post, D. A. 2004. A new method for estimating flow duration curves : an application to the Burdekin River Catchment, North Queensland, Australia. *IEMSs 2004 Proceedings of the International Environmental Modelling and Software Society*, Osnabruck, Germany, 14-17 June, 2004, International Environmental Modelling and Software Society.

Post, D. A., Kinsey-Henderson, A. E., Stewart, L. K., Roth, C. H. and Reghenzani, R. 2003. Optimising drainage from sugar cane fields using a one-dimensional flow routing model : A case study from Ripple Creek, North Queensland. *Environmental Modelling and Software* 18 : 713-720.

Post, D. A. and Croke, B. F. W. 2002. Predicting hydrologic response from physio-climatic attributes : an application to ungauged sub-catchments of the Burdekin River, North Queensland. *IEMSs 2002 Proceedings of the first biennial meeting of the International Environmental Modelling and Software Society*, Lugano, 24-27 June, 2002, International Environmental Modelling and Software Society, Volume 1, 334-339.

Post, D. A. and Jones, J. A. 2001. Hydrologic regimes of forested, mountainous, headwater basins in New Hampshire, North Carolina, Oregon, and Puerto Rico. *Advances in Water Resources* 24 : 1195-1210.

Post, D. A. and Jakeman, A. J. 1999. Predicting the daily streamflow of ungauged catchments in S. E. Australia by regionalising the parameters of a lumped conceptual rainfall-runoff model. *Ecological Modelling* 123 : 91-104.

Post, D. A.; Grant, G. E. and Jones, J. A. 1998. Ecological hydrology : expanding opportunities in hydrologic sciences. *Eos* 79 (43) : 517,526.

Post, D. A.; Jones, J. A. and Grant, G. E. 1998. An improved methodology for predicting the daily hydrologic response of ungauged catchments. *Environmental Modelling and Software* 13 : 395-403.

Post, D. A. and Jakeman, A. J. 1996. Relationships between physical descriptors and hydrologic response characteristics in small Australian mountain ash catchments. *Hydrological Processes* 10 : 877-892.

Post, D. A.; Jakeman, A. J.; Littlewood, I. G.; Whitehead, P. G. and Jayasuriya, M. D. A. 1996. Modelling land cover induced variations in hydrologic response : Picaninny Creek, Victoria. *Ecological Modelling* 86 : 177-182.

Selected Student Theses

2003 : Mirjam Alewijnse. *Grazing and water infiltration in the savanna landscape*. Honours, James Cook University, Townsville.

2002 : Anne-Katrin Heine. *Characterisation of gully erosion by airphoto interpretation and GIS techniques of rangelands in semiarid north-eastern Australia*. Graduate Diploma, University of Bochum, Germany.

2000 : Christine Jurgensen. *Gully and sheet erosion in grazed areas in north-eastern Queensland, Australia*. Graduate Diploma, University of Osnabruck, Germany.

Dr Anthony Scott

Visiting Fellow, iCAM
Environmental Science, Environmental History

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Career Brief

I started my career as a Chemical Engineer, completing a PhD at the University of Sydney in 1989. After a short period with an engineering consultancy, I spent 3 years as a consultant to the Sydney Water Board, setting up and managing environmental monitoring programs, undertaking environmental audits, and designing process equipment at some of Sydney's largest sewage treatment plants.

In 1992, a sudden change in direction and lifestyle led to a 3 month volunteer project in northern California mapping an endangered tree species, followed by various short term environmental projects around Canberra. In 1993, a Graduate Diploma in Environmental Science from ANU, completed the transition from engineering to science.

In 1994 I joined CSIRO Division of Water Resources (and CSIRO Land & Water after 1995) and spent the next 8 years undertaking environmental research. After a short break from work in 2002, I spent one year at the CRC for Freshwater Ecology, as a knowledge broker, and also as the project officer for the 'Living Murray Initiative' – which assessed the need for environmental flows in the Murray River.

In early 2004, I started my work at iCAM, assisting the IWRAM project in northern Thailand.

Research, Teaching & Professional Activities

Over the last ten years my research activities have covered a broad range of environmental topics, ranging from pesticide contamination of waterways, soil erosion, water resources, environmental history and freshwater ecology

One of my key interests has been 'environmental flows' and the modelling of relationships between aquatic ecology and river hydrology. I was a member of the team at CSIRO that developed the software package 'Environmental Flows Decision Support System' which was later customised into the 'Murray Flows Assessment Tool' (MFAT). This tool was used in 2002-03 by the Murray-Darling Basin Commission and the CRC for Feshwater Ecology to assess different environmental flow options for the Murray River, the results of which were used by the Murray-Darling Basin Ministerial Council to make their decision on extra water for the Murray.

Another one of my main areas of research has been environmental history. This culminated in the publication of a book on the environmental history of the Tuggerah Lakes, three estuarine lakes 60 km north of Sydney. The book uses oral history, along with large amounts of other historical information, to assess the long term changes and impacts that have occurred since European settlement.

My current research aims are to apply my knowledge and expertise in both water resources and environmental history to the integrated catchment research being undertaken at ICAM.

Selected Publications

Scott A, Olley J (2003) Settlement, erosion and muddy waters – lessons from the past. A 20 page colour brochure published by the MDBC.

Scott A (2001) Water erosion in the Murray-Darling Basin: Learning from the past. CSIRO Land & Water Technical Report 43/01.

Scott A (2002) 'Tuggerah Lakes; way back when…' Environmental history book published in association with Sainty & Associates and Wyong Shire Council.

Scott A (2001) Waterbirds. Section 6.3 of 'Rivers as ecological systems: the Murray-Darling Basin', (Ed. WJ Young), MDBC, Canberra, pp259-270.

Scott A (2001) Other Riverine Animals. Section 6.4 of 'Rivers as ecological systems: the Murray-Darling Basin', (Ed. WJ Young), MDBC, Canberra, pp271-283.

Bowmer KH, Korth W, Scott A, McCorkelle G, Thomas M (1998) Pesticide monitoring in the irrigation areas of south-western NSW; 1990-1995. CSIRO Land & Water Technical Report 17/98.

iCAM Administrative Staff

Ms Susan Cuddy

iCAM Projects Manager

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Career Brief

Susan Cuddy is Projects Manager in iCAM. She has a Bachelor of Arts from Queensland University with majors in pure mathematics and German literature, and Graduate Diplomas in Secretarial Studies and Computing Studies from CCAE (now University of Canberra).

Susan has a background in project management, applications programming, GIS and database design. She has many years of experience in developing integrated modelling solutions for catchment land and water resource managers in Australia and near neighbours. Research interests/capabilities are in the meaningful translation of science and research results for managers and community groups via design of appropriate computer interfaces.

Ms Susan Kelo

iCAM Administrator

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Career Brief

I have been working for the Australian National University for 12 years. My current position is the administrative officer for the Integrated Catchment Assessment and Management Centre. I ensure the routine operation of the Centre, support the Projects Manager on budgetary matters and provide administrative assistance to the Director. My nominal position is with the Centre for Resource and Environmental Studies where my duties contribute to the public face of CRES including service to the Modelling and Simulation Society of Australia and New Zealand Inc., the International Environmental Modelling and Software Society and the Environmental Modelling and Software journal.

Ms Amanda Letcher

Administrator, iCAM

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Career Brief

I am a casual administrative assistant for the Integrated Catchment Assessment and Management Centre. I develop promotional material for the Centre for use on the iCAM website and elsewhere. I also assist Susan Kelo as required.

iCAM Research Assistants

Mr Ambrose Andrews

Research Assistant, iCAM

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Career Brief

I am a casual research assistant at the Integrated Catchment Assessment and Management Centre. I am designing and implementing software interfaces for various project applications including the Namoi and Gwydir DSS.

Mr Felix Andrews

Research Assistant, iCAM

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Career Brief

I have been a casual software engineer at iCAM for about 18 months. During that time I have worked on implementation of the IHACRES hydrological model, an interface for the Ben Chifley Dam Catchment decision support system (CatchMODS), a sensitivity analysis of the Murray Flow Assessment Tool, the website of the Sustainable Terrestrial, Aquifer and Riverine Systems (STARS) Research Network, and a few other small jobs.

In second semester this year I will start an honours course, jointly supervised from iCAM and the Computational Science program. The topic is still being finalised, but will involve investigation of the ecology of inland river systems.

Mr Michael Kehoe

Research Assistant, iCAM

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Career Brief

Undergraduate in Mathematics. Summer Scholar and casual work with iCAM.

Philip Alcorn

PhD Scholar

Crown and canopy dynamics in subtropical eucalypt plantations

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Research Description

Growth and wood quality of forest stands are intimately linked to the development of the forest's canopy. The size and distribution of leaf area within crowns set limits to biomass production by defining light interception. While it may be desirable to grow trees with large crowns to facilitate rapid stem biomass accumulation, the enlarged branches to support high leaf areas are usually undesirable in the early growth phase until a sufficiently long branch-free section of the stem has formed. It is therefore standard practice in plantations grown for solid wood products to control branch development through stand density and/or pruning. Understanding the effect of these silvicultural treatments on the morphology and physiology of tree crowns can aid the development of models to explain and predict the growth of forest stands.

The aim of this project is to provide a mechanistic understanding of crown and canopy dynamics in a number of subtropical eucalypt species, to build the scientific foundations for stand manipulations to enhance wood quality and productivity. Field experiments will be employed to test the hypotheses that:

(1) The plasticity of green crowns (length, shape, number and size of branches) in response to stand density is greater in the more shade-tolerant eucalypts than in the intolerant eucalypts,

(2) The effect of green crown pruning on biomass production in eucalypts is related to the amount of foliage removed, the nutrient status of pruned foliage, the water status of pruned trees and the shade tolerance of the species.

Specifically the study will examine crown dynamics in the early growth phase of three plantation eucalypts (*Eucalyptus pilularis*, *E. dunnii* and *E. cloeziana*) with differing branch shedding habits. In addition, a detailed investigation of the physiological and morphological responses to differing green pruning severities will be conducted on two of these species exhibiting differing crown dynamics. Allometric relationships between stem, branch and crown components will be developed to aid the investigation. The outcomes from this project will aid the development of a stand management simulation model for the species in question.

Hidayat Alhamid

PhD Scholar

Indigenous forest management in West Papua: a comparative study

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Research Description

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.

Glen Bann

PhD Scholar

Dryland salinity, biodiversity and geodiversity in eastern Australia: quantifying dryland salinity and its effects on terrestrial biodiversity using bio and geoindicators – with applications for NRM

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Research Description

Dryland salinity and biodiversity loss are among the most severe environmental challenges that Australia will face in the future. Yet there is surprisingly little research, previous and current, investigating the interaction and the effects of dryland salinity on biodiversity, especially terrestrial species. It is probable that dryland salinity is contributing substantially to the demise of Australia's plants and animals, yet it is not listed as a 'threatening process', nor is it being addressed and managed as such. This issue is of paramount importance and deserves urgent attention.

This research will investigate the effects of dryland salinity on terrestrial biodiversity, using a number of different survey methods, and will integrate biological and geophysical techniques to investigate relationships between the regolith, dryland salinity and terrestrial biodiversity. In addition, the techniques used will be quantified and integrated into an efficient and reliable survey and monitoring method that may be applied to eastern Australian sites currently affected by salinisation and waterlogging. This information may be used to target priority areas for revegetation and remnant retention activities, using perennial vegetation such as farm forestry.

The aims of the study:

1) To gain a better understanding of the effects of dryland salinity (and waterlogging) on terrestrial biodiversity (threatened ecological community; box/ red gum?) in eastern Australia.

2) To investigate an efficient method using bio and geoindicators, to determine if native vegetation and habitat (biodiversity) are suffering from dryland salinity.

3) To investigate relationships between bio and geoindicators for vegetation surveys affected by dryland salinity (and water logging).

4) To develop effective on-ground management and monitoring strategies to embrace the indicators that prove useful.

Ultimately, to encourage more, better located, and biodiverse revegetation (agroforestry) with retention and rehabilitation of existing remnants.

Lara Boyd

PhD Scholar

Assessing the quality of remnant native vegetation on private land in north west Victoria

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Research Description

The Victorian Government has recently implemented a new policy for the management and enhancement of native vegetation. This policy titled 'Victoria's Native Vegetation: A Framework for Action' has a main aim of achieving a 'Net Gain' in the extent and quality of native vegetation.

The importance of native vegetation is in its value, protecting native flora and fauna as well as land and water resources. The protection of these resources has significant social and economic benefits. Thus, the protection, enhancement and restoration of native vegetation remnants is a priority for the Victorian Government. The quality of remnant native vegetation on private land is also important because it often represents the last stand of rare or threatened vegetation communities. Remnants of native vegetation provide corridors between reserves and are therefore also important for the protection of biodiversity.

To assist in achieving a 'Net gain' in extent and quality of native vegetation as part of this new policy the 'Habitat Hectare' method has been developed to assess the quality of stands of native vegetation. In the Victorian Mallee, in particular along the Murray River around Mildura a large number of properties that were previously used for dryland cropping and grazing activities are being converted to irrigation developments. As part of these new developments many landholders are applying for permits to clear native vegetation. The Habitat Hectare method is being used to help decide what vegetation can be cleared, and where vegetation is cleared, what offsets are required.

The project will look at how this new policy and the 'Habitat Hectare' method will lead to the achievement of a 'Net Gain' in the extent and quality of native vegetation in the Victorian Mallee. The quality of selected remnants on private property will be measured using the 'Habitat Hectare' method and other well-established methods and compared. It is hoped that the project will lead to a better understand of remnant vegetation quality in the Victorian Mallee which will allow appropriate management of the vegetation.

Matthew Brookhouse

PhD Scholar

Dendrochronological reconstruction of climate and streamflow in the Cotter River catchment

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Research Description

Eucalypt tree-rings are an immensely valuable natural repository of climatic data. However, the belief that the dendrochronological potential of eucalypts is limited by indistinct tree-ring boundaries, chronic suppression by folivorous insects and relatively short life-spans has stifled eucalypt tree-ring research. Recent advances in dendrochronological sub-fields of dendroecology and pyrochronology, debate over the intensity of folivorous insects throughout eucalypt forests and an emerging interest in local climate variability are progressively challenging such widely held assumptions. Moreover, the emerging body of dendrochronological research indicates that climatic data may be extracted from eucalypt tree-rings. This potential remains unrealised.

To date, most dendroclimatological research has focused upon one species, *Eucalyptus pauciflora*. Sampling strategies have ignored fundamental principles of limiting factors, ecological sensitivity and replication. Consequently, no literature exists to guide the selection of sites or species in eucalypt-based dendrochronological studies. In addition statistical aspects such as sample size requirements, intra/inter-sample correlation, spatial and temporal dependence of sample sensitivity, and serial correlation within individual tree-ring series have not been examined.

These fundamental sampling and analysis issues must be addressed before sampling targeted at eliciting climate signals from eucalypt tree-rings can be undertaken. The present study aims to resolve some of these outstanding issues and investigate the potential of eucalypt tree-ring data for climatological analysis through investigation of statistical properties of eucalypt tree-ring data utilising established datasets collected by the Department of Sustainability and Environment, examination of the potential role of species and site selection on dendroclimatic signals preserved within eucalypts' tree-ring series and the derivation of tree-ring chronologies and reconstruction of pre-instrumental climate records from samples with high ecological sensitivity. The project is supported by the Cooperative Research Centre for Greenhouse Accounting.

Nicolette Burford de Oliveira

PhD Scholar

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

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Research Description

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 youthsí 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 individualís 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.

Paul Carlile

PhD Scholar

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

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Research Description

This study looks at how to improve 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 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. First, the model aims to provide effective management options for salinity through distribution at the management scale. Second, 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. I have previously conducted research in hydrology, remote sensing and GIS.

This doctoral research is supported by the Department of Land and Water Conservation and the Integrated Catchment Assessment and Management Centre, ANU.

David Carpenter

PhD Scholar

A human ecological investigation into the dynamics of post-green revolution agricultural change: a case of resource poor farmers from the Philippine island of Bohol

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Research Description

While the green revolution undoubtedly raised aggregate production levels across Asia, the benefits of its technology were mainly felt in favourable rice producing areas. In marginal areas like the limestone plateau of south central Bohol green revolution technology was not widely available until the mid 1980s and its acceptance by resource poor farmers has been partial. This thesis documents an attempt by an NGO (SEARICE) to introduce post-green revolution technologies into the village of Campagao in south central Bohol using a human ecological framework influenced by the concept of social capital to investigate this transition and its successes and failures. In particular the thesis focuses on the economic, political, social, ecological, and cultural barriers to the adoption of post-green revolution rice farming technologies at the individual and village level. A preliminary analysis of the data points to a critical disjunction between the modernisation policies of the Philippine National Government, and the policies of the myriad of NGO's that are active in Bohol and elsewhere in the Philippines. The former hope to increase production at the national level through the modernisation of agriculture coupled with weak land reform measures, while the latter focus on increasing agricultural biodiversity, empowering farmers and increasing food security: in the middle are the farmers.

Peter Deane

Master of Philosophy Scholar

The weakest link: environmental value and its influence over private forest use in South-East New South Wales, Australia

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Research Description

This research investigates the inter-relationship between private (family) landowners and the native forest on their properties, in the Bega Valley and Bombala Local Government areas of south-eastern New South Wales. Research funding was provided by SE NSW Private Forestry, an organisation promoting forest management on private property in that region. Consequently, this research had two goals; one for SE NSW Private Forestry and one for the MPhil candidature.

The research component that was conducted for SE NSW Private Forestry focused on obtaining an idea of just what landowners had been doing and were planning to do with their native forest. This research has been completed. Data was collected via a self-administered mail-questionnaire directed through a sample-survey framework and basic statistical analysis was conducted on the responses. The primary result found that recreational and aesthetic uses were consistently the most common and

important that had been undertaken and/or planned for in the future by landowners who responded to the survey. The full results from this part of the research are available in a report, the reference for which can be found below.

Entwined with the sponsored research above but producing a separate outcome, is the research component relating to the MPhil candidature. This part of the research investigates three specific questions: (1) what effect environmental and forest values have on how private forest landowners in south-eastern New South Wales use their native forests; (2) what are the methodological implications of framing question one within a transcendental-realist ontology (or colloquially, critical realism) as compared to (a form of) epistemological positivism, the latter generally being the most common approach used for research on landowners and their use of forest; and, (3) can it be argued that critical realism assists in creating a more complex account of forest use by landowners than does using (a form of) epistemological positivism?

The evidence utilised in this research is drawn from the same self-administered mail-questionnaire as for the funded part detailed above, but uses two differing research strategies to approach the data; inductive-statistical and retrodictive. This research is ongoing.

Details on report funded by South-East New South Wales Private Forestry:

Deane, P., Schirmer, J. and Bauhus, J. (2003). *How private landowners use and value the native forest that they own*. Unpublished report, School of Resources, Environment and Society, Australian National University: Canberra, Australia.

This thesis is currently under examination.

Andrew Deane

Master of Philosophy Scholar

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

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Research Description

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 analysed to determine the separate and cumulative effects of various treatments on stand structures.

Bruce Doran

PhD Scholar

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

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Research Description

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 people's 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 people's 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

Mekong Regionalisms and Governance: A critical political analysis of 'environment and development' governance in the Mekong Region

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Research Description

John is a political economy and governance researcher focusing on "environment and development" governance in the Mekong Region from a base at Chiang Mai University in northern Thailand. His work is highlighting many deficiencies in regional state-led governance and the importance of critical civil society in contesting water resources and other other "development" interventions in an era of complex new regionalisms.

Steve Douglas

PhD Scholar

Relevance of non-indigenous religious and spiritual beliefs to environmental attitudes and behaviours in Australia

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Research Description

After having explored technical ecological, educative and legislative ways of greatly reducing human environmental impacts, I concluded that whilst they all have their merits, there was a missing link that needed to be addressed if greater depth of reform is to be achieved. My training as a Yoga teacher caused me to investigate how that belief system and many others deal with "the ecological crisis". I discovered that the religious and spiritual dimension of environmentalism was under-explored in Australia and especially so in the context of it practical application.

I am considering an investigation of the extent to which religious and spiritual beliefs influence Australian farmers to undertake particular management practices such as converting to "organic" farming or biodynamics as well as pursuing more general environmental reforms such as protecting remnant vegetation and undertaking revegetation or other restorative works.

The role of religion in the environmental crisis is problematic and has generally been seen in the Australian context in terms of certain Christian beliefs acting as drivers and justification for massive land clearing for agriculture and a zealous pursuit by governments of both major parties of strongly pro-growth policies in immigration and so-called "development". Christianity is undergoing something of an environmental reformation, with the Pope having issued two clear proclamations on the need for Catholics to have respect for ecological issues and to minimise their harm to "God's creation". Other Christian churches, particularly the Uniting Church, are getting involved in Landcare, attempting to resurrect certain rituals with reference to the maintenance of Creation, and other more community-based environmental projects, whilst the rapidly growing Jehovah's Witness faith has an overtly pro-environmental stance arising from a significant theological difference to other forms of Christianity and it requires its practitioners to avoid materialism and consumerism.

With Christianity still the dominant religion of Australia, I am keen to explore how it applies the new or rediscovered perspectives of its environmental reformation, particularly the extent to which this might influence individual land managers' practices such as making a decision not to clear more remnant vegetation or to cease using artificial biocides in agriculture. The role of other religions and beliefs in Australia will also be examined, including Anthroposophy (the teachings of Rudolph Steiner, the founder of biodynamic agriculture), Buddhism (generally regarded as being more environmentally friendly than Christianity), and Islam (which is not known in the West for its environmental stance but which has a clear pro-environment position derived from the Qur'an).

Other than being restricted to Australia, the geographic scope of investigations is yet to be determined.

John Drewry

PhD Scholar

Nutrient generation in Australian catchments: land use and management factors affecting water quality

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Research Description

Within agricultural catchments the loss of sediment and nutrients such as phosphorus and nitrogen from pastoral land is known to decrease the quality and recreational use of surface waters. Water quality issues have become increasingly important to many catchment stakeholders. To assist policy makers, a number of catchment management programs have been developed to enable simulation of the effects of management change. However, there is limited information available on nutrient generation rates relevant to Australian catchments and agriculture. There is also a need to improve model simulation of impacts of current and future land management changes on water quality and catchment attributes within catchment models for stakeholder use. While working with Lachlan Newham, Tony Jakeman, Richard Greene and Barry Croke, my research will focus on these catchment issues.

Prior to joining the PhD program at ANU, I worked as a soil scientist with the Land and Environmental Management group at AgResearch Ltd in New Zealand. I have carried out research into management, pasture production and environmental issues. Another area of recent interest is the development of sustainable farm practices within catchments to minimise environmental impacts.

Selected Publications

Drewry, J. J.; Littlejohn, R. P.; Paton, R. J.; Singleton, P. L.; Monaghan, R. M., Smith, L. C. 2004: Dairy pasture responses to soil physical properties. *Australian Journal of Soil Research* 42: 99–105.

Drewry, J. J. 2003: Dairy grazing strategies to minimise soil pugging and compaction in Waikato. *Proceedings of the New Zealand Grassland Association* 65: 99–103.

Drewry, J. J.; McDowell, R. W.; Monaghan, R. M.; Thorrold, B. S. 2003: Soil quality indicators in four dairy catchments: environmental and management implications. Eds: Gao, J.; Le Heron, R.; Logie, J. *Proceedings of the 22nd New Zealand Geographical Society Conference*. The University of Auckland. Pp 284–288.

Drewry, J. J; Littlejohn, R. P.; Paton, R. J. 2000: A survey of soil physical properties on sheep and dairy farms in southern New Zealand. *New Zealand Journal of Agricultural Research* 43: 251–258.

McDowell, R.W.; Drewry, J. J.; Muirhead, R. W.; Paton, R. J. 2003: Cattle treading and phosphorus and sediment loss in overland flow from grazed cropland. *Australian Journal of Soil Research* 41: 1524–1532.

Betteridge, K.; Drewry, J.; MacKay, A.; Singleton, P. 2003: Managing treading damage on dairy and beef farms in New Zealand. Booklet for farmers and industry. Land and Environmental Management, AgResearch. 35 pp.

Rory Eames

PhD Scholar

Is working together enough? The role of 'community' in catchment and regional environmental management frameworks

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Research Description

'Community', 'stakeholder' and 'public participation' are often referred to as key aspects of integrated and collaborative frameworks used to address complex environmental degradation issues, especially at the catchment and regional scale. In Australia, Integrated Catchment Management and to some extent Landcare have provided the predominant avenues for this to happen, and the case study of the Swan-Canning catchment in South West Western Australia is typical of this approach. However a combination of factors surrounding this case study suggests that the conceptualisations of the role of community in environmental management are increasingly inadequate. An understanding of these factors, combined with a synthesis of theories from a range of literature suggests a fruitful way to (re)conceptualise the role of community in collaborative environmental management at the catchment and regional scales.

David Eastburn

PhD Scholar

Realising rural community capacity to sustain future landscapes

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Research Description

The basis of my research is the assumption that members of rural bioregional communities have a rich base for interpreting the past, are highly sensitive to current climatic, environmental, market and policy changes and have a strong interest in a sustainable future for the landscapes in which they live and work. They should, therefore, have greater involvement in decision-making and management processes that relate to the sustainability of their 'places' so that they can respond with local knowledge, imagination and passion, rather than being forced to react to distant decisions.

The research will examine the 'politics' of sustaining landscapes, and the values that different groups within society ascribe to different landscapes at different times. In particular, it will investigate current and historical policies relating to river regulation which impact/ed on the sustainability of landscapes. Research will identify attributes that rural communities, and natural resources management institutions, may benefit from in order to effectively contribute to ecologically and socio-culturally sustainable future landscapes. It will also explore the roles of community and communication in sustaining landscapes.

Saan Ecker

PhD Scholar

Assessing socio-economic and cultural drivers advancing and impeding environmental certification in the Blackwood Basin, SW Australia using product "career" as a framework

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Research Description

Australia is at an early stage in developing accredited Environmental Management Systems (EMS) and even earlier in developing certification processes for agricultural products. The principle objective of this study is to determine the role of attitudes, values and beliefs in driving environmental certification systems for agricultural products in Australia, focusing on the Blackwood Basin in the South West of WA. The study runs in tandem with the development of an environmental certification process – "BestFarms" - in that catchment.

The study will focus on attitudinal influences on products from production to consumption, considering attitudinal influences that occur through out the cycle. The study explores five of the Blackwood Basins major agricultural products - grains, milk, wool, wine and fruit using a conventional and a certified example for each product type. Assessment of the product's environmental 'career' will be developed through informal interviews with best practice case study farmers and other actors in the supply chain, including processors, distributors and consumers. An abbreviated life cycle assessment will also be undertaken to estimate each products ecological footprint.

Potentially, this knowledge can be used by organisations promoting environmental certification to target and develop systems that recognise the role of attitudes, values and beliefs, thereby positively influencing rates of adoption.

Susan Emmett

PhD Scholar

The effects of soil properties and management disturbance on native earthworms in wet eucalypt forest ecosystems

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Research Description

Forest management practices such as clearcutting, burning and soil disturbance greatly impact on soil quality and soil fertility by the alteration of organic matter inputs, by changes to the soil physical structure and by changing the soil biological and chemical composition. Prescribed burning, thinning and clearcutting remove the forest understorey and energy rich forest floor and impact on soil biological communities, such as earthworms that are dependent on this food source.

