THE AUSTRALIAN NATIONAL UNIVERSITY

SCHOOL OF RESOURCES, ENVIRONMENT & SOCIETY

YEARBOOK **2005**

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.

Photos:
Thanks to all who contributed photos to this Yearbook, especially to the winners of this years photo competition: Richard Baker, Tiff Brown, Janette Lindesay and Prachi Dixon-Jain

Yearbook Production Team:
Debbie Claridge, Clive Hilliker, Steve Leahy, Zosha Smith, Panit Thamsongsana

Printed on Recycled Paper

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; Asia Pacific School of Economics and Governance; the Centre for Resource and Environmental Studies; and the National Institute for Environment.

SRES celebrated its fourth birthday in July 2005. During our fourth year, our staff maintained their high international and national profiles and productivity, publishing 53 book chapters and journal papers, 2 books, and 30 conference and research papers. Our teaching and learning programs continued to evolve, and to be recognised for their quality and innovation. SRES staff and students attracted more than $1.5 million in new external grants to support their research. Fifteen graduate students, 25 Honours, and 28 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 2005

HOW TO CONTACT US

phone: +61 (0)2 6125 2579
fax: +61 (0)2 6125 0746
email: sres@anu.edu.au
www: sres.anu.edu.au

mail:
School of Resources, Environment & Society
The Australian National University
Canberra, ACT 0200
AUSTRALIA

street:
School of Resources, Environment & Society
Buildings 48 & 48A, Linnaeus Way
The Australian National University
Acton, Canberra
AUSTRALIA

ADMINISTRATIVE RESPONSIBILITIES

Head of School
Professor Peter Kanowski
head.sres.science@anu.edu.au

School Administrator
Ms Zosha Smith
zosha.smith@anu.edu.au

Student Programs Administrator
Ms Panit Thamsongsana
panit.thamsongsana@anu.edu.au

Graduate Program Advisers
Environment (including Resource Management)
Dr Richard Greene
richard.greene@anu.edu.au

Geographical Sciences
Dr Peter van Diermen
peter.vandiermen@anu.edu.au

Undergraduate Program Convenors
Forestry
Dr Cris Brack
sres-fpc@anu.edu.au

Geography
Dr Richard Baker
sres-gpc@anu.edu.au

Human Ecology
Mr David Dumaresq
sres-hepc@anu.edu.au

Resource and Environmental Management
Dr John Field
sres-rempc@anu.edu.au

Honours Coordinator
Dr Janette Lindesay
sres-hc@anu.edu.au

Science Faculty Student Adviser
Dr John Field
john.field@anu.edu.au

FOR FURTHER INFORMATION

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 **info.anu.edu.au/StudyAt/050PP_Graduate_Coursework/index.asp**
  - The Graduate Studies in Environment (including Resource Management) website **info.anu.edu.au/StudyAt/_Graduate_School/Study_Fields/_environment/index.asp**
  - The Graduate Studies in Geographical Sciences website **info.anu.edu.au/StudyAt/_Graduate_School/Study_Fields/_geography/index.asp**
- 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 2005

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 2005

The School of Resources, Environment and Society (SRES) at The Australian National University (ANU) celebrated its fourth birthday in July 2005. This report summarises our achievements in SRES' fourth 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 many Cooperative Research Centres (Bushfire, Greenhouse Accounting, Landscape Evolution and Mineral Exploration, and Sustainable Production Forestry). 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. Amongst others, staff of various CSIRO Divisions continued to play important roles in both supervision and as external reviewers of students' progress.

SRES staff and associates continued to refine and enhance our teaching and learning programs for undergraduate and coursework graduate students. 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, Steve Dovers and Libby Robin, and Professor Ian White), from RSPAS (notably Drs Deirdre McKay, Kersty Hobson and Bryant Allen, and Professor Geoff Hope), and from the university's Emeritus Faculty (coordinated by Peter McCullagh) in convening and delivering SRES courses. Their contributions helped SRES strengthen our research-led learning.

SRES continued to support a vibrant Honours Program, which 25 scholars completed in the year under review. The Program benefitted greatly from the efforts of Dr Janette Lindesay as Convenor, with assistance from Dr John Field and Ken Johnson. In 2004-5, SRES Honours students worked in the field in East Timor, Tasmania, rural NSW, Sydney and Canberra; several students presented their research results to the communities in which they worked, and were well received. A similarly vigorous preparatory program, through the SRES Independent Research Project courses convened by Dr Robin Tennant-Wood and Ken Johnson, contributed to the Honours Program's success.

SRES staff and students continued to play strong roles in the coordination and promotion of environment research, teaching and outreach across ANU. Professor Peter Kanowski continued as Co-Convenor, with Professor Mike Hutchinson of CRES, of the ANU National Institute for Environment (NIE). SRES also provided accommodation for the NIE team, to which SRES School Administrator Zosha Smith was seconded for five months in 2004. SRES staff and students continue to benefit from the efforts of the NIE Executive Officer (in the year under review: Tane Power, Zosha Smith and Martha Luksza), Senior Projects Officer (Charles Tambiah), and other members of the NIE Team (Sara Beavis, Oliver Story and Roland Trease). Six members of SRES (Richard Baker, Clive Hilliker, Peter Kanowski, Brendan Mackey, Panit Thamsongsana and Anna Van Dugteren) participated in the ANU-wide review of environment research and teaching chaired by Professor John Richards. SRES staff were instrumental in the development of a new undergraduate degree focused on sustainability which will be offered by the ANU from 2006.

We were able to commemorate the many legacies of our late colleague Dr John Banks (see SRES Yearbook 2004, pp 8-9) in the formal renaming of the SRES courtyard as the John Banks Court. John's widow Margaret was able to join SRES staff and students, and others of John's colleagues from around the campus, at the naming ceremony in April 2005. John's legacy was also honoured on a much larger scale with the ACT Government's announcement and conduct of a design competition for a new international arboretum and gardens at Green Hills, close to the ANU. We also record the death of Dr Les Carron (1920-2004), a distinguished member of the academic staff of the Australian Forestry School and the ANU Department of Forestry from 1949 -1985, and extend our sympathy to his wife Peg and her family.

SRES staff and students

In June 2005, SRES comprised 17 academic staff, 32 research and visiting fellows, 14 support staff, 92 graduate and 17 Honours students, and around 250 undergraduates enrolled in one or more of our courses.

Particularly notable staff achievements in the past year included:

- Dr Richard Baker was appointed Associate Dean Teaching and Learning for the Faculty of Science;
- Drs Sandy Berry and Hartmut Holznecht joined SRES as ARC and ACIAR-funded, respectively, postdoctoral fellows;
- Dr Ben Cashore (Yale University), Dr Lihui Chen (Yunnan University), Dr David Cook (CSIRO Entomology), Mr Jim Douglas (formerly Forests Advisor, World Bank), Dr Roger Heady (formerly RSBS), Dr Colin Matheson (CSIRO Forestry & Forest Products) and Ian Williamson (University of Melbourne) joined SRES as Visiting Fellows for varying periods;
- 2 books were published with significant SRES staff input: many SRES staff and students contributed to the genesis and writing of Social Learning in Environmental Management (Eds: Meg Keen, Val Brown and Rob Dyball); Val Brown and other colleagues edited Sustainability and health;
- SRES staff and students published 62 refereed research papers or the equivalent in 2004 (see pages 120-122);
- recent SRES PhD graduates Drs Kimberly van Neil and Shawn Laffan's paper, "Gambling with randomness" was listed as one of the "top ten downloads" for the International J Geographical Sciences, and recent SRES PhD graduate Dr Kate Semple (in conjunction with SRES Adjunct Professor Phil Evans and Dr Ross Cunningham of CRES) won the Wood and Fiber Science prize for the best paper in 2004;
- Dr Brendan Mackey was awarded a $870,000 ARC Linkage Grant, in partnership with the Wilderness Society, SA Department of Environment and Heritage, NT Department of Infrastructure, Planning and Environment, and La Trobe and Edith Cowan Universities, to develop new techniques and methods for biodiversity conservation evaluation and planning, inclusive of large scale connectivity processes;
- Professor Neil Gunningham continued his strong record of ARC grant success with $207,900 for Load Capacity Regulation: Facilitation Participatory Environmental Policy;

- ACIAR awarded grants of c $150,000 to Drs Ryde James, Digby Race, Hartmut Holzknecht and Ken Groves, to review portable sawmilling in the Pacific; and to Professor Peter Kanowski and Dr Hartmut Holzknecht, to review commercial tree growing in PNG farming systems;
- SRES Forestry Program staff were members of the successful CRC Forestry bid, which will contribute $200K annually to SRES research;
- members of iCAM continued to generate substantial research and consultancy funding, securing – amongst others - both ARC Linkage (Decision support, Eurobodalla catchments - Lachlan Newham; Sensitivity assessment techniques - Dr John Norton) grants and Cotton Catchment Communities CRC (Rebecca Letcher) support.
- SRES staff continued to play many important professional and community roles, locally, nationally, and internationally:
  - Dr Richard Baker continued as a member of the World Conservation Union's (IUCN) Commission on Environmental, Economic & Social Policy;
  - Dr Cris Brack was appointed to the Victorian Goverment's Independent Expert Advisory Council on forestry;
  - Dr Geoff Cary continued as a member of the ACT Bushfire Council, and was appointed to NSW Parks and Wildlife Advisory Council;
  - Dr Richard Greene was President of the Australian Association of Natural Resource Management;
  - Professor Neil Gunningham was appointed as an editor of the Environmental and Planning Law Journal, and made major presentations to OECD and US Environmental Protection Agency expert groups;
  - Professor Peter Kanowski served as a member of the jury for the ACT Arboretum and Gardens competition, and was appointed a member of the Interim Board for its implementation;
  - Dr Brian Lees was appointed a member of the International Geographical Union Commission on Geographic Information Science, and continued as Asia-Pacific editor for the International Journal of Geographic Information Science and the Chair of the Management Committee for the ANU Kioloa Coastal Campus;
  - Dr Brendan Mackey continued as a member of IUCN's Commission on Environmental Law and co-chair of its Ethics Specialist Group, and continued as Associate Editor for "Environmental Conservation";
  - Bob Newman, a Visiting Fellow with SRES, and Professor Peter Kanowski were appointed Fellows of the Institute of Foresters of Australia;
  - Dr Chris Tidemann's innovative work on pest birds featured strongly in the local and national media.

Student achievements

SRES students continued to achieve success in their own right and in collaboration with staff. 5 PhD students (Bruce Doran, David Forrester, Ingo Heinrich, Karen King, and Abdolrassoul Salman Mahiny) were awarded their degrees; 10 Masters' students by coursework and research completed their degrees; 25 Honours students completed their programs. The abstracts of their theses are presented on pages 100-119.

The achievements of outstanding undergraduate students were recognised through prizes and awards. Those awarded for 2004 were:

- ACTION Trust Honours Scholarships: Kyra Peak, Jean Rivard
- Australian Institute of Agricultural Science & Technology Prize: Patricia Payne
- Curly Humphreys Honours Scholarship in Forest Operations: Ben Wielinga
- Howlett Honours Prize in Geography: Melissa Burgess
- Institute of Wood Science Prize: Mark Stretch
- Jacobs Medal for Outstanding Field Studies in Forestry: Mark Stretch
- State Forests NSW Prize in Forest Mensuration: Robyn Sakkara
- Schlich Memorial Trust Prize for Forestry: Andrew Ford
- WP Packard Prize in Geography: Jacinta Bogard

The year ahead

The ANU is embarking upon a vigorous program of organisational change to give effect to its vision of developing further as a nationally-distinctive, internationally-significant, education-intensive research institute. The formation of the ANU Institute for Environment, in which SRES has a central role in partnership with CRES and others, and of the College of Science, are two manifestations of these changes.

The strong teaching and learning partnerships SRES already has across the ANU – for example, with the Faculty of Arts, with CRES, and with the Research School of Pacific and Asian Studies – and both established and emerging research partnerships – for example, with the Centre for Aboriginal Economic Policy Research, with National ICT Australia, with the Research School of Earth Sciences, and through the CRC LEME - offer excellent foundations for strong contributions to ANU priorities. SRES staff and students will be working to capitalise further on these relationships, and the support they provide for research and learning relevant to sustaining our natural, managed and built environments.