This ARC funded project investigates the relationships between vegetation, soil properties (chemical, physical and biological) and native earthworms in several tall eucalypt sites in south-eastern Australia. In addition, the effects of disturbance from forest management operations on native earthworms are being examined. Preliminary findings from the *Eucalyptus regnans* site suggest that at ten years post-harvest, the probability of native earthworm occurrence is strongly related to soil organic carbon (SOC) content. Such a finding suggests that the proposed Montreal soil indicator, changes in SOC, is representative of important soil biological properties.

Houshang Farabi

PhD Scholar

A Risk-Based Approach to the Control of Water Quality Impacts Caused by Forest Road Systems

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Research Description

Forest operations and road construction have severe impacts on both abiotic and biotic parts of the ecosystem. Forest roads and timber harvesting activities generate high risks to soil and water. Both foresters and hydrologists have long been interested in the problems caused by forest roads to soil and water. Water quality impacts caused by forest road systems have become a major environmental issue in research in the last two or three decades. In Australian forest management systems, there is a legacy from previous road construction and many old roads now cause water quality problems. Many existing forest roads are not well- designed and pose a high risk for soil erosion and water quality impacts that must be fixed using a new approach.

In this research, it is argued that the likelihood and location of soil erosion and water quality impacts caused by forest road systems can be identified by a specific risk assessment method using terrain attributes. In this research, a specific risk assessment process will be developed for surveying, assessing and gathering data related to the elements at risk (soil erosion and water quality) from road prisms. In addition, various methods of constructing forest roads with regard to their impacts on soil and water will be studied. A suitable method will then be chosen based on the characteristics of the area of study and facilities available. Following this, a database will be constructed in a GIS and the impacts of various sections of forest roads will be evaluated through testing (quality and quantity) variables related to the elements at risk using GIS software (ArcView, ArcInfo, IDRISI, ERDAS) and risk evaluation methods. Samples will be taken in the field (Stromlo Forest) using GPS, to validate the results. The best and simplest methods for assessing the risks of existing forest roads will finally be offered using the results of field sampling and GIS evaluation.

Sue Feary

PhD Scholar

The Role of Forestry in achieving Equality for Indigenous Australians

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Research Description

Key indicators of human well-being demonstrate that Indigenous Australians are the most economically and socially disadvantaged group in Australia. Over the last few decades successive State and Commonwealth governments have funded programmes to redress this situation but there has been little improvement in the statistics, particularly for rural communities. One possible reason for the lack of progress is that employment programmes aimed at creating economic wealth for individuals do not adequately acknowledge the inextricable links between economics, culture and customary values that exist in Indigenous communities.

A recent initiative of the Commonwealth government, to develop a national Indigenous Forestry Strategy (NIFS) is more cognisant of the need to identify programmes that have 'caring for country' components and are community, rather than individually based.

Aboriginal people across much of Australia have had an association with forests that goes back for millennia. Traditional use of forests was for food, raw materials for artefacts and shelter and for medicines. There is an extensive ethnographic literature pertaining to management of forests through periodic burning although the extent to which it occurred is contested. Contemporary communities retain links with forests through co-management arrangements with conservation agencies and involvement with state forestry departments in undertaking pre-logging surveys for cultural heritage. In some parts of Australia traditional knowledge of forest ecosystems and customary practices can complement western scientifically based land management techniques.

The focus of the strategy is to build on the desire of Aboriginal people to play a more active role in natural resource management, by facilitating partnerships between forestry industry enterprises and Indigenous communities. Opportunities for both wood eg plantations and non-wood e.g. bush tucker enterprises are examined.

The strategy is being undertaken by consultants funded through the Department of Agriculture, Fisheries and Forestry (DAFF) and the Aboriginal and Torres Strait Islander Commission (ATSIC) guided by a Steering Committee. The consultants completed an initial round of consultation with Indigenous communities and forest industry in 2003 and a draft strategy has been prepared based on the outcomes of the consultation process. In partnership with the ANU, DAFF and ATSIC are also funding the PhD research to critically evaluate the development and implementation of NIFS. This will be done through action research using several case studies where Indigenous communities and industry have established joint ventures that are or have the capacity to bring social, economic and environmental benefits to both communities and industry. Strategy implementation success will be measured through performance indicators developed in consultation with the joint partners.

Karen Fisher

PhD Scholar

Development, equity and the environment: the case of water in the Philippines

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Research Description

This research considers development and the management of environmental resources in a decentralised governance structure and focuses on the relationships between government agencies and the private sector, negotiation between parties and implementation of policy in the Philippines. I will look at municipal waterworks services in the Philippines as a case study to explore how development policy is put into practice in the context of environmental, social and economic objectives.

The field research will focus on Tagbilaran City, Bohol, in which water and sanitation services are shared amongst various public and private sector agents. The research makes an important contribution to the ongoing debate that is concerned with water resource management and institutional arrangements in developing countries. The research will also explore the extent to which privatisation can play a part in promoting and enhancing the equitable distribution and access to safe drinking water.

David Forrester

PhD Scholar

Increased productivity in mixed species plantations of *Eucalyptus globulus* and *Acacia mearnsii*

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Research Description

Mixed plantations of eucalypts with acacias have the potential to improve stand productivity over that of respective monocultures through the facilitative effect of nitrogen-fixation by acacias, and increased resource capture through above- and below-ground stratification. Monocultures of *Eucalyptus globulus* ssp. pseudoglobulus and *Acacia mearnsii* and mixtures of the same species were planted at three different proportions following a replacement series in a randomised block design in 1992 near Cann River, Victoria, Australia. *Eucalyptus globulus* and *A. mearnsii* heights and diameters and stand volume and above-ground biomass were higher in mixtures from 3-4 years after planting. This difference in productivity between mixed plots and mono-specific eucalypt plots generally increased with time up to age 11 years.

Greater growth in mixtures was due to a combination of factors. Nitrogen and phosphorus cycling through litter fall was significantly higher in stands containing *A. mearnsii* than *E. globulus* monocultures. Rates of litter decomposition were lowest in *E. globulus* monocultures, highest in *A. mearnsii* monocultures and intermediate in 1:1 mixtures. These changes in nutrient availability reduced C allocation below ground in mixtures compared to *E. globulus* monocultures. In addition, a stratified canopy developed in mixtures such that *E. globulus* overtopped *A. mearnsii* from about 6 years of age. This led to an overall increase in light absorption when compared to *E. globulus* monocultures.

Several additional mixed species field trials in NSW and a pot trial of *E. globulus* mixed with *A. mearnsii* showed that the interactions between species in mixtures are also influenced by resource availability and site quality. This study has demonstrated that given the right site and mixture of eucalypts and N-fixing trees, mixed stands can be an attractive silvicultural alternative to monocultures.

This project is being carried out in collaboration with CSIRO FFP, and SF NSW. Financial assistance from the Forest and Wood Products Research and Development Corporation and the CRC for Greenhouse Accounting is gratefully acknowledged.

Martin Golman

PhD Scholar

Determining the optimum land-use options in the context of the April Salumei forest area, Papua New Guinea

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Research Description

In Papua New Guinea (PNG), the rich forest resource is managed on behalf of the landowners by the Government, though the resource is communally owned by the local tribes and clans. Management of these forests by the Government does at times lack the capacity for proper planning, strategically, tactically and operationally. In addition, planning to integrate resource owners' social and environmental values of their forests is done poorly. As PNGs' forest assets are presently managed mostly for timber production, the future of these resources will be at stake under the current pressure on them to generate revenue. Managers of the forests will be forced to adopt alternative, multiple-use strategies in the face of not only economic aspirations, but environmental as well as social pressures to meet sustainable forest management (SFM) requirements.

This research project has been developed to address the above issues and therefore will investigate the nature of the surrounding social, environmental and management aspects in the April Salumei forest context. At the same time, tools available for multiple use planning such as Geographical Information Systems (GIS), as a spatial analytical tool and multiple use planning models will be reviewed. Information will be gathered on biophysical, social and cultural impacts, biodiversity and forest growth and will become the basis for determination of an optimum land-use option.

This research will provide a holistic systems-management philosophy that is more vigorous and compelling in PNG Forest Management than the narrow orientations of the past.

This doctoral research is supported by the John Allwright Fellowship of the Australian Centre for International Agricultural Research (ACIAR).

Simon Gordon

PhD Scholar

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

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Research Description

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.

Quintin Gravatt

PhD Scholar

Phosphorus management in potato soils

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Research Description

The aim of this project is to develop cover crop practices for the heavily fertilised potato cropping soils of the Robertson district that will minimise erosion and runoff of water, potentially rich in phosphorus (P), thereby resulting in significant improvements in the environmental management of this sensitive catchment area. The cover crops will: (i) improve infiltration, decrease erosion, and off-site transport of P; (ii) increase access to accumulated soil P, making it available to a subsequent potato crop, thus decreasing the P loading of the soil; and (iii) have a biofumigation effect that will reduce the use of soil fumigants.

Ingo Heinrich

PhD Scholar

Dendroclimatology of the Australian Red Cedar in Eastern Australian Rainforests

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Research Description

Whilst a number of annually resolved long-term climatic proxydata records exists 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 early in 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.

Further information about my previous research can be found at: http://www.jcu.edu.au/~x-geih/ingos.html

Kevin Jeanes

PhD Scholar

Hydrologic Function Assessment in Support of Mechanisms to Reward Upland Poor for Environmental Services They Provide within Sumatra, Indonesia

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Research Description

In terms of a broad environmental governance goal, the current research is a component of a broader research programme which seeks to foster recognition and rewards for environmental services, and develop institutional and policy innovations, in an effort to reverse the trends of increasing rural poverty and the sell-out of natural capital within the upland and mountainous regions of South and South East Asia.

More specifically, the research intends to focus upon river basin study sites within Sumatra, Indonesia. Against a background of deforestation, loss of catchment environmental services, and poorly connected

stakeholder 'knowledge systems', the study will explore the possibilities and constraints for improved river-basin environmental management in association with developing reward mechanisms for forest and watershed function-related environmental services.

Adopting an integrationist approach by working across the disciplines of landscape ecology, catchment hydrology, environmental modelling and social science, the research will first attempt to identify the major conflicts, pressures and issues related to forest, land use and watershed functions, between upland and lowland communities, within the selected river basins. Second, it will attempt to identify the magnitude and direction of the environmental externalities experienced 'downstream' that are likely to be induced by 'upstream' changes in watershed function. Third, it will attempt to explore the bio-physical limits to the gains which might be made from changing upper catchment and upper river basin management. Fourth, it will explore (briefly) the socio-cultural and economic constraints and capacity for upland communities to change behaviour or implement changes in landscape and resource management if requested to do so. Finally, it will explore the implications of all these findings in relation to the development of mechanisms for internalizing costs and benefits, as intended to be implemented under the broader South East Asia-wide upland environmental governance research programme mentioned above.

This doctoral research will be carried out under guidance of the Integrated Catchment Assessment and Management Centre, ANU, through a collaborative linkage with the World Agro-Forestry Centre (ICRAF), South East Asian Regional Office, Bogor, Indonesia.

Bandara Kangane

PhD Scholar

Genetic improvement of *E. grandis* to increase the solid wood product value

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Research Description

E. grandis is one the most commercialized *Eucalyptus* species grown throughout the tropics and sub-tropics. *E. grandis* has been favoured because of its fast growth, superior form and the wood properties suitable for a variety of products. Currently, the majority of the *E. grandis* plantations are being established for wood pulp and fuel wood production. However, it has been shown that *E. grandis* wood can be used for higher value solid wood products such as construction timber and appearance wood products.

This project's aims are to evaluate the genetic variation of the wood (wood density and density components, density gradient, wood shrinkage and wood collapse) and growth traits of *E. grandis* genetic trials in Sri Lanka and northern Australia, to estimate the genetic parameters and then develop appropriate breeding strategies for value-added solid wood products.

The project is being undertaken in collaboration with CSIRO Forestry and Forestry Products and is funded by the Australian Center for International Agricultural Research (ACIAR).

Stuart Johnston

PhD Scholar

Soil characteristics and processes critical to the sustainability of alpine grasslands

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Research Description

The tall alpine herb field 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 herb fields. 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 herb fields. From this, a state transition model for alpine herb field ecosystems is to be developed to help in the understanding of ecosystem function and help management.

Stefan Kaufman

PhD Scholar

Theory and practice in advancing individual and collective agency for sustainable development

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Research Description

How do we operationalise sustainable development? One requirement is the presence of actors who are able to link everyday choices in their personal, community and organisational spheres to constructive outcomes in broader social, economic and environmental domains. Very broadly, I am interested in using an agency/structure analysis (and related theories that cast light on a broadly social constructivist model) to reflect on and strengthen initiatives aiming to enhance individual and collective agency for environmental sustainability.

Sustainability-promoting projects in Australia and internationally are aiming for a pragmatic combination of devolution of responsibility and the 'learning' processes of locally sensitive engagement. Examples of this mix include social marketing, participatory environmental management, 'green' business innovation and partnership-based government. At least in part, this trend reflects hard lessons that top-down responses to acute problems in one aspect of sustainable development can perversely transform them into even more costly, complex and chronic problems in

others (Gunderson and Holling 2002). Unfortunately, it is also associated with a lack of devolution of resources, and the creation of 'blank' (lack of attention to issues without champions powerful enough to agitate for them) and 'blind' (loss of state capacity to monitor and influence activities) spots in institutions nominally charged with enhancing the public good.

Nevertheless, these activities occurring 'below' formal policy regimes can be seen as the locus of institutional change for sustainability - reshaping interaction between existing institutions and creating new ones (Stewart and Jones 2003). Successful examples manage 'internal' dynamics of information and power asymmetry, and are simultaneously able to anticipate and adapt to or mitigate social and biophysical contexts and processes that extend beyond those apparent in the everyday. It is this balancing between agents' experience of reality and the need to enhance collective agency in broader contexts (whether political, technological, environmental etc), that particularly interests me as a research topic. It is about learning how groups of people can identify and create desirable futures that are sustainable on personal through to societal scales. I am hoping to do primary research in the action research mode with people working in such situations, ideally engaging in our own social learning process by reflecting on and enhancing our understanding and effectiveness through a cycle of theory and practice.

Publications:

Dyball, R.; Beavis, S.; Kaufman, S. 2003, "Complex adaptive systems: models of social learning and sustainability", in *Social Learning for Sustainability*. M.Keen, V. Brown, and R. Dyball (Eds.), Australian National University

Kaufman, S. 2002, "Why people (don't) carpool", a conference paper based on honours research, presented at the 2nd National Conference of Sustainable Campuses, RMIT, Melbourne, September 2002

Dana Kelly

PhD Scholar

The role of power in community participation programs for rangeland management

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Research Description

This research examines how power relationships influence community participation in government natural resource management programs. In the Australian rangelands, the trend in policy and government guidelines has been to promote participatory approaches for a variety of reasons; yet many efforts fail to achieve effective outcomes. A model has been developed to highlight the complexities of participation processes.

Results indicate power relations influence all aspects of participation. Also, landholders and government staff tend to have different understandings of power. Higher levels of power sharing in decision-making are often assumed to be better, but this research found that this is not always the case. Sometimes landholders do not want the responsibility for power in decision-making. Power relations were found to be dynamic and fluctuating.

Ernst Kemmerer

PhD Scholar

Optimal thinning sequences for solidwood production in eucalypt stands

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Research Description

This study investigates the use of dynamical models and optimal control theory to determine the thinning schedule that maximises the volume of large dimension timber that can be harvested over a rotation. Central to finding a theoretically optimal thinning regime is developing a system of equations that describe the growth response following thinning. The system of equations becomes the basis for any dynamic optimisation routine, and therefore the output of the system needs to be responsive to changes in the control variable of stand density.

One approach is to use a state-space representation of the growth model, where the current state is determined only by the previous state, and is independent of past history (so called Markov independence). However, eucalypts are relatively intolerant to intra-stand competition and the past history of the stand is known to affect the thinning response. A state-space representation is therefore unsuitable since it violates the assumption of Markov independence. To overcome this problem 'forest analysts' have (with varying degrees of success) introduced additional state variables such as age, elapsed time since thinning, and other density/time related explanatory variables to ensure that the state variables provide a sufficient description of system behaviour.

Conventional forest growth models use regression analysis to find the average expected response from a set of sub-optimal thinning schedules. If the effect of past thinning treatments is not captured in the model, then the thinning response is underestimated for well-managed stands, and overestimated for poorly managed stands, and the variance is attributed to random errors. Effectively these models attempt to find the optimal thinning sequence based on the results from a set of sub-optimal thinning sequences. Furthermore, these sequences are derived from thinning experiments that are more than often limited in terms of plots size, number of plots and number of replications.

An alternative approach is therefore required to develop models that are responsive to thinning, and to develop a method of finding the optimum sequence for sawlog production from measurements of sub-optimal thinning schedules. This study uses the concept of a production possibility frontier to find the maximum possible sawlog production at each time-step. This was done by applying the objective function to each measurement age to develop an optimal response surface over time and with changes to stand density. The result is a wood production model that is responsive to changes in stocking and age and shows the optimum path for maximising the volume of large dimension timber over a rotation. The results of the model were verified using dynamic optimisation and further modified for different site qualities.

Karen King

PhD Scholar

Simulating the effects of anthropogenic burning on patterns of biodiversity in landscapes

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Research Description

Historical fire regimes dictate the current mosaics of vegetation within landscapes. Contributions by both natural and anthropogenic ignitions determine such fire regimes. Simulation models can provide an insight into how historical fire regimes produced present day landscape vegetation mosaics, and as such they can be used to devise appropriate fire management strategies. Such models incorporate a sound understanding of fire–vegetation interactions into a simulation model capable of depicting fire regimes over heterogeneous landscapes and large temporal and spatial scales. FIRESCAPE-SWTAS is a process-based landscape simulation model devised for simulating natural and anthropogenic burning patterns within the World Heritage Area in the southwest of Tasmania. The frequencies and locations of lightning, arson and management ignitions can be varied to identify key long-term principles in fire regimes responsible for creating and maintaining current vegetation distributions. FIRESCAPE-SWTAS demonstrates that the current mosaic of vegetation is unlikely to have resulted solely from lightning fires, suggesting long-term anthropogenic manipulation of the landscape with fire. Within multiple century investigations, changing the anthropogenic ignition regime has a direct impact on the resultant mosaic of vegetation and overall fire regime dynamics. Such findings have implications for current fire management strategies.

This thesis is currently under examination.

Alex Lee

PhD Scholar

Using airborne scanning LiDAR to measure carbon in Australian vegetation

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Research Description

As a party to the Kyoto Protocol negotiations under the 1994 UN Framework Convention on Climate Change, Australia has a strong interest in calculating greenhouse gas emissions associated with land use change and forestry. As a result, information on biomass and how this changes through time, particularly in response to different land management practices, is required to support regional calculation of carbon budgets. Carbon budgets can be measured with three main components. Carbon carrying capacity (CCC) is defined as the maximum carbon that can be stored in an ecosystem given prevailing environmental conditions and natural disturbance regimes. CCC provides a useful baseline against which current carbon stocks (CCS) can be compared. The difference between CCC and CCS can further be used as a measure of forest Carbon Sequestration Potential (CSP). Remote sensing data has been demonstrated to provide useful landscape-wide assessments of a range of forest and woodland attributes. However, due to the inherent high variability found in natural and managed natural forest and woodland systems, and the diversity of land management practices employed, there is an ongoing need for improved methods of biomass estimation at a range of spatial and temporal scales, and a greater understanding of carbon dynamics for practical and cost effective carbon accounting.

To address these issues, a major sampling program based on remote sensing was initiated in 2000 between the CRC for Greenhouse Accounting, ARC SPIRT and the Department of Agriculture, Fisheries, and Forestry Australia. This program sought to integrate and calibrate coarse scaled data with fine scaled remotely sensed data or field data, to estimate a range of forest attributes relating to biomass, structural diversity and species/community composition in south-central Queensland. Subsequently, in 2003 the National Forest Inventory initiated a pilot study in northeast Victoria to test the implementation of a Continental Forest Monitoring Framework, seeking to further extend some of the remote sensing developments undertaken in Queensland.

My PhD research is currently developing methods of utilising airborne laser data through 3D modelling of trees to determine above-ground forest biomass; these methods have produced results equivalent to those estimated with traditional field plots. It has been found that for certain forest measurements, airborne laser data can provide information just as detailed as that measured in field plots, but over a much larger area. Forest biomass estimates are enhanced by integrating laser data measurements of tree height, cover, the number of trees, and the relative amount of over-storey and understorey in a stand. This information can also give an indication of the successional or growth stage of the woody area and potentially some indication of how long it has been since the last major disturbance. Information obtained from integrating airborne laser data with 3D modelling of trees can then be used to train satellite imagery to better estimate CCS, and potential changes in CSP across the landscape.

David Little

PhD Scholar

Rock weathering and regolith formation in relation to nutrient uptake, organic acids and enzymes in the rhizosphere

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Research Description

As geologists and regolith scientists we observe patterns in nature at a variety of scales, from the big picture at the global scale, right down to the scales of individual mineral grains and micro-organisms. The regolith is particularly interesting because it exhibits patterns strongly related to processes occurring over a similar variety of scales, in particular in response to climate, geology, topography, time and biological activity. Traditionally, plant-regolith inter-relationships have been oversimplified or ignored. Despite a recent increase in studies there remain many opportunities to increase scientific understanding in this area, especially regarding rhizosphere processes and the implications this has for regolith.

I propose to examine the effect that the combined activities associated with nutrient uptake, anion exudation, and enzyme secretion by plant roots and their associated micro-flora have on mineral weathering and regolith formation. This will begin by using detailed chemical, mineralogical and microbiological investigations in the regolith under co-occurring eucalypts and acacias in a dry sclerophyll forest at Mulloon Creek, Bungendore, in New South Wales. A broad scale comparative study

will aim to examine any differences in the rhizosphere effect as a result of changes in geology and / or climate.

This research will contribute to the scientific knowledge base regarding the root-soil interface, and has implications for understanding biological weathering and biogeochemical cycling. The research also has implications for geochemical exploration, by providing useful information on how plant roots take up economically important minerals for transport to and accumulation in the above ground biomass.

Kirsten Maclean

PhD Scholar

Between Spaces - Negotiating Environmental Knowledges at the Environment and Development Interface, Australia

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Research Description

There are ongoing debates in the contemporary environment and development literature regarding the role of both scientific and indigenous participation in sustainable development initiatives. These debates have been critical of the supremacy of western scientific knowledge in such initiatives, with some academics asserting that science can be imperialistic, and its application can sometimes lead to social inequity and exclusion. In response, local and indigenous knowledges have often been offered as providing a panacea for all environment and development problems.

Other scholars have argued that we need to move beyond this dichotomy. Before this can be done we need to understand the commensurability of these knowledge groups. In particular, how do the different interest groups construct notions of 'the environment'? What are these constructions and how can they be allianced? How do different administrative regions affect and manage these alliances and networks? To what extent is this equitable and how can this be improved? Finally, what role is there for local knowledge and, in particular, indigenous ecological knowledge in these networks?

I propose to engage with these debates by conducting an investigation into the knowledge synergy that is (or indeed is not), occurring between local and more 'global' knowledge bases in Australia. The empirical focus is upon knowledge interfacing between government organisations, non-government organisations, 'communities' and individuals working to protect and manage biodiversity and threatened species in Australia. I use two case studies - one in Central Victoria and the other in Southern Northern Territory as a basis for this investigation. The case studies act as points of access into the localised knowledge networks surrounding the protection and management of biodiversity and threatened species in Australia.

The research methodology takes a 'participatory rural appraisal' approach. This involves compiling ethnographies of the projects, conducting focus groups with interested stakeholders, holding semi-structured interviews with key participants and doing transect walks. The emphasis is upon open, flexible, interactive research relationships between all stakeholders who choose to be involved. This will help get at the perceptions, opinions and relationship dynamics of and between different stakeholder groups, as well as set the foundations to devise appropriate strategies for greater interfacing between these groups.

Rassoul Mahiny

PhD Scholar

A Modelling Approach to Cumulative Impact Assessment for Rehabilitation of Remnant Vegetation

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Research Description

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 the habitat of fauna and hence decreasing biodiversity. As well as determining the possible effects of newly proposed development plans on the remnant vegetation patches, a major task is to compensate for the changes that have been brought about by past development. 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 the impacts on the remnant patches in the past. Based on this, the direction of change could be reasonably identified and mitigation practices be suggested.

The study area is to the north of Boorowa, NSW. Changes in remnant patches over nearly 27 years are studied and modelled through remote sensing and GIS. The model is used to predict the changes that will occur over the next 27 years. For assessing cumulative impacts in the patches, landscape metrics and physiognomic aspects are integrated. Scoring of the cumulative impacts is done using the integrated change calculations for the past 27 years and what is actually predicted to occur in the next 27 years. The impact scores show the degree of change as well as vulnerability of the patches and hence their priority for mitigation. The relationships between the impact score and landscape parameters are also explored.

This thesis is currently being examined.

Chris McElhinny

PhD Scholar

Forest and woodland structure as an index of biodiversity

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Research Description

This project examines the nexus between biodiversity and forest and woodland structure at the scale of a stand or patch of vegetation. An important output from this study will be the development of an index of structural complexity to provide managers with a practical tool for assessing biodiversity and vegetation condition, and for monitoring the impact of management decisions in woodland and dry sclerophyll forests. Following an extensive literature review a system for quantifying 130 structural attributes at a stand or patch scale has been developed.

This system is currently being used to collect data from more than 180 plots in 60 study sites across the Murrumbidgee and Lachlan Catchments. Sites have been chosen to provide a representative sample of some key dry sclerophyll and woodland communities across a range of conditions and tenure. Data collection is nearing completion. It is anticipated that multivariate analysis of this data will provide an objective basis for identifying the key structural attributes that should be included in an index of structural complexity.

Angela Newey

PhD Scholar

Organic Matter Decomposition as a Function of Depth in the Soil Profile

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Research Description

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.

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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Research Description

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 being paid 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 allow recommendations to be made regarding the conservation of riparian habitat for birds within agricultural systems.

Ida Aju (Daju) Resosudarmo

PhD Scholar

Decentralization for Forests and Development? The Dynamics of Local-Government Decision Making of Kutai Barat and Bulungan Districts of East Kalimantan, Indonesia

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Research Description

Many countries around the world are devolving political, fiscal, and administrative powers to sub-national governments; at least sixty countries have embarked on some kind of decentralized control over a natural resource or forest. However, so far, there is limited evidence that decentralization has benefited forests and the people who depend on them.

This research examines the outcomes of Indonesia's recent decentralization process in the context of forest use and management. It will observe the dynamics of forestry and forestry-related decision making processes and their implementation. It will explore elements such as the actors and their roles, locus and distribution of power, and accountability mechanisms. Research will involve investigation at the national, sub-national, and local levels.

Jacqui Russell

PhD Scholar

Development of critical human ecology as a research methodology

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Research Description

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 that 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'.

Jacki Schirmer

PhD Scholar

Transforming conflict: case studies of conflict over the establishment of new plantations in Western Australia, the Republic of Ireland and Scotland

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Research Description

The study is evaluating the reasons why attempts to transform conflict over the expansion of tree plantations have varying levels of success. To do this, three case studies are being examined and compared, investigating community reactions to plantation expansion in the Great Southern region of Western Australia, County Leitrim in the Republic of Ireland, and Dumfries and Galloway in southern Scotland. A wide range of processes used to transform conflict – including regulatory, legislative, participatory and planning processes – are being examined. The work is supported by the Cooperative Research Centre for Sustainable Production Forestry in Hobart.

Karim Sabetraftar

PhD Scholar

The hydrological flux of organic carbon and how it can be analysed spatially using environmental modelling and GIS

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Research Description

Terrestrial carbon accounting to date has largely ignored the hydrological flux of organic carbon. However, recent studies have suggested that this is an important lateral process that may constitute a significant stock and flux of organic carbon at the catchment scale.

The major objectives of this study are to (1) investigate the hydrological flux of organic carbon in the river environment of the Cotter River Catchment, ACT and (2) evaluate the contribution of this flux to terrestrial carbon accounts.

The research focuses on using a hydrological simulation model (IHACRES) to analyse organic carbon samples from streams and tributaries in the Cotter River Catchment. Potential inputs of organic carbon across the catchment will be estimated using the NDVI process based-model of net primary production (NPP). The relationship between the hydrological organic carbon data and predicted terrestrial productivity in the catchment will then be investigated.

Sunil K. Sharma

PhD Scholar

A comparison of combinatory methods and GIS based multi-objective land use assessment and allocation

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Research Description

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, growing demand for the land to fulfil the development needs of the human beings coupled with a greater awareness of environmental, economic and social issues has led to increasing complexity in land use decision-making. This research will address the land use decision making problem through applying simulated annealing, tabu search, genetic algorithms and GIS-based technique to Narawalle Creek of New South Wales (NSW) and compare their performance and applicability.

Danny T. Siegenthaler

PhD Scholar

Transitional vegetation response to global warming: implications for carbon sequestration

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Research Description

The landscape of southeastern New South Wales, particularly around the Canberra region has historically been under considerable pressure from settlers clearing native eucalypt woodlands and forests to accommodate grazing of sheep and cattle. Broad scale clearing leaves only scattered remnants of the original vegetation, resulting in the conversion of relatively continuous ecosystems, such as forests, into islands of natural habitat surrounded by a matrix of agriculture and urban development. Impacts of such clearing are usually considered in terms of local species, environmental degradation such as soil erosion and salinity problems and these factors in turn impact carbon stocks. Vegetation loss, fragmentation and degradation alter microclimatic regimes thus influencing vegetation regeneration processes and adversely affecting carbon sequestration.

Impacts of land clearing on Carbon Carrying Capacity (CCC) and Net Biome Productivity (NBP) are calculated over time periods of tens to hundreds of years. The accelerated greenhouse effect is predicted to significantly alter climatic regimes such that ecosystem response is in disequilibrium. Thus, in calculating CCC and NBP in response to greenhouse forced climate change it will be necessary to simulate the transitional (non-equilibrium) response of vegetation systems to changing climatic regimes. This requires the capacity to model potential plant responses on a species-by-species and spatially explicit basis. In landscapes that have been subject to vegetation loss, fragmentation and degradation, the transitional vegetation responses will reflect the altered micro climatic regimes and how these influence regeneration processes.

This project aims to investigate the effects of forest fragmentation on vegetation regeneration processes and to integrate these relationships into a landscape-based, vegetation succession model. This vegetation model will in turn be coupled to a carbon accounting model.

There will be three main studies:

Analysis of existing forest fragments to determine spatial patterns in regeneration.

Experimental analysis of seedling growth in relation to microclimatic conditions caused by forest fragmentation and how these processes relate to patterns in vegetation.

Development of a simulation model, calibrated with existing and newly generated field data, to explore potential expansion of fragments given certain micro-, meso- and macro-climatic conditions. The model will enable changes in carbon stocks to be estimated on a landscape-wide basis.

Catherine Simpson

PhD Scholar

The estimation and prediction of dry sclerophyll forest condition on the Southern Tablelands, NSW using spatial data

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Research Description

Whilst extensive in eastern Australia, native dry sclerophyll forests (DSF) on the Tablelands largely occur as patches of remnant regrowth that emerged following the abandonment of unproductive agriculture on private lands. These forests have generally been overlooked by systematic assessments in favour of the taller, wet sclerophyll public forests. As a result, conservation priorities and management strategies on a landscape scale are poorly developed. However, a number of organisations and researchers have recognized the potential biodiversity conservation and economic values of DSF.

Recent research at ANU suggests that advances in remote sensing technologies (particularly hyperspectral imagery) have the potential to characterise relevant spatial patterning and structural attributes at scales sufficient for DSF conservation priorities and management strategy development. However, a recent pilot study highlighted the limitations of using spectral analysis alone for mapping DSF condition where structural differences are subtle.

This project will investigate the extent to which the condition of a representative sample of remnant DSF in SE Australia can be established by using digital interpretation and analysis of remotely sensed data. The research will explore the utility of varying combinations of spectral and textural analysis techniques, as applied to satellite data sources with varying spectral and spatial resolutions, for extracting DSF condition. Knowledge on the extent and condition of DSF will be used to enable recommendations on future management strategies to enhance the biodiversity conservation and economic values of DSF.

The research is partially supported by the Rural Industries Research and Development Corporation (RIRDC) and CSIRO Sustainable Ecosystems.

Sanjeev Kumar Srivastava

PhD Scholar

Testing a spatial model for predicting fish abundance and distribution

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Research Description

In my PhD I will compare different conventional and knowledge-based models for the prediction of fish distribution and abundance using ad hoc or bad datasets. Natural history collections across the world hold useful information on fish occurrence over a wide temporal range; this information can be used to predict the distribution pattern of fish and to identify changes in their distribution patterns at different spatial scales. Since the information in natural history collections and other such databases are not the result of well designed sampling, and are collected opportunistically, to extrapolate from such data using multivariate analysis is regarded as unreliable and a knowledge-based system is found to be more useful. The applicability of knowledge-based models will be

tested at different spatial scales in the Murray-Darling river basin, which is one of the largest and driest catchments of the world.

Before joining the PhD program at SRES, I was working as a Scientist at the National Bureau of Fish Genetic Resources, Lucknow, India under the Indian Council of Agricultural Research. In addition, I am one of the collaborators for the FishBase project of the World Fish Center in Malaysia.

Recent Publications

Srivastava, Sanjeev K., Reyes, R., Fabres, B., Ponniah, A.G. and D. Kapoor, D. Mapping Indian inland fish diversity using historical occurrence data in FishBase. *Proceeding of International Symposium of Application of GIS/Spatial Analyses in Fisheries and Aquatic Sciences*, held at University of Sussex, Brighton, UK, 3-6th September 2002. (in press)

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* 15(4).

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.

Geraldine Teakle

PhD Scholar

Perceiving, learning and adapting to risk: the case of tropical cyclone prone communities in Darwin, Australia

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Research Description

Variability and uncertainty characterise the nature of the environment on planet Earth. Not surprisingly, human populations have the ability to live with, and adapt to their environment. Despite this, and the benefits of modernisation such as mobility and longevity, the world trend in disaster-related loss of life continues to increase. Although there has been a fall in fatalities attributable to some natural phenomena in wealthy countries over the last century, the economic cost has risen sharply. Regardless of these trends, people today, more than ever before are living and moving, into regions on the planet known to be *risky*. This is especially so in Australia where, for example, people are moving to risky coastal localities in unprecedented numbers.

To understand better why people choose to live in risk-prone locations, and how people perceive natural hazard risk and learn and adapt to it, I have chosen the tropical cyclone-prone community in the city of Darwin at the top-end of Australia as a case study for this purpose. I also propose to investigate this process of learning and adaptation in the context of historical and contemporary policy response and implementation. Within this context, gaining an understanding of tropical cyclone risk perception of both the general community and the government and private sectors will be fundamental to the study. I hope the study will be used to inform policy, formal and informal disaster and environmental management arrangements, the community and more specifically, the literature on risk perception and adaptation. The global goal is to enhance the resilience and sustainability of the community and the environment in cyclone-prone Darwin, and beyond.

Ha Thi Thu Tran

PhD Scholar

The impact of the renovation policies on sustainable forest management in the Northern Uplands region, Vietnam

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Research Description

In the 1990s the Vietnamese Government shifted from a subsidised central economy to a market economy, and transferred land use rights from the State to users through implementing new policies called *Doi Moi* (Renovation Policies). The Government expects that by increasing local income based on forestry activities deforestation will be stopped and the forest will be managed sustainability. The purpose of this research is to analyse the impacts of the renovation policies on forest management over the last decade and to answer the question: "How have Renovation Policies affected sustainable forest resource management in the Northern Uplands region of Vietnam?".

In Vietnam, sustainable forest management depends on many factors, one of which is to understand the optimal farming practices for forest land. However, to meet optimal forest resource use, not only secure forest land tenure rights, but also market reforms and other related policies will be needed. This analysis will help policy and decision makers to apply appropriate approaches and develop them further in order to strengthen efforts towards sustainable forest management in Vietnam.

Robert Waterworth

PhD Scholar

The distribution of carbon and nutrients in the stemwood of *Pinus radiata* (D. Don.) under differing environmental conditions

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Research Description

The way trees grow and in the process store carbon and nutrients in the stemwood is related to site and climatic conditions. This research aims to determine distribution of carbon, carbon isotopes and nutrients (primarily nitrogen) at a sub-annual level within the stem of *Pinus radiata* (D. Don) under differing environmental conditions. This will provide a better understanding of the relationships between carbon storage, stem volume increment and environment.

The research is based on historical data and recently collected samples from CSIRO's Biology of Forest Growth experiment, a long-term research trial terminated by the 2003 Canberra bushfires. The trial consisted of combinations of irrigated and fertilised treatments, representing a diverse range of growing conditions. The initial phase of the research involves full stem analysis of sample trees to determine the stem volumes and changes in stem form between the treatments. This information will then be used in combination with historical measurements, x-ray densitometry and carbon analysis to develop sub-annual estimates of carbon accumulation in the stem. Further analysis of the effects of climate on stemwood properties, such as carbon isotopic ratios and microfibril, are also planned.

Nutrient analysis will focus on the C:N ratio of heartwood rings laid down during major treatments to determine if this varies with increased nutrient availability. This heartwood C:N ratio is important when considering the potential changes to forest biomass stocks under changing site and climatic conditions.

The research is being carried out with assistance from CSIRO Forestry and Forest Products. Funding from the CRC for Greenhouse Accounting is gratefully acknowledged.

Eddie Webber

PhD Scholar

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

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Research Description

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

Wendy Welsh

PhD scholar

GIS and numerical groundwater modelling

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Research Description

Groundwater is an important resource in many parts of Australia. Unfortunately it is hidden from view and therefore difficult to quantify. Quantification and understanding of the resource and its interactions with surface water are essential to the effective management of groundwater.

A GIS-based method of estimating the magnitude of the water balance components and their interaction with surface water was developed and trialled near Bowen, a Queensland coastal irrigation area. Here rainfall is seasonal and high-value horticulture depends on groundwater. Over-extraction of the groundwater causes seawater intrusion, which leads to long-term aquifer contamination. Historical data were combined with formulae based on Darcy's Law of groundwater flow to produce spatial and temporal water balance estimates.

Although the GIS-based method produces water balance estimates faster than the more traditional numerical groundwater flow modelling, the latter method allows for the prediction of future water levels and water balances.

A MODFLOW-based groundwater model is being created for the Great Artesian Basin. This is the most important source of water in western Queensland and parts of regional NSW, SA and NT. The aquifers are laterally continuous across the Basin and extend to 3000 m below the ground in the central depocentres. The groundwater is potable for stock, and in most areas is under sufficient pressure to flow freely when tapped. However, many bores flow uncontrolled into open bore drains, wasting water and reducing groundwater pressures.

Springs, which are the Basin's natural groundwater discharge zones, have also declined due to over-extraction of groundwater. In 2001 the native ecosystems dependent on the Basin springs were listed as *endangered* under the Commonwealth Environment Protection and Biodiversity Conservation Act.

The groundwater model, which uses data collected since the 1800s, will increase understanding of Basin hydrology and enable spatial and temporal predictions of groundwater recoveries due to on-ground work, such as rehabilitating uncontrollable bores and replacing open bore drains with pipes, tanks and troughs.

This work is supported by the Bureau of Rural Sciences. Data are provided by the Queensland Department of Natural Resources, Mines and Energy, the NSW Department of Infrastructure, Planning and Natural Resources, the SA Department of Water, Land and Biodiversity Conservation and the NT Department of Infrastructure, Planning and Environment.

Vanessa Wong

PhD Scholar

The effect of salinity and sodicity on soil carbon stocks and fluxes

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Research Description

The soil organic carbon pool is the world's largest terrestrial carbon sink, and interest is rising in the effects of land use practices in mitigating carbon dioxide emissions. Saline soils were estimated to cover over 5.5 million ha within Australia in 2000, while sodic soils were estimated to cover 74 million ha, or 28% of the landscape in Australia, which is predicted to increase in the future. Increases in both salinity and sodicity can lead to a decline in vegetation health and plant biomass production, and in extreme cases, result in the complete loss of vegetation and the development of salt scalds, which become increasingly susceptible to soil erosion. Because the amount of carbon present in the soil is dependent on inputs and losses, increasing salinity and sodicity levels have the potential to decrease carbon inputs into the soil from declining vegetation inputs and increasing erosion, in addition to altering soil physical and chemical properties which would subsequently impact upon nutrient cycling and biotic activity. Therefore, any change in management regime, including both degradation and rehabilitation processes, has the potential to affect the carbon flux and store of a particular area.

By investigating the microbiological and environmental processes that govern the breakdown of soil organic matter in saline environments, the fate of organic carbon after its incorporation into the soil and means of reclamation of saline and/or sodic soils to enhance carbon sequestration can be determined. This project aims to determine how increasing salinity and sodicity affect soil carbon stocks and fluxes, and the extent of hysteresis these systems exhibit upon rehabilitation. The results will undoubtedly provide a broader understanding of issues associated with salinity, sodicity and carbon, and have the potential to be applied towards changing land management practices to reduce carbon loss and enhance carbon sequestration.

This project is being supported by the CRC for Greenhouse Accounting and CRC LEME.

Don Bakat

Master of Forestry Scholar

Influence of different thinning intensities on the diameter and height increment of *Terminalia brassii* at Ulabo, Papua New Guinea

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Research Description

Serving as a Forest Officer with both the Forest Industry and the Papua New Guinea National Forest Service for over 15 years, one fact that I have realised is that commercial timber stands in the natural forest are decreasing rapidly. The Papua New Guinea Forest Authority's statistics show that the commercial timber output has been declining since 1998 and currently there are only 26 potential forest areas remaining in the country.

Having been exposed to various facets of forestry, ranging from plantation establishment and management, plantation research, community forestry, development and evaluation of forest working plans, monitoring of logging operations, forest inventory and management plans to forest engineering over the last 12 years, I settled into plantation forestry in which I still have a keen interest. Plantation forestry in PNG has the potential to meet the domestic and international demand for wood. Papua New Guinea has many native tree species that can be grown in plantations that have the potential to net optimal market prices.

However, very little is known about some of these high value species, especially their silvicultural requirements and the regimes under which they grow best. Numbers of high value species are being planted in plantations and silvicultural research is an important part of these plantations.

In my Master of Forestry research I aim to investigate the influences of thinning intensity on the diameter and height growth of *Terminalia brassii*. It is based on a plantation compartment which was planted in December 1985 and a thinning trial established in 1988. Annual measurements were recorded from 1988 to 2003 and the data is original, based on my own research.

Van Ngoc Do

Master of Forestry Scholar

Conservation and effective utilization of forest tree genetic resources for plantation forestry in Vietnam

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Research Description

Vietnam is a tropical country, which has abundant and diverse flora. However, for various reasons, the area of national natural forests has decreased considerably during the past several decades, resulting in the danger of extinction of many tree species as well as great losses of valuable genetic resources.

As part of the effort to rehabilitate the forest ecosystems, the Vietnamese government has initiated national forest development programs aimed at meeting various demands for wood and other products as well as addressing environmental degradation in the country. Therefore, plantation forestry plays an extremely important role in Vietnam's pursuit of sustainable development.

My research will focus on two issues. The first is to develop sound gene resource conservation strategies for economically valuable, indigenous tree species in natural forests for use in national plantation forestry in the future. These conservation strategies will not only maintain the existing gene pool of the species but also diversify genetic variation, which is the material for future breeding strategies. The second issue concerns effective utilization of gene resources of both exotic and indigenous tree species with high value being used for national plantation forestry through breeding strategies. These breeding strategies are aimed at providing genetically-improved planting materials for national planting programs, increasing economic and environmental values of plantation forests.

Thao Van Duong

Master of Forestry Scholar

Conservation Strategy for Targeted Tree Species in Vietnam

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Research Description

Vietnam is one of the richest countries in terms of biodiversity in the world, with more than 12,000 plant species. However, the rapidly growing population and pressure for social and economic development are leading to increasing rates of destruction and degradation of natural habitats, including forests. The loss of natural resources and degradation of land are affecting the economy and wellbeing of the nation. The loss of habitats is leading to accelerated rates of loss of genetic resources, which are fundamentally important in the adaptation and improvement of plant species under cultivation. A large number of valuable species, many endemic to Vietnam, are under threat of extinction. Employing a sound conservation strategy would help save the valuable resources of the country.

Focusing on endangered tree species, this research reviews the current forest genetic resources in Vietnam in which genetic loss and threatened trees species are emphasized. It will review current literature on basic genetic processes and discuss the implications of different tree characteristics for forest conservation. The discussion reveals key principles for forest genetic conservation strategy. The paper assesses impacts of humans on forest genetics and the response of humans to degraded forest resources including several approaches that are being applied in forest conservation worldwide. The paper then focuses on the current forest conservation status in Vietnam. In particular, the methods and results of main forest conservation projects in Vietnam are discussed. The next step of the research is to establish criteria for selecting a short list of real endangered tree species for developing conservation strategies. As the list of endangered tree species is compiled, data on each species will be reviewed. Finally, based on the current literature review of forest genetic conservation, what has been done in Vietnam in forest conservation and data on the endangered tree species list, the paper will develop appropriate conservation strategies for the selected tree list.

Cheryl Edridge

Master of Environmental Science Scholar

Protected areas as cultural landscapes

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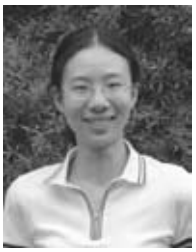
Research Description

For my final paper I look at the meanings and motivations behind the establishment of protected areas. In the case of national parks, the practice of excluding human use and habitation can be seen to marginalise indigenous people who have vested their own meanings in the landscape and have a different world view. In this paper I look at national parks in New Zealand and Australia that have been declared World Heritage sites to find out what other meanings are vested in the landscape and how different world views affect management practice. I propose that the distinction between natural and cultural landscapes is an artificial one since all landscapes are layered with human meaning, and that land management is also a cultural practice.

This thesis is currently under examiniation.

Baihua Fu



Master of Environmental Science Scholar

Eutrophication in river or lake catchments

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Research Description

Finishing Graduate Diploma in Resource and Environmental Management in SRES in 2003, I am now studying for the Master of Environmental Science this year. My main interest is in land management and water quality issues, particularly eutrophication in river or lake catchments. Eutrophication is a worldwide water quality problem. Understanding the process of nutrient loads is essential to addressing eutrophication and related issues of land management. My research project is therefore looking at the relationship between land use and nutrient loads in Bundella Creek, a sub-catchment of the Namoi Basin, NSW. The purpose of the research is to understand the reasons for the high nutrient concentration in that area and coming up with a suitable land management strategy. This research may be further expanded to the whole Namoi catchment due to their similar conditions of land use and water quality. The problems of nutrient loads in some catchments of China may be addressed in my PhD study in the future.

William Marthy

Master of Environmental Science Scholar

Forest conservation, wildlife research and management

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Research Description

I joined SRES in first semester 2003. I am currently doing my Master in Environmental Science.

I am a biologist with my major interest in bird conservation, both as a hobby and a career. In the past have I worked with a bird conservation NGO trying to identify the most important conservation areas in Indonesia using birds as an indicator. As a birdwatcher this was a good opportunity to expand my bird list and see many beautiful and amazing birds in Indonesia's remaining forest.

Despite my background, I am now interested in forest conservation, focusing on how to integrate biology-ecology information with economic and social aspects, especially in the current forest situation in Indonesia where 'small' blocks rather than big blocks of forest dominate the landscape.

Rebecca Pagan

Master of Forestry Scholar

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

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Research Description

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.

Julia Pickworth

Master of Environmental Science Scholar

Community perceptions of pine plantations

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Research Description

My research is currently focused on community perceptions of plantation forestry, particularly perceptions of pine plantations on private land in the Bombala Shire, NSW. There has been a recent increase in the area of pine plantations in this region; this increase is welcomed by some in the community and opposed by others. A planning process led by the NSW Department of Infrastructure, Planning and Natural Resources (DIPNR) is currently being implemented to develop a landscape plan for pines in this region. At this stage, my research is focussed on the community's perceptions of the impacts of pines, as well as their perceptions of the planning process. My research is likely to develop during this year, possibly expanding to other issues and other Snowy River communities.

Michael Poesi

Master of Forestry Scholar

Tree breeding to improve aspects of *Calophyllum euryphyllum* in PNG

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Research Description

This year I am doing a Master of Forestry, having completed the Graduate Diploma in Science last year. From 1995 to 2002, I worked as a forest researcher with the Papua New Guinea Forest Research Institute, a research division of the Papua New Guinea Forest Authority. My research interest has been focused on tree improvement of Papua New Guinea's native species. In the last eight years, I have been involved in domesticating (screening) some potential species. This involves the assessment of quantitative traits of these native species and evaluating their potential for growing in small-scale plantations. In my major research essay, I examine the tree improvement aspects of PNG *Calophyllum euryphyllum*, one of the most important native species ranked highly as round logs in the export markets for PNG species. *C. euryphyllum* current wood demand is mainly being met from natural forests. There is little genetic information available, thus there has up until now been no major program for growing this species as a plantation species.

Michael F. Ryan

Master of Forestry Scholar

Natural expansion of native forests onto cleared agricultural land

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Research Description

During the 20th-century the Southern United States of America, much of Central Europe and parts of Australia underwent significant natural forest expansion onto abandoned agricultural land. These new forests have had major environmental and economic implications and in many instances have far exceeded the area of active reforestation.

The aim of this study is to use existing literature, historic photographs and artwork to identify the nature of the landscape at that time of agricultural abandonment that resulted in the expansion of natural forests. It will look at two overseas case studies, one in Alabama in the Southern USA and one in Italy, and explore the economic and environmental consequences in these cases. It will then focus on Northern NSW and quantify the changes in forests from the 1930s to present.

These case studies will explore the causal factors and conditions under which forests can expand onto agricultural land. The outcomes have potential implications for Australia's current requirement to retire large areas of marginal agricultural land.

Emma Soraya

Master of Forestry Scholar

An Optimization Model for the Management of Cultivated Rattan

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Research Description

My major research essay will look at growth and yield models for rattan cultivated in Kedang Pahu Watershed, East Kalimantan, Indonesia. Indigenous people in Kedang Pahu have been cultivating rattan for centuries. Rattan is considered as the most valuable of Indonesia's non-timber forest products (NTFPs), having both economic and ecological values. Because of their commercial value, wild rattan resources in Indonesia are being depleted by over-exploitation.

In my Master's project, how the rattan farmers manage their rattan gardens will be simulated and the optimal sustainable harvesting level will be defined. By simulating actual cultivated rattan management, the growth model can be described and the yield model can be derived as well. This will be followed by optimization for the sustainable harvesting level, so the optimum strategies of cultivated rattan management can be found. Nevertheless, because cultivated rattan has not yet been studied intensively in Indonesia, the availability of data becomes the main constraint on this study. This obstacle will be resolved by combining this study with other studies of rattan growth models.

Karen Teo Chwee Peng

Master of Geographical Sciences Scholar

Tropical rainforest in the wet tropics (namely Southeast Asia), GIS, vegetation ecology

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Research Description

I graduated from Nanyang Technological University, Singapore, with a degree in Geography and Mathematics. Before embarking on my postgraduate studies here in the Australian National University, I taught geography and social studies in a secondary school in Singapore for seven years. My interest is in the sustainability of fragmented forests, with special focus on fragmented forests in Asia. As a result of development, many forested areas in Asia have been stripped of their natural flora to accommodate an increase in population and in economic activities like plantation agriculture, industrial and infrastructural development. My Masters research aims to look into the impacts of these activities on the forests. Besides looking into how biodiversity changes due to the fragmentation of forests, I am also interested in finding out the impacts of fragmented forests on the people, the economy and the politics of the area.

Georgina Usher

Master of Environmental Science Scholar

The role of Private Sector Conservation Enterprises in Australia

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Research Description

The overarching objective of the research I am undertaking is to achieve an improved understanding of the nature and scale of private sector conservation enterprises operating in Australia. The research will endeavour to characterise their activities in terms of scale, organisational structures, work force, financial/capital base, location and activities undertaken. In the longer term the research will identify any barriers to the formation and operation of private sector conservation enterprises including both 'natural' barriers (such as non-excludability and non-rivalry) and policy induced barriers (including regulatory restraints to trade and accounting standards).

The understanding gained through the project will facilitate the development of policies, to be implemented by Government, to improve the role of private sector conservation enterprises in Australia.

Sunit Adhikari

Graduate Diploma in Science Scholar

Resource Economics, Resource Planning and Management

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Research Description

I am from Nepal (Tanahun district), where farm and forestry are the backbone of people's livelihoods. This dependency of villagers on forests for basic needs impressed and encouraged me to focus my career in the forestry and environmental fields since my childhood. I am a forestry graduate and completed my B. Sc. Forestry degree at the Institute of Forestry, Pokhara, Nepal. Prior to that I gained my B. Sc. degree in General Science majoring in Physics, Statistics and Mathematics. Later, I completed a Master of Economics degree from the Central Department of Economics, Tribhuvan University, Nepal.

Immediately after graduation, I worked in a collaborative research project on "Land Tenure and Forest Management" administered by the International Food Policy Research Institute (IFPRI), Washington D; the results were published in Keijiro Otsuka and Frank Place (2001), *Land Tenure and Natural Resource Management*, Baltimore: Johns Hopkins University Press. I have worked with various non-government and bilateral organizations such as United Mission to Nepal (UMN), DANIDA/ Natural Resource Management Sector Assistance Program (NARMSAP) for more than six years in the field of community forest management and human resource development, which are of paramount importance for sustainable development of forest resources in a poor country like Nepal. I was mainly involved in planning, designing, implementing and monitoring of community forestry related activities, which are demanded by the beneficiaries in the bottom-up planning approach.

My interests are in group formation and management operational plan preparation, community forest hand-over, technical skill development to manage the forest resources, policy formulation and implementations is the first generation program in Community Forestry. It is expected that in the course of rapid expansion, a series of largely unanticipated "second generation" issues of governance, equity and productivity will begin to emerge, and this is now happening in Nepal. There is therefore a need for further study if the community forestry approach is to continue to build on its earlier success. This is especially urgent in view of the fact that this country has come to be regarded as a model of successful community forestry development, so that both success and failure in this country have implications that spread far beyond Nepal's borders.