ACADEMIC STAFF

Professor & Head

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

Professor

N.A. Gunningham. LLB MA(Sheffield) Solicitor Eng. & Wales

Readers

R.M. Baker. BA(ANU), PhD(Adel)
B.G. Lees. BA, PhD(Syd)
B.G. Mackey. BAppSci(Canberra), MEnvSt, PhD(ANU)

Senior Lecturers

C.L. Brack. BSc(For)(Hons)ANU, PhD(UBC)
G.J. Cary. BAppSci(Env Biology)(Hons), (UT, Sydney), PhD(ANU)
D.C. Dumaresq. BA(Qld)
J.B. Field. BScApp(UNSW), PhD(UNE)
R.S.B. Greene. BSc, PhD(WA)
R.N. James. BSc(Wellington), BScFor(ANU), DPhil(Oxon)
K. M. Johnson. MEcon(Qld)
J.A. Lindesay. BA, PhD(Witw)
S. Mahendrarajah. BSc(Ceylon), MAgr, Dev Econ(ANU), PhD(ANU)
C.R. Tidemann. BSc, DipEd(Adel), PhD(ANU)
P. van Diermen. BEc(Adel), MA(Flinders), PhD(ANU)

Lecturers

R. Dyball. BAHons(ANU)

Research and Postdoctoral Fellows

S.L. Berry. AssocDip LabTech(Darling Downs), BScHons(Macquarie), PhD(ANU)
D. Kain. BScFHons, PhD(ANU)
K. King. BAppSci(Canberra), GDipREM, PhD(ANU)
J. Marsden-Smedley. BScHons, PhD(Tas)
W. Merritt. BSc(NRM) (UWA), PhD(ANU)
D. Race. BAppSci, GradDipEnvMgt, MAppSci, PhD(ANU)
D. Sinclair. BScHons(Sydney), M EnvLaw(ANU)

Visiting Fellows

J.G. Bauhus. DipFor PhD(Gottingen)
U.N. Bhati. BScAgrEc(India), MSc(India), PhD(ANU)
J. Birkeland. BA(Bennington), MA(UC Berkeley), JD(UC Hastings), PhD(Tasmania)
R. Bradstock. BScHons, PhD(Sydney)
V. Brown. AO, BSc(Qld), Grad.Dip.Ed(CCAE), PhD(ANU)
B.W. Cashore. BA Hons (Carleton), MA (Carleton), PhD (Toronto)
L. Chen. BA, MA, Phd(China)
D.C. Cook. BEcHons(Murdoch), PhD(UWA)
J.B. Dargavel. BScFor(Edinburgh), MscFor(Melbourne), PhD(ANU)
J. Douglas.
P. Evans. BSc, PhD(Wales), AIWSC
R.G. Florence. MScFor(Qld), PhD(Syd), FIFA
M. Gill. OAM, BAgrSc, MSc, PhD(Melbourne)
K. Groves. BSc(Wales), MSc(ANU)
R. Heady. BAppSci, GradDipREM, GradDipElectronics(CCAE), PhD(ANU)
H. Holzknecht . BAHons, MA(UQ), PhD(ANU)
N. Humphreys. BSc(For)Syd, Dip For(Cbr), FIFA
E. Linacre. MA(Edin), MSc, PhD(Lond)
C. Matheson. BScHons(ANU), BA(ANU), PhD(La Trobe)
R. Newman. BSc(Melb) DipFor(AFS) Cert Bus Admin (HRI, Hemingway Robertson Institute, Melbourne)
G.P. Richards. BSc(ANU), GradDip, MAppSci(UC), PhD(ANU)
R. Tennant-Wood. DipT., BEd (GU), BA(Hons) (UNE), PhD (ANU)
D. Tongway. Dipl.Appl.Chem(Bendigo Technical College)
B.J. Turner. BScFor(Syd), MF, DFor(Yale)
R. Weber. BSc(Melb.), PhD(Tas)

SUPPORT STAFF

Academic Skills Advisor
S. Holzknecht. BA Hons(Qld), Dip ESL, MA(PNG), PhD(ANU)

Administrative Staff
M. Lewis. BComm(Accounting)
Z.M. Smith. BA(Modern Languages)
P. Thamsongsana. Cert Steno (MTSU)

Field Services
P. Bairstow. Assoc.Dip(GeoSci)
M. Davanzo.

Information Services
J. Boland
D.L. Claridge. BAppSci(Vegetation & Wildlife Management)
C.A. Hilliker. BSc(Botany), Grad.Dip(Management)
S.J. Leahy. BSc Hons(ANU), MIAG
K.H. Nissen. BEngineering(Auckland)

Laboratory Services
J.P. Marsh. BAppSci (Biology)

Research
A. Ford. BComm/BScFHons (ANU)
T. Brown. BSc Hons(EnvSci)

ASSOCIATED STAFF

Kioloa Executive Officer
E. Wallensky. MA(ANU)

Education Officer, CRC for Greenhouse Accounting
R. Harris. BSc Hons (UQ), GDipSciComm (ANU), PhD (ANU)

iCAM STAFF

Professor & Head
A. Jakeman. BSc (Hons I) (UNSW), PhD(ANU)

Projects Manager
S. Cuddy. BA (U.Q.), GradDip Sec (CCAE), GradDip (CCAE)

Professorial, Research and Postdoctoral Fellows
B. Croke. BSc (UNSW), PhD(UNSW)
R. Letcher. BEc (ANU), BSc(Math) (Hons), PhD(ANU)
L. Newham. BSc (REM) (Hons) (ANU), PhD(ANU)
J. Norton. BSc (Cambridge), PhD (Imperial College)
J. Ticehurst. BSc (REM) (ANU), PhD (ANU)
W. Merritt. BSc(NRM) (UWA), PhD (ANU)

Adjunct Professor
P.Cornish. BScAgr (Hons) (Sydney), MScAgr (Sydney), PhD (UNE)
M. McAleer. BEc (Monash) PhD (Queens)
P.C.Young. BTech. (Hons I), M.Sc.(Loughborough), PhD (Cambridge)

Visiting Fellows
R. Evans. BSc (ANU)
N. Hall. BSc (Hons), GradDip (Oxford), PhD
D. Post. BSc (Hons) (Newcastle), PhD (ANU)

Administrative Staff
S. Kelo.
A. Letcher.

Research Assistants
A. Andrews.
F. Andrews.
M. Kehoe.
S. Powell.BAppSc (Roseworthy)

PhD & MPhil Students:

Philip Alcorn	PhD
Glen Bann	PhD
Liliana Baskorowati	PhD
Lara Boyd	PhD
Matthew Brookhouse	PhD
Nicolette Burford De Oliveira	PhD
Melissa Burgess	PhD
Paul Carlile	PhD
David Carpenter	PhD
Kylie Carman-Brown	PhD
Andrew Deane	MPhil
Peter Dostine	PhD
Steven Douglas	PhD
John Drewry	PhD
Rory Eames	PhD
David Eastburn	PhD
Saan Ecker	PhD
Susan Emmett	PhD
Houshang Farabi	PhD
Suzanne Feary	PhD
Karen Fisher	PhD
Baihua Fu	PhD
Nicholas Gellie	MPhil
Martin Golman	PhD
Simon Gordon	PhD
Quintin Gravatt	PhD
Sarah Hemmingsen	PhD
Cameron Holley	PhD
Diana James	PhD
Stuart Johnston	PhD
Bandara Kangane	PhD
Stefan Kaufmann	PhD
Dana Kelly	PhD
Ernst Kemmerer	PhD
Adam Leavesley	PhD
Alex Lee	PhD
David Little	PhD
Kirsten Maclean	PhD
Chris McElhinny	PhD
Angela Newey	PhD
Kate Park	PhD
Ida Aju Resosudarmo	PhD
Jacqueline Russell	PhD
Karim Sabetraftar	PhD
Jacqueline Schirmer	PhD
Birte Schoettker	PhD
Sunil Sharma	PhD
Catherine Simpson	PhD
Sanjeev Srivastava	PhD
Matthew Taylor	PhD
Geraldine Teakle	PhD
Kylie Theakston	PhD
Thi Thu Ha Tran	PhD
Renee Visser	PhD
Robert Waterworth	PhD
Edward Webber	PhD
Wendy Welsh	PhD
Vanessa Wong	PhD

Masters Students:

Sunit Adhikari	MF
Ari Arifah	MEnvSc
Gerard Crutch	MGeogSc
Jhuma Dewan	MEnvSc
Hung Dong Khanh	MF
James Gray	MF
Catherine Gross	MEnvSc
Kirsty MacPherson	MEnvSc
Ahmad Maryudi	MF
Muhammad Zahrul Muttaqin	MF
Kala Perkins	MEnvSc

Julia Pickworth	MEnvSc
Susan Powell	MEnvSc
Ray Rahayu	MEnvSc
Liping Rao	MFor
Kathryn Read	MEnvSc
Michael Ryan	MF
Laxman Shrestha	MF
Niranjan Shrestha	MF
Ramkaji Shrestha	MF
Jodi Smith	MRES
Ian Swain	MEnvSc
Atsuko Tanaka	MEnvSc
Simon Travis	MF
Alberto Valerio	MEnvSc
Catherine Vavrina	MEnvSc
Stephanie Weidemann	MEnvSc

Graduate Diploma Students:

Christopher Comans	GDipRES
Tandin Dorji	GDipSc
Karen Hughes	GDipSc
Francina Frenshegty Kesaulija	GDipSc
Sharon Lane	GDipREM
Angus McIntrye	GDipREM
Sonam Phuntsho	GDipSc
Luke Pinner	GDipREM
Khandaker Mohammed Toufiqur Rahman	GDipREM
Rinchen-Wangdi	GDipSc
Arief Setiyo Utomo	GDipSc
Mary Stutters	GDipREM
Karma Tempa	GDipSc
Nima Tshering	GDipSc
Suhella Mohan Tulsiani	GDipREM
Rolf Von Behrens	GDipREM

Graduate Certificate Student:

Vidya Ramesh	GCertRES

Honours Students:

Marianne Anderson

Andrew Beard

Jane Bryan

Naomi Brydon

Emma Clifton

Carola Ines Kuramotto De Bednarik

Robert De Ligt

Jessica Drake

Janet Finn

Ivan Hanigan

Adrian Hathorn

Bradley Jackson

Michael Neimanis

Eleanor Sobey

Anna Van Dugteren

Lyndsey Vivian

Colin Wiltshire

Staff, students and visitors at SRES weekly morning tea

John Banks Court

On 6 April 2005, SRES and university staff named the courtyard (the social hub of SRES) between the Forestry and Geography buildings as the John Banks Court, to commemorate Dr John Banks' many contributions to the ANU.

This commemoration is fitting as the courtyard and the trees within were planned by John, and used by him for teaching. The court adjoins the Lindsay Pryor walk, which similarly honours Lindsay's contributions. John collaborated extensively with Lindsay, their popular book "Trees and Shrubs in Canberra" was one of the many outcomes of their joint work.

Robert Burne (Department of Earth and Marine Sciences) is congratulated by Peter Kanowski (SRES) on winning the ANU Green / National Institute for Environment photo competition. The winning photo was taken in Banks Court

Field-based learning is one of the strengths of SRES' teaching programs, helping students connect theory and practice in partnership with environment and resource management professionals and prospective employers. Here is a sample of recent SRES field courses

Resources Environment and Society
(SRES1001)

SRES students undertake a forest assessment exercise at Kioloa Coastal Campus that includes mapping the understorey-canopy distribution and performing an analysis of the vegetation history (burning, grazing, and other disturbances).

Discussing ecological processes in a South Coast forest

Alastair Greig taking a historical beach walk along the Kioloa beach where Captain Cook first saw Aboriginal people

Australia's Forests
(FSTY1004)

The Australia's Forests field course is conducted in partnership with public and private land managers on NSW's western slopes. It introduces students to many of the issues in managing forests and woodlands for conservation and production.

Australia's Forests, students line up for their orienteering challenge on their first year field course at Laurel Hill

One of Australia's cultural icons, the Dog on the Tuckerbox, on the return trip from a field week on the NSW western slopes

Fire, Flood and Drought
(SRES2004)

This course focuses on the underlying principles required for understanding climate variability, weather, water resources and occurrence of bushfires, and the fascinating inter-relationships that exist among these key elements of the Australian environment.

Measuring stream flow, turbidity, volume and erosion

Southeast Asia Field School
(GEOG3015)

Early January 2006

This course explores the development of South East Asia through an intensive three week field school. Students are exposed first hand to the economic, social and environmental conditions in several Southeast Asian countries, including Singapore and Thailand.

Vietnam Field School:
Contemporary Change in Southeast Asia
(GEOG2017)

November-December 2006

By intensive teaching in the field, visits to projects and institutions and contact with local cultures, students develop their understanding of culture and development in Vietnam and the region.

Traditional lifestyles and modern technology meet

Tearful farewell!

Human Ecology
(ECOS2001)

This course explores the interrelationships between cultures and ecosystems

A favourite component is the extended fieldtrip to the Snowy mountains in which these complex issues are experienced first hand by students

In-field lecture from a senior government advisor on alpine management

Students set off for Dicky Cooper Bogong from Schlink Pass, high in the Australian alpine landscape

Landscape Ecology
(Geog3011)

Practicals are based on the application of GIS to modelling plant-climate relations. These computer-based practicals are complemented by field-based investigations

Identification of species occurring in the forest understorey and recording vegetation cover abundance for each plant growth form, Monga National Park

Preparing for a day in the field, Murramurrang National Park

Recording vegetation strata and plant growth forms, Monga National Park

Land and Catchment Management
(SRES3004)

Major environmental issues related to land and marine environments, including rangelands, mine sites and the coastal zone, are examined through lectures, research projects and by visiting field study sites

Students wade through the Nature Reserve at Macquarie Marshes during their major field trip to the marginal rangelands of western NSW

Independent Research Project
(SRES3010)

SRES 3010 encourages independent research in the field. Here a student investigates post-fire peatland water-holding capacity in an project funded by department of Environment and Conservation NSW

Digging to find the outlet flow point from Dane's Bog, Perisher Valley, Snowy Mountains NSW

Conducting a transect to guage bog capacity

Dr Richard Baker

Geography Program Convenor

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

Phone: +61 (0)2 6125 4873
E-mail: Richard.Baker@anu.edu.au

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/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

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

Phone: +61 (0)2 6125 3535
E-mail: Cris.Brack@anu.edu.au

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 New Zealand, 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 am involved in teaching and learning in these areas for all years from 1st year undergraduates to final year post-graduate coursework to provide an integrated 'stream' of measuring, modelling and management planning for natural resources.

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 2004 my research focused on: improving our ability to measure and report on the carbon sequestration at a national level; enhancing inventory data collection (including the use of LIDAR and ground-based lasers); and determining the impact of uncertainty on making good management decisions. I continued 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)

Brack, C.L. (2004) Projecting native forest inventory estimates from public to private tenures. *Australian Forestry* 67(4): 230 - 235.

Richards, G.P and Brack, C.L. (2004) A continental biomass stock and stock change estimation approach for Australia. *Australian Forestry* 67(4): 284 - 288.

Richards, G.P and Brack, C.L. (2004) A modelled carbon account for Australia's post-1990 plantation estate. *Australian Forestry* 67(4): 289 - 300.

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.

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.

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

Gilbert, M. 2004. Trends in Urban Tree Removal on Leased Land across Canberra, ACT. (Honours)

Soraya, E. 2004. Management models for rattan gardens of Kedang Pahu West Kutai, East Kalimantan, Indonesia. (Masters by research)

Andriyana, W. 2004. Testing the feasibility of centroid and importance sampling for estimating volume of standing trees in a tropical forest context. (Masters by research)

Angombe, S. 2004. Site Form and improving volume estimation of uneven-aged forest stands in northern Namibia. (Masters by research).

Kyle, J. 2003. Investigating land cover change and vegetation growth in Turner as a way of quantifying the changes in Canberra as a Garden City. (Honours).

Getting into the tree crowns: urban forestry and biomass studies

Dr Geoff Cary

Senior Lecturer
Fire Science

Phone: +61 (0)2 6125 0059
E-mail: Geoffrey.Cary@anu.edu.au

Career Brief

Geoff graduated with BAppSc (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 has also been a lecturer in environmental modelling and coordinator of the first year forestry field trip at various times.

Research, Teaching & Professional Activities

Geoff convenes the second year course *Fire, Flood and Drought*, which covers fire weather, and fire behaviour, prediction and suppression of fires. He convenes the third year course *Fire in the Australian Environment* which 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. He also contributes a module on modelling net primary productivity and dynamics of the terrestrial carbon cycle in the third year course *Landscape Ecology*.

Geoff is a researcher in Project B.1.2 (Managing bushfire risk in a changing world) of the Bushfire CRC. His work with Dr Ross Bradstock (NSW Department of Environment and Conservation), Dr Rod Weber (ADFA/UNSW), Dr Karen King (BF CRC Postdoctoral Fellow), Dr Malcolm Gill (Visiting Fellow, SRES) and Dr Jon Marsden-Smedley (SRES) addresses the effectiveness of a range of approaches to bushfire management for the reduction of risk of unplanned fires and adverse outcomes relating to biodiversity, water and air quality.

Prescribed fire for fuel reduction in urban bushland

Geoff co-leads GCTE (Global Change in Terrestrial Ecosystems) Task 2.2.2 (Relationships between global change and fire effects at the landscape scale). The phase of this work on comparison of sensitivity of landscape-fire-models to variation in terrain, fuel pattern, weather and climate, funded by the US National Centre for Environmental Analysis and Synthesis, has recently been completed and resulted in a publication in Ecological Modelling and Landscape Ecology.

Geoff is an Associate Editor for the International Journal of Wildland Fire. He was a member of the ACT Bushfire Council from 2001 to 2005 and has recently been appointed to the NSW Parks and Wildlife Advisory Council. He represents The ANU on the Bushfire CRC Stakeholder Advisory Council, is a member of the CRC's Education Reference Group, and was invited by Beijing Forestry Department of International Cooperation to present lectures at a forest fire risk management workshop in Beijing in October, 2004.

Selected Publications

Dovers, S., Cary, G. and Lindenmayer, D. (2004) Fire research and policy priorities: insights from the 2003 National fire forum. *The Australian Journal of Emergency Management* 19: 76-84.

Keane, R. E., G. J. Cary, I. D. Davies, M. D. Flannigan, R. H. Gardner, S. Lavorel, J. M. Lenihan, C. Li, and S. T. Rupp. (2004). A classification of landscape fire succession models: spatial simulations of fire and vegetation dynamics. *Ecological Modelling* 179: 3-27.

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. (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.

Selected Student Theses

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

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

Kelly, C. (2004) The effects of fire frequency on the understorey of a subalpine snow gum forest (Honours thesis).

Mr David Dumaresq

Convener, Human Ecology Program

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

Phone: +61 (0)2 6125 0349
E-mail: David.Dumaresq@anu.edu.au

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

Convener, Human Ecology Program

Lecturer
Human Ecology, Social Learning and Change, Dynamic Systems Thinking

Phone: +61 (0)2 6125 3704
E-mail: Rob.Dyball@anu.edu.au

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. Robert studied for a PhD as a student of Centre for Resource and Environmental Studies (CRES), whilst lecturing in the Human Ecology program in SRES. His PhD was titled *A Critical Analysis of Human Ecology*, which involved the application of dynamic systems thinking to the conceptual structure of Human Ecology to create a powerful means of understanding the characteristic changes in human-ecological situations. Robert continues to lecture in the Human Ecology Program. He lectures in Human Ecology, Urban Ecology, Sustainable Systems and Ecology and Social Change.

Research, Teaching & Professional Activities

Current research is on furthering the application of dynamic systems thinking in Human Ecology and in understanding socio-biophysical interactions more generally. Much of this work involves collaboration with Dr Barry Newell from the Faculty of Engineering and Information Technology and with various colleagues in CRES.

Together with colleagues in the program Robert will be a session convenor in the stream "Teaching and Research in Human Ecology" at the Society for Human Ecology Conference in Utah in October, 2005.

Robert is helping to organise the 2005 Fenner Conference on "Urbanism, Health and the Environment" with the National Centre for Epidemiology, Population and Health.

Selected Publications

Keen, M., Brown, V.A., Dyball, R. (2005) Social Learning for Sustainability: Building a Sustainable Future, London, Earthscan

Dyball, R. "Teaching Human Ecology" in Sustainability in the Tertiary Sector, Tutech Technical University, to be published June 2005

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, Biota and Regolith / Soils, Regolith and Landscape Evolution, Sustainable Land Management

Phone: +61 (0)2 6125 3566
Email: John.Field@anu.edu.au

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 advisor 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

Academic Adviser in RMES

Senior Lecturer
Soil and Land Management

Phone: +61 (0)2 6125 3822
E-mail: Richard.Greene@anu.edu.au

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), 29, 1077-1091.

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

Environment Regulation, Management and Policy

Phone: +61 (0)2 6125 3397
E-mail: Neil.Gunningham@anu.edu.au

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), 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 and my colleagues researched 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, and under a current ARC Linkages Project in collaboration with the Victorian Environment Protection Authority, I am taking this a step further by examining collaborative decision-making mechanisms across a range of institutions.

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, Kagan, & Thornton (2004) "Social License and Environmental Protection: Why Businesses Go Beyond Compliance" 29 *Law and Social Inquiry* 307-341.

Gunningham and Sinclair (2004) "Curbing Non-Point Source Pollution: Lessons from the Swan-Canning" *21 Environment and Planning Law Journal*, 181-199.Gunningham, (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, (2002) "Regulating Small and Medium Sized Enterprises" *Journal of Environmental Law*, Vol 14 (1), pp1-32,

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

Senior Lecturer
Plantation management, silviculture to improve wood quality

Phone: +61 (0)2 6125 4330
E-mail: Ryde.James@anu.edu.au

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 the CRC for Sustainable Forestry Landscapes where my contribution involves an ARC funded project investigating the response, through crown dynamics, of the application of silviculture to two species of sub-tropical eucalypts.

Forest planning describes activities at a range of scales from the International to the compartment level in the field. My work has concentrated on the higher levels. I recently spent time with the FAO in Rome using their data base to estimate the potential of the worlds plantation forests to produce the type of high value timber products which could substitute for wood from natural forests. With Dr Brian Turner, I was involved 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.

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.

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

Ryde James and Alberto Del Lungo, 2005: The potential for fast-growing commercial forest plantations to supply high value roundwood. Working Paper WP/33, Forest Resources Division, FAO, Rome (Italy)

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.

Selected Student Theses

Ford, A. 2004: Site quality for *Pinus radiata* D.Don : Southern Tablelands NSW.

Packer, A. 2004: The use of eucalypt regeneration as a bio-indicator for assessing effectiveness of cording in Southern Tasmania.

McWilliam, R. 2003: An Investigation of the suitability of a power assisted tool for pruning Australian plantations.

Blessington, L.J. 2003: Using retrospective sampling to develop growth trends for *Pinus radiata* (D. Don) and *Eucalyptus globulus* on low rainfall sites in South Australia.

Klootwijk, T. 2002: Modeling crown rise in *Eucalyptus grandis* W. Hill ex Maiden (Flooded Gum) on the northern coast of NSW.

Tappe, J. 2000: The seasonal growth of *Pinus radiata* (D. Don) in the Canberra region.

Kearney, D.E. 1999: Branching patterns, initial stocking and silviculture for *E. grandis* and *E. pilularis* plantations, NSW.

Mr Ken Johnson

Geography Honours Convenor

Senior Lecturer
Information Systems, Urban Geography
Policy and Planning

Phone: +61 (0)2 6125 4267
E-mail: Ken.Johnson@anu.edu.au

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.

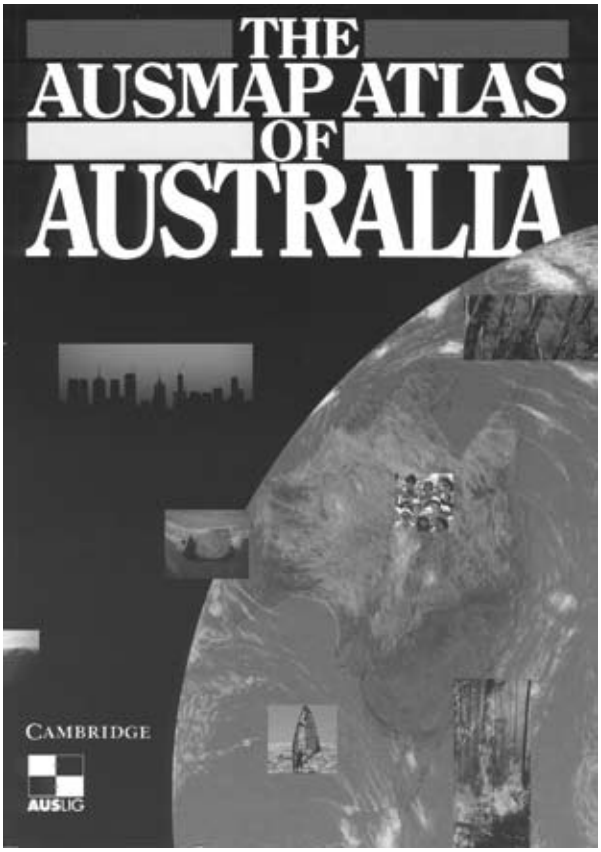
Johnson K.M. and H.C. Garnett. 1970. *The economics of containerisation.* Allen and Unwin, London

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

Head of School

Professor of Forestry
Forest and Environmental Policy, Forest Genetics, Forestry and Environmental Education

Phone: +61 (0)2 6125 2667
E-mail: Peter.Kanowski@anu.edu.au

Career Brief

Peter Kanowski has been Head of the School of Resources, Environment and Society since it was established in 2001. Peter was appointed Professor of Forestry at ANU in 1995, was Head of the ANU Department of Forestry from 1996 -2001, and has been Convenor of the ANU National Institute for Environment since 2004. In 2003/4, Peter was a member of the panel conducting the Council of Australian Governments' National Inquiry into Bushfires. He was a member of the Steering Committee for the ACT's post-bushfire Non-Urban Land Use Study in 2003, a member of the ACT International Arboretum Jury in 2004-5, and is a member of the ACT Water Supply Catchment Management Advisory Committee.