Selected publications

CFD, 2002. Monitoring and Evaluation Training Manual, a training guideline for district level training, Community Forestry Division, Department of Forests, Kathmandu, Nepal (in Nepali).

Adhikari, S., 2001. The Economic Performance Analysis of Community Forest Management in Nepal, a case study of Toplang Community Forest User Group, Dhading, a dissertation paper submitted to Tribhuvan University, Central Department of Economics, Kirtipur for the requirement of partial fulfilment of M. A. Degree in Economics (unpublished).

Adhikari, S., 1995. Impact of Biogas on Forest Conservation, a case study of Bandipur VDC, Tanahun district, Nepal, a research report submitted to Biogas Support Program, SNV - Nepal, Kathmandu.

Kinley Budur

Graduate Diploma in Science Scholar

E-mail: Kinley.Budur@anu.edu.au.

Research Description

I am from Bhutan. I received my diploma in forestry from the Natural Resource Training Institute in Bhutan and have been working in the Social Forestry Division, Department of Forest for 7 years in the field of Social Forestry, Community Forestry and Private Forestry.

My intention in doing the Graduate Diploma course in ANU is to upgrade my knowledge and skills, which will eventually enable me to perform my responsibilities in a more efficient way when I return to my home country.

Jhuma Dewan

Graduate Diploma in Resource and Environmental Management Scholar

The process of people's participation in Environmental Management and Development and as well as poverty eradication in developing countries

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Research Description

I was nominated for the undergraduate AusAID scholarship program from Bangladesh, and completed my Bachelor of Environmental Science at Charles Sturt University, Australia in 1998. Then I returned to Bangladesh and immediately joined a household livelihood security/ socioeconomic survey team from CARE-Bangladesh, conducting a month long survey with the indigenous people living the south east part of Bangladesh called Chittagong Hill Tracts (CHT). I was also involved with the analysis, report preparation and project planning process in the CHT. Then I joined the Flood Proofing Project under the Integrated Food Security Program of CARE- Bangladesh as a Technical officer (Environment). My main responsibility was providing assistance during Environmental Impact Assessment in the project areas, preparing training modules on Arsenic mitigation options and environmental management and development for the project staff and the project participants. I was also involved in creating close liaison and building alliances with government and other organizations that were also working in the field of environmental management. After working 2 years in the field of environment I was employed as a Technical Officer in the field of Rights and Social Justice, Gender mainstreaming and establishing Governance within the local bodies. I facilitated many training and orientation programs for the staff and project participants on these topics.

Simon Greenaway

Graduate Diploma in Forestry Scholar

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Research Description

I am currently enrolled in a Graduate Diploma Science Forestry leading to a Master of Forestry. My previous work experience has been in community forest projects with indigenous communities in Central Australia, farm forestry extension in South-Eastern New South Wales and in timber drying and processing of native species for appearance-grade products and furniture manufacture. My interests focus on Eucalypt plantations for the production of high value timber products, wood technology and utilisation for architectural applications.

Catherine Gross

Graduate Diploma in Resource and Environmental Management Scholar

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Research Description

The business world presents a significant challenge for implementing sound sustainability principles and practices, and this is my area of interest. I am currently studying for a Graduate Diploma in Environmental Science, hoping to move to the Masters degree this year. I plan to focus my research on the "Greening of Business" which will include the development and implementation of strategies and measurement of results. My background in Information Technology management and strategy development in the USA provides relevant experience. I am also interested in the application of biotechnology to sustainability challenges. The risks and benefits need to be assessed and measured scientifically.

Ahmad Maryudi

Graduate Diploma in Science Scholar

The roles of the government in forest certification and labelling schemes in Indonesia

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Research Description

I am currently doing the Graduate Diploma in Science leading to Master of Forestry. I have undertaken the following coursework to fulfil the requirements for the degree: Forest Planning, Forest Harvesting, Economics for Forestry and the Environment, and Social Forestry. This semester, I am doing three courses in SRES: Environmental Policy and Planning, Introduction to Global Change and Introduction to Greenhouse, and one course in Public Policy and Governance: World Trade Organization.

Forest certification and labelling (C&L) is my main research interest. There has been an evolution in policy making in forestry sectors to market institutions since evidence has shown the failure of the government-led approach in addressing poor forest practices. My research interest is centred on the question whether or not C&L can provide a viable alternative for sustainable forest management. Since I am from Indonesia, I want to carry out my research in the context of forest management in Indonesia.

I am particularly interested in the role of the government, since the Indonesian Government is very active in promoting C&L for forest management. This is partly because the government wants to ensure the security of its exports; in other words, the Indonesian government has developed a defensive marketing strategy for Indonesian forest products through C&L. This effort may attract criticism since one of the fundamental concepts of C&L is that it is a voluntary scheme.

Sally McCarthy

Graduate Diploma in Resource and Environmental Management Scholar

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Research Description

I completed a Bachelor of Veterinary Science at the University of Sydney in 1984, and then worked as a veterinary surgeon in private practice. I am now studying for a Graduate Diploma in Resource and Environmental Management in order to change career into the area of environmental science. My main interests are wildlife management and environmental policy and planning. I have focused on these areas in my coursework, and intend to undertake an independent research project in the second semester of 2004.

Muhammad Zahrul Muttaqin

Graduate Diploma in Science Scholar

Forest policy and economics

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Research Description

I come from Indonesia. I completed my degree of Bachelor of Forestry in Bogor Agricultural University in 1996. After serving in private industry until 2000, I am now working in an Indonesian government agency called the Centre for Social and Economic Research and Development on Forestry (CESERF) in Bogor. Since I have been dealing intensively with policy and economic-political issues in forestry, I hope to study these fields further in ANU.

Liping Rao

Graduate Diploma in Science Scholar

Degraded catchment rehabilitation

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Research Description

Environmental degradation is one of the most significant limitations to sustainable development in China. Its two major rivers, the Yangtze and the Yellow Rivers have been seriously impacted by extensive exploitation and utilization of the natural resources within the catchments. This has been due to the lack of consideration for environment health and a lack of knowledge of catchment management. The severe catchment degradation, including deforestation and water erosion, have been widely debated recently owing to the new-found awareness of the importance of sustainable development. I am very interested in the rehabilitation and management of river catchments in Australia, and I hope what I learn about and experience on this issue in Australia can be adapted to China.

Alberto Valerio

Gradulate Diploma in Science Scholar

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Research Description

Before coming to ANU to study, I was involved for over a decade in farmer-level agrarian reform and rural development in the Philippines, community-based coastal resource management, and upland resource management projects, while working as a community development officer, project manager, and senior manager in non-government organizations in the southern part of the Philippines. These undertakings were supported financially by official development assistance programmes from the national government and from local government units. The projects were aimed at poverty reduction, the promotion of peace and development in these conflict-prone areas of the southern Philippines. My academic background was a 4-year Bachelor of Arts in General Science, with some Philosophy and Humanities courses.

Semy JM Siakimotu

Graduate Diploma in Resource and Environmental Management Scholar

Climate Change

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Research Description

Upon completion of my Forestry degree in 2001, finding a job in Canberra proved a bit difficult. I knew I'd have too much time to myself so continuing with further studies was the better option. I am now employed by CSIRO at Black Mountain as a Technical Assistant in the field of climate change research.

I am currently undertaking a REM Graduate Diploma by coursework (part-time) with the aim of gaining entrance into the Masters Program to do research in the field of climate change. My heritage is from the Pacific Islands of Niue and Samoa and I believe that these two islands are part of a group of islands under the umbrella of 'highly vulnerable' to the physical impacts of climate change.

Felicity Anderson

The effects of Time Controlled Grazing on soil properties in the high rainfall zone of southern NSW

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Research Description

As the new paradigm in Australia agriculture is likely to become sustainability, there is an increasing need to develop more ecologically sustainable agricultural systems. While there has been much research into developing sustainable cropping systems, most research in the grazing industry has tended to focus on the drier arid and semi-arid rangeland areas. There has been comparatively little research into grazing systems in the high rainfall zones, where the focus has been on pasture improvement and fertiliser application. Whilst significantly increasing productivity in these systems, it has not addressed the lack of sustainability inherent in the use of high levels of external inputs. Conventional farming, such as set stocked grazing, is increasingly being seen as unsustainable and leading to catchment-wide problems of soil acidification, sediment and nutrient runoff, erosion, salinity, and decreasing pasture composition quality. Time Controlled Grazing is claimed to enhance sustainability in grazing systems through enhancing soil physical, chemical and biological properties, and achieving maximum pasture growth. This leads to a range of benefits that have catchment-wide applications. Increasing vegetative cover within a system leads to increased stability of soil aggregates through more root structures and higher levels of organic matter. This allows for better water use efficiency of the system. Time Controlled Grazing can also act to minimise inputs through achieving maximum functioning of the natural ecological processes of a system.

The aim of this research is to investigate these claims by comparing soil properties on farms operating under the principles of Time Control Grazing and Set Stocking. The study was carried out across five sites in the Central and Southern Tablelands, in the high rainfall zone of NSW. It consists of a field component and laboratory work that looks at a range of soil physical and chemical properties that are impacted upon by grazing, as well as a pasture study. Results from a preliminary study in 1996 are used as benchmark results for the current study and allow investigation of impacts over time, as the systems have now been in place for at least ten years. The research aims to provide hard data on soil parameters and how they are affected by different grazing regimes, which could have catchment-wide implications. The results will be conveyed to the broader grazing community through assistance from the Department of Infrastructure, Planning and Natural Resources.

Suzanne Bond

The value of small patches of revegetation as breeding habitat for small woodland birds

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Research Description

Many woodland birds are in decline in south-eastern Australia due largely to clearing for agriculture, which has resulted in extensive loss of woodland cover, and the fragmentation of surviving remnants. Species that inhabit woodland exclusively, or are heavily reliant upon woodland, are therefore particularly vulnerable to extinction. Despite the general dismissal of small patches of vegetation as viable habitat for birds in the past, such patches are now increasingly being recognised as having value for birds. In rural regions it may not always be feasible or realistic to set aside large portions of land for plantings aimed at biodiversity conservation, and so this research aims to assess how effective relatively small vegetation patches can be in halting woodland bird decline.

My project complements a local study known as Birdwatch, a joint initiative between the Canberra Ornithologists Group, Greening Australia and the Commonwealth Scientific and Industrial Research Organisation. Birdwatch investigated what bird species utilise replanted patches to ascertain if revegetation efforts were making any difference to avian biodiversity conservation. My research will determine whether these revegetation patches hold any value to woodland birds as breeding habitat, and not merely shelter or foraging habitat. Sites of varying revegetation age have been surveyed to determine if there is any relationship between the age of revegetation and the species of birds that attempt to breed at those sites. Initial results indicate that although birds are quick to colonise new patches of vegetation, it takes them longer to breed there.

Gabrielle Breen

Global warming, local responses: an integrative inquiry into the ACT residential sector

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Research Description

Climate change poses an immense challenge to global sustainability. Local communities offer significant opportunities for greenhouse gas abatement. In the ACT, the residential sector has been identified as a key priority for achieving the Territory's target of stabilising net greenhouse gas emissions at 1990 levels by 2008. This research investigated how the ACT residential sector was responding to the greenhouse challenge, and what opportunities existed for a better response. An integrative research approach guided the inquiry. A case study employed participant observation, informal interviews, a document review, and a group workshop to 'map out' greenhouse gas abatement responses within the residential sector. A decision into practice framework provided the integrating concepts for the study.

The case study produced several findings. First, responses to greenhouse were embedded in and intersected with other issues and goals, such as international and national factors, sustainability, economic viability, and social equity. Second, there was no cohesive, whole-of-sector approach; government, industry, householders and non-governmental organisations defined and responded to the issues differently. Moreover, there were significant differences in response within each stakeholder group. Third, relationships within the residential sector partially structured its overall response to greenhouse, and may have posed a barrier to change. Finally, the research identified a range of opportunities to better respond to greenhouse, including strategic priorities, increased education, and capitalising on synergies and co-benefits. In light of these findings, the research recommended more forums for dialogue between stakeholders in the residential sector. This would enable better understanding between diverse stakeholders and facilitate greater collaboration. Public consultation on the forthcoming release of the draft ACT Greenhouse Strategy (2004) offers an excellent focus for such dialogue.

At a broader level, my experiences in designing and conducting this research revealed challenges, both in articulating a research approach and principles that embodied my ideals about research for sustainability, and in ensuring the design, method and process adhered to these ideals. While partly reflecting the time and skill limitations associated with honours research, I believe these challenges also exposed more systemic problems in current approaches to knowledge for sustainability. Future research might usefully explore this area further.

Melissa Burgess

Accounting for the fear of crime: spatio-temporal patterns of avoidance

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Research Description

The fear of crime is regarded as a dysfunctional phenomenon that can have serious consequences at both the individual and community level. Individuals react to the fear of crime by experiencing a range of negative physiological or psychological changes. In order to minimise these impacts, people generally attempt to avoid those places where they feel unsafe. This occurrence can ultimately lead to the social, economic and physical breakdown of communities, thus encouraging more crime and more fear.

The aim of this project is to map and account for the fear of crime in Kings Cross, New South Wales. It will focus specifically on people's fear of being robbed, beaten or attacked. The research will examine three questions in fulfilling this aim: where are people afraid of crime; what symbols of crime cause people to feel afraid of crime in those specific areas; and which socio-demographic groups are more fearful of crime? While these questions have been studied throughout the literature, this project will develop the research into the fear of specific crimes and people's avoidance-based reactions. The results from this research may have potential applications in projects that aim to combat the fear of crime. The project will use GIS to spatially represent those areas avoided by people because they fear crime. The applied method will hopefully overcome the problems inherent in previous modelling tools that have been used to display areas of fear.

Rachel Clarke

Landholder perceptions of dryland salinity and the implications for management: a case study of landholders in the Boorowa region, NSW

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Research Description

Management of land degradation problems such as salinity have traditionally been tackled using technical solutions. However, increasing emphasis is being placed on the nature of land degradation as a social problem, and how this realisation can be harnessed to develop effective land management strategies.

This research examines how landholders' perceptions of salinity can influence the management strategies they employ. An investigation of other factors that are likely to influence land management will also be carried out, to determine the extent to which perceptions of salinity will influence management. Salinity has been an acknowledged phenomenon in the region for an extensive period of time, and management strategies for dealing with the problem have been employed by many landholders for over ten years. The maturity of salinity in the region makes Boorowa a good case study; as it is predicted that salinity will continue to spread over the coming decades, lessons learned from the evolution of salinity management in the Boorowa region will be valuable in providing direction for more effective management of salinity in other areas where it is an emerging problem. This thesis aims to provide direction for future management of salinity based on landholder perceptions of salinity and other socio-economic limitations that face landholders in rural Australia.

Alex Cribb

A Soft Systems exploration of whether Triple Bottom Line frameworks engender social and behavioural change: case study of a waste management initiative at the Department of Family and Community Services, Australia

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Research Description

The last 15 years have seen thousands of organisations around the world adopt voluntary Triple Bottom Line (TBL) reporting frameworks as they struggle to make sense of the sustainability agenda. It is generally accepted that TBL reporting frameworks allows society to judge whether organisations are meeting the duties placed upon them, such as compliance with legislation, and the extent to which they are meeting the standards they set for themselves. More specifically TBL reports disclose an organisations environmental, social, and economic performance for a defined period. However a distinct lack of attention has been given to the implications TBL reporting frameworks have as tools for internal management. There is some evidence to suggest that their greatest advantages lie in their use as such tools.

Using Peter Checkland's Soft Systems Methodology (SSM) this action research project aims to explore whether a TBL reporting framework engenders social and behavioural change in the case study of a TBL waste minimisation, re-use and recycling initiative at the Department of Family and Community Services. SSM is used flexibly as an analytical tool, a methodological approach, and a vehicle for purposeful change in the system of waste minimisation, re-use and recycling behaviour.

Janet Finn

A study of changing palaeoenvironmental conditions and prehistoric human occupation at Bobundara Swamp, south coast New South Wales

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Research Description

Bobundara Swamp changed from a saline estuarine system at sea-level stabilisation, about 6000 BP, to the present day freshwater swamp conditions. Changes over time would have changed its value to the prehistoric Aboriginal population of the area, and to the European land owners from the Nineteenth Century. Previous work shows, first, the Aboriginal record of occupation is discontinuous, and, second, the stratigraphical and palynological record, while more continuous, is of a low resolution. However, the coastal margins were a rich source of available resources and therefore Bobundara Swamp was possibly an excellent example of resource exploitation.

The aim of this project is to investigate the value of diatoms, charcoal and magnetic resonance to reconstruct the history of the swamp and give a higher resolution of the changes over time. These results will be assessed to see if there is also evidence for anthropogenic changes (such as swamp vegetation burning and changes from European land use practices) and if a more specific identification and interpretation can be made of changes in human occupation and use of this changing resource base.

The proposed approach is to examine a 10-metre sediment core from Bobundara Swamp at 20 cm intervals for diatoms, charcoal and magnetic resonance to monitor environmental and anthropogenic changes within the swamp, and to compare this to previous archaeological research.

Emily Flowers

The effect of salinity on the breeding and development of the Spotted Grass Frog, *Limnodynastes tasmaniensis*

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Research Description

Salinity is a natural phenomenon in the Australian landscape but it has become more common since European settlement. Historically, salinity research has focused on agricultural issues, while the impacts on native ecosystems and biodiversity have been generally overlooked. My study focused on how salinity affects *Limnodynastes tasmaniensis*, a species common throughout south-eastern Australia., also Amphibians generally have an osmoregulatory system that is poorly suited to saline environments, and this species has a complex life cycle that exposes it to both terrestrial and aquatic salinity.

I ran a laboratory experiment in parallel with field research to look at the effect of increasing salinity on the growth and development of *L. tasmaniensis*, as well as getting an overview of the environmental conditions the species is exposed to in the Boorowa region. The laboratory experiment built on a previous study, which found that constant salinity impacted on the growth and development of *L. tasmaniensis*. By contrast, my study found that increasing salinity had no significant impact on growth or development of *L. tasmaniensis*. Gradually increasing salinity, as occurs with naturally drying-out water bodies, allows tadpoles to adapt to higher concentrations of salts than they are otherwise able to tolerate.

The field research indicated that water bodies experience fluctuating salinity, with a higher average and range in temporary water bodies than permanent water bodies. Also, *L. tasmaniensis* was more likely to inhabit and breed in permanent water bodies. The temporal nature of salinity fluctuations, with varying low concentrations early in the breeding cycle (spring) and higher concentrations later (summer) allows gradual adaptation to high salinity, thus increasing the survival rate of tadpoles.

Andrew Ford

Estimating land suitability for plantations in the Southern Tablelands

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Research Description

There is increasing interest in softwood plantation establishment in the Southern Tablelands region in both the public and private sectors. This project seeks to identify areas where softwood plantation establishment is most suitable.

The project aims to map the expected productivity of *Pinus radiata* plantations established on cleared, private land across the Southern Tablelands region in New South Wales. It will use the Net Primary Productivity estimates produced by the Australian Greenhouse Office as a base layer, and will estimate Mean Annual Increment (MAI) using various modelling techniques. Areas such as existing native forest, which are unsuitable for plantation development, will be excluded from the plantation suitability study. This will be mapped using GIS in order to identify areas where softwood plantations will be most productive.

Using this land suitability map, other variables that may affect the profitability of plantations will be considered, such as distance to mills and time until harvest. This will produce a map indicating where plantations might be most profitable given the current locations of roads and processing infrastructure.

Michelle Gilbert

Trends in urban tree removal on leased land across Canberra, ACT

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Research Description

The urban forest is a distinctive niche of the forestry sector. Any mention of urban forestry in Australia would be incomplete without reference to Canberra, recognised internationally as an outstanding example of a contemporary planned city. Canberra is a valuable model of how to integrate trees in the planning and development of a modern city, as unlike other Australian cities, the establishment of the city and its trees occurred simultaneously.

The ACT Government manages Canberra's urban forest with the objective to ensure that Canberra's 'Garden City' character and 'Bush Capital' environment are maintained and enhanced. However, community concerns about the absence of tree protection legislation resulting in the loss of trees from the urban environment and perceived erosion of the 'Garden City' nature inspired a debate on tree protection in Canberra during the mid to late 1990s. The ACT Government has since introduced the *Tree Protection* (*Interim Scheme*) *Act 2001*: *An Act for the Interim Protection of Significant Trees, and for Other Purposes*, passed by the ACT Legislative Assembly on 29 March 2001. This Act applies to trees on Territory land leased for urban land and other land used for non-rural purposes. Leaseholders must therefore seek approval by application for the removal of a tree on their block. If trees are requested for removal, government officers evaluate each tree requested for removal on a case-by-case basis against key criteria.

This study aims to determine urban tree removal trends across Canberra since the introduction of the *Tree Protection* (*Interim Scheme*) *Act 2001*, by identifying what trees are being requested for removal and what trees are being granted removal and where. Results from this study have the potential to guide policy and planning by influencing the implementation of the *Tree Protection* (*Interim Scheme*) *Act 2001* and therefore ensure the long-term maintenance and retention of Canberra's urban forest into the future.

Bronwyn Higgins

The rationality of farmer planning: a cast study in water reforms

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Research Description

Public and governmental concern for the health and sustainability of the Murray Darling Basin has become highly politicized and emotional over recent decades. Debates surrounding the issues of environmental flows for rivers and the extraction of water for irrigated agriculture have grown in their intensity as the issue of sharing Australia's water resources has been recognized as an increasingly complex one. These debates have prompted policy and legislative attempts, at both the Commonwealth and State levels, to achieve: (1) more consistent regulation of the use and extraction of water from river systems; (2) improved water use efficiency by irrigated agriculture; and (3) improved environmental quality through environmental flows and the more appropriate use of harvested water.

A large portion of this increased regulation has been directed at irrigated agriculture, which in itself is a vital contributor to the Australian

economy, as well as a support for the livelihoods and existence of many rural communities and businesses. Whilst there have been several studies exploring the potential social and economic impacts of increased regulation of water resources through policy directives (socio-economic perspectives), little of this research has focused on any particular components of the policy directions (eg. the specific Water Sharing Plans for all NSW catchments instituted under the NSW Water Management Act 2000) nor on the way in which farmer rationality shapes adoption of and planning for changes brought about by policy directives (a sociological perspective). It is my argument that Australian farmers are key agents for the implementation of much of Australia's natural resource management (NRM) policy, and that specific research should be conducted into the rationality of their planning, the key factors which drive their planning decisions, and therefore the effect that legislation and increasing regulation may have on their planning over time. Unless policy makers understand and accommodate the rationalities expressed by these policy agents, NRM policy will be plagued by inadequacies and the achievement of positive and equitable environmental management will elude us.

My research will essentially aim to create a better understanding of "what makes farmers tick" in terms of their management planning. To achieve this, the planning attitudes of irrigated cotton growers in the Upper Namoi will be canvassed with particular regard to the imminent changes to water access entitlements, through a series of face-to-face semi-structured interviews. The resultant data will be correlated with existing literature on various rationalities in order to provide an overview of the issues which drive the rationalities and associated planning responses of farmers in this specific and current policy context. It is hoped that this understanding will allow an exploration of how NRM policy targets could better coincide with the nature of farmer rationality mindsets. It is hoped that this will provide some practical directions for the formulation of policy which accepts the sociological realities of farmer mindsets and which therefore implements applicable and effective directives for implementation in everyday on-ground situations.

Mark Imber

Floristic response of a *Danthonia* grassland community with a heterogeneous fire history in the Australian Capital Territory

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Research Description

Over 95% of Australia's original lowland temperate grasslands have been destroyed since European contact. The remaining five percent are fragmented into small isolated remnants, which are often only in semi-natural condition, making native grasslands one of the most threatened ecosystems in Australia (Kirkpatrick, Gilfedder and Fensham, 1988; Kirkpatrick, McDougall and Hyde, 1995). Indeed the extent to which natural temperate grasslands are threatened is recognised by policy makers with the ecosystem being protected under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) and in the Australian Capital Territory (ACT) under the *Nature Conservation Act 1980* (ACT).

My research looks at the effects of prescribed burning on a *Danthonia* dominated natural temperate grassland in the Australian Capital Territory with a heterogeneous fire history. Prescribed burning is often touted as a suitable and beneficial disturbance tool for the conservation management of grasslands. There is, however, little written in relation to the influences of managed fire regimes on *Danthonia* dominated grasslands, especially regards successful conservation management. My research therefore, is aimed at contributing to the ongoing effort to better understand the ecological processes within natural temperate grasslands, particularly in regard to responses to fire as a management tool.

This project specifically aims to:

describe and compare the floristic composition of an area of *Danthonia* dominated natural temperate grasslands on the Majura Training Area with a heterogeneous fire history;

examine the effects on floristic diversity of prescribed burning during different seasons within the grasslands;

identify rare species; and

provide recommendations for future management of *Danthonia* dominated grasslands.

Brad Jackson

Long-term rainfall variability in the Murray Darling Basin

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Research Description

As highlighted in recent years, rainfall is one of the largest variables impacting on the health of Australia's rural and urban areas. Drought periods can reduce water storage levels and increase the frequency of large-scale wild fires, whilst rapid increases in rainfall can lead to floods, and both can have devastating impacts on the Australian community. The occurrence and regularity of rainfall remains a largely unknown factor in Australia, except for the usual description of rainfall being scarce and Australia as being a 'dry country'. In 1908, Dorothy Mackellar described Australia in her poem '*My* Country' as a land *'of droughts and flooding rains'*, but what she didn't describe was 'to what extent?'

My research is designed to determine the occurrence of rainfall in the Murray Darling Basin (MDB), the powerhouse of Australia's rural economy. The research will attempt to identify not only the patterns of rainfall recorded at 42 locations across the MDB both spatially and temporally, but will also attempt to identify what impact known atmospheric drivers, such as El-Nino and the Pacific Decadal Oscillation, have on this rainfall.

The rainfall data analysed has been sourced from records that start as early as the 1880s and end in 2003. This provides a great opportunity to look at longer-term rainfall trends in Australia and it is anticipated that my research may be useful in a practical sense for farmers in the MDB. It will also be useful for town planners and governments as they plan and implement policies for future resource use within and around cities, and to assist in preparation for adverse events in the future.

Lucinda Keane

Climate change and the Australian wheat industry: barriers to adoption of mitigation and adaptation options

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Research Description

The reality of climate change involves impacts on and changes in, among others, agricultural ecosystems. As a party to the United Nations Framework Convention on Climate Change, Australia has agreed to work towards the 'stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system ... within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner' (Article 2).

A larger body of research has been done in Australia to this end. A number of investigations have considered the impacts on the agricultural industry generally, and the wheat industry in particular. These investigations have provided an insight into the range of potential impacts (both positive and negative) of climate change. Studies have also been done in that past regarding education and risk management planning. Climate change is just one aspect of risk management that farmers should consider. Given this background, the primary aim of my study is to evaluate the factors that currently prevent or discourage wheat growers from adopting

climate change adaptation and mitigation options. The secondary aim is to assess whether adoption of climate change adaptation and mitigation options, or lack thereof, is an issue of education or rather, of environmental priority. I have designed a survey to seek opinions from growers for their views regarding climate change, and I am planning to interview from people within government departments and independent industry groups.