Peter 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 the ANU 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.

Since returning to Australia, Peter 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. He has continued to work internationally, in forestry education and in intergovernmental forest policy processes.

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 forest policy is now part of the research program of the Cooperative Research Centre for Forestry, for which I also chair the education program. I manage two ACIAR-sponsored research projects: one on hybrid eucalypts for marginal farmlands in Australia and South Africa, in collaboration with Dr Dominic Kain from SRES and colleagues from CSIRO, State Forests of NSW, South Africa's CSIR and the University of Stellenbosch; the second, with Hartmut Hozknecht and colleagues at ANU and in PNG, is reviewing the prospects for incorporating commercial tree growing into PNG farming systems. 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.

Selected Publications

Burley, J and Kanowski, PJ. 2005. Breeding strategies for temperate hardwoods. *Forestry* 78(2).

Schirmer, J and PJ Kanowski. 2005. A mixed economy Commonwealth of States: Australia. Chapter 5 in: M Garforth and J Mayers (Eds). Plantations, privatisation, poverty and power. Changing ownership and management of State forests. Earthscan. 101-125.

Ellis, S., PJ Kanowski and R Whelan. 2004. *National Inquiry on Bushfire Mitigation and Management*. COAG, Canberra. www.coagbushfireinquiry.gov.au

Kanowski, PJ and Borralho, NMG. 2004. Economic returns from tree breeding. In: J Burley *et al* (Eds). *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

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

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

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

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

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

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

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

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

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

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

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

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

Dr Brian Lees

Reader in Geography
Geographical Information Science,
Geomorphology

Phone: +61 (0)2 6125 2745
E-mail: Brian.Lees@anu.edu.au

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 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 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".

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. In the second phase 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. My teaching is intimately linked with this research.

Selected Publications

Lees, B.G. 2005. Timing and formation of coastal dunes in northern and eastern Australia. *Journal of Coastal Research*.

Doran, B. and Lees, B.G. 2005. Investigating the spatio-temporal links between disorder, crime and the fear of crime. *Professional Geographer*. 57(1),1–12.

Huang, Z and Lees, B.G. 2005. Representing and reducing error in natural resource classification. *International Journal of Geographic Information Science*.

Huang, Z and Lees, B.G. 2004. Combining Non-Parametric models for multisource predictive forest mapping. *Photogrammetric Engineering & Remote Sensing*. 70(4), 415-427.

Laffan, S. and Lees, B.G. 2004. Predicting regolith properties using environmental correlation: a comparison of spatially global and spatially local approaches. *Geoderma*, v120(3-4), pp 241-258.

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

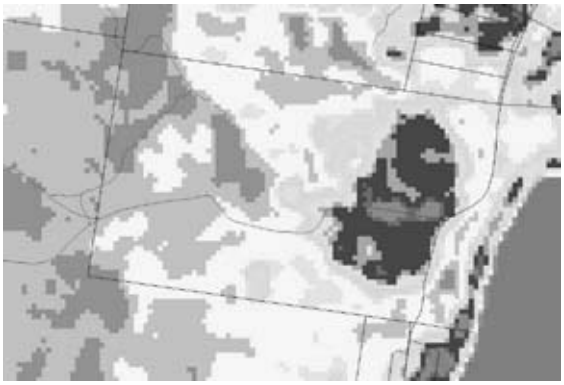
Selected Student Theses

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

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

Zhi Huang BSc.Msc(UNSW) 'Modelling uncertainty in complex forest mapping: an integrated application of AI and GIS'. (2003).

Bruce Doran BSc(hons)(ANU) ' Modelling the Ecology of Fear'. (2004).



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

Dr Janette Lindesay

SRES Honours Coordinator

Senior Lecturer
Climatology, Applied Climatology, Greenhouse Science, Climate Variability and Change

Phone: +61 (0)2 6125 4921
E-mail: Janette.Lindesay@anu.edu.au

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 retains that administrative position, and is now also undertaking teaching and research in atmospheric science and climatology in SRES.

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 recent research project investigated damaging advective frost events and their impact on viticulture in the Canberra region. I also contribute to informing the policy debate in the area of drought.

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, and offer an online Masters course on Greenhouse science. 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 11 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. 2004. Climate and drought in the subtropics: the Australian example, in *From Diaster Response to Risk Management*: *Australia's National Drought Policy*, Botteril, L.C. and Wilhite, D.A. (eds), Springer, Dordrecht, pp. 15-36.

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, pp. 21-47.

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, pp. 32-40.

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.

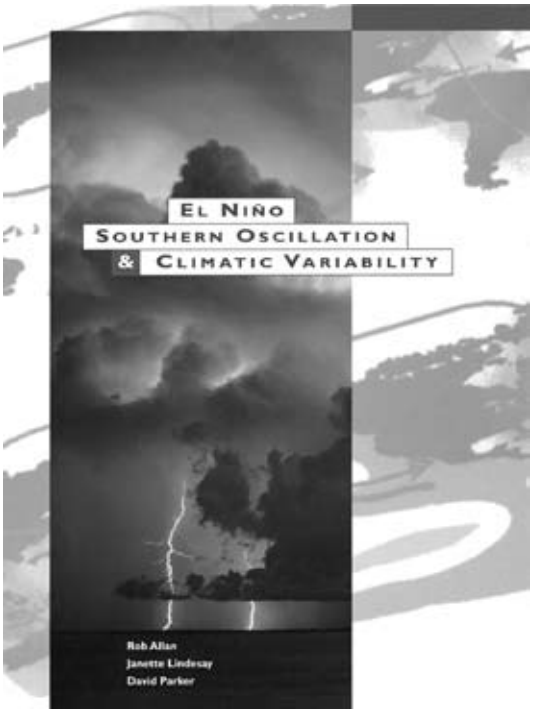
Hobbs, J.E., Lindesay, J.A. and Bridgman, H.A. (eds). 1998. *Climates of the Southern Continents*: *Present*, *Past and Future*, John Wiley and Sons, Chichester, 297 pp.

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
Environmental Biogeography,
Environmental Conservation, Cross-Disciplinary Studies in Sustainability

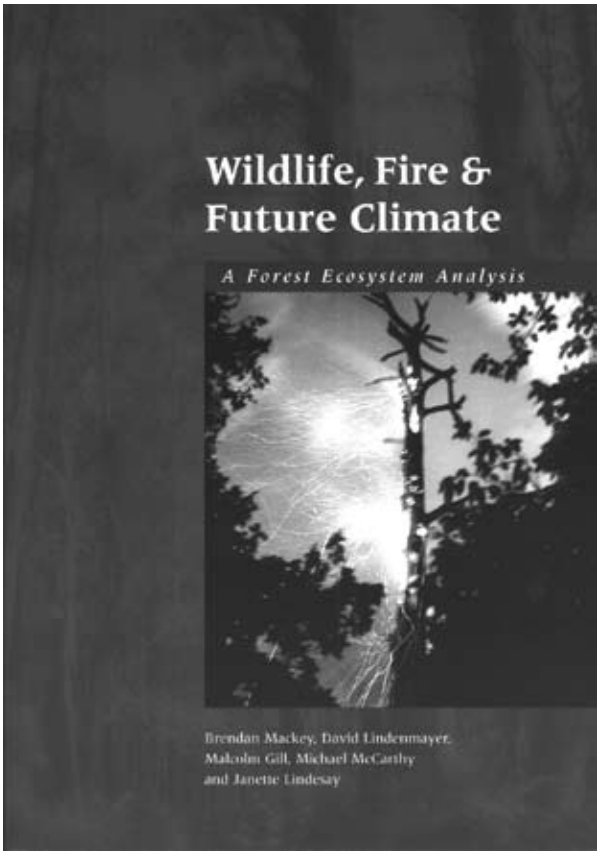
Phone: +61 (0)2 6125 4960
E-mail: Brendan.Mackey@anu.edu.au

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

I am Chief Investigator for an ARC Linkage research project which is investigating connectivity processes important for conservation assessment and planning, including: continental landscape productivity; dispersive fauna; biodiversity decline in extensive country; and trophic regulation by meso-predators. I am a member of the CRC for Greenhouse Accounting (www.greenhouse.crc.org.au). 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 am a member of the *WildCountry* Science Council. I teach the following courses: Introduction to Global Change; Introduction to Greenhouse; Environmental Biogeography and Global Ecology.



Selected Publications

Mackey, B.G., Soulé, M.E., Nix, H.A., Recher, H.F., Lesslie, R.G., Williams, J.E., J Woinarski, C. Z.R., Hobbs, J. and Possingham, H.P. (in press, 2005). Towards a scientific framework for the WildCountry project. In. *Key Topics and Perspectives in Landscape Ecology*. Cambridge University Press. Edited by Jianguo Wu and Richard J. Hobbs.

Mackey B.G. and Su W. (in press, 2005). 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. (2004). The Earth Charter and ecological integrity – some policy implications. *WorldViews*: *environment*, *culture*, *religion*: 8(1): 76-92.

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

Phone: +61 (0)2 6125 3538
E-mail: Mahen.Mahendrarajah@anu.edu.au

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; off-site nutrient externalities, and environmental accounting and environmental macroeconomics. My teaching includes 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, economics of reclamation of imperata infested lands in the Philippines, the impact of economic reform on deforestation in Vietnam, bio-energy potential of camphor laurel in NSW, firewood plantation in Nepal, and property rights and incomplete contracts in sustainable 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

Phone: +61 (0)2 6125 2375
E-mail: Chris.Tidemann@anu.edu.au

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

Senior Lecturer
Development Studies,
Economic Geography,
Small Business Policy

Phone: +61 (0)2 6125 3663
E-mail: Peter.vanDiermen@anu.edu.au

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 ADBs 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.

Dr Sandra Berry

Senior Research Associate
WildCountry Project

Phone: +61 (0)2 6125 4417
E-mail: Sandy.Berry@anu.edu.au

Career Brief

Sandy grew up in Bundanoon, southeast NSW and Toowoomba, southeast Queensland where she obtained an Associate Diploma in Laboratory Techniques from the Darling Downs Institute of Advanced Education. For a decade she worked as a laboratory technician in a range of research institutions. An interest in bushwalking led to a deepening interest in the Australian vegetation and the physiology of plants, and undergraduate studies at Macquarie University.

After completing an Honours degree Sandy came to ANU in 1988 to work as a Technical Officer with the Ecosystem Dynamics Group in the Research School of Biological Sciences. After several years of providing support for field related research she enrolled in a PhD, finally producing her magnum opus: *A study of the relationships between climate, carbon dioxide and the vegetation over the Australian continent at the present and the Last Glacial Maximum* in 2002. This led to a 3 year post-doctoral fellowship at RSBS with the Cooperative Research Centre for Greenhouse Accounting.

Research, Teaching & Professional Activities

My research is supported by an ARC Linkage Grant between ANU and the Wilderness Society through the *WildCountry* project. It is concerned with investigating how vegetation cover and productivity changes over time over the whole of Australia, and the impact that this may be having on animal, and particularly bird, distributions. I am particularly interested in how plants and the vegetation respond to the direct effect on photosynthesis of the increasing concentration of carbon dioxide in the atmosphere, and the consequences of this for the fauna.

I currently serve as the ACT Regional Councillor for the Ecological Society of Australia.

Selected Publications

Berry, S.L., Roderick, M.L. 2004. Gross primary productivity and transpiration flux of the Australian vegetation from 1788 to 1988 AD: effects of CO2 and land use change. *Global Change Biology* 10, 1884-1898.

Berry, S.L., Roderick, M.L. 2002. CO2 and land use effects on Australian vegetation over the last two centuries. *Australian Journal of Botany* 50, 511-531.

Berry, S.L., Roderick, M.L. 2002. Estimating mixtures of leaf functional types using continental-scale satellite and climatic data. *Global Ecology and Biogeography* 11, 23-40.

Roderick, M.L., Berry, S.L. 2001. Linking wood density, tree growth and environment: a theoretical analysis based on the motion of water. *New Phytologist* 149, 473-485.

Roderick, M.L., Farquhar, G.D., Berry, S.L., Noble, I.R. 2001. On the direct effect of clouds and atmospheric particles on the productivity and structure of the vegetation. *Oecologia* 129, 21-31.

Roderick, M.L., Berry, S.L., Noble, I.R. 2000. A framework for understanding the linkage between environment and vegetation based on the surface area to volume ratio of leaves. *Functional Ecology* 14, 423-437.

Roderick, M.L., Berry, S.L., Noble, I.R. 1999. The relationship between leaf composition and morphology at elevated CO2. *New Phytologist* 143, 63-72.

Roderick, M.L., Berry, S.L., Noble, I.R., Farquhar, G.D. 1999. A theoretical approach to linking the composition and morphology with the function of leaves. *Functional Ecology* 13, 683-695.

Roderick, M.L., Berry, S.L., Saunders, A.R., Noble, I.R. 1999. On the relationship between the composition, morphology and function of leaves. *Functional Ecology* 13, 696-710.

Berry, S.L. and Mulvaney, M. 1995. *An environmental weed survey of the Australian Capital Territory.* A report prepared for the Conservation Council of the South-East Region and Canberra.

Dr Dominic Kain

Postdoctoral Fellow
Forest Genetics and Tree Breeding

Phone: +61 (0)2 6125 2361
E-mail: Dominic.Kain@anu.edu.au

Career Brief

Dominic completed a BSc (Forestry) 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 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 was a geneticist with the CRC for Sustainable Production Forestry in Hobart, based at the ANU, until late 2003. He is now a Postdoctoral Fellow supported by the Australian Council for International Agriculture Research (ACIAR).

Research, Teaching & Professional Activities

My research interest is in all aspects of the genetic improvement of trees, with a focus on breeding and selection strategies for inter-specific hybrids, and the genetic improvement of wood quality. Developing breeding objectives, integrating quantitative and molecular genetic selection technologies, and breeding eucalypts that tolerate dry and saline conditions are other topics I am working on collaboratively or developing research proposals to address.

Currently, my main activity is within an ACIAR-funded collaborative research project involving ANU, the CSIRO and its South African equivalent, the CSIR. The project aims to develop high performance eucalypts and eucalypt hybrids for marginal lands in south and eastern South Africa and southeastern 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. We are using this knowledge to develop efficient selection strategies for future improvement of the most promising species combinations.

I also supervise two postgraduate students in tree breeding, contribute to teaching courses in forest genetics at ANU and at the CSIR, South Africa, and present 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* x *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). Genetics of physical wood properties and early growth in a tropical pine hybrid. *Canadian Journal of Forest Research* 33: 1923-1932.

Kain, D.P., Harding, K.J., Dieters, M.J. and Li, B. (2005). Early selection and rapid field screening for genetic improvement of wood density and spiral grain in pines. Canadian Journal of Forest Research (submitted).

Kain, D., Dieters, M.J., Harding, K.J., and Li, B. (2005). Genetic parameters for wood quality and growth traits in *Pinus elliottii* var. *elliottii*, *P. caribaea* var. *hondurensis*, and their F1 hybrid. Canadian Journal of Forest Research (submitted).

Dr Karen King

Postdoctoral Fellow
Fire Ecology,
Landscape Simulation Modelling

Phone: +61 (0)2 6125 2529
E-mail: Karen.King@anu.edu.au

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 Project B1.2 in February 2004. The objective of this project is to investigate managing bushfire risk in a changing world. Four Australian study landscapes have been selected - south west Tasmania, Southern Highlands, Sydney basin, and arid Australia. These represent a diversity of ecosystems and human value systems (eg property, biodiversity, water and air quality). My work involves investigating bushfire risk to identified values in each of these landscapes using computer simulation modelling. Management options to reduce these risks are investigated, as are climate and global change scenarios.

Dr Jon Marsden-Smedley

Research Fellow

Phone: 02-6125 9718
E-mail: Jon.Marsden-Smedley@anu.edu.au

Career Brief

After completing his BSc honours at the University of Tasmania Jon was employed by the Tasmanian Parks and Wildlife Service to research buttongrass moorland fire behaviour and management. On completion of that job Jon completed a PhD at the University of Tasmania, again in the field of buttongrass moorland fire. Following his PhD he returned to the Parks and Wildlife Service to take up the position of Fire Management Officer for Tasmania's Wilderness World Heritage Area before coming to Canberra to work in the Landscape Fire Group at SRES.

Research, Teaching & Professional Activities

My main research interests are in operational fire management. In particular, I am interested in the integration of ecological and hazard reduction values into prescribed burning operations, fire risk assessment, the development of operational fire management systems and fire history.

In my current position at SRES I will be assisting Dr Karen King with the development of fire regime models, in particular for Central Australia.

Selected Publications

Pyrke A and Marsden-Smedley JB in press. Fire attributes classification, fire sensitivity and flammability of Tasmanian vegetation. TasForests.

Johnson KJ and Marsden-Smedley JB 2001. Fire history of the northern part of the Tasmanian Wilderness World Heritage Area and its associated regions. Papers and Proceedings of the Royal Society of Tasmania 136: 145-152.

Marsden-Smedley JB and Catchpole WR 2001. Fire modelling in Tasmanian buttongrass moorlands III. Dead fuel moisture. International Journal of Wildland Fire 10: 241-253.

Marsden-Smedley JB, Catchpole WR and Pyrke A 2001. Fire modelling in Tasmanian buttongrass moorlands IV. Fire extinguishment. International Journal of Wildland Fire 10: 255-262.

Marsden-Smedley JB and Kirkpatrick JB 2000. Fire management in Tasmania's Wilderness World Heritage Area: ecosystem restoration using Indigenous-style fire regimes? Ecological Management and Restoration 1:195-203.

Marsden-Smedley JB, Rudman T, Catchpole WR and Pyrke A 1999. Buttongrass moorland fire behaviour prediction and management. TasForests 11: 87-107.

Marsden-Smedley JB 1998. Changes in the fire regime of southwest Tasmania over the last 200 years. Papers and Proceedings of the Royal Society of Tasmania 132: 15-29.

Marsden-Smedley JB and Catchpole WR 1995a. Fire modelling in Tasmanian buttongrass moorlands I. Fuel characteristics. International Journal of Wildland Fire 5: 203-214.

Marsden-Smedley JB and Catchpole WR 1995b. Fire modelling in Tasmanian buttongrass moorlands II. Fire behaviour. International Journal of Wildland Fire 5: 215-228.

Dr Wendy Merritt

Postdoctoral Fellow
Environmental Modelling,
Forest Inventory,
Water Resources

Phone: +61 (0)2 6125 2529
E-mail: Wendy.Merritt@anu.edu.au

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.

Selected Publications

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*, (in press).

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

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. 2005. Sensitivity testing of a model for exploring water resources utilisation and management options, *Environmental Modelling and Software*, 20, 1013-1030.

Merritt, W.S., and Alila, Y. 2004. Chapter 7. Hydrology. In Cohen, S., Neilsen, D., and Welbourn, R. (eds.) *Expanding the dialogue on climate change and water management in the Okanagan Basin, British Columbia, Final Report*, 63-88.

Merritt, W.S., Y. Alila, M. Barton, B. Taylor, and S. Cohen. Hydrologic response to scenarios of climate change in the Okanagan Basin, British Columbia, *Journal of Hydrology* (submitted).

Neilsen, D., Koch, W., Merritt, W.S., Frank, G., Smith, S., Alila, Y., Carmichael, J., Neale, T., and Welbourn R. 2004. Risk assessment and vunerability - case studies of water supply and demand. In Cohen, S., Neilsen, D., and Welbourn, R. (eds.) *Expanding the dialogue on climate change and water management in the Okanagan Basin, British Columbia, Final Report*, 115-135.

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.

Dr Digby Race

Lecturer and Research Fellow
Community and Farm forestry

Phone: +61 (0)2 6125 2737
E-mail: Digby.Race@anu.edu.au

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 also works closely with the Australian Forest Growers and the regional private forestry development committees, 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

Digby's main teaching contribution is as coordinator of the post-graduate course: *Participatory Resource Management* (FSTY 8037) – which explores the theoretical concepts and practical applications to enrich the community/social dimension of natural resource management (NRM), particularly when NRM is pursued for community development. This course is delivered in partnership with Jacki Schirmer, Julia Pickworth and a variety of 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. (2004) Greenhouse gas abatement: A review of potential social implications of land use change. *Australian Forestry*, 267-273.

Race, D. (ed) (2004) Integrating Forestry into Farms, Communities and Catchments: Proceedings of the Australian Forest Growers Biennial Conference – Ballarat 2004. Australian Forest Growers: Deakin West, ACT. 196 pp.

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

ARC Research Fellow
Environment and Safety: Regulation, Law and Policy

Phone: +61 (0)2 6125 5020
E-mail: Darren.Sinclair@anu.edu.au

Career Brief

Darren completed a Bachelor of Science (Hons) at the University of Sydney in 1990. 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 Master 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 Research Fellow at SRES since mid 2003.

Research, Teaching & Professional Activities

I am currently involved in an Australian Research Council funded research project investigating the safety, health and environmental performance of 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. (2005) "Policy instrument choice and diffuse source pollution" Journal of Environmental Law, Vol 17, No 1.

Gunningham, N. and Sinclair, D. (forthcoming 2005) "Regulating water pollution from light industry: Lessons for the Swan-Canning" Environmental and Planning Law Journal.

Gunningham, N. and Sinclair, D. (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

Adjunct Professor
Silviculture, forest dynamics, nutrient cycling

Phone: +49 761 203 3677
E-mail: Juergen.Bauhus@waldbau.uni-freiburg.de

Career Brief

Jürgen studied Forestry in Freiburg, Vienna, and Göttingen and worked Jürgen studied Forestry in Freiburg, Vienna, and Göttingen and worked in Germany and Canada before he worked in the ANU Forestry Program between 1996 and 2003. Since June 2003 he has held a professorship and the Chair of Silviculture in the Faculty of Forest and Environmental Sciences at Freiburg University, Germany. His research focuses on ecology and silviculture of native forests, carbon and nutrient cycling, dynamics of mixed-species stands, structural diversity and coarse woody debris. He is section editor of the European Journal of Forest Research and an associate of the Cooperative Research Centre for Greenhouse Accounting. and member of the editorial board of Australian Forestry. At Freiburg University, he is the director of the International PhD Program "Forestry in Transition" and the new international MSc course "Forests, Environment and Bioresources".

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, eco-physiology of trees and carbon and nutrient cycling.

Current projects:

An ARC funded project in collaboration with State Forests NSW aims at "Guiding early silvicultural interventions through predicting canopy and crown dynamics in plantations of sub-tropical eucalypts". Specifically the project investigates the plasticity of green crowns of different species as affected by stand density, and the response of trees to green pruning (see also PhD student Philip Alcorn).

European Union Project with partners in Spain, Netherlands, Brasil, Ecuador, Peru and Bolivia examining the role of smallholders in the sustainable management of forested landscapes in the Amazon basin.

European Union Project with partners in India and the Netherlands investigating the importance of plantations in a "crowded world", in particular in the provision of ecosystem goods and services. This also includes the development of a graduate course on this topic.

Exploring the use of Near-Infrared-Spectroscopy in fine-root studies. In particular, this DFG-funded project investigates the quantification of fine roots and the separation of the fine roots of different species using spectral properties of these tissues.

A number of PhD projects such as "Litter decomposition in mixed species of beech and spruce", "Tree growth in logged-over rainforest in south-east Kamerun" and "The effects of different fire regimes on soil fertility and vegetation diversity in dry dipterocarp forests in Thailand".

My teaching covers forest dynamics and silviculture, at undergraduate and postgraduate levels (see: http://www.waldbau.uni-freiburg.de/Mitarbeit/bauhus.html)

Selected Publications

Forrester D.I., Bauhus J., Cowie A.L. (2005) On the success and failure of mixed-species tree plantations: lessons learned from a model system of *Eucalyptus globulus* and *Acacia mearnsii*. *Forest Ecology and Management* 209, 147-155.

Chen W., Zhang Q., Cihlar J., Bauhus J. and D.T. Price (2004) Estimating fine-root biomass and production of boreal and cool temperate forests using aboveground measurements: A new approach. *Plant and Soil* 26, 31-46.

Bauhus J., Vor T., Bartsch N. and A. Cowling (2004) The effects of gaps and liming on forest floor decomposition and soil C and N dynamics in a *Fagus sylvatica* forest. *Canadian Journal of Forest Research* 34, 3, 509-518.

Bauhus J., van Winden, A. P. and A. B. Nicotra (2004) Above-ground interactions and productivity in mixed-species plantations of *Acacia mearnsii* and *Eucalyptus globulus*. *Canadian Journal of Forest Research* 34, 686-694.

Forrester D., Bauhus J., and P. K. Khanna (2004) Growth dynamics in a mixed species plantation of *Eucalyptus globulus* and *Acacia mearnsii*. *Forest Ecology and Management* 193, 81-95

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.

Selected Student Theses

Forrester, D. 2004. Mixed-species plantations of nitrogen-fixing and non-nitrogen-fixing trees (PhD thesis)

McElhinny, C. M. 2005. Quantifying stand structural complexity in woodland and dry sclerophyll forest, south-eastern Australia (PhD thesis)

Dr U.N. Bhati

Visiting Fellow
Economics and marketing

Phone: +61 (0)2 6125 3220
E-mail: UN.Bhati@anu.edu.au

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 sixteen 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

In collaboration with colleagues, I am currently working on starting two new research projects; one is on the degree of integration in the structural timber market in Australia, and another is on the markets for forest products in India.