Christine Kelly

The effects of varying fire frequency on the understorey of a subalpine plant community

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Research Description

Fire is a natural and persistent feature of the Australian landscape, but little is known of the interaction of fire frequency and plant community dynamics in subalpine regions. Such knowledge is important for management practices and the maintenance of biodiversity in these regions.

This research aims to discover whether variations in the frequency of fire cause an alteration of the understorey plant composition in a subalpine community. The study will use the Piccadilly fire ecology plots in the Namadgi National Park. These plots were established in the 1970s by the CSIRO in order to analyse the effects of prescribed fire frequencies on the Snow Gum community. In all there are 23 plots of 20 m x 20 m that have been assigned various frequencies of burning throughout the previous thirty years. They range from having not been burnt at all throughout the treatments, to intermediate frequencies of burning and then high frequencies (approximately every two to three years).

In 2003, the devastating fires that engulfed extensive regions of the ACT saw all of the plots being burnt. The fact that all the plots were burnt at the same time is an important component of this research as it has removed the confounding effect of time since fire. This makes it an ideal time to study the understorey composition to determine whether there are any differences attributable to the varying fire frequencies. The study will involve extensive sampling of the understorey plant community to determine whether there is any difference in species abundance, and differences in shrub and grass densities. Sampling will also be conducted to determine whether the overstorey of Snow Gum may be affecting the understorey composition through competition, as an alternate explanation of any differences that may exist.

Gayle Kennedy

Variation in wood density and growth between inter- and intra-provenance crosses of *Pinus radiata* D.Don

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Research Description

Pinus radiata, commonly known as radiata pine, is the most significant plantation species of south-eastern Australia. While the species has undergone substantial genetic improvement over recent decades, the improvement has largely been limited to growth and form traits. In addition, the breeding population predominantly comprises genetic material sourced from just one of the four naturally occurring geographically disjunct populations - the Monterey provenance.

This study has involved X-Ray densitometric assessment of increment cores - sourced from CSIRO Progeny Trial (PT57) in Bucchleuch State Forest, NSW – including all possible combinations of the four provenances. The results could potentially identify individual provenances and/or crosses between provenances, which if infused within the current commercial breeding population, may bring about substantial improvement in wood density characteristics.

Emily Kilham

Aboriginal communities and government agencies: partnerships in natural resource management

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Research Description

Aboriginal cultural values and extensive ecological knowledge could contribute to more holistic natural resource management approaches. For this to occur Aboriginal People themselves must be equitably and effectively involved in the process. The effective involvement of Aboriginal People in NRM could also be a means by which to address some of the social and economic inequities existing between Aboriginal and non-Indigenous Australians.

It is important to recognise the diversity in Aboriginal cultural values, ecological knowledge and historical experience. This study considers issues relating to partnerships in NRM between government agencies and Aboriginal communities in the Eden-Monaro region. In addressing the situation of some people in a particular place it aims to assist in the development of local solutions to local problems. The study involves an analysis of government legislation that provides for Aboriginal People's involvement in NRM. I consider how legislation can be translated into real and positive outcomes for Aboriginal People on the ground.

Fieldwork for my project involved semi-structured interviews with about 30 individuals from a wide range of backgrounds and experiences. This has been important in developing an informed and balanced understanding of the issues and challenges for those involved in partnerships in the Eden-Monaro region. Preliminary findings indicate that mutual understanding and respect, two-way learning, effective communication, good relationships, flexibility, patience and acknowledgement of past mistakes are all vital ingredients for successful partnerships.

Kate Lea-Perry

Water quality dynamics in an oyster growing area of the lower Tweed River estuary

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Research Description

The sustainability of the Sydney Rock oyster (*Saccostrea glomerata*) industry in New South Wales is inherently reliant on a consistent supply of high quality water to oyster leases. Areas suitable for the cultivation of this product, however, frequently coincide with coastal estuaries with large or increasing human populations and associated development. Inputs derived from catchment development, such as stormwater discharge, sewage outfalls or agricultural runoff, have been linked to excessive concentrations of nutrients and contaminants in estuarine ecosystems. These inputs have the potential to negatively affect estuarine ecosystems, and threaten the commercial viability of existing oyster leases.

The primary aim of this research is to characterise the water quality dynamics of the lower Tweed River estuary in northern NSW, with specific focus on oyster growing areas. Information gained through this characterisation will contribute to further understanding of the behaviour of the estuarine system in response to inputs from its heavily developed catchment. The findings of the water quality analysis will also contribute to existing knowledge of the estuary's suitability for the production of healthy oysters, and possibly indicate whether commercial production of the Sydney Rock oyster can be sustained in an estuary under development pressure.

Water quality data collected by the Tweed Shire Council and NSW SafeFood provided the basis for this research. Preliminary findings indicate the estuarine water quality declines significantly after moderate to heavy rainfall events, and recovers quickly to within acceptable levels, as specified by the 2000 ANZECC water quality guidelines. It is believed the rapid recovery may be due to high levels of tidal flushing from the ocean. Also, despite the intensification of catchment development over the period for which data were available, it appears estuarine water quality has not declined significantly. This may be due to recent upgrades of effluent treatment facilities, or improvement of stormwater management in the catchment.

Jenna Leonard

Interactions between regolith and vegetation- a reconnaissance study in dry sclerophyll woodlands

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Research Description

The interaction between vegetation growth and soil development is poorly understood. Previous studies have focused on the acquisition of nutrients by agricultural crops, while newer studies have begun to look at the role of vegetation in reclaiming degraded lands; however, plants in natural settings have not been the subject of detailed study. The focus of this research is on the transfer and distribution of mineral nutrients from the regolith into and between vegetation components. For this reason we have chosen relatively undisturbed sites with old vegetation types to observe the maximum influence of vegetation on the regolith over a long time period.

My honours project will build on previous undergraduate work which mapped the distribution of pH, Ec and mineral cations along a 10 m transect between a eucalypt sp and an acacia sp. I will examine the distribution of mineral cations up through the vegetation of both plants at this site, and extend the study of both soil and vegetation at another site. This will give some baseline data on transfer, stores and cycling of nutrients between regolith and vegetation.

Lindsay Morgan

Ecologically sustainable practices in the NSW Monaro region: The landowner's perceptions

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Research Description

Without society sustain ably interacting with nature, nature will not sustain society

Ecological sustainability is a stewardship between both natural and human resources. Sustainability is meeting the needs of the present without compromising the abilities of the future. Sustainability is not about a choice; it is necessary if society want's to continue in healthy living environment.

As the dominant land use in Australia, agriculture plays a central role in sustainability. For the agricultural industry sustainability integrates three main goals- environmental health, economic profitability, and social and economic equity. Due to Australia's diverse environment, very few sustainable practices with global applicability have been locally successful. A paper from the Bureau of Rural Science confirmed this, stating that large zonal or whole of Australia approach will frequently be confounded by large variability. Therefore more specific studies are needed to identify and develop locally applicable sustainable practices.

The aim of this thesis is to explore the often-lacking social dimension of sustainable agricultural practices within the very conventional Monaro region in NSW. The purpose is to investigate landowner views toward adopting ecologically sustainable practices, through what motivates, what barriers they face and how it all interrelates in conserving biodiversity. By using qualitative research an understanding of the landholder's capacity to change to sustainable practices will be obtained. This information will provide a more realistic and applicable resource management plan and hopefully an ecologically sounded future for the region.

Wing Sze (Prudence) Ng

Land use and management effects on coastal-lake-catchment systems in the Eurobodalla Shire

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Research Description

The rapid development of the Australian coastal zone has placed significant stress on the sustainability of coastal river, lake and estuary systems. In the Eurobodalla region, changes in landuse and management in the catchments of coastal lake and estuaries have the potential to significant impact on water quality. These changes result from development such as increased urban settlement, an increase in tourism, runoff from agricultural land and forestry and clearance of vegetation. The objective of this project is to identify the potential effects of catchment development on water quality in coastal catchment.

The Tuross and Coila coastal-lake-catchments will be used as case studies for the project. Current water quality and related environmental issues in both catchments will be investigated through application of Catchment-scale Management of Diffuse Sources (CatchMODS) model. CatchMODS is a modelling tool that is able to simulate current catchment conditions and the effects of management activities on the quality of receiving waters at catchment scales. It estimates fluxes of sediment and nutrients.

Different land use and management scenarios will be constructed and tested in the CatchMODS model for each catchment case study to investigate the effects of these changes on water quality. The critical pollutant source areas of sediment and nutrients and changes in sediment and nutrient annual loads will be identified in each catchment case study. The outcome of this research will assist planners and managers such as those in the Eurobodalla Shire Council to develop sustainable catchment management plans.

Catriona Ockwell

Factors Shaping Australia's Heritage Legislation

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Research Description

After almost thirty years, the new National Heritage Regime established under legislation on the first of January 2004 replaces Australia's first piece of national legislation, the *National Heritage Commission Act 1975*. As a result, Australia's heritage legislation has entered a new chapter and thus provides an exciting context in which to explore the relationship between heritage values and their legislative recognition and protection. Heritage has been defined as the components of the natural or cultural environment that have aesthetic, historic, scientific or social significance, or other values for current and future generations of Australians. Although the term heritage encompasses these indefinite values, decisions made through the application of relevant legislation in effect determine and shape Australia's heritage. Therefore, the purpose of the research is to explore the concepts, tensions, rights and values shaping Australia's heritage legislation and thus Australia's heritage. For example, the increased significance of heritage and persistence of the past through the application of heritage law may unduly burden the present and restrict the future. Perceptions of heritage, like other environmental concepts and principles, are also encumbered with the inherent tension between public and private rights. Heritage legislation is influenced by and creates these temporal and rights tensions as it attempts to establish appropriate heritage protection and management, justified by the importance of heritage. This thesis also seeks to identify and analyse the implications of the new National Heritage Regime through legislative interpretation, case examples and discussions with government representatives and heritage groups.

Alex Packer

The effect of cording snig tracks on soil chemical properties using eucalypt regeneration as a bio-indicator of soil health

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Research Description

Forestry activities, especially harvesting, cause significant changes to the forest environment. Soil compaction and disturbance has emerged as a major issue facing forest managers, especially on the highly trafficked areas of timber extraction tracks. Cording is the most common preventative measure undertaken by forest harvesters' in Tasmania. Cording reduces the direct contact between the harvesting machines and the soil. It therefore has the potential to buffer the underlying soil from the negative impacts of compaction and disturbance commonly induced by harvesting operations. Cording is prescribed in the Tasmanian Forest Practices Code (2000) and is used in most forest types. After the completion of harvesting operations the cording is mechanically lifted and burnt in the high intensity regeneration burn. Despite its broad scale application, little research has been conducted into the efficiency and effectiveness of this technique. The beneficial effects of cording therefore remain largely unquantified.

This project will investigate changes in soil properties under corded snig tracks. Soil samples taken from under the residual cording after the burn will be analysed for total nitrogen, phosphorous and organic carbon. These will then be compared to the burnt untrafficked control samples. Regeneration of eucalypts will also be surveyed on and off snig tracks to investigate any differences in stocking between the trafficked and untrafficked areas. Appropriate corded coupes for this project have been found in southern Tasmania at the Warra Long Term Ecological Research site. The two study sites, WR008B and WR008H, both have had extensive soil sampling pre and post harvest, aiding the overall description of these sites.

Kyra Peake

Food (in)security among the urban poor in Dili, Timor-Leste

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Research Description

Timor-Leste suffers a chronic food security problem, exacerbated by an El Nino related drought cycle. Achieving food security is a key priority of the new government as they strive to fulfil their vision of creating a just, sustainable and democratic society. While much is being invested in improving agricultural productivity, recent times have seen rapid urbanisation and urban food insecurity is a growing problem in a context where agricultural constraints are not so readily identified as the root cause.

It is well understood that urban dwellers participate heavily in the cash economy and as such their ability to procure food is primarily a function of income relative to food prices. In Dili, there is generally enough food to go around throughout the year yet 1 in 5 urban dwellers are seriously food insecure.

World over, the commodification of food has had major implications for social justice, environmental sustainability and political relations. This study focuses on the social justice aspect as it examines how the urban poor in Dili respond to an inability to access sufficient food through the market economy. It will investigate the nature of this inability in relation to a variety of responses including alternative means of procuring food and short-term coping strategies. It will also determine where the 'safety net' lies for food insecure households and explore associated issues of control, vulnerability and dependence.

Jean Rivard

Linking landscape productivity and wildlife refugia in space and time

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Research Description

The need for conservation of biodiversity is a reality and is articulated in statutes and international agreements. Biodiversity assessments inform conservation efforts and enable effective monitoring of the terrestrial biodiversity. However, solid biodiversity assessments can only be achieved through extensive fieldwork, and from a planning perspective, repeated assessments need to be generated over huge areas. Modelling ecological parameters related to measures of biodiversity offers a simplified approach.

This research uses four years of imagery from the MODIS sensor aboard the Terra satellite, a component of the NASA's Earth Observing System. It concentrates upon quantifying the variability of primary productivity in the landscape, as derived from vegetation indices remotely sensed at 250 metres resolution.

High primary productivity 'anomalies' are of particular interest in regions having high space and time variability in resource availability. As such, the study area encompasses the entire Northern Territory so that varying resource availability regimes are observable against ecological gradients, but equally acknowledging that issues of scale remain central when planning for biodiversity conservation. A primary focus will be to detect in the time series a threshold related to constant and high primary productivity at the driest times. Simultaneously, a qualitative analysis using published information will explore the link between such probable threshold and the ecological concept of refugia.

Alexandra Schatunowski

Fire Ecology of *Podocarpus lawrencei* Hook f.

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Research Description

Commonly known as the Mountain Plum Pine, *Podocarpus lawrencei* is a dense prostrate shrub occurring in small isolated patches of boulder fields in both alpine and subalpine regions of Tasmania, New South Wales and Victoria. This habitat is of great importance to the threatened *Burramys parvos* (Mountain Pygmy-Possum), as the *Burramys* habitat is restricted to these *Podocarpus* dominated boulder fields. This study looks at the *Podocarpus* populations on Mount Blue Cow, Kosciusko National Park, as the largest populations of *Burramys* in NSW were recorded here, and the fires of January 2003 have destroyed a large proportion of this habitat. There have been few studies looking at the *Podocarpus* in this area, and little is known of the species' fire ecology. I aim to age this population of burnt Podocarps, using tree rings, to generate a limited fire history of the area. I will also look into the current seedling recruitment and seed bank to investigate any patterns present.

Peter Somerville

The contribution of lithology and regolith to stream salinity in the Boorowa catchment

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Research Description

Dryland salinity is a continuing problem in semi-arid upland catchments of the River Murray. The Boorowa River, 110 km north-west of Canberra in central west New South Wales, is an upland catchment of the River Murray and is affected by dryland salinity. The most obvious signs of salinity in the catchment are (i) saline scald sites and (ii) stream water salinity.

This study examines rock weathering as it contributes ions to the regolith and the potential of the regolith to store salts, resulting in saline scalds in the landscape. Ion exchange processes in the clay layers of the regolith are examined to determine how salts are released from the regolith into stream water via groundwater flow.

John Tabor

Colonisation of clearfelled eucalypt coupes by rainforest tree species from mixed forest edges

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Research Description

An increasingly important goal of native forest management is the maintenance of species composition and biodiversity. This is a key attribute of ecologically sustainable forest management. Tasmanian mixed forest, defined as forest with a eucalypt overstorey and rainforest understorey, is an important forest type both in terms of its extent and its uses for wood production, craftwood and honey production, aesthetics, recreation and conservation of biological diversity. Currently the standard silvicultural treatment in these forests is to clearfell, burn and sow with eucalypt seed on 80 to 90 year rotations. This is significantly different from the natural disturbance regimes of 100 to 350 year fire intervals. The regeneration of rainforest species within this forest type is dependent upon plants and seed that survive the burn, or colonisation from seed, the main sources being retained edges of clearfelled areas. Previous research has shown that hot burns typical of those used to regenerate coupes do not result in optimum rainforest regeneration, but favour the wet sclerophyll species. This may indicate that outside seed sources may play a very important role in the continued presence of rainforest species in areas managed for wood production. Knowledge of the processes of colonisation of clearfelled coupes, particularly the role of uncut edges could have important implications for management.

The project will look at the changes in abundance of regeneration of four rainforest tree species at different distances from retained edges. It will also investigate the influence of factors such as prevailing winds, time since logging and pre and post logging vegetation structure on rainforest regeneration. This will be achieved by surveying a range of clearfelled coupes in southern Tasmania at the Warra Long Term Ecological Research Site and nearby production forests.

Nick Travers

Modelling residential water consumption in Canberra using Decision-Tree and Loess Local Regression (LLR) analysis

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Research Description

Residential water consumption accounts for the largest proportion of water consumption in urban areas. A product of environmental and socio-economic factors, the enormity of residential consumption poses a significant problem for the management of urban water supplies. Consumption models are one means of identifying the underlying drivers of consumption. These models provide an insight into residential water consumption in future years. The investigation models residential water consumption in Canberra for the period 1993-2003. Decision-tree analysis (DTA) and Loess Local Regression (LLR) was used to identify the most important socio-economic factors driving consumption in Canberra. To model the spatial component of the consumption, DTA models for years 1996 and 2001 were built. These models, then, were aggregated to form the temporal consumption model. Thus from the temporal consumption model information about (A) which socio-economic factors determined consumption in the period 1993-2003, (B) which combinations of factors resulted in what levels of consumption, and (C) which factors will most influence consumption in coming years.

Anna van Dugteren

Temporal and spatial variability of phytoplankton populations in three New South Wales estuaries

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Research Description

Estuaries across large parts of the world are experiencing loss of species, declining water quality and increasing eutrophication as a result of over-fishing, pollution derived from agricultural, urban and industrial development in estuarine catchments, and within-estuary developments. Temperate estuaries are considered to be the most degraded of all marine ecosystems as a result of human impacts.

Oysters have been described as "integrative indicators of water quality" and purifiers of estuarine water, as they filter feed on the microscopic phytoplankton in estuaries. Phytoplankton or micro-algae are the free-floating, microscopic flora suspended in marine and freshwaters that photosynthesise inorganic carbon into organic compounds, providing the primary productivity that drives aquatic food webs.

This project originates in concerns within the oyster industry about declining oyster production in NSW, due partly to environmental factors. My thesis examines phytoplankton in three New South Wales estuaries – the Tuross, Clyde and Georges River estuaries – using data on phytoplankton species and numbers collected by the NSW food safety regulator, Safefood NSW, over the last two years. These data may reveal the causes of environmentally induced declines in oyster production. Quantitative and qualitative methods will be used to attempt to understand and explain the phytoplankton dynamics in each of the estuaries; compare the phytoplankton dynamics in the three estuaries over time; and, examine some of the factors that may cause changes in phytoplankton populations in each of the estuaries such as light, salinity, nutrients, wind mixing, estuarine hydrodynamics as well as catchment, climate and seasonal influences.

Meghan Whitbread

Stand competition and stand development in direct seeded windbreaks on the Southern Tablelands, NSW

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Research Description

Direct seeding is a method for establishing vegetation by sowing seeds *in situ* rather than planting seedlings. Successful establishment is largely dependant on climatic factors, with the expectation of moisture for several weeks post sowing combined with an effective method of weed control. A major advantage of direct seeding is lower tree establishment costs, especially where high initial tree densities are required. There are now numerous sites within the Southern Tablelands where competition between trees is prolific and self-thinning is occurring. What is not known is the intensity of competition and how this changes over time as the stand develops.

This study will look at the differences that are occurring in the developmental stages of the windbreaks and specifically look at what species are occupying the site at what age, and to what density. The extent of competition within these development stages and between the species will be measured. Recommendations will be made regarding the most appropriate thinning regimes for each windbreak, by looking at the basal area of each species and the distribution of the basal area across dominance classes.

Auro Campi de Almeida

PhD

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

This thesis examines the feasibility of using a process-based model as a practical management tool for predicting forest growth and explaining the main factors that affect the productivity of Eucalyptus plantations in Brazil. The 3-PG model (Landsberg & Waring, 1997) was adopted for the study. The principles underlying the model and the features of the sub-models are outlined. The model was parameterised for Eucalyptus grandis hybrid plantations, based mainly on data collected in an experimental catchment (Microbacia, MBE) of 286 ha. Model performance was compared with data collected monthly in the catchment and in permanent sample growth plots measured annually in other areas, covering about 186 000 ha of plantation owned by Aracruz Celulose in eastern coastal of Brazil. The features of the experimental areas and data collection procedures are presented in detail. Intensive measurements of climate from a dense network of 19 automatic weather stations, unequally distributed across the Aracruz estates, provided accurate data to generate weather information for any area and allow analyses that provided important insights into the effects of drought periods and of vapour pressure deficit on tree growth. Biomass partitioning was determined from data obtained by destructive sampling of trees which, associated with physiological measurements, provided the information needed to understand observed differences between genotypes (clones). These observed differences could be attributed primarily to differences in biomass partitioning and secondarily to differences in stomatal conductance. The results allowed identification of differences between clones in carbon allocation to roots. Using data from an irrigation and fertilization experiment, where water and nutrients were not constraints on forest growth, a reliable empirical value of canopy quantum efficiency - the efficiency with which the tree canopy converts radiant energy to carbohydrates - was established for this species. A sensitivity analyses was carried out identifying the most important parameters from the forest management point of view.

Application of the model using the parameter values determined in the MBE study allowed accurate description of the growth patterns of stands in terms of mean annual increment, total stand volume, basal area, diameter at breast height, leaf area index and available soil water. For areas other than the MBE the goodness of fit between peak mean annual increment, and mean annual increment to harvest, estimated using generic parameter values, and observed peak and mean annual increments in ten regions, was high ($r^2 = 0.93$, $P < 0.05$, SE = 1.44 $m^3\ ha^{-1}\ year^{-1}$ and $r^2 = 0.81$, $P < 0.05$ SE = 2.25 $m^3\ ha^{-1}\ year^{-1}$ respectively). The model was used to predict potential productivity in a number of operational areas. The results are being used to guide fertiliser applications and evaluate management limitations.

A spatial version of the model running in a Geographic Information System (GIS) is being used to estimate productivity in terms of forest volume in current production areas and on new lands, and to quantify the effects of environmental factors and management actions on forest productivity. This use allows quantification of the risks associated with production, and increases the quality of the decision-making process. Current research is focused on the question of soil fertility rating, as well as tree physiological characteristics and differences among clones at several sites. A total of 520 permanent sample plots (check plots) distributed in the planted areas was installed. These are allowing comparisons of model performance and actual productivity and will provide the information required for model improvement. The progress made in applying 3-PG reported here demonstrates the valuable role that process-based models can play as practical and applied tools in commercial forest management, especially in fast-growing Eucalyptus plantations with short-rotation times (5-7 years), and for testing hypotheses about the way trees function and respond to environmental changes.

Rico Cabangon

PhD

Physical and flexural creep properties of wood wool cement boards

Medium to high density wood-wool cement boards (WWCBs) are increasingly being manufactured and used for structural applications. Unacceptably high levels of creep of WWCBs, left unsupported over long spans as ceiling panels in the Philippines, have been observed and a solution to this problem is urgently required. Current knowledge of the time-dependent behaviour of WWCB is limited. This study examined the physical properties and creep behaviour of WWCB manufactured from radiata pine (*Pinus radiata* D. Don.) as influenced by board constituents, structure, and environment (relative humidity [r.h.] and temperature). Practical methods of improving the properties of WWCBs were developed based on information acquired about the factors that significantly affected the physical and creep properties of boards.

The amount and type of constituents in WWCBs strongly influenced their physical properties and creep behaviour. However, the RCr values of boards were within acceptable limits (< 2) irrespective of the amount and type of board constituents or time of curing. Altering the structure of WWCBs had both positive and negative effects on their physical and creep properties. In three-layer cross-ply boards, aligning wood-wool strands (in the surface layers) parallel to the test span doubled the modulus of elasticity (MOE) and modulus of rupture (MOR) of boards in comparison to those with randomly oriented strands. The RCr of boards containing strands aligned parallel to the span was 20% lower than that of boards containing randomly oriented strands. In contrast, boards containing strands aligned perpendicular to the span exhibited significantly higher RCr (2.6) than the control.

Finite element techniques were used to examine the effect of shelling ratio (the ratio of the amount of materials in the surface layer and the amount of materials in all layers) and percent alignment on the reserve factor (RF) value of boards. Increasing the amount and percent alignment of strands increased the RF value of boards. The RF value was higher when the strands in the core of three layer boards were randomly oriented. Finite element modelling also revealed that failure in boards occurs first in tension, followed by failure in compression.

Both r.h./moisture content and temperature had significant effects on the physical and creep properties of WWCBs. Conditioning and testing of boards above 300C had adverse effects on their flexural strength but had little effect on thickness swelling (TS) and water absorption (WA). In terms of the effect of 'environmental factors' on the creep of boards, r.h. had a greater effect than temperature. The RCr of boards conditioned and tested at 95% r.h. was unacceptably high, at 2.85 after 672 h under load. Creep testing of boards under conditions of cyclic variation in r.h. or temperature showed that RCr was significantly higher when r.h., rather than temperature, was varied. WWCBs subjected to cyclic variation in temperature, irrespective of load level, had RCr values < 2. Boards subjected to cyclic variation in r.h. on the other hand, had a RCr value of 3.02. Overall, these results suggest that the creep of WWCBs is particularly affected by cyclic variation in r.h. This finding explains why WWCBs exposed in changing and high humidity environment of the Philippines show pronounced creep.

Surface coatings were effective in reducing moisture adsorption by WWCBs and in reducing mechano-sorptive creep. In general, oil-based coatings were better at restricting moisture adsorption and reducing creep than water-based coatings or water repellents. Film-forming coatings were also better at restricting creep of boards than penetrating type finishes. The application of surface coatings to WWCBs also reduced, to varying degrees, the TS and WA of boards. Oil-based finishes were more effective at improving the water resistance of boards than water-based (acrylic) finishes.

Leah Horowitz

PhD

Stranger in one's own home: A micropolitical ecological analysis of the engagements of Kanak Villagers with a multinational mining project in New Caledonia

This thesis takes an actor-oriented approach to a micropolitical analysis of the engagements of Kanak villagers in the Voh-Koné area, New Caledonia, with the Koniambo Project, a proposed joint nickel mining venture involving a multinational (Falconbridge) and a local mining company (SMSP). In the introductory chapter, I outline my theoretical framework, which expands political ecology by applying insights from micropolitical theory to a focus on intracommunity disputes surrounding natural resource exploitation projects. I argue that such a close examination is necessary if we are to understand local tensions and factions and their multiple influences on the outcomes of development projects.

The Koniambo Project promises to redress some of the economic imbalances prevalent in the archipelago by benefitting the largely Kanak, and historically underprivileged, Northern Province. Thus, this mining project has great politico-economic significance, both for pro-independence leaders as well as for those who wish to maintain New Caledonia as a part of France. However, while people expected benefits for the Kanak people as a whole, the project sparked intracommunity conflicts at the local level. I argue that villagers' claims to the right to authorize mining activities as well as their desires to receive recognition from the mining company reflected their eagerness to prove a high social position. Meanwhile, in line with the traditionally competitive political climate within Kanak communities, there were many debates about who exactly the 'landowners' were. Indeed, the project's potential to disrupt or reinforce control over land – which, unlike material goods, was a socially acceptable object of overt rivalry – created unexpected socio-political stakes. These differential micropoliticial possibilities shaped people's discourses about the project's other impacts. For instance, those who expected to be able to access employment opportunities as well as social recognition from the mining project were more inclined not to worry about the project's consequences for natural/cultural resources. Similarly, Voh-Koné area villagers' statements and actions regarding dangers from spirits or forbidden places were strongly influenced by their expectations of the project's ability to strengthen or weaken their social status, as determined by their genealogies and proven through demonstrations of their relationships to their ancestors.

In the final chapter, I provide a summary of my conclusions about the micropolitics behind local community members' engagements with the Koniambo Project. Next I explain how, while this case itself is unique due to the project's unusual politico-economic significance, the theoretical framework and methodology I used can help to create balanced, nuanced analyses of intracommunity diversity and micropolitical conflicts that objectively yet sympathetically portray local people as real human beings. Finally, I suggest new directions for further research on the interactions of mining companies and local communities.

Zhi Huang

PhD

Individual and Combined AI models for Complicated Predictive Forest Type Mapping Using Multisource GIS Data

This thesis describes a study of forest type mapping using multisource GIS data. The study first investigated the effectiveness of three individual Artificial Intelligence (AI) models including a Decision Tree, an Artificial Neural Network, and a model based on Dempster-Shafer's theory in mapping complicated forest types. The study then developed a new strategy to combine these AI models and examined the advantages of the combination strategy in forest type mapping. Meanwhile, data errors were identified in the study and the modes and effectiveness of the individual and combined AI models in handling the data errors were evaluated. The study also developed Fuzzy Expert Systems for forest type mapping and examined the advantages.

The study found that the three individual AI models were fairly good classifiers for complicated forest type mapping, among them the Decision Tree achieved the best overall and Kappa accuracies. However, it is shown that none of them achieved the best user's accuracies and producer's accuracies on all of the forest types, and they had quite different characteristics in predicting spatial patterns and handling data errors. This is believed to be because of the different principles the three AI models are based on.

On the other hand, the study indicated that the combination strategy was effective and efficient in mapping complicated forest types. The strategy was able to not only improve classification performance and handle data errors effectively but also provide an estimation of prediction confidence that is impossible by using individual classifiers. Several methods including the majority voting system, Dempster-Shafer's theory (Dempster's rule of combination), simple statistical functions, and fuzzy set theory were used for the combination strategy. Two combination stages were subsequently implemented. Among the combined AI models, vote7 at the second combination stages achieved the best overall classification performance, with an increase of over 7% in overall accuracy and an increase of 9% in Kappa accuracy from the Decision Tree. The subsequent Z-test shows a significant difference between vote7 and the Decision Tree at the 90% confidence level.

In addition, this study showed that building Fuzzy Expert Systems directly from learning samples was cost-effective and avoided the knowledge acquisition "bottle neck" problem. Applying the Fuzzy Expert Systems to forest type mapping demonstrated that they were capable classifiers and had the advantages of enhancing comprehensibility, handling classification uncertainty, and providing explanations behind the classification process. However, they also have the limitations of consuming much time and demanding many resources.

Tom Measham

PhD

Learning and change in rural regions: Understanding influences on sense of place

This thesis is about how people develop attachments to places, and what this means for natural resource management. The concept of 'sense of place' is proving to generate considerable interest in the domain of natural resource management. In particular, the concept offers considerable potential as a way of integrating social, ecological and economic dimensions of environment. This makes the concept highly relevant to an emerging agenda from a range of disciplines and management approaches concerned with the links between social systems and natural systems (Cheng et al 2003, Plumwood 2002, Moore 1997).

Recent interest in place has led to a research agenda for exploring how this concept can play a greater role in resource management (Cantrill and Senecah 2001). Central to this research agenda are questions of how attachments to place are developed and studying the influences on sense of place. In response to the emerging role of sense of place in natural resource management and the research agenda for exploring this concept, this thesis is concerned with 3 questions: what are the key influences on sense of place?; what is the relationship between sense of place and activities in practice?; and how do people learn about place and respond to change? To explore these questions, the thesis presents findings from interviews with 40 participants in case studies of the Atherton Tablelands and Woodstock, north Queensland. The research employed a purposeful sampling design with the aim of capturing as many different senses of place as possible within the limits of this study. Participants represented a broad range of land uses, ethnic backgrounds, ages and durations of time in place. The data from these interviews were analysed using qualitative methods drawing on grounded theory (Charmanz 2000) and influenced by adaptive theory (Layder 1998). The research included a focus on honouring human experience (Braud and Anderson 1998), and also recognising the importance of prior research on how people develop a sense of place (Relph 1976, Piaget 1971).

The analysis showed how sense of place was influenced strongly by childhood experiences, both for people who grew up in the case study locations and for people who grew up elsewhere. Other strong influences on place involved living in a similar environment overseas, seeking profit and a having a sense of self focussed on agricultural production. Of particular interest is that for many participants who moved to the case study locations, their sense of the Atherton Tablelands or Woodstock was well developed prior to arriving there.

The ways that sense of place related to practice are presented as a series of themes. These include the practice of admiring place from the comfort of home, making the land produce, and engaging with place through activities such as hunting, camping and fishing. Participants also described the practice of caring for place, such as looking after traditional country and restoring the family farm.

The ways participants learned about place focussed on their childhood experiences, learning from elders, the role of comparisons between places, and the importance of continuity in learning about place. Participants described very few ways of learning about place during adulthood. One of these was seeing place under different conditions, such as after a fire or flood. Another was through involvement in community events such as festivals.

In discussing the implications of these findings for natural resource management and policy, the thesis highlights how for several participants the key influences on sense of place are tied to non-economic values. Furthermore, this thesis shows that for many people identity and place are strongly linked and this adds to research that explains why farmers may not behaviour 'rationally' according to structural adjustment in Australian agriculture (Botterill 2001). The thesis also discusses the links between sense of place and post-productivist values in considering a series of transitions in regional Australia identified by Holmes (2002). The findings of this thesis concerning learning about place emphasise the potential role for environmental education during childhood. The thesis also discusses the implications of how people learn about place during adulthood, arguing that further support for festivals and community events can play a significant role in exploring the links between social and ecological systems.

In conclusion, the thesis argues that the concept of place continues to offer considerable potential for understanding change in regional Australia, and in particular a grass roots shift towards post-productivist values. This role can be developed by further supporting environmental education in childhood and community events such as festivals which help us to consider the links between ourselves and our environments.

Chris O'Hara

PhD

The significance of soil physical fractions for the cycling of phosphorous, carbon and nitrogen in forests of south-east Australia, and taken up a position with Agriculture Victoria

Soil organic matter (SOM) is central to many forest ecosystem properties and processes. The recycling of nutrients, in particular phosphorus (P), via SOM is critical to sustaining nutrient supply. Increasingly, SOM is being investigated by physical fractionation procedures, including particle size and density floatation approaches or combinations thereof. Isolated physical fractions of SOM may better relate to SOM functions and associated processes such as nutrient cycling. Studies of forest soil fractions have primarily focused on carbon (C) and nitrogen (N). In contrast there has been sparingly little study of P in soil light and heavy density fractions. Furthermore, in Australia there has been relatively little study of forest SOM by size or density fractionation procedures. This study was undertaken to provide fundamental descriptions of the distribution of C, N and P in soil physical size - density fractions from native eucalypt forests of south eastern Australia and to investigate the relationships between these size - density fractions, organic matter dynamics and nutrient cycling.

The fractionation procedure used here separated a finer, composite mineral soil fraction (< 63 µm) from a coarse, particulate fraction (63 - 2000 µm), which was subsequently separated into light and heavy fractions by water floatation. In addition a nitric acid digestion was used to estimate the charcoal content of the light fraction, as fire is a recurring agent in Australian forests. Following development of a simple, safe and economic size - density fractionation procedure a series of field studies were undertaken. Firstly, soil size - density fractions were compared under contrasting native forest and pine plantation, which in part served as a pilot project for the fractionation procedure but also served to examine

the effects of land-use change. Subsequently, a series of field studies were undertaken in a range of forests whereby the responses of soil size - density fractions were examined in relation to increasing stand age (chronosequence), the intermediate effect of disturbance (harvesting and three levels of fire intensity) and different levels of stand productivity. In relation to stand productivity, relationships were examined between P in light fraction organic matter and conventional indices of soil P availability, between soil physical fractions and above-ground organic matter (litterfall and litter layer) and between soil physical fractions and measures of stand productivity (basal area and basal area increment). Finally, the P supplying capacity of light fraction organic matter was examined in a bioassay.

Under pine (*Pinus radiata* D. Don) plantations, light fraction organic matter dry weight, C and nutrient content were about two-times higher (5.3 t C ha^{-1}, 8 kg P ha^{-1}, 0 - 10 cm) than under native forest (*Eucalyptus delegatensis* [R.T. Bak.]) (3.3 t C ha^{-1}, 4 kg P ha^{-1}). However under pine plantations, C in the mineral soil fraction (< 63 µm) from 5 - 10 cm was lower than from the native forest. In addition, fine-root (< 2 mm) mass was lower under the pine plantation. The higher light fraction organic matter under pine is consistent with slower decomposition and more recalcitrant organic matter. This could result in changed nutrient availability. The lower C in the < 63 µm fraction (5 - 10 cm) may be a product of changed C input processes under pine, in particular the incorporation of more recalcitrant pine litter into the top 5 cm and lower C inputs derived from roots.

In a chronosequence of Mountain Ash (*E. regnans* [F. Muell.]) stands, from 10 - 12 years old to 250 years old, light fraction organic matter in the top 5 cm was higher under 10 - 12 year-old regrowth forest (1.1 t C ha^{-1}, 1.0 kg P ha^{-1}) than under stands aged 61 to 250 years old (0.5 t C ha^{-1}, 0.4 kg P ha^{-1}). The higher light fraction under 10 - 12 year old stands might be derived from harvest residues or high inputs from the regenerating stand, such as from root turnover and self-thinning. Subsequently, the light fraction organic matter reflects the progressive development with increasing stand age of relatively stable recycling of nutrients via biologically active SOM. In contrast, up to 61 years of age the C and N content of the finer mineral soil fraction (< 63 µm) in the top 2.5 cm increased and thereafter decreased, suggesting an accumulation and subsequent decomposition of relatively stable C pools with medium to longer turnover times. This may be due to changes in the occurrence of Acacia species, and therefore the quality of litter inputs, and greater decomposition in older stands brought about by changes in the hydrological regime. The responses of both soil physical fractions are potentially consistent with longer term stand organic matter dynamics although each is reflecting different processes which may be occurring simultaneously.

To investigate the response to and recovery following disturbance of soil physical fractions, two contrasting regrowth forests, one of high fertility and productivity (*E. regnans*) the other of much lower fertility and productivity (*E. sieberi* [L. Johnson]), were studied approximately 10 - 11 years after harvesting and burning. At both sites the dry weight and quantity of C, N and P in light fraction organic matter increased significantly, generally in the order unburnt < burnt < intensively burnt soil microsites, which corresponded to regrowth productivity as determined by above ground biomass. This indicates the possibility that, following early conditions of improved N and P nutrition and productivity with increasing fire intensity, there has subsequently been a greater accumulation and retention of nutrients in the biological cycle and that higher amounts of nutrients may be recycling via SOM and contributing to higher productivity. In addition, at the Mountain Ash site the C, N and P in the heavy fraction increased and in the < 63 µm fraction decreased in response to fire intensity suggesting influences on these fractions have been altered. This may have been due to greater establishment of acacia on intensively burnt microsites, increased microaggregation and changes in iron and aluminium P adsorption complexes brought about by intense fire.

The relationships between soil physical fractions, measures of nutrient availability, organic matter recycling and productivity were investigated in stands located in Alpine Ash (*E. delegatensis*) and Silvertop Ash (*E. sieberi*) forests. Productivity measures used were basal area increment (%) and basal area. Strong correlations were evident between P in light fraction organic matter and soil P availability and between P and C in light fraction organic matter and litter decomposition constants. These measures might reflect different rates of nutrient cycling. Furthermore, significant correlations were evident between P and N in soil light and heavy organic matter fractions and measures of stand productivity. In particular, higher P contents (µg P g $fraction^{-1}$, kg P ha^{-1}), suggesting a capacity for greater P recycling, were positively correlated with higher productivity whereas narrower C:P ratios, suggesting an increased likelihood of P release, were negatively correlated with higher productivity. These relationships suggest that the light fraction is a pool of organic matter actively participating in biological processes and P recycling and contributing to P supply. A subsequent plant bioassay strongly indicated that light fraction organic matter can contribute to plant P nutrition in the short term. When extrapolated to yearly supply capacity the light fraction organic matter could potentially contribute significantly to meeting annual P demands of the vegetation if turnover rates are sufficient.

Collectively these investigations strongly indicate that in native eucalypt forests the light fraction organic matter is an active fraction of SOM and sensitive to stand processes and dynamics. Furthermore, the light and probably also heavy fraction of particulate organic matter are likely to be involved in nutrient recycling and supply, particularly for nutrients such as P, where recycling via organic matter contributes significantly to supply. This project provides a foundation for further studies of P in SOM density fractions, which may contribute to

Kate Semple

PhD

Utilising plantation-grown acacia and eucalypt wood for the manufacture of cement-bonded composites

This thesis aims to further the use of plantation acacia and eucalypt wood for the manufacture low cost portland cement-bonded building panels, including wood wool-cement board (WWCB), cement-bonded particleboards (CBP) and cement-bonded flakeboard. In many countries where acacia and eucalypt species have been introduced in the last several decades to supply wood and pulp needs there is the urgent need for the development of low-cost housing. Cement-bonded composite panels are considered in this thesis as among the most suitable materials for such purposes. They can be made using smaller, less capital-intensive facilities from simple, locally available constituents; wood fibre, cement and water, with the cement binder giving the panels enhanced resistance to weathering, fire and biodeterioration.

Despite the good representation of acacia and eucalypt species in plantations (mainly in developing countries), little is known of the suitability of many of these for wood-cement composites. A small number of species is represented in wood-cement compatibility tests of various types, however, these often do not correlate well with the performance of woods in wood-cement composites in practice, largely because the wood is tested in a finely ground form not used in the manufacture of composites such as WWCB and CBP. This problem was addressed in this study by developing a compatibility test method that more accurately predicts the behaviour of wood wool and flakes with cement. A wide range of tropical and temperate species of acacias and eucalypts, sourced from controlled growth trials, were tested for potential suitability for WWCB or flakeboard using this alternative method. Eucalypt species were more compatible with cement than most acacia species; the compatibility of acacias was reduced by high quantities of hot-water-soluble extractives in the wood.

Waste stem residues from short-rotation mallee eucalypt trees grown on farms to ameliorate soil degradation and to service the leaf oil industry was examined as a potential wood source for CBPs and flakeboards. Such wood is thought to have little use other than for low-value fuelwood, however, viable alternative markets for the wood are necessary for the commercial viability of mallee plantations. The compatibility with cement of five commercially important species of mallee was assessed first, followed by the trial manufacture of CBPs with an emphasis on appropriate conversion techniques for flakes from such small diameter stems with a high volume of bark. The performance of mallee eucalypt wood was compared with that of selected leaf-oil-producing species of melaleuca, as well as commercial timber species including blue gum, radiata pine and maritime pine. Large flakes imparted better strength properties to boards than particles. The strength of boards made from mallee flakes was compromised somewhat by the production of thicker flakes from the small diameter, higher density stems, whereas boards made from pine and fast-grown blue gum wood were of good quality.

Readily available wood from planted acacias, both tropical and temperate species, is often not immediately suitable for cement-bonded composites because of the presence of soluble wood extractives including sugars and heartwood tannins that affect the bonding between wood and its cement binder. As a result, many previous attempts to use acacias (particularly tropical species) in wood-cement composites have not been successful. Even when wood has been pre-soaked to remove extractives and/or cement-setting accelerators used to strengthen the consolidation of the composite, the mechanical properties of boards made from species such as Acacia mangium were found to be below standard in some studies. Reasons for these poor results were investigated in detail in this thesis since a principle objective was to demonstrate that good quality wood-cement composites (in this case low-cement content WWCB) can still be manufactured from the wood of this ubiquitous species using relatively simple techniques. This is especially so because the wood of A. mangium is easily machined into good quality wood wool. Questions including the efficacy or necessity of cold-water extraction, and strong variation in the efficacy of cement setting accelerators for this species were addressed.

It is shown that the use of carefully selected chemical additives, either singly or in combination, can eliminate the need to pre-soak the wood, thus addressing problems relating to the extra time, space and water required for this process and the disposal of extract. When used in small quantities cement-setting accelerators were only effective in neutralising the strong inhibitory effect of the heartwood of A. mangium on cement if they chemically interacted with heartwood polyphenols and strongly accelerated cement hydration. Paradoxically, the most effective additives were also those with the most potential to cause problems with corrosion of nails or any adjacent metal framing if boards were exposed to moisture, and therefore accelerator addition needs to be kept to a minimum.

The study was designed to provide more information on the suitability of acacia and eucalypt wood for wood-cement composites and demonstrate that problems hampering the use of selected species can be overcome using relatively simple techniques. Further research is needed, however, to further improve flake quality from higher density eucalypt woods and to determine whether the board manufacturing techniques developed for Acacia mangium can be applied in the case of other tropical and temperate acacia species.

Kimberly Patraw Van Niel

PhD

Geographical issues in predictive vegetation modelling: Error and uncertainty in GIS data, methods, and models

Predictive vegetation modelling makes extensive use of GIS data methods and models, yet error in each may affect the integrity of vegetation modelling outcomes. While error has increasingly been studied in GIS, it has not been extended to interface applications such as vegetation modelling. In this study, a framework was developed for considering error and uncertainty within GIS data, methods, and models, and how they affect the process and outcomes of predictive vegetation modelling.

As a basis for the study, predictive vegetation models were developed for 17 tree species in a temperate Eucalypt forest in New South Wales. GIS method error was examined in relation to stochastic analyses, particularly focusing on error propagation. GIS data error was examined based on an error analysis of the DEM and the propagation of that error in the development of the predictive environmental variables, and the ultimate effect of the propagated error on model development and results. To examine error due to GIS models, the individual species predictions, and associated errors and uncertainties, are used to demonstrate the use of individual species data for the development of traditional outputs, such as maps and GIS layers, that are flexible and data rich.

The results of this thesis have a number of implications for predictive vegetation modelling. The analysis of error in GIS methods showed that selection of the pseudo-random number generator and the method of spatial autocorrelation development in stochastic analyses of propagation of uncertainty can threaten the integrity of results. The examination of GIS data error showed that some environmental variables are more sensitive to error in the DEM than others. The results contradict the prevailing, and until now untested, theory that indirect variables would be less prone to sensitivity due to their quantitative proximity to the original DEM data set. Also, error in environmental variables may have a much larger effect on the process and results of predictive vegetation modelling than had previously been suggested. In this analysis, propagated GIS data error has an extensive effect on model development, species-environment relationship interpretation, statistical fit, and spatial predictions. These results show that selection of predictive variables should consider GIS data error and uncertainty and that this type of uncertainty needs to be reported for model outputs, for both interpretations and predictions. Finally, the study into GIS model error shows that it is feasible to develop models for species, retaining a stronger theoretical link to current vegetation theory, while still providing traditional output, which can incorporate methods of tracking and reporting error and uncertainty information developed throughout the modelling process. The thesis concludes with a discussion of how this framework could be expanded to develop a deeper understanding of error and uncertainty during data development, selection, and modelling, which can ultimately lead to reducing and controlling error in the modelling process.

Kusuma Dewi Sri Yulita

PhD

Generic delimitation of Hopea Roxb. and Shorea Roxb. ex C.F.Gaertn. (Dipterocarpaceae): Molecular and Morphological Evidence

The two largest genera in the Dipterocarpaceae, Hopea and Shorea, have many similarities and exhibit continuous morphological variation at both the generic and specific levels and they are regarded as closely related genera (Ashton, 1982). The many similarities between the two genera leave very few discrete characters to separate them. The single and most conspicuous morphological character distinguishing the two genera is the comparative development of the fruit calyx. Hopea is characterised by two long and three short fruit calyx wings, while Shorea has three long and two short wings on the fruit (Ashton, 1982).

This study investigated the phylogenetic relationship of Hopea and Shorea to address the issue of their generic delimitation. Observations and measurements were made of morphological characters, and DNA sequences were obtained for the trnL-F region of the chloroplast and the ITS region of the nuclear genome.

Cladistic analyses were performed on a dataset of 40 selected morphological characters, categorised as either quantitative or qualitative. These analyses enabled the construction of a putative phylogeny of Hopea and Shorea, and the characters that define each genus were identified and examined. A detailed study of the inflorescence structure of some selected Dipterocarpaceae species was also carried out. The inflorescence was parsed into hierarchical nested units and the characters obtained were incorporated into the cladistic analyses. Several analyses were performed to test the effect of different parts of the data set on the robustness of the resultant topologies. Results from the morphological study showed that neither Hopea nor Shorea are monophyletic genera.

Analyses of the molecular data sets were performed to infer phylogenetic relationships using independent sources of evidence, the chloroplast and nuclear genomes. Analyses that examined the effect of insertion-deletion events and of different putative outgroups on the robustness of the resultant topologies were also performed. The results suggested that Hopea is probably a monophyletic genus (albeit with some minor recircumscription) while Shorea is clearly non-monophyletic.

Since the study used two independent data sets—morphological and molecular–a combined analysis using both was also performed. This combination of data provided a better insight into the relationships of Hopea and Shorea. Results from this analysis were largely similar to those obtained from analyses of molecular data.

Wiene Andriyana

Master of Forestry

Testing the feasibility of centroid and importance sampling for estimating volume of standing trees in a tropical forest context

In many tropical countries, the most common method for estimating volume of standing trees is by using volume tables or volume equations. However, studies have shown that inappropriate use of volume table has contributed to inaccurate estimate of tree volume. At the same time, the construction of specific and appropriate volume table required large investment of time and money.

The centroid and importance samplings are methods to estimate volume of standing tree, which eliminates the need for volume equations. These techniques utilize prior knowledge about tree shape assumption and later on correcting this assumption with one actual measurement on the tree to improve the reliability of the assumption. Several studies have suggested that these techniques can be potentially applied to the context of tropical rain forest (for example: Wood et al., 1990; Wiant et al., 1992a). However, until recent times the adaptability and the appropriateness of centroid and importance sampling in the tropical rainforest context to estimate volume of standing trees have not been widely studied or published. Therefore, this project was initiated to gain a better understanding of how centroid and importance sampling perform in tropical rain forest contexts.

This study simulated the application of the centroid and importance method (variance-reduction methods) for estimating the volume of standing trees, by using a case study in the forest region of Jambi Province, Indonesia.

The results of this study show that the centroid and importance methods are superior in term of precision when compared to all other volume equation methods. This study shows that even with the use of simple proxy taper function, the centroid and importance methods still give reasonable estimates of standing trees volume. This study has also demonstrated that for a tropical forest context, the adapted centroid and importance approaches can be applied without taking measurement or estimation of total height, while still giving a reliable estimate of volume.

In conclusion, based on this simulation study, the centroid method with the conoid assumption is highly recommended, particularly for forest inventory with the purpose of determining the level of Annual Allowable Cut. It gives the highest precision and negligible bias. It has been demonstrated in this study that the centroid method provides a more reliable estimate of volume even when compared to the use of volume equations that were made locally. However, to apply the centroid method at least some conditions must be fulfilled, including the provision of instruments that will enable measurement of upper-stem diameter.

Simon T. Angombe

Master of Environmental Science

Site form and improving volume estimation of uneven-aged forest stands in Northern Namibia

Accurate and reliable evaluation of site suitability is vital for the assessment of afforestation projects. This study examines whether Site Form can be used to develop volume models. It highlights the conceptual approach to forest classification using Site Form, which is the average height of trees at a nominated diameter. The analysis follows three steps: First determining the reference diameter using the regional forest inventory data. Second determining site form of the plots and classifying it into different site classes. Third, developing volume models that utilize Site Form as a variable.

Based on the tree height data from different regions of Namibia, 300 mm was identified as a reference diameter. This has been applied as a best estimate to segregate site quality of the uneven-aged forest into different site productivity. Therefore based on this information, the Site Form was determined for different plots. The results show that indeed Site Form can be used to classify forest into different classes based on site productivity. As a result, volume models were developed, expressed as a function of site and diameter at breast height. This findings has strong implications for measurement of volume and site productivity in the field for Namibia forested areas.

Narendra Bahadur Chand

Master of Forestry

Property rights and sustainable management of community forests in Nepal

The development of community forestry in Nepal is a major initiative of the government and significant achievement has been made in designing community forest groups as self-governing and independent institutions. Under community forestry the government has decentralised state rights over forests to the local community in order to manage the forests more sustainably. More specifically, the objectives of the program are the conservation of forest ecosystems, promotion of economic development and maintenance of equity in distribution of benefits. However, the impacts of the community forestry have been mixed in terms of equity and efficiency. One of the main issues is whether or not property rights systems decentralized from the state are compatible with the aim of sustainable forest management. This study analyses whether the community forestry approach is appropriate for managing the forests of Nepal. It also examines whether or not the property rights systems existing in community forests are compatible with the pursuit of sustainable forest management especially in achieving the goals of equity and efficiency.

The analysis shows that common property management is the best regime for managing the forests of Nepal because of the indivisible nature of a forest, the link between poverty and resources and the inefficiency of private and state property management, and the socio-economic situation of Nepalese society. Furthermore, the analysis shows that community forest users have a wide range of property rights that are essential for equity and efficiency. The rights include right of withdrawal, right to income, right to management, right of exclusivity and right to bequeath. However, the impact of these rights for equity and efficiency may not be fully realised. One reason is the disparity in the endowment of wealth in the community, which tends to influence the decision-making processes of community forestry. A second reason is the absence of a market for various forest goods and services, and a third reason is the weak implementation of community forest policy by government staff.

This study highlights the vital role of government staff in achieving the goals of equity and efficiency. Detailed analysis of the social attributes of communities, the biophysical attributes of forests, their inclusion in forest operational plans and constant monitoring can bring about equity, to some extent. Exploration of new markets for forests goods and services by government staff can also help to use resources efficiently. Although the analysis shows that forest user groups hold a wide range of property rights, with the emergence of new markets for forest goods and services may have to be defined new rights for new goods and services.

Junqi Chen

Master of Forestry

Assessment of The Rehabilitation of Degraded Rangelands, Using Landscape Function Analysis

Australian rangelands are prone to degradation under adverse natural conditions (e.g. low and highly variable rainfall) and inappropriate management. Therefore methods of analysis are necessary to help landholders understand the dynamics of rangelands and to recognize the functional status, as well as to assess the effectiveness of various rangeland rehabilitation strategies.

The aims of this study were to investigate the applicability of The Landscape Function Analysis (LFA) in describing the functional status of semi-arid rangelands and in assessing the effectiveness of two different rehabilitation strategies on degraded rangelands. The LFA investigations were conducted on two CSIRO long-term rehabilitation experimental sites on degraded semi-arid woodlands in eastern Australia, i.e. active rehabilitation using log mounds on mulga woodlands at Lake Mere, NSW, and passive rehabilitation by using an exclosure to fence off all grazing animals on poplar box woodlands at Oakvale, NSW.