From mid 1997 to the end of 2004, I devoted almost all of my time to the ANU Forestry Market Report Project. The project had the objectives of preparing and disseminating nationally quarterly market reports on forest products and inputs for Australian forest growers. The market reports were primarily for small-scale growers. By December 2004, thirty market reports had been completed. They covered topics such as: China: a market for Australian exporters of forest products; Australian Pine Log Price Index; Australia's competitors in the Japanese woodchip import market; 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; firewood market; stumpage trends in South Australia; Japanese woodchip import market; carbon credit 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 and magazines have published these reports. They are also available on web sites of ANU (http://sres.anu.edu.au/associated/marketreport/index.html) and other organisations.

Selected Publications

Bhati, U.N. and Kwon, K.W. 2004. *The Forest Products Market in Korea*. School of Resources, Environment & Society, Faculty of Science, The Australian National University, Canberra, August.

Bhati, U.N. 2004. Market report for Australia's small-scale cabinet timber growers. In Suh, J., Smorfitt, D.B., Harrison, S.R. and Herbohn, J.L., Eds. *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, The 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, The 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

Phone: +61 (0)2 6125 2224
E-mail: Janis.Birkeland@anu.edu.au

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 where she raised children and did her PhD in environmental planning 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 that uses Systems Mapping as a tool for eco-innovation.

Research, Teaching & Professional Activities

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

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

Visiting Fellow
Fire science and management, plant ecology

Phone: +61 (0)2 95856492
E-mail: Ross.Bradstock@npws.nsw.gov.au

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 in southern 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
Managing for local sustainability,
Collective decision-making,
Sustainability and health

Phone: +61 (0)2 629 62958650
E-mail: Val.Brown@anu.edu.au

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 the ANU 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, Grootjans J, Ritchie J, Townsend M, and Verrinder G. 2005 *Sustainability and Health*: *Supporting global ecological integrity in public health*. Allen and Unwin. Sydney. Earthscan, London 360pp

Keen, M., Brown Valerie A. and Dyball, Robert 2005 *Social Learning in Environmental Management*. Earthscan, London. 250 pp.

Aslin, H and Brown, Valerie A. 2004 *Towards Whole of Community Engagement.*

A practical toolkit. Murray Darling Basin Commission, Canberra

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).

Selected Student Theses

Greg Paine *Parts, wholes and sustainable development*

Jennifer Scott *Integrating Sustainability Provisions into Contemporary Decision Making*

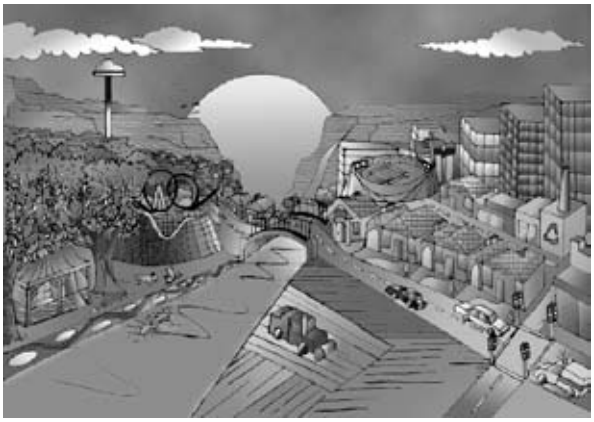
Rodney Griffith: *How Shall We Live? Sustainable Development as transformational change*

Brian Dwyer *Attitudes to Remediation in the Murray-Darling Basin*

Mazrura Suhani *Separate Realities: community-based environmental management for health*

Fred Lehmann *Weight Load Carry: the physiology and politics of the army backpack.*

Sarah Kelly *Construction of sense of place in the era of globalisation: a case study*



Lawrence Issa

Dr Benjamin Cashore

Visiting Fellow
Forest Policy; Non-state governance (market-driven environmental and social certification); Comparative Environmental Policy and Governance

E-mail: Benjamin.Cashore@yale.edu

Career Brief

Benjamin Cashore is Associate Professor, Environmental Policy and Governance, specializing in Sustainable Forest Policy, at Yale University's School of Forestry and Environmental Studies. He is Director of the Yale Program on Forest Certification and is courtesy joint appointed (Associate Professor) in Yale's Department of Political Science. He holds a PhD in political science from the University of Toronto, BA and MA degrees in political science from Carleton University, and a certificate from Université d'Aix-Marseille III in French Studies. He was a Fulbright Scholar at Harvard University during the 1996-1997 academic year.

He has held positions as Assistant Professor, School of Forestry and Wildlife Sciences, Auburn University (1998-2001); postdoctoral fellow, Forest Economics and Policy Analysis Research Unit, University of British Columbia (1997-1998), and as a policy advisor to the leader of the Canadian New Democratic Party (1990-1993).

Cashore's new book, *Governing Through Markets*: *Forest Certification and the Emergence of Non-state Authority* (with Graeme Auld and Deanna Newsom) was awarded the International Studies Association's 2005 Sprout prize for the *best book* on international environmental policy and politics. Published by Yale University Press in 2004, the book identifies the emergence of non-state market driven global environmental governance, and compares its support within European and North American forest sectors.

Cashore is also co-editor of *Forest Policy for Private Forestry* (with Teeter and Zhang), CAB International; and coauthor of *In Search of Sustainability*: *The Politics of Forest Policy in British Columbia in the 1990s* (with George Hoberg, Michael Howlett, Jeremy Raynor and Jeremy Wilson) from the University of British Columbia Press.

He is also author or co-author of several articles that have appeared in *Governance*, *Policy Sciences*, the *Canadian Journal of Political Science*, *Business and Politics*, *Forest Policy and Economics*, *the Journal of Forestry*, *Canadian Public Administration*, *Canadian-American Public Policy*, the *Russian Journal of Sociology and Social Anthropology* and the *Forestry Chronicle*, as well as chapters in several edited books published by Oxford University Press, Ashgate Press, Macmillan UK, Transaction Press, the University of British Columbia Press, the University of Toronto Press, CAB International, Forstbuch Press, and IUFRO.

In addition to the 2005 Sprout prize, Cashore was awarded (with Steven Bernstein) the 2001 John McMenemy prize for the *best article* to appear in the *Canadian Journal of Political Science* in the year 2000 for their article, "Globalization, Four Paths of Internationalization and Domestic Policy Change: The Case of Eco-forestry in British Columbia, Canada."

Selected Publications

BOOKS

2004 Governing Through Markets: Forest Certification and the Emergence of Non-State Authority with Graeme Auld and Deanna Newsom. (New York and London: Yale University Press, 2004), Winner of the International Studies Association's 2005 Harold and Margaret Sprout Prize, for the best book in the field of international environmental policy and politics

2001 In Search of Sustainability: British Columbia Forest Policy in the 1990s (with George Hoberg, Michael Howlett, Jeremy Rayner and Jeremy Wilson). University of British Columbia Press, Vancouver

EDITED BOOKS

2002 Forest Policy for Private Forestry: Global and Regional Challenges (with Teeter and Zhang) CAB International, Oxon, UK.

SELELECT JOURNAL ARTICLES AND BOOK CHAPTERS

2005

"Does Forest Certification Matter? An Analysis of Operation-Level Changes Required During the SmartWood Certification Process in the US (lead author Newsom and second author Bahn). Forthcoming (subject to moderate revisions) at Journal of Forest Policy and Economics.

"Change in the Governance of Forest Resources" Forthcoming as part of IUFRO-WFSE book Forests in the Global Balance - Changing Paradigms with Peter Glück and Jeremy Rayner (lead authors). *Convening lead authors*: Peter Glück, Jeremy Rayner and Benjamin Cashore; *Contributing authors*: Arun Agrawal, Steven Bernstein, Doris Capistrano, Karl Hogl, Bernd-Markus Liss, Connie McDermott, Jagmohan S. Maini, Tapani Oksanen, Pekka Ollonqvist, Helga Pülzl, Ewald Rametsteiner, and Werner Pleschberger

"North American Chapter", forthcoming as part of IUFRO-WFSE book Forests in the Global Balance - Changing Paradigms *Convening lead authors*: Brad Stennes, Sen Wang, Concepción Luján Alvarez, Constance McDermott, Bill Wilson, and Benjamin Cashore. *Contributing authors*: Susan J. Alexander, David N. Bengston, Alan Carroll, Jesús Miguel Olivas García, Hilda Guadalupe González Hernández, Shashi Kant, Dean Mills, Darcy Mitchell, Sinclair Tedder, G. Cornelis van Kooten, Bill Wagner

"Public Influences on Plantation Forestry", With Glenn T. Howe (lead author), with Bruce Schindler (second author), Eric Hansen, Denise Lach, and Ward Armstrong, March/April, Journal of Forestry.

2004

"Legitimizing Political Consumption: The Case of Forest Certification in North America and Europe" (with Graeme Auld and Deanna Newsom) forthcoming in special issue of the Russian Journal of Sociology and Social Anthropology.(This is a *reprint* of our 2003 chapter in Politics, Products, and Markets. Exploring Political Consumerism Past and Present).

"Non-State Global Governance: Is Forest Certification a Legitimate Alternative to a Global Forest Convention?" (with Steven Bernstein), in John Kirton and Michael Trebilcock (eds.) Hard Choices, Soft Law: Combining Trade, Environment, and Social Cohesion in Global Governance (Aldershot: Ashgate Press)

"The United States' Race to Certify Sustainable Forestry: Non-State Environmental Governance and the Competition for Policy-Making Authority" (With Auld and Newsom), Business and Politics Volume 5, Issue 3 (November, 2003) [Produced in April, 2004]

2003

"British Columbia's Environmental Forest Policy in Perspective", (with Graeme Auld) December Journal of Forestry

"Private Policy Networks and Sustainable Forestry Policy: Comparing Forest Certification Experiences in the US Northeast and the Canadian Maritimes", (with James Lawson). Canadian-American Public Policy (Spring)

"Private or Self-Regulation? A Comparative Study of Forest Certification Choices in Canada, the United States and Germany" (with van Kooten, Vertinsky, Auld and Affolderbach) Journal of Forest Policy and Economics

"Legitimizing Political Consumption: The Case of Forest Certification in North America and Europe" (with Graeme Auld and Deanna Newsom), Politics, Products, and Markets. Exploring Political Consumerism Past and Present edited by Micheletti, Andreas FØllesdal, and Dietlind Stolle. Transaction Press, at Rutgers University, New Brunswick, New Jersey. Forthcoming. [NOTE: this chapter was reviewed by editors and then was reviewed by Transaction Press].

"Forest Certification (Eco-labeling) Programs and their Policy-Making Authority: Explaining Divergence Among North American and European Case Studies" (with Graeme Auld and Deanna Newsom) Journal of Forest Policy and Economics (Volume 5, issue 3). 225-247

2002

Legitimacy and the Privatization of Environmental Governance: How Non State Market-Driven (NSMD) Governance Systems Gain Rule Making Authority". Governance, vol. 15, no. 4 (October). 503-529

"Perspectives on Forest Certification: A Survey Examining Differences Among the US Forest Sectors' Views of Their Forest Certification Alternatives" (With Graeme Auld and Deanna Newsom) in Forest Policy for Private Forestry. Accepted through a blind peer review process established by editors. CAB International.1

"Forest Certification in the Heart of Dixie: A Survey Of Alabama Landowners" (With Deanna Newsom, Graeme Auld, and Jim Granskog) in Forest Policy for Private Forestry. Accepted through a blind peer review process established by editors, CAB International.*

"Firm Choices on Sustainable Forestry Forest Certification: The Case of JD Irving, Ltd.*" (with Jamie Lawson) in Forest Policy for Private Forestry. Accepted through a blind* peer review process established by editors, CAB International.*

"The International-Domestic Nexus: The Effects of International Trade and Environmental Politics on the Canadian Forest Sector" (with Steven Bernstein), in Howlett (ed.), Canadian Forest Policy: Regimes, Policy Dynamics and Institutional Adaptations (Toronto: University of Toronto Press).

"Perspectives on Forest Certification as a Policy Process: Reflections on Elliott and Schlaepfer's Use of the Advocacy Coalition Framework: in, Christopher Elliott, Errol Meidinger, and Gerhard Oesten (editors), Social and Political Dimensions of Forest Certification. Remagen-Oberwinter, Germany: Forstbuch. 2002.

Dr Lihui Chen

Visiting Fellow
Catchment management, regional cooperation, culture and community development

Phone: +61 (0)2 6125 4206
E-mail: Lihui.Chen@anu.edu.au

Career Brief

Lihui Chen grew up in Kunming, Southwest of China. After BS and MS degree in Physical geography, she starts her career in 1993 as assistant research in Yunnan Institute of Geography. In 2000, Lihui Chen gained PhD of Human Geography in Nanjing University and return to the Institute. As a professor, she also undertakes the teaching and supervising the graduate students after the institute incorporated in the Yunnan University since 2002.

Research, Teaching & Professional Activities

My interesting ranges over the broad fields of catchment management, including trans-boundary catchment Integrated management, community development, cooperation among the riparian countries, and the effects caused by dam-building.

During recent years, my experience focus more on the mountainous communities development and the rehabilitation of the resettlement communities caused by dam in the Lancang-Mekong catchment.

Selected Publications

Chen Lihui, Integrated development and management of international river basin, Pressed Company of Yunnan science and technology, 2002.

Chen Lihui Fu Baohong, Xu Jing et al. Dam and resettlement, 1th ed. Pressed

Company of Yunnan science and technology, 2004.

Chen Lihui, He Daming, Sustainable ecology around the Manwan dam, China population resources and environment, 2003, Vol13, No.68, 121-123.

Chen Lihui, Liqin, Obstacles in production restoration and the related reasons in the area around the Manwan dam, Resources and environment in the Yangtze basin, 2003, Vol.12, No.6, 541-546.

Chen Lihui, Zeng Zhungu and He Daming, Conflicts and coordinating the relationship among the interests parties, World regional studies, 2003, Vol.12, No.1. 71-78.

He Daming, Chen Lihui, The impact of hydropower cascade development in the Lancang-Mekong basin, Yunnan, Mekong update & dialogue, Volume5, No.3, July-September 2002.ISSn 1441-8355.

Chen Lihui, Ding Lixun, Land institution limited by regional condition, Yunnan geographic environment research, 2001,Vol.13, No.2,pp60-68.

Chen Lihui, Zeng Zhuigu, Integrated management and theoretical basis for the exploitation of international rivers, Resources and environment in the Yangtze basin, 2001,Vol.10,No.4,pp309-315.

Chen Lihui, He Daming, Integrated allocation of the water in Lancang-Mekong river, Economic Geography, 2001,Vol.21,No.1, pp28-32.

Chen Lihui, Meng Ming, Analysis on short-term action in the northwest of Yunnan province, Symposium of development and conservation of the mountain area, Pressed company of Yunnan science and technology, Kunming, China, March 1999,pp218-223.

Chen Lihui, Hydropower cascade and its impact on fishery in Lancang-Mekong, Second regional conference on fishery of Mekong, 29 April-3 May, 2002, Phnom Penh, Combodia.

Chen Lihui, Dam-building decision institution in china and integrated management of watershed, International conference on "Advances in integrated Mekong river management", 25-27 Oct.2004, Lao Plaza Hotel Vientiane, the Lao PDR.

Dr David Cook

Adjunct Senior Lecturer
Invasive species management

Phone: +61 (0)2 6125 3632
E-mail: David.Cook@anu.edu.au

Career Brief

David was born and raised in the Great Southern region of Western Australia. He completed a Bachelor of Economics degree with Honours at Murdoch University in 1995. Between 1996 and 2004 he worked as a Regional Economist for the Department of Agriculture Western Australia in Bunbury. During this period David completed a PhD with The University of Western Australia's then School of Agricultural and Resource Economics (1999-2001), and worked as a postdoctoral research assistant at the Wye campus of Imperial College London (2003-2004). In 2005 David moved to Canberra to take up a Research Economist position with CSIRO Entomology, and an adjunct appointment with SRES.

Research, Teaching & Professional Activities

David's research interests centre around biosecurity issues. Much of his work has involved invasive species affecting agricultural industries, ranging from vertebrates, invertebrates, weeds, pathogens, fungi, aquatic and marine species. He has completed economic analyses on many different incursion responses, and on-going management strategies for naturalised pest species of regional, state and national significance. He has also investigated the social welfare implications of quarantine restrictions for various pests and diseases, comparing the traditional gains from trade and the increase in expected damage from exotic species capable of utilising the trade link as an entry pathway. David maintains a keen interest in environmental issues, many of which concern species introductions. He will be working in the newly-formed CRC for National Plant Biosecurity to investigate multi-criteria analytical frameworks to include environmental and socio-economic information into the formation of invasive species risk management policies.

Selected Publications

Cook, D.C. 2005. The 'Paradox of Thrips': Identifying a Critical Level of Investment in Pest Exclusion Activities in Western Australia. *Australasian Agribusiness Review* 13, http://www.agrifood.info/Publications_Review/Cook.htm. ISSN 1442-6951.

Cook, D.C., Fraser, R.W., Wilby, A, Waage, J.K. and Mumford, J.D. (2004). Beyond the Biosecurity Horizon. In: *Research Papers*: *Economic Services Group and Regional Economists*, R. Kingwell (Ed.). Government of Western Australia – Department of Agriculture, South Perth. pp. 87-98.

Cook, D.C. (2003). Devising a Method of 'Expected Damage' Estimation for a Polyphagous Invertebrate Pest Exotic to Western Australia". In: *Research Papers*: *Economic Services Group and Regional Economists*, R. Kingwell (Ed.). Government of Western Australia – Department of Agriculture, South Perth. pp. 160-175.

Cook, D.C. and Fraser, R.W. (2002) Exploring the Regional Implications of Interstate Quarantine Policies in Western Australia. *Food Policy* 27 (2): 143-157.

Cook, D.C. 2001. An Economic Evaluation of the Benefits from Import Clearance Activities in Western Australia. *Australasian Agribusiness Review* 9, http://www.agribusiness.asn.au/. ISSN 1442-6951.

Cook, D.C. (2001). *Impact and Beneficiary Analyses for Agricultural Protection Activities in Western Australia*: *Varroa Bee Mite*, *Tracheal Bee Mite and Bee Louse*, Miscellaneous Publication No. 5/2002. Department of Agriculture Western Australia, South Perth. 26 p. ISBN 1326-4168.

Mumford, J.D., Knight, J.D., Cook, D.C., Quinlan, M.M., Pluske, J. and Leach, A.W. (2001). *Benefit Cost Analysis of Mediterranean Fruit Fly Management Options in Western Australia*. Imperial College, Ascot. 52 p.

Dr John Dargavel

Visiting Fellow
Forest history & Forest policy

Phone: +61 (0)2 6125 3565
E-mail: John.Dargavel@anu.edu.au

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.

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.

I enjoy the variety of disciplines that forest history draws me into. Writing a play, 'Hard work to starve', about a timber dispute in southern Tasmania in the 1920s proved to be great fun when the people of Geeveston performed it. Currently I am writing a biography of Charles and Ruth Lane Poole. Charles was the Commonwealth's first forester and Ruth was the interior decorator who designed the furniture for the Prime Minister's and the Governor-General's residences that were opened in Canberra in 1927.

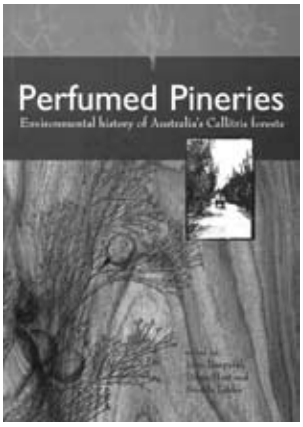
Selected Publications

Dargavel, John. 2004. The Fight for the Forests in retrospect and prospect. *Australasian Journal of Environmental Management* 11(3), pp.237-244.

Dargavel, John. 2004. Persistence and transition on the Wangites-Wagait Reserves, 1892-1976. *Journal of Northern Territory History*, 15: 5-19.

Dargavel, John 2003.'Not easy work to starve their employees': the 1921-22 Tasmanian Timber Dispute. *Labour History* 24:47-67.

Dargavel, John 2003.Re-reading *The Fight for the Forests*: an introduction. In Proc. Symposium 'Win, lose or draw the Fight for the Forests?', http://cres.anu.edu.au/fffweb/



Schirmer, Jacki, Fiona Scarff, Sonya Duus and John Dargavel 2003. Is Australian forest management exemplary? In Proc. Symposium 'Win, lose or draw the Fight for the Forests?', http://cres.anu.edu.au/fffweb/

Dargavel, John 2003. Determining plantation prospects: parameters and purposes. *Australian Forestry* 60(1): 9-11.

Mr Jim Douglas

Visiting Fellow
Economics of forests, the international dialogue on forests and development, and natural resources policy issues.

Phone: +61 (0)2 6125 5990
E-mail: Jim.Douglas@anu.edu.au

Career Brief

Active since late 1970s in international forestry, with assignments for FAO as project manager, ANUTECH in consultancy, and the World Bank. Recently retired as Forests Advisor with the latter organization, after a 15 year engagement.

Research, Teaching & Professional Activities

Major responsibility for research, technical and operational programs in forests in the World Bank. Teaching and training responsibilities for technical and operational staff in the Bank, and in client country organizations; some short term teaching assignments at Johns Hopkins and Georgetown Universities in Washington, while serving with the Bank.

Selected Publications

Numerous reports, conference papers and technical reports authored while with the Bank; primary responsibility for drafting the new Bank Forest Sector Strategy, and Operational Policy, approved by the Board of Directors of the Bank in 2002, and published by the Bank.

I contribute to the academic mission of the SRES through research in the areas of interest identified, and teaching, supervision, discussion and government advisory assignments as determined by the head of SRES.

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

Phone: +1 604 822 0517
E-mail: phevans@interchange.ubc.ca

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 he was appointed as Director of the ANU 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

Heady, R.D., Evans, P.D. 2005. Wood anatomy of Actinostrobus (Cupressaceae). *IAWA Journal* 26(1):79-92.

Roberts, R. J., Evans, P.D. 2005. Effects of manufacturing variables on surface quality and distribution of melamine formaldehyde resin in paper laminates. Composites, Part A: *Applied Science and Manufacturing*. 36A(1):5-104

Orton, C.R., Parkinson, D.Y., Evans, P.D., Owen, N.L. 2004 Fourier transform infrared studies of heterogeneity, photodegradation, and lignin/hemicellulose ratios within hardwoods and softwoods. *Applied Spectroscopy*. 58(11):265-1271.

Semple, K.E., Cunningham, R.B.,Evans, P.D. 2004. Manufacture of wood-cement composites from Acacia mangium: Mechanistic study of compounds improving the compatibility of Acacia mangium heartwood with Portland cement. *Wood & Fiber Science* 36:250-259.

Kataoka, Y., Kiguchi, M., Evans, P.D. 2004. Photodegradation depth profile and penetration of light in Japanese cedar earlywood (*Cryptomeria japonica* D Don) exposed to artificial solar radiation. *Surface Coatings International Part B: Coatings Transactions* 87(3): 187-193.

Evans, P.D., Donnelly, C., Cunningham, R.B. 2003. Checking of CCA-treated radiatapine 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. *Forest Products Journal*. 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)::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*. 16:89-100.

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.

Selected Student Theses

Roberts, R. 2004. Liquid penetration into paper, Ph.D

Cabangon, R. 2004. Flexural visco-elastic properties of wood-wool cement boards, Ph.D

Semple, K. 2004. The compatibility of eucalypts and acacias with Portland cement, Ph.D

Dr Ross Florence

Visiting Fellow
Ecology & silviculture of eucalypt forests; forest policy & planning

Phone: +61 (0)2 6125 3565
E-mail: Ross.Florence@netspeed.com.au

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 A. Malcolm Gill

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

Phone: +61 (0)2 6125 4417
E-mail: Malcolm.Gill@anu.edu.au

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, probability models of fire occurrence. These models relate nicely to: ecological effects of fires in the landscape, including biodiversity; and, risk management, including risk to housing.

Selected Publications

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.

Gill, A.M. and Bradstock, R.A. (2003). Fire regimes and biodiversity: a set of postulates. In: G. Cary, D.B. Lindenmeyer and S. Dovers (eds) *Australia Burning*: *Fire Ecology*, *Policy and Management Issues*. Pp. 15-25. CSIRO Publishing, Melbourne.

Gill, A.M., Allan, G. and Yates, C. (2003). Fire-Created Patchiness in Australian Savannas. *International Journal of Wildland Fire* 12, 323-331.

Gill, A.M., Good, R., Kirkpatrick, J., Lennon, J., Mansergh, I. and Norris, R.. (2004). *Beyond the Bushfires 2003*, *Environmental Issues in the Australian Alps*. Australian Alps Liaison Committee, 2004.

Mr Ken Groves

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

Phone: 0410 511 549
E-mail: kwgroves@bigpond.net.au

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.

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.