The LFA results showed that undegraded semi-arid woodlands are highly organized ecosystems with highly stable, permeable and fertile patches/thickets located at runon areas that receive redistributed runoff water, litter and soil particles. These patches are surrounded by more open and less vegetated areas that consist of unstable and infertile inter-patches/inter-thickets. After degradation, the functioning patches/thickets will diminish and cannot hold, utilize and cycle sparse resources within the ecosystem.

LFA results also showed that after 15 years of active rehabilitation by log mounds at Lake Mere, the ecosystem functions have been greatly improved. The strategy has effectively reconstructed long-lasting functioning patches, which recover the eco-processes regulating sparse resources. In contrast, the LFA results demonstrated that the dysfunctional system at Oakvale has not been effectively rehabilitated by simply removing grazing disturbance without changing the eco-processes of resource regulation.

LFA results show that even after approximately 30 years of passive rehabilitation (exclosure of grazing) the functioning patches have not been reconstructed. The results also imply that the degradation at Oakvale had probably exceeded a critical threshold from which the ecosystem cannot recover itself without outside intervention.

Based on landscape ecological theories, LFA integrates 11 surface soil indicators into 3 indices, which show critical characteristics of rangeland ecosystem functions. The indicators are easy to investigate and are unambiguous. The investigation of LFA can be conducted by visual survey and are not affected by seasonality. The LFA indices have very strong correlations with measured soil properties and are very practical and cost-effective. Therefore LFA is very reliable in demonstrating landscape ecosystem functions and in assessing the effectiveness of different rehabilitation strategies in Australian semi-arid woodlands.

Larysa Halas

Master of Geographical Sciences

Application of the landform evolution model to upland catchment for gully erosion prediction and landform development modelling over the medium and long temporal scales

Soil erosion produces serious environmental problems associated with land degradation and hazards that restrict many agricultural activities. Gully development can be a natural process in response to climate fluctuation, bushfires and tectonic uplift or accelerated by human activity that exerts substantial pressure on soils and vegetation. It results in loss of fertile soils, hazardous mass movement and sedimentation of waterways. Gully development incorporates phases of active channel deepening and subsequent filling promoted by revegetation. Erosion processes are hard and costly to control, and erosion hazard prevention requires research to achieve accurate predictions.

Modern developments in geomorphology and computing techniques have allowed the creation of physically based landform evolution models, designed to simulate geomorphic processes in order to predict landscape change and locate hazardous areas.

This study uses Dunn's Creek catchment, on the border between ACT and NSW, as a case study for application of a landform evolution model to simulate gully erosion and hillslope development over medium and long-terms. The physiogeographic features of the study area were assessed in order to determine factors controlling geomorphic processes. The regional setting of the study catchment was explored in GIS environment to gain spatial cognition of the processes that shape it. The spatial and temporal scales appropriate to the intended modelling were defined.

The paper reviews four recent landform evolution models and their appropriateness for upland catchment application to modelling gully erosion and landform development. The models were assessed against the study catchment requirements. The SIBERIA model was selected as the most appropriate for gully erosion prediction and landform development simulation.

The simulations differed in their spatial and temporal scales and in the parameter inputs. The model generated several outputs of predicted sediment yield: a) as elevation loss / increase in mm per last time step of the simulated period at every point in the catchment; 2) as elevation loss / increase in m for every node since the start of the simulation; 3) sediment yield in T/Ha for every node per last time step of the simulated period. The model also produced outputs for channel network growth: gully / channel depth, the spatial distribution of the channel initiation function and cumulative area distribution. The generated statistical results of the simulations were compared. The simulations have tendency to over-predict the sediment yield, although the predicted spatial distribution of gully depths is close to observed data. The elevation characteristics of simulation 3 were tested against the geomorphic statistics produced by the ArcEvolve program. The testing proved that SIBERIA could reproduce the area-slope relationships of the catchment, however there is a degree of uncertainty in the sensitivity of the chosen geomorphic descriptors.

Son N. Ho

Master of Forestry

Plantation Forests and Biodiversity Conservation and Restoration: Implications for Vietnam's 5MHRP

Plantation forests are making an increasing contribution to wood and pulp production in many countries, and the plantation estate is set to expand rapidly in many parts of the world, including Vietnam. This study investigates a number of questions relating to biodiversity in plantation forests, seeking synergies between plantations and biodiversity conservation and restoration. This study was conducted primarily through literature search and review.

The paper first discusses the definition of plantation forests and the environmental issues associated with plantation development, to provide a context for the study. It is concluded here that a plantation forest is not inherently good or bad for the environment, and generally the impact of plantations on the environment is site-specific. It then discusses the definition of biodiversity. While biodiversity may be readily defined in conceptual terms, the translation of the word into something meaningful at the practical level is more difficult, although recent work has help to address these issues. The paper also discusses arguments that relate to biodiversity conservation in plantations. It concludes that plantation forests can have positive impacts on biodiversity if they substitute for harvest natural forests, and help restore degraded landscapes. However, plantation forests can have adverse impacts on biodiversity, for example, if they replace natural ecosystems. There are ways of designing and managing plantation forests to enhance their contribution to biodiversity conservation and restoration. These can be implemented at both the landscape and stand levels, and through management of genetic resources.

The implications for Vietnam's five million hectare reforestation programme (5MHRP) are then reviewed. There is no doubt that the 5MHRP will have considerable impact on biodiversity in Vietnam; hence, its potential contribution as well as potential risks needs to be appreciated in decision-making, planning, and implementation. The 5MHRP has components of both protection and production forests, and thus its potential contribution to biodiversity conservation and restoration varies considerably between these components. In some cases, the most important contribution will be the provision of ecosystem goods and services; in others, substantial biodiversity benefits are likely.

Recognising different goals within the 5MHRP has implications for decision-making and planning, and for plantation management. Also, it is necessary to assess the potential contributions of plantation management at both the landscape and stand levels, and through management of genetic resources. The contribution of protection forest component of the 5MHRP to biodiversity conservation and restoration objectives can be significantly achieved at both landscape and stand level because forests are established for environmental conservation and protection purposes. However, the production forest component will contribute primarily at the landscape level; conservation at stand level is more difficult because forests will be harvested on relatively short rotations. In both cases, though, it is essential to recognise the diversity of means to achieve biodiversity conservation and restoration objectives.

Van Chieu Hoang

Master of Forestry

Economic and social effects of forestland allocation to households in Vietnam

Land in Vietnam belongs to all people while the State is the representative of this ownership. So, people's ownership over land is actually the ownership of the rights to use their land. In this policy framework, forestland allocation means allocation of the rights to use forestland. Forestland allocation began in mid-1960s and allocation of forestland to private users such as households, individuals and other forms of private uses commenced in 1982. This allocation of forestland to rural households and individuals has generated broad economic and social effects. It is widely recognised that rural people's livelihoods have improved through involvement in forestland allocation, as people have been assisted to improve their lives by various projects and organisations, through forestry production following forestland allocation. Also, as a result of forestland allocation people have incentives to maximise outcomes from their allocated forestland by intercropping and increasing investments in their crops. In addition, encouragement of people's participation in and improvement of people's awareness of forest management are the major achievements of forestland allocation in terms of the social aspects. However, land fragmentation and misuse of resources remain the significant economic shortcomings, while new conflicts within rural communities over land uses, the limited rights of women over land rights ownership and less effective assistance to the poor are the main shortcomings of forestland allocation from a social perspective.

H.W.K. Jayatilake

Master of Forestry

Tea smallholders in Sri Lanka: Finding a balance between their livelihood needs and forest conservation

This essay explores the causes and implications of the continuous loss of rainforests in Sri Lanka. Tea smallholders, amongst others, have been identified as important stakeholders to engage if a new approach to forestry is to be developed.

Sri Lanka's rainforests are critically important as a rich source of biodiversity, and conserving water and soil resources, yet account for just over 3% of the country's wet zone forest cover. Although the Forestry Sector Master Plan (1995) reported the need for the Forest Department to enhance their partnerships with a range of stakeholders to achieve better management of the wet zone forests, the subsequent forest management plans do not offer any strategies to involve tea smallholders – a group of people responsible for some of the clearing of rainforests. Furthermore, the current approach used by the Forest Department does not adequately address community participation as a means of gaining public support for sustainable forest management.

Although illegal, many poor tea smallholders clear small areas of rainforest to establish tea crops for sale in the global tea market. While tea smallholders are marginalised in Sri Lanka's forest policy and initiatives, this study argues the need to include them if the sustainable management of rainforests is to be achieved. In addition to an extensive literature review, a survey based on a limited interview questionnaire was conducted to assess the socio-economic characteristics of 148 tea smallholder families who illegally occupy areas within the boundary of the protected Dellawa rainforest in Sri Lanka. The survey was undertaken with the assistance of six forest officers of the Forest Department, during September 2003.

The results of the survey suggest that the tea smallholders would like to continue their tea cropping, as it provides regular and reliable income. However, they would also like to be more involved in forestry. Experiences from India and Nepal indicate that active community involvement in developing forest policy and implementing initiatives can be a powerful process that enhances the benefits for a range of local and national stakeholders – creating a locally-defined version of sustainable forest management. It appears that the rainforests of Sri Lanka would benefit from forest management that catered for a wide range of interests, guided by the concepts of community-based forest management and community forestry, so that more people view forestry as a positive feature.

Meena Kunwar

Master of Environmental Science

Spatial information technologies: what can they contribute to community forestry development in Nepal

The focus of community forestry (CF) in Nepal is to contribute to improving livelihoods of rural communities. However, factors such as lack of focus on economic incentives, and an environment unfavourable for disadvantaged people to participate meaningfully in decision making, are hindering achievement of this goal. Development of comprehensive operational plans based on sound information, increased participation, and appropriate participatory tools to involve disadvantaged in decision making are required to address these constraints. For these reasons, more accurate and relevant spatial information technologies (SIT) can play a key role in CF development in Nepal. This study investigates how SITs contribute to improvements in the CF development process, analyses the potential roles of SIT in CF, and explores possible ways of integrating such technologies in CF development in Nepal.

The study concludes that SIT have considerable potential to enhance CF development in Nepal. They could have a wide utility in CF including visualization and mapping, as efficient tools for operational plan development and as spatial information systems. These in turn would contribute to strengthening participatory processes, provide the basis for active forest management, contribute to increasing the efficiency of Department of Forest and Forest User Groups, and assist in managing conflicts. The integration of SIT in CF development needs to focus on providing services to Forest User Groups.

The study identifies a number of constraints to adoption of SIT on a wider scale: the lack of enabling policies; limited and inadequate funds; lack of physical infrastructure; technological difficulties; scarcity of human resources; and hesitation over adoption of new technologies. There are also factors which help to create an environment favourable for SIT in CF in Nepal- for example, the recognition of SITs among the stakeholders and experience from pilot projects – which provide opportunities to respond to these constraints.

The study concludes that the successful integration of SIT in CF development in Nepal will require a long term strategy which addresses constraints in a logical, structured and progressive way. The demands of a strategy are needs-based priority setting, new policy initiatives, building financial support, strengthening existing planning and decision support systems, capacity building for government and communities, achieving smooth technological transition, and establishment of mechanisms for continued co-operation and collaboration between a wide the range of parties. In the short to medium term, implementation of the strategy could start with the present resources in pilot projects, with a feasibility study, development of policy, guidelines and a common framework for SIT implementation, and institutional development.

Khac Lam Nguyen

Master of Forestry

Prospects for the Forest Industry and Industrial Forest Plantation in Vietnam

The boom of the forest industry following the economic reforms in Vietnam has presented many challenges and opportunities to industries in the forestry sector, especially industrial forest plantations. This study, by examining the potential, status, strategies and the relationship between the forest industry and forest plantation in Vietnam, has put forward a number of recommendations for further development of the industries.

With high potential and supporting policies, the forest industry has grown rapidly, especially in producing wood furniture for export. This has led to an increasing demand for wood, while natural forest logging has been restricted. Consequently, a gap has appeared between the demand for and supply of wood in Vietnam. The shortfall could be bridged by importing wood and/or expanding plantation forests. However, the conventional sources of cheap wood imports from neighbouring countries such as Laos, Cambodia and Indonesia are being limited by new policies of these nations.

Timber supply from domestic plantation forests is promising as Vietnam has a comparative advantage in agriculture due to conducive climate and cheap labour. Nevertheless, this study shows that the expansion of industrial plantation forests will probably not be able to fill the timber deficit if the current situation is not improved. Four main reasons for this are: large areas identified as "bare land" for forest plantation are actually in use; domestic-planted timber might not be suitable for making valuable wooden products; certain species of locally-grown timber seem to be not price competitive; and, local forest products could be boycotted by international consumers if the forests are not certified.

Given the above findings, this study has proposed a number of measures. First, it is necessary to review the current land use planning based on participatory principles. Secondly, up-to-date silvicultural techniques should be applied, where appropriate, to improve forest yield and timber quality. In combination with this, institutional support such as establishing forest collective bodies may help to reduce transaction costs making local timber more cost-competitive. Furthermore, the government should provide an appropriate environment for enterprises and tree growers to have their forests certified. More studies on related areas are needed to improve the prospects of the forest industry and industrial plantation forests in Vietnam.

Karma Thinley

Master of Forestry

Improving Governance and Institutions for Effective People's Participation in Sustainable Forest Management in Bhutan: Drawing on International Experiences and Lessons

People's participation in forest management has received renewed impetus through the current concept of sustainable forest management (SFM), which is predicated on the notion of sustainable forestry – the socio-political processes by which a desired forest condition (the sustainable forest) is achieved. To date, efforts in participatory forestry have principally centered on developing participatory tools and programs. However, there is growing recognition among development practitioners of the importance of "good" governance and "appropriate" institutional settings in fostering effective people's participation in SFM.

This study explores the proposition that "effective people's participation is crucial in achieving SFM, which in turn is contingent on 'good' governance and 'appropriate' institutional arrangements" and considers these issues specifically for the case of Bhutan. Firstly, a set of key principles and elements of SFM, participation, governance and institutions are identified from the literature; secondly, these principles and elements are applied to investigate current trends in SFM in Bhutan to highlight some key issues and put forward some recommendations.

In the context of this study, the level and quality of representation, the degree of power-sharing between stakeholders, and the goals and objectives of participation are identified as key determinants of effective people's participation. Ideally, participatory processes should encourage greater local authority and ownership over forest resources and incorporate traditional knowledge and practices in forest management. To ensure representative and effective public participation in forestry decision-making processes, forestry governance regimes must ensure that the decision-making processes are brought to the grassroots level. The authority for local forest management has to be devolved to locally established and downwardly accountable decentralised organisations. These local organisations and traditional institutions have to be given legitimacy, which entails recognising traditional customary rules and practices, and providing well-defined property rights over the resource.

The study shows that Bhutan's development concepts of "Gross National Happiness" and the "Middle Path", which are deeply embedded in traditional Buddhist values, provide an overarching conceptual framework for articulating appropriate forest policies and strategies in support of SFM in Bhutan. Also, the series of administrative and political reforms undertaken in Bhutan, and the resulting "Development Committees" instituted at the district and block levels, provide appropriate fora for local people to participate in public decision-making processes. However, field implementation of participatory forestry in Bhutan remains at a very early stage mainly due to lack of appropriate forest policy and legislative frameworks to give effect to genuine people' participation in SFM.

Therefore, in order to promote these principles and spirit and to achieve genuine people's participation in SFM, it is imperative that forest policies and Acts recognise the fundamental principles and elements underpinning SFM, to guide as well as to give legitimacy to field activities. Further, decentralised local government organisations, such as the Geog (block) Development Committee (GYT) and traditional institutions governing forest resources management and use have to be given more authority over local forest resources and legitimate roles in forestry decision-making process.

Damian Wood

Master of Environmental Science

Environmental education in Australian secondary schools: An analysis of past initiatives and future directions for environmental education in Australian secondary school

Environmental education has a long history in Australia. Before and after European settlement, Australian societies have adopted a range of methods designed to educate young people about the environment on which their existence depends. In recent times as pressure on our environment and natural resources has increased, it is becoming apparent that our society is confronting a growing crisis. For Australian society to operate in greater harmony with our limited environmental resources, young Australians need to be informed of these issues and empowered to affect change in the future.

This project asks the question; what role can Australian secondary schools play in assisting the achievement of a more ecologically sustainable society? To address this question, this project is in two parts. Firstly, a history of the development of environmental education policy in Australia is examined. Particular emphasis is placed on policies that have directly influenced the secondary school curriculum and the delivery of environmental education programs in schools. Resulting from this analysis, it is demonstrated that secondary schools have achieved mixed success in delivering educational outcomes that have flowed on to positively influence the attitudes and behaviours of students towards their environment. Many examples of innovative and highly effective environmental education programs exist. However, it will be argued that across Australia, our secondary schools are failing to deliver the educational outcomes necessary to initiate behavioural change on the scale that is required to have significant long term environmental benefits.

The second part of the project examines recent initiatives to re-invigorate environmental education in Australia. Particular emphasis is placed on the Commonwealth's National Action Plan for Environmental Education and associated initiatives. Through the National Action Plan, mechanisms to facilitate a nationally coordinated approach to environmental education have been established and the importance of this development is analysed. To assess whether these developments will assist secondary schools in delivering environmental education outcomes, the crowding of the modern school curriculum and the difficulties associated with affecting attitudinal changes are also addressed. To support this analysis a case study of a group of year eight student's attitudes and behaviours towards their environment is included.

Maria Arnold

An assessment of threats to chimpanzees in Budongo, Bugoma and Kibale forests, Uganda

The tropical rainforests of Western Uganda have been consistently selected as among the world,s most valuable and endangered ecosystems. As a flagship, keystone and umbrella species, chimpanzees have been identified as an ideal focal species for the conservation of these forests. This study investigated potential threats to the three largest chimpanzee populations in Uganda, which occur in Budongo, Bugoma and Kibale forests. A variety of social, cultural and biophysical data from numerous sources were integrated in a Geographic Information Systems framework. This allowed a comprehensive examination of a wide range of potential threats at local and regional scales. Demographic indicators reflecting potential threats - such as human population densities and poverty levels - were examined spatially and temporally, and then considered in conjunction with the results of an assessment of forest loss using MODIS satellite data. Estimates derived from the analysis of forest loss indicated that a total of 157.2 km" of fully stocked tropical high were degraded or lost in these critical habitats during the seven year period 1995-2002. Clear relationships and statistically relevant associations between the selected anthropogenic variables and forest loss were not forthcoming. The results of a subsequent examination of influences such as the absence or presence of forest resources outside protected areas; road networks; and deterrents to illegal activities such as the presence of rangers and researchers, suggests that these variables may be more useful in identifying threats to chimpanzees and chimpanzee habitat.

The results reveal important differences between regional and local scale pressures, demonstrating that conservation efforts require a range of integrated and carefully chosen strategies that address site-specific threats. Recommendations to enhance and further define chimpanzee conservation strategies in the three forests are presented, and conclude that without urgent efforts focussed on specific threatening processes, opportunities to ensure the long term survival of wild chimpanzee populations in Uganda.

Simon Baird

The Olympics: Transforming environments in host cities

This research set out to evaluate whether or not there was a difference in the scale of transformation taking place in Beijing and Sydney 6-7 years prior to hosting the Olympics in each city.

The literature review explored how large-scale triggering events affect complex adaptive systems such as cities. Subsequently, I developed an explanatory framework and theory to distinguish between different cities to determine if this could explain differences in their potential to be transformed by the Olympics. I posited five criteria for evaluating the difference in pre-bid potential for environmental transformation in Beijing and Sydney preparations for hosting the Olympics.

There was sufficient literature to evaluate all five criteria for Sydney; but only the first four criteria for Beijing. As such, I undertook an original survey of two universities in Beijing to investigate whether or not there was a social expectation that the Olympics would transform the city's environment. This survey provided valuable insights into the transformative potential of the Olympics.

The explanatory framework and theory was a useful tool to distinguish significant differences between Sydney and Beijing's pre-bid potential for environmental transformation. The key reason for this difference was that the pre-bid environmental conditions and infrastructure capacity were significantly different for each city. Further, this difference determined the political and social expectations for change.

The explanatory framework and theory also enabled a distinction between criteria which did and did not have the potential to affect large-scale environmental transformation in each city. In conclusion, this study found that the Olympics had greater potential to transform the environment in Beijing (a developing city) than in Sydney (a developed city). Generalising these findings, it is possible to infer that a common large-scale triggering event will impact complex adaptive systems differently; determined by each systems' pre-existing capacity to undergo change. This finding concurs with Gunderson and Holling's general theory about systems and change resulting from large-scale triggering events.

Yvette Bettini

Understanding individual local ecological knowledge

Despite genuine attempts to ease environmental degradation, the integration of human activity and ecological systems has not been achieved to the extent necessary. A realisation is emerging that the desire to make a difference is not the only common ground stakeholders need to achieve change. Individual or collective interests may conflict at the fundamental level of values and perceptions, making a collaborative effort also an exercise in comprehension of the perspectives or understandings the actors possess. The dominance of western thought and the traditional role of scientific knowledge as the mode of enquiry within it has led to the categorisation of knowledge types based on 'characteristic' differences, defined by the principles and methods of western science. Rather than drawing distinctions, similarities need to be highlighted to create shared understandings, a precursor for collaboration.

This research examined one of these traditional categorisations, the information and experience formed through in situ human-environment interactions, or local knowledge, by:

Examining the content of a local knowledge base, focusing, though not exclusively, on ecological knowledge, for application in environmental management.

Identifying the origins and influences of this knowledge system to aid in the understanding of the knowledge culture.

The overall approach was to treat local knowledge as inductive knowledge, without imposing the testing and validation standards of deductive scientific inquiry.

A case study approach was adopted to explore these aspects of the local knowledge of a community, and concentrating on knowledge of the local estuarine ecosystem further focused the research. Knowledge was collected using informal, semi-structured interviewing techniques and analysed for its context by collating a question matrix to examine the overall responses. Building individual knowledge profiles attempted to identify the factors influencing the knowledge formed and held by individuals, and the implication of using this form of knowledge was commented on in light of these findings.

The results of the study found that knowledge formation is largely dependent on the internal attributes of the individual: their value system, perception of environmental significance and personal characteristics such as curiosity and observational capacity. External attributes determine an individual's opportunity to form knowledge and include: the length of habitation in an area, frequency and type of environmental interactions, incentives for observing and learning about the environment and the occasions to share this knowledge with others.

The findings suggest that local knowledge is not being utilised or formed to its full potential due to the human centred values that underlie the community's perception of environmental services. However, this potential could be reached if latent recognition of ecological significance which already exists could be brought to peoples' consciousness and thereby expand the perspective from which they view their local environment, as well as evoke curiosity and further learning.

Understanding the foundations and dynamics of local knowledge contributes to the appreciation and acceptance of this knowledge system, thereby increasing the level of understanding between knowledge cultures needed for effective environmental management.

Lee Blessington

Using retrospective sampling to develop growth trends for *Pinus radiata* (D. Don) and *Eucalyptus globulus subsp. globulus* (Maiden et al. and Kirkpatr.) on low-rainfall Sites in South Australia

Research on low-rainfall plantation forestry has received increased attention in recent years as expansion of Australia's plantation forests flows into drier regions. Yield models and appropriate silvicultural regimes in these regions will be required. This thesis examines height, basal area and stem form growth trends of *P. radiata* growing in a low-rainfall region in the Bordertown area of South Australia. It was initially anticipated that growth trends of *E. globulus* would also be developed. However, poor growth ring definition inhibited the extraction of accurate growth increment data. Data collection was based on retrospective sampling utilising stratified diameter classes. Retrospective sampling proved to be a suitable and accurate method of determining past tree growth for *P. radiata*.

P. radiata height growth is sustained longer in thinned stands in comparison to an unthinned stands, indicating that the general consensus that thinning does not influence height growth may not hold on water limited sites. Furthermore, height increment (CAI) appeared to be controlled by rainfall once the site was fully occupied.

The results for basal area growth of *P. radiata* showed that within the limits of stand densities sampled (600sph – 2800sph) site occupancy occurred at approximately 5 years of age. Following site occupancy basal area increment declined markedly, but at the tree-level responded immediately to thinning and good seasonal rainfall. Early thinning – prior to site occupancy – increased basal area increment markedly; however early thinning did not significantly prolong the inception of competition. Thinning responses were less evident at the stand level with extended lag periods observed, indicating poor stand level responses to thinning.

Basal area growth was also highly dependent on water availability, i.e. low stand densities were associated with comparatively rapid basal area increment and increased tree size. However, increased tree size also resulted in a rapid decline in increment following water deficit, where tree growth reduced to a level capable of being supported by the site. Maximum stand efficiency up to 8 years of age was attained at stand densities in the range of 1300 – 2000 stems ha^{-1}. However individual tree size increased markedly at lower densities, therefore total stand productivity may have to be sacrificed to shorten the rotation length.

Comparisons of the established growth curves for height and basal area with the South Australian yield curves indicated that *P. radiata* might not have the capacity to maintain rapid growth on low-rainfall sites. A continuation of such trends would indicate that the potential of *P. radiata* to produce conventional forest products within a commercially viable rotation length may be limited on low rainfall sites. Furthermore observed trends confirmed the general argument that utilisation of the current South Australian site quality system may not be applicable for low-rainfall sites.

Analysis of *E. globulus* was considerably more difficult because of poor growth ring definition. It was evident that the formation of earlywood and latewood was highly influenced by the low-rainfall environment. Variation in wood formation was observed within trees, between trees and between stands and was attributed to "lammas" and "indistinct" growth rings. In all trees these were the major factors inhibiting the extraction of accurate growth trends for *E. globulus*. Therefore the utilisation of retrospective sampling for growth analysis of *E. globulus* may be limited in low-rainfall climates.

Zoe Cozens

Involving Kooris in marine area management: Improving relations and facilitating communication

This thesis investigates how Aboriginal people are currently involved in marine area management and develops some ideas about how they may be more effectively involved. Currently Aboriginal people are not effectively involved in marine area management. Their involvement is rarely more than consultative. Aboriginal people have unique interests in marine areas that need to be accommodated for sustainability and for Australia to become more socially just.

For coastal Aboriginal people the tidal line is not the point at which their associations with country end, they perceive marine areas to be a part of their 'country'. Coastal Aboriginal peoples' understandings of how marine areas should be managed are founded on this perception. They believe they have fishing rights, and that their fishing practices are sustainable. Aboriginal peoples' perspectives of marine areas are not widely recognised within the current management framework. It is however essential for sustainability that Aboriginal peoples' fishing practices are recognised and managed in a culturally sensitive way.

This research is founded upon an understanding of Aboriginal peoples' perception of marine areas as it is recognised that such an understanding is key to developing approaches that facilitate the involvement of Aboriginal people. An extensive literature review provided the basis for this understanding and a legislative and policy review determined how Aboriginal people can currently be involved in marine area management.

A geographic case study the far south coast of NSW was used to explore the interests and level of involvement of Aboriginal people in marine areas. Qualitative research techniques including semi-structured interviews and participant observation were used to gain insight into the contemporary interests and involvement of Aboriginal people of the region. Four guiding issues emerge about how Aboriginal people may be more effectively involved in marine area management. Key recommendations about how they may be more effectively involved are made.

Mira Durr

The emission of sulfur dioxide from acid sulfate soils in the Tweed Region, Northern NSW, Australia

The emission of sulfur dioxide from acid sulfate soils is an area of ground breaking research. Acid sulfate soils have been recently identified as a source of atmospheric sulfur dioxide emissions (Macdonald et al 2003). Little study has been conducted on the factors controlling the generation of sulfur dioxide in acid sulfate soil environments. This research attempts to identify some of these controlling factors, focusing on different land uses in acid sulfate soil environments on the Tweed River floodplain.

Measurements of sulfur dioxide emissions from five different acid sulfate soil environments including remnant forest, pasture, growing cane block, fallow cane block and scald site were conducted with emission chambers and passive diffusion samplers. A number of abiotic and biotic factos within these sites were also measured. Soil descriptions of all sites were conducted, focusing on pH and REDOX changes down the soil profile. Soil bacterial populations, focusing on the isolation and enumeration f the bacterium Thiobacillus ferrooxidans, were measured at each of the sites using a 'most probably number count' technique.

Results indicated the high level of complexity in the generation of sulfur dioxide from acid sulfate soils. Meteorological conditions strongly influence rates of soil evaporation and soil moisture; low air pressure conditions and precipitation; these factors are drivers of the sulfur dioxide system. Soil physical characteristics and soil conditions, including soil moisture and soil moisture evaporation; also influence the emission of sulfur dioxide gas.

Bacterial activity may be an influencing factor in the generation and liberation of sulfur dioxide in acid sulfate soil environments. Bacterial populations are influenced by a host of environmental factors within the acid sulfate soil environments. The quantification of bacterial populations within acid sulfate soil environments is an important area of future research.

Dayani Gunawardana

The Relationship Between Primary Productivity and Forest Litter Invertebrates: A Case Study in the Kioloa Study Area

Net primary productivity (NPP) has been hypothesised as a determinant of both regional and global scale patterns in species diversity and abundance. Today, climate change and continued increases in atmospheric CO_2 are predicted to substantially affect NPP. The implications of changes in NPP for biodiversity, ecosystem functioning and carbon accounting are still uncertain, partly due to a lack of understanding regarding the relationship between NPP and biodiversity and abundance. The aim of this thesis was to investigate the relationship between NPP and the abundance and diversity of organisms in the detritus based food chain.

Wood (2001) predicted variation in NPP between a number of forested sites in Murramarang National Park. Litter was collected from six sites ranging from low to high predicted NPP and the invertebrates extracted in modified Berlese funnels. A total of 28424 litter invertebrates were counted and 24 orders of arthropods were recorded. The relationships between site variables (including predicted NPP, litter moisture, litter mass, litter C:N, and soil available water storage capacity) and the diversity and abundance of litter invertebrates were analysed.

Anomalies at two sites lead to a re-examination of the sites and the model used by Wood (2001) to predict NPP. It was found that NPP predictions were strongly correlated with estimated solar radiation and that the model had not adequately taken account of the effects of water availability on NPP. Measures of invertebrate community structure were found to correlate better with estimates of the available water storage capacity of the soil than with predicted NPP.

There were substantial differences in community structure at a local scale. At a site scale these differences were correlated with revised estimates of NPP (largely based on soil available water storage capacity). If we assume the revised estimates of NPP to be relatively accurate, these results support the theory that NPP may be an indicator, if not a determinant of litter invertebrate composition and abundance at a local scale. Sites predicted to have higher NPP had a greater biomass and abundance of predators and a lower ratio of non-predators to predators. These results support the theory that top-down control may become increasingly important as NPP increases.

Antony Hunn

The maping of private dry sclerophyll forest using landsat ETM and ancillary data, Southern Tablelands, NSW

Dry sclerophyll forest is distributed widely across the Southern Tablelands of New South Wales, mostly occurring on private property and on relatively low productivity sites. In comparison to more productive forest types, dry sclerophyll forest is not well represented in public forest reserves for conservation, biodiversity, or resource values, and relatively little research has been performed on the values of this forest type on the Southern Tablelands. To date, the distribution, extent and structural variation of dry sclerophyll forest has remained largely unquantified.

In order to learn more about the conservation and resource values of this forest type a method was developed for producing accurate thematic maps using remotely sensed and ancillary data, including digital terrain models, forest ecosystem classification data, and other ground-sourced data. For the purpose of dry sclerophyll forest classification, the six non-thermal bands of year 2000 Landsat ETM data were transformed into a three-layer combination of the first principal component, the tasselled cap greenness index and the normalised difference vegetation index. This was performed on five study area subsets of the Landsat ETM data. Digital terrain models were used to apply topographic normalisations of the Landsat data to three of these study area subsets.

Dry sclerophyll forest was distinguished from other vegetation types with an accuracy of around 90% for each study area, using Landsat ETM data. However, the identification and classification of the structural variation in dry sclerophyll forests, proved difficult, with only a weak distinction in structure classified. It is speculated that the 25-metre spatial resolution of the Landsat data used was too coarse to produce the desired classification of structural variation in dry sclerophyll forest.

Woodland was distinguished from dry sclerophyll forest relatively well. However, there was some confusion between woodland and more open stands of dry sclerophyll forest. A number of species associations of dry sclerophyll forest were also relatively successfully distinguished from surrounding dry sclerophyll forest associations. Topographic normalisation of the Landsat ETM data assisted in this identification and improved classification accuracies, particularly in areas with high topographic relief, by removing much of the influence of topographic effect.

A digital colour orthophoto, with a one-metre resolution was also assessed for its value in classifying and mapping dry sclerophyll forest occurrence and structure. The spectral separation of dry sclerophyll forest and woodland, and therefore the detection of dry sclerophyll forest structural variation, was unsuccessful. However, prospects for the future application of digital orthophotos to the classification of dry sclerophyll forest, are discussed.

Julia Kyle

Investigating land cover change and vegetation growth in Turner as a way of quantifying the changes in Canberra as a garden city

The evolution of Canberra into a garden city has taken almost a century to achieve. A garden city broadly defined for Canberra as the unique balance that exists between the built areas and vegetation in the landscape. Today as Canberra's population continues to grow and new demands are placed on the city, this balance is being altered.

This study provides a novel way to quantify the changes in Canberra as a garden city and explores the reason for these changes. The study addresses land cover change and vegetation growth and the driving forces behind these changes. Assessment of these changes was achieved through Line Intersect Sampling that was applied to a time series of aerial photographs (1955, 1968, 1975, 1985, 1995 and 2001) of the suburb of Turner. Turner was chosen for this investigation because it represented garden city ideals reminiscent of older suburb development in Canberra.

Trees made up a large part of vegetation in the landscape increasing in area from 6.75% to 38.4%, confirming they were a major part of Canberra as a garden city. However in the next 10 years, losses in tree cover due to increases in tree maturity and tree removal may change the garden city of Canberra because of the exposure of more built areas in the landscape. A dramatic 4% increase in residential footprints from 1995 to 2001, also suggests that built areas in the landscape could become more prevalent. On residential blocks this is evident when considering there was a decrease in private lawn, hedge and shed area which represented a decrease in garden space as residential footprints increased. However, an increase in shrub area over time suggested a possible dominance of shrubs in the landscape in the future. Driving these patterns in the landscape have been mainly changing demographic and social trends.

These changes that have occurred over the last decade indicate that the garden city in Canberra has the potential to be lost because the balance between built areas and vegetation in the landscape is slowly being lost. A decision needs to be made now if the garden city should be maintained in Canberra. If Canberra is to continue as a garden city, city planners can use the 'database' of information regarding past trends in the landscape from this study as a guideline for future planning and development decisions.

Rob McWilliam

An investigation of the suitability of a power assisted tool for pruning Australian plantation

The production of clearwood or knot free timber requires strict intervention and timing in forest plantations. Traditionally pruning for the production of clearwood has employed manual tools and a young male workforce that is fit and capable of meeting the high physical demands of the task. Attempts to mechanise pruning in the past have led to little success or acceptance by industry. However finding suitable mechanised tools may benefit the industry by increasing the scale of pruning, the number and type of workers involved, the production of pruning, and safety aspects.

The Electrocoup electronic pruning secateurs are used in many countries around the world for various types of pruning. The Electrocoup is a light battery powered device which is an advance on previous attempts to mechanise pruning and has overcome many of the flaws (noise, vibrations, pollution, and danger) commonly associated with mechanical pruning. The aim of the study was to test the Electrocoup under Australian conditions and determine its suitability for forest pruning. Production studies that compared the output of the Electrocoup with conventional loppers per unit of time were carried out to determine whether production rates using the Electrocoup were equal, better or worse. Time studies were also used to identify any changes the Electrocoup caused to the work elements of pruning.

Results were obtained which showed that the average production of the Electrocoup per 15-minute interval was much the same as that achieved by the best pruner using conventional manual tools. More over this study demonstrates that a novice pruner could, within a very short time, attain the work productivity of a professional pruner. When using conventional manual equipment, novice pruners could not achieve this improvement. This is a major benefit since the learning curve associated with the Electrocoup is considerably shortened compared to conventional manual shears, enabling operators to become efficient much sooner. Also the Electrocoup operator demonstrated that rises in productivity could be enjoyed towards the end of the day when fatigue by manual pruners began to take effect.

Results from this study were compared to a larger study in Argentina. The results were not inconsistent and it is suggested that the implications for the workforce are similar. Currently only individuals that are young, strong, fit and male can carry out pruning since the task requires a high level of physical strength. The removal of the major physical component of pruning with the Electrocoup therefore has the major advantage to a contractor of enlarging the current workforce involved in pruning to involve those that are older and less physically capable but who have more stable working habits. The enlargement of the workforce therefore removes the reliance of pruning contractors on those individuals that are fit and young. The Electrocoup also increases the "life" of the worker allowing pruners to remain employed longer than traditionally expected and therefore providing further social benefits.

This study alone has identified advantages to the worker which can result in financial gains. Initially it is quite unclear how a machine, which costs more than conventional equipment and does not improve productivity could improve the economics of pruning. This becomes clear when the longer term benefits of the Electrocoup are considered such as the shorter learning curve and the greater gang stability resulting from the increased pool of workers to select from. These benefits could out run the short-term disadvantage of the high price of the Electrocoup.

Lisa Petheram

What is a good forest? Ex-forest Worker Perspectives From the Wombat State Forest

Underlying the global rhetoric for a more sustainable forestry, there is a growing acceptance of the need to consider the social aspects of forestry. Research on human constructions of forests can provide crucial understandings of people's preferences and values in respect to forests that is lacking at present. These understandings are useful, not only in guiding forest planning and management, but in helping under-represented stakeholders to express their views on forests. In turn, this can encourage their participation and the acceptance of their perspectives by others, and hence help reduce polarisation of issues.

The Wombat State Forest in Victoria was selected as a case-study because community forest management is currently being introduced to the area. The aim was to investigate the perspectives of one particular forest interest group—that of ex-forest workers. This research involved individual in-depth interviews of nine ex-forest workers, to explore their perceptions, experiences, views and underlying values in relation to the Forest. Relevant literature was also used to support the interview data.

Although these workers saw the Forest primarily in terms of a 'used and managed' entity, they were concerned for the Forest in more than a narrow economic way. They all had deep connections with parts of the Forest and placed strong emphasis on the need for consideration and care within it. There was a strong belief in the need for practical knowledge and experience in the forest. And most were very concerned that the Forest had been mismanaged over the last 30 years. All felt frustrated and helpless that they had been portrayed in a negative light in the media and were being blamed for overlogging. These feelings appeared to be exacerbated by their working class situation and their lack of voice.

The results suggest that these ex-workers have many perspectives that have gone unheard in the past. Also, it is proposed that if people were to understand perspectives of groups such as ex-forest workers, on a deeper level than portrayed in the media, then this may improve the chance of groups working together towards developing and reaching common goals in forest management. The knowledge and skills held by these ageing workers from their long experience of selective harvesting and nurturing in the Forest are about to be lost, unless studies on those aspects are conducted very soon. It is suggested also that research on people's sense of place and values towards a region could help stakeholders realise that there is common ground, particularly concern and value towards the same place (the Forest). Consideration of this concern and 'sense of place' should be given more emphasis in the current processes to initiate community forest management (currently being introduced) in the Wombat State Forest.

Louisa May Roberts

Ground based, mobile gamma ray spectrometry and electromagnetics for assessing local scale soil properties

The current economic, social and environmental climate has lead to constant pressure on land managers for greater agricultural production whilst developing sustainable land use practices. In addition, Australias European history has been dominated by the mistaken, perception of the high fertility of the Australian landscape and the resulting, frequently unsustainable, agricultural production expectations. However fundamental farming beliefs and attitudes in the agricultural community still defied change (Breckwoldt, 1988). Today this outlook is finally changing but the major limitations to implementing the final transition are economic viability and insufficient information to make accurate and effective decisions (Charman, et al. 2000).

This study was aimed at assessing a method of obtaining more accurate and detailed soil data than is currently available in order to address this issue. This was done using mobile, ground based and Gamma Ray Spectrometry (Radiometrics) and Electromagnetics (EM) in comparison to an existing soil map and further geochemical regolith data.

Radiometrics measures potassium, uranium and thorium to 0.6m and indicates parent material mineralogy and weathering properties. EM measures apparent electrical conductivity, in this study, up to six meters and can be used as a surrogate measurement for salt. These spatially accurate, nearly continuous measurements were compared with traditional soil maps to indicate improved accuracy and detail, and with regolith data to show relationships with soil properties. The potassium band and the EM were run through an unsupervised classification with a DEM to create a geophysically, based soil/regolith map.

The geophysical tools indicated that the variations in parent material, regolith mineralogical composition and in the presence of salts in the profile can be correlated with soil textural variations, weathering products of the parent material, possible nutrient status, soil depths and salt intensity. Therefore it is concluded that both geophysical tools are valuable in the mapping of soil and regolith properties.

Two major advantages in the use of radiometrics and EM over traditional methods for soil surveying were observed. The first was the ability to predict soil management properties, such as texture and salt content, from spatially referenced, detailed measurements. These measurements create accurate determination of regolith variation in the landscape to within a 5 metres radius. The second major advantage over traditional soil surveying methods is the ability to create gradational boundaries, based on statistical means, between the changes in regolith characteristics. This is a significant improvement to the polygon boundaries of traditional soil maps from limited soil samples and landscape position.

In terms of improving land management these developments in soil mapping can provide the information a land manager needs to implement a suitable land use or management strategy within a paddock. The geophysical tools have the potential to identify sites of soil degradation, such as salinity, before visible signs appear, which can prevent future economic and environmental loss. The more precise and appropriate management possible from knowing small-scale variations in the important soil properties will mean improved production, land sustainability and minimal waste in resources.

Currently, the expense of the survey, the expertise needed for the intensive processing and interpreting means that it is along way from any real application. However, as technology and knowledge progresses, there can only be better, more accurate and more exciting conclusions to be drawn from both the combination of these two ground-based tools and their integration with other remotely sensed techniques.

Sarah Scroope

Managing protected areas for indigenous interests

The changes that have occurred in thinking towards protected areas over the past 40 years amount to a revolution. Whereas previously the cultural dimensions of protected areas were ignored, there is increasing recognition that Indigenous people have a range of interest and fundamental rights. The new paradigm for protected areas advocates that Indigenous people should be involved in the management of these areas. The challenge is to translate this rhetoric into practice and develop management approaches that effectively address Indigenous people's interests. This research is timely and valuable as it identifies the key principles for meeting this challenge.

Investigating how to translate the ideas of the new paradigm into changed practice on the ground reveals that protected area management must recognise Indigenous people's holistic relationship to country. Australia's Indigenous Protected Areas (IPAs) are established with the twin aims of addressing conservation goals and meeting the Indigenous landowners aspirations for country. This research explores this approach to protected area management by focussing on the management of Deen Maar IPA by the Framlingham community. An understanding of the political, social, economic, cultural and environmental context of IPAs reveals four key principles to ensure protected area management gives positive and mutual effect to both the plurality of Indigenous interests in country and conservation. Protected area management must:

1) Take a holistic approach;
2) Devolve leadership and decision-making power to the community;
3) Build community capacity; and
4) Support Indigenous caring for country.

This study argues for the adoption of these key principles in current and future protected area management; and recommends that government support these principles for conservation and expand the conservation estate based on the devolved conservation that IPAs represent.

Matthew Swift

"In the hands of the Gods" Responses of the Balinese community to the Bali bombing

Over the last century Bali's image as a cultural paradise has drawn thousands of tourists to the island. The "island of the Gods" has lured pilgrims from all over the world resulting in a diverse and multicultural island community. Since the early 1980s, the Balinese economy has become highly dependent on the tourist industry. On October 12th 2002, the tragedy of the Bali bombing threatened this industry and created a social disaster that extended far beyond that night. The over-reliance on a single economic sector has made Bali particularly vulnerable to a decline in tourism exposing institutional vulnerabilities within the community and threatening the main source of livelihood for millions of local Balinese.

This thesis investigates the responses to the social and economic impacts as a consequence of the Bali bombing. Disaster theory is the basis of this analysis. Disaster theory provides a framework to view the social context of this event. The vulnerability of the community to a disaster is shown to be an outcome of a combination of socio-economic and political factors. The particular circumstances of a community influences not only their vulnerability to an event, but the capacity to respond.

Four sectors of the Balinese community in two case study areas were chosen for their different but equally high tourism dependence. Within these two areas the local government, expatriate community, some local

Non Government Organisations (NGOs) and local community members where interviewed. Responses to the social and economic affects of the Bombing were found to be varied and highly regionalised within the two case study areas. Culture, religion and social background all play a part in how the community viewed and responded to this disaster. It is argued here that the way tourism has developed, the lack of public participation in the tourism process and institutional inefficiencies have not only created the social and economic disaster, but influenced the community's response to it.

Finally, despite the best efforts of the local communities to reduce vulnerabilities, this thesis illustrates that tourism as an industry is deeply affected by global events. Tourism is based on image, and the power of terrorism to intimidate potential travellers is unparalleled to most other global events. It is shown that local government and community focus on improving Bali for tourism is ineffectual against wider global forces. All of these factors influence the Balinese community's ability to recover in the long term. In Balinese terms at least, the only solution is the return of the tourist as one respondent said – "they will come back, it is in the hands of the Gods".

Susan Tate

Characterisation of Aeolian materials in the Girilambone Region, North- Western Lachlan Foldbelt NSW

Regolith, the unconsolidated material above bedrock, in the Girilambone Region of NSW, contains significant amounts of alluvial, colluvial, and aeolian transported material. However, apart from the desert regions, little is known about aeolian materials in Australia. This has led to a lack of understanding of soil-landscape processes and mineral exploration techniques in the Girilambone Region. In addition, a particular problem in the Girilambone Region for identifying aeolian materials, is the absence of discrete aeolian mantles. Aeolian materials are being deposited on existing (transported) sediments, and are being mixed with other regional (alluvial and colluvial) materials, as well as residual regolith materials. Therefore, the aim of this research was to de

A detailed study was made of the characteristics of regolith materials found at four major study sites: i) leucitite basalt outcrops in the Girilambone Region that have always been positive landscape features, hence act as "Natural Dust Traps" (NDT) and preclude additions of alluvial and colluvial transported material, ii) a variety of regolith landform units throughout the Girilambone Region, iii) a dune-swale land system (part of the Girilambone Region) approximately 100km west of Cobar, and iv) an internally draining lake and lunette system (Lake Corop) in northern Victoria. These sites were chosen to include aeolian material from different sources and that had been reworked to different extents. The dune-swale land system and lake and lunette system also acted as "standard" aeolian materials, due to the extensive research previously reported at the sites. A range of particle size, mineralogical, geochemical, and micromorphological techniques were used to investigate the characteristics of aeolian materials from the four study sites.

The results showed that the properties of soils overlying the NDT are critical to unambiguously characterise aeolian material that would have been deposited uniformly in the surrounding Girilambone Region. The NDT soils contained both aeolian quartz (dissimilar to the mineral composition of the underlying leucitite basalt) and in situ mafic-derived clays, some of which coated the quartz. Therefore, the characteristics of 70µm spherical quartz particles, coated with in situ clay, were taken as indicative of aeolian materials in the surrounding Girilambone Region. Similar aeolian materials were then detected across different regolith landform units throughout the Girilambone Region, being most concentrated in the upper 0.2m of the profile and subject to a range of post-depositional processes.

Finally, it was shown how a knowledge of these characteristics could assist understanding of soil-landscape processes and mineral exploration, not only in the Girilambone Region, but also in other areas of Australia affected by transported materials.

Matthew J. Walker

A Property Valuation Framework for the Southern Tablelands: Incorporating the Influence of Trees on Property Prices

The expansion of farm forestry is critical in addressing land degradation in the Australian landscape. Many landholders on the Southern Tablelands have planted trees on their properties to improve land quality and sustainability, but there are additional financial benefits which can be derived from farm forestry. Research has shown that returns can be achieved from timber production as well as increased farm productivity due to shade, shelter and fodder benefits provided by trees. Two additional benefits of farm forestry that have received comparatively little attention are improvements in property prices (capital gains) and the potential value of environmental services, in particular carbon and biodiversity credits.

This research proposed and tested a framework that incorporated the influence of trees on property prices and the potential value of environmental services. The study was conducted on the Southern Tablelands where increasing numbers of Canberra and Sydney residents are purchasing rural properties, especially smaller properties known as hobby farms. Anecdotal evidence suggests that the rural real estate market pays a premium price for a property with trees, in comparison to a cleared property. To explicitly quantify this premium, a contingent valuation (CV) technique using photographs of case study properties, expert land valuers and real estate agents was conducted. The CV survey consisted of three parts: (1) assessing the cleared hectare value of hypothetical properties where only the presence of trees changed, (2) assessing the cleared hectare value of paired properties where the main difference between each pair was the occurrence of trees, and (3) open-ended questions comparing the views of existing use buyers to hobby farm buyers with regards to trees on rural properties. All the case study properties are within the hobby farm region (i.e. one hour drive from Canberra and/or three hours drive from Sydney). The survey results showed that, in general, a rural property with 5%-50% tree cover will sell for approximately 20% more than the same property if it was completely cleared. This result indicates that the value of having trees on a 100 hectare (ha) property is between $20,000 and $42,000. For a larger property (approx. 300 ha), trees can increase the land value by over $130,000.

The potential values of carbon and biodiversity credits were calculated for the four case study properties to determine likely income levels for rural landholders on the Southern Tablelands. This analysis was then extended to assess how ecosystem service payments could influence land values. Under a Kyoto Protocol-style carbon credit market, the present value of payments received ranged from $33 to $2,109 across the case study properties. This result assumes a conservative carbon price of $2/tonne CO_2-equivalent is offered and that only 60% of the sequestered carbon is sold for credit purposes. Were this price to increase to $20/tonne CO_2-equivalent, the projected dollar value of carbon credits would also increase by an order of magnitude, up to $333 to $21,087. For greater returns, landholders could choose to sell 100% of the sequestered carbon between the years of 2008 and 2012, but this option omits the 40% buffer to allow for modelling error.

A modified version of the 'BushTender' scheme was used to quantify the biodiversity value of remnant native vegetation sites on the properties in the form of an index. The scored index also allowed sites to be prioritised in order of 'best value for money', for a government buyer interested in biodiversity conservation over a three year period. A scenario approach was employed; specifying three levels of government funds available to buy conservation of biodiversity from the property owners. Under Scenario 1, assuming a marginal price of $0.11 per biodiversity index unit, the government would only pay two property owners for biodiversity conservation. The present value of this income equates to $7,890 with a split between Case Study one (CS 1) and Case Study four (CS 4) at $94 and $7,797, respectively. To purchase the remaining 0.7% of biodiversity units offered across the properties (Scenario 3), this would cost the government an additional $26,892 (present value).

This study provides a strong case for explicitly including the influence of trees, when valuing rural properties on the Southern Tablelands. Combining the lifestyle value of trees with payments for two ecosystem services could increase the value of the case study properties by as much as 32%. Although further validation is required, the property valuation framework proposed in this study provides a useful tool for incorporating these influential factors. The capital gains aspect of trees, combined with the future emergence of carbon and biodiversity credits, could provide important incentives to rural landholders to adopt farm forestry

Cressida Wilson

Remnant woodland condition and its influence on woodland bird species richness and community composition

Many woodland birds have been suffering from population declines as a result of habitat loss, fragmentation and degradation. To prevent further declines, the needs of those woodland birds must be met through habitat retention, restoration and recreation. An important part of successful conservation is to understand the ways in which habitat loss, fragmentation and degradation affect woodland birds. To advance this understanding, the responses of woodland birds species richness and community composition to remnant size and site attributes, including dominant tree association, mid storey, logs, litter, rockiness and Callitris was studied.

The research was undertaken in Cowra Shire, central-western NSW, at 69 sites ranging from 1ha to 250ha. Site attributes were surveyed using a visual estimation system over the entire remnant. Birds were surveyed using a 20 minute, 2ha area search by volunteers. The data were analysed using general linear mixed modeling and multivariate statistics to ascertain the influence of landscape and site attributes on bird species richness and bird community composition, respectively.

Remnant size, tree association, mid storey, litter, logs and rockiness had a positive, significant influence on woodland bird species richness and/or community composition. Dieback, mid storey type, weeds and Callitris had limited influence and tree density, hollows, native grasses, woody weeds and bare ground had no influence. These results indicate that site attributes were more important in Cowra Shire for woodland birds than remnant size, and thus the management recommendations included in the thesis concentrate on increasing the heterogeneity of remnants rather than increasing their size.

As the majority of the remnants analysed were on private land, the uptake of management recommendations rests with the landholders, and thus the success of further work in the Cowra Shire depends their participation and enthusiasm for both their local environment and the birds.

Alyson Wright

Roads out of Poverty: Comparisons of Koiari Villages

Poverty in Papua New Guinea (PNG) remains a problem of opportunities. For many poor people, it is compounded through living in geographically isolated, remote and rural regions of PNG where there are limited options. This thesis investigates the impact and importance of rural roads for poor people in PNG. The research incorporates a review of past literature, an analysis of data from the PNG National Census 2000 and a case study of villages in the Koiari region of PNG. The fieldwork was conducted in two villages - Doe and Bodinumu - from September to December 2002.

Combining a mix of qualitative and quantitative data sources the lived experiences of the rural Koiari villagers is explored. The impacts and importance of rural roads is highlighted through comparative approach. This approach compares Koiari villages which are located on, or close to, roads (on-road villages) to those villages which have poor access to roads (off-road villages). The reality for the Koiari villages off-road is lower education and literacy levels, less market participation, less durable housing and poor access to health .care. These factors all indicate that poverty is higher in the Koiari region where there is no. road access. The increasing disparity between the poor and the better off villages is defined geographically within the Koiari region. Cash-earning activities are increasing in areas with reliable access to markets. Yet in the same time frame, the provision of social services such as schools, aid posts and roads, remains poor or non-existent for isolated communities.

This thesis suggests that PNG Government recognise the burden associated with living in off-road villages. Of particular urgency, is a need to address the poor education and ill health of people in these villages. Furthermore, this research provides a valuable starting point for dealing with the issues of transportation in rural PNG. Additional research, that includes broader studies regions, other transport modes, women's transport burdens and delineates the acceptable distances from services and infrastructure that villages can be located, would contribute to greater understandings of transport and poverty in PNG.

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