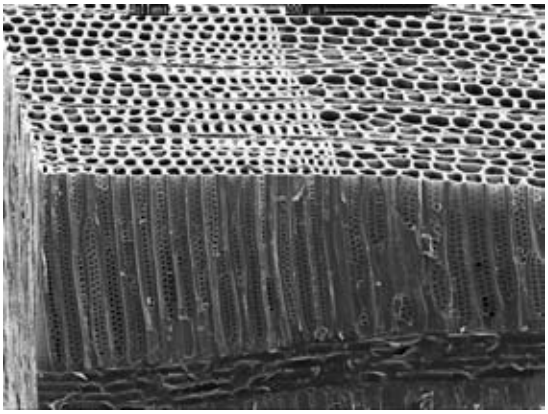
Dr Roger Heady

School Research Associate
Wood Anatomy, Electron Microscopy

Phone: (02) 6125 3543
E-mail: Roger.Heady@anu.edu.au

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 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.



Scanning Electron Micrograph of the wood of Wollemi Pine

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 Hartmut Holzknecht

Ressearch Fellow
Social anthropology, Melanesia, land and other natural resource use and tenure systems, community and rural development, institutions and institutional change, policy development, socio-economic persistence and change

Phone: + 61 (0)2 6125 8149
E-mail: Hartmut.Holzknecht@anu.edu.au

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. The 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, I have 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. I have 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.

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

At SRES, I am also supervising graduate students up to PhD level. I am 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'. An ACIAR-funded study, 'Papua New Guinea Agroforestry', will begin on May 1st, 2005.

Selected Publications

Holzknecht, H. [in press] 'The "Rural Development" Session'. *Development Bulletin*, Special Edition – 'The Good News Conference.

Mandan, T. and H. Holzknecht [in press] 'Burum Development: *Nanak Mutuk*'. *Development Bulletin*. Special Edition – 'The Good News Conference.

Kanowski, P., H. Holzknecht and C. Perley [in press] 'Oceania: islands of contrasts', Chapter 18 in G. Mery *et al.* (eds.) World Forests, Society and Environment Project. Helsinki: International Union of Forest Research Organizations.

Holzknecht, H. 2005 Session Opening and Closing Remarks, 'Overcoming Constraints in Papua New Guinea'. February 18. Lowy Institute for International Policy, Sydney.

Holzknecht, H. Presentation 'Oceania: islands of contrasts'. IUFRO-WFSE Policy Workshop, January 12-16, Victoria, B.C., Canada [preparing policy brief to accompany WFSE volume for the IUFRO World Congress, Brisbane, August 2005].

Holzknecht, H. 2004 [November 24-26] 'Good News' Conference, Divine Word University, Madang and State, Society and Governance Project, The Australian National University.

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.

Mr Neil Humphreys

Visiting Fellow
Management systems, forest operations and farm-based plantations

Phone: +61 (0)3 9349 1088
E-mail: forpac@bigpond.com

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

Phone: +61 (0)2 6254 7871
E-mail: Edward.Linacre@anu.edu.au

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. 2004. Evaporation trends. *Theor. Appl. Climatol.* 79: 11 – 22.

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.

Dr Colin Matheson

Visiting Fellow
Quantitative, population and conservation genetics of forest trees, genetics of wood properties

Phone: +61-2-62818322
E-mail: Colin.Matheson@csiro.au

Career Brief

Colin Matheson was born in the UK and moved to Melbourne with his family to complete his time at school. He came to Canberra to undertake his first degree at the ANU in Botany and Zoology with Honours in Botany for a population genetics project on a small crucifer, after which he had a year working on eucalypts with Professor Lindsay Pryor at the Botany Department. He then returned to Melbourne for his PhD at La Trobe University on the genetics of the fruit fly *Drosophila melanogaster*. After that he came again to Canberra to take up a position with the then Department of National Development at the then Forest Research Institute in Yarralumla, Canberra, working on the genetics of trees. He then undertook a degree in Mathematics and Statistics at the ANU part time. In 1975, the Institute joined CSIRO and Colin has remained working at Yarralumla on breeding pines, eucalypts and acacias in collaboration with various industry bodies.

Colin has been Chair of Research Working Group No 1 of the Australian Forestry Council and Chair or Co-chair of two Working Parties of the International Union of Forestry Research Organizations. He has conducted a number of consultancies to Zimbabwe, China and Malaysia, was a Visiting Scientist at Oxford University and the University of Florida and was Co-Director of the Oxford Forestry Institute summer course on forest research. In addition, he has been an Invited Speaker at a number of international conferences in various countries.

Research, Teaching & Professional Activities

My current interests are in forest genetics with some emphasis on the genetics of wood properties, conservation and disease resistance in radiata pine as well as the strategy of breeding programs themselves. I am working on projects aimed at finding the best ways of improving the quality of juvenile wood and reducing its incidence as well as acoustic methods of measuring wood stiffness. Another of my projects aims to breed softwoods for planting on sites drier than those traditionally used for radiata pine. Because of the new pine pitch canker disease in California and Mexico, new collections from candidate species in these regions is not possible, so I am working to conserve ex situ genetic resources of these species as well as to find genetic resistance to pitch canker. Because of its applied focus, my work has been funded for many years partly by private companies and cooperatives both in Australia and New Zealand.

Although employed in a research position, I have supervised graduate and Honours students for many years, both through ANU and Melbourne University. I have designed and delivered courses on tree breeding and on design and analysis of experiments, one of which culminated in a collaborative book. In addition, I have contributed occasional lectures to the ANU Forest Genetics course; teaching most of the 'Production Genetics' part of the Conservation and Production Genetics course at SRES in 2003.

Selected Publications

Williams, E.R., Matheson, A.C. and Harwood, C.E. (2002) *Experimental Design and Analysis for Tree Improvement.* (2nd Ed, CSIRO: Melbourne).

Rogers, D.L., Matheson, A.C., Vargas-Hernández, J.J. and Guerra-Santos, J.J. (2004) Genetic Conservation of Insular Populations of Monterey Pine (*Pinus radiata* D. Don). *Biodiversity and Conservation* (In Press)

Wu, H.X. and Matheson, A.C. (2005). Genotype by environment interactions in an Australia-wide radiata pine diallel mating experiment: implications for regionalised breeding. *Forest Science* 51, 29-40.

Dickson, R.L., Matheson, A.C., Joe, B., Ilic, J. and Owen, J.V. (2004) Acoustic segregation of Pinus radiata logs for sawmilling. *NZ Jour. For. Sci.* 34(2), 175-189.

Wu, H.X. and Matheson, A.C. (2004) General and specific combining ability from partial diallels of radiata Pine: Implications for utility of SCA in breeding and deployment populations. *Theoretical and Applied Genetics* 108, 1503-1512.

Matheson, A.C., Wu, H.X., Spencer, D., Raymond, C.A. and Griffin, A.R. (2002). Inbreeding in radiata pine: III. Effect of inbreeding on age-age correlation and early selection efficiency. *Silvae Genetica* 51 (2-3), 115-122.

Wu, H. X., Matheson, A.C. and Abarquez, A..(2002). Inbreeding in radiata pine: IV. Inbreeding effect on wood density. *Annals of Forest Science* 59(5-6), 557-562

Matheson, A. C., Dickson, R. L., Spencer, D. J., Joe, B. and Ilic, J.(2002) Acoustic segregation of *Pinus radiata* logs according to stiffness. *Annals of Forest Science*, 59(5-6), 471-477.

Schimleck, L. R., Evans, R., Ilic, J., and Matheson, A. C. (2002) Estimation of wood stiffness of increment cores by near-infrared spectroscopy. *Canadian Journal of Forest Research*, 32, 129-135.

Yang, J.L., Fife, D. and Matheson, A.C. (2001) Growth strain in three provenances of plantation-grown *Eucalyptus globulus* Labill. *Australian Forestry* 64 (4), 248-256.

Wu, H. X. and Matheson, A. C. (2001a) Analyses of half-diallel mating design with missing crosses: theory and SAS program for testing and estimating GCA and SCA variance components. *Silvae Genetica*. 50, 265-271.

Wu, H.X. and Matheson, A.C. (2001). Reciprocal, maternal, non-maternal effects in radiata pine diallel mating experiment on four Australia sites. *Forest Genetics* 8, 205-212.

Nyakuengama, J.G., Matheson, A.C., Evans, R., Spencer, D.J. and Vinden, P. (2000) Genetics of heartwood formation and moisture status in *Pinus radiata*. *Appita J.* 53, 30-35.

Nyakuengama, J.G., Matheson, A.C., Evans, R., Spencer, D. and Vinden, P. (2000) Effect of Age on Genetic Control of *Pinus radiata* Earlywood and Latewood Properties. *Appita J.* 53(2), 103-107.

Wu, H.X. and Matheson, A.C. (2000). Analysis of half-diallel mating design with missing crosses: theory and SAS program for testing and estimating GCA and SCA fixed effects. *Silvae Genetica* 49, 130-137.

Matheson, A.C., Eldridge, K.G. and Spencer, D.J. (2000) A workshop on issues and strategies to conserve the genetic resources of *Pinus radiata* ex situ. *Forest Genetic Resources* 27, 75-78.

White, T.L., Matheson, A.C., Cotterill, P.P., Johnson, R.G, Rout, A.F. and Boomsma, D.B. (1999) A Nucleus Breeding Plan for Radiata Pine in Australia. *Silvae Genetica* 48(3-4), 122-133.

Nyakuengama, J.G., Matheson, A.C., Evans, R., Spencer, D.J. and Vinden, P. (1997) Wood quality and quantitative genetics of Pinus radiata IV. Time trends in the genetic control of density and pulp and paper-making traits and their interrelationships. *Appita J.* 50 (6), 486-494.

Wu, H.X., Matheson, A.C., and Spencer, D.J. (1997) Study of inbreeding in radiata pine I. The effect of inbreeding on growth, survival and variance. *Theoretical and Applied Genetics* 97, 1256-1268.

Wu, H.X., Matheson, A.C., and Spencer, D.J. (1997) II. Evolution of inbreeding depression and effect on growth curve. *NZ Jour. For. Sci.* 28(2), 123-139.

Butcher, P.A., Matheson, A.C. and Slee, M.U. (1996) Potential for genetic improvement of oil production in *Melaleuca alternifolia* and *M. linariifolia*. *New Forests* 11, 31-51.

Matheson, A.C., Spencer, D.J. and Kriedemann, P.E. (1995) Age-age correlations and early selection in radiata pine. 1. Family x environment interactions in plantation and greenhouse. *Australian Forestry* 58(2), 35-43.

Matheson, A.C., White, T.L. and Powell, G.L. (1995) Effects of inbreeding on growth, stem form and rust resistance in *Pinus elliottii*. *Silvae Genetica* 44(1), 37-46.

Matheson, A.C., Spencer, D.J. and Magnussen, D. (1994) Optimum age for selection in *Pinus radiata* using area under bark for age:age correlations. *Silvae Genetica* 43(5/6), 352-357.

Mr Bob Newman

Visiting Fellow
Forest history and forest policy

Phone: +61 (0)2 6282 5256
E-mail: rlnewman@webone.com.au

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

Visiting Fellow
Greenhouse

Phone: +61 (0)2 6274 1926
E-mail: Gary.Richards@ea.gov.au

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 Southern Tablelands Council.

Since 1998 Gary has been the Director and Principal Scientist for the development of Australia's 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 on the IPCC revision to international accounting guidelines for Agriculture, Land Use and Forestry.

Gary has received achievement recognition awards including a Public Service Medal for contribution to greenhouse accounting and sustainable land management, and was a member of a team that won the 2004 CSIRO Chairman's Medal.

Research, Teaching & Professional Activities

My work has primarily been around multi-disciplinary planning and policy related issues, previously heavily oriented toward the human dimensions of natural resource management. Recent work has oriented toward applications of GIS systems and remote sensing techniques for land use modeling and decision making. Specific research interests focus on the development of GIS-based carbon budget models to assess the greenhouse gas emissions implications of land use and forest management activities.

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. 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., 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.

Paul, K.I. Polglase and P.J. Richards G.P. (2003) 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. (2003). 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.

Richards, G.P. and Brack, C. (2004) A Continental Biomass Stock and Stock Change Estimation Approach for Australia. *Australian Forestry* 67 (4) 284-288.

Richards, G.P., and Evans D.W. (2004) Development of the FullCAM Carbon Accounting Model, (FullCAM vers. 1.0) for the Australian Continent. *Australian Forestry* 67 (4) 277-283.

Richards, G.P., and Brack, C.L. (2004) A Modelled Carbon Account for Australia's Plantation Forests. *Australian Forestry* 67 (4) 289-300.

Lowell, K., Richards, G.P., Woodgate, P., Jones, S. and Buxton, L. (in press) Fuzzy Clasification for Assessing the Reliability of Multi-Period Landcover Change Maps.Photogrammetric *Engineering and Remote Sensing*.

Dr Robin Tennant-Wood

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

Phone: +61 (0)2 6125 3534
E-mail: Robin.Tennant-Wood@anu.edu.au

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, when not at the ANU, holds the position of Director of the Canberra and South East Region Environment Centre. She has been a Visiting Fellow in SRES since February 2003, interrupted only by a mercifully brief interlude as a Senior Policy Officer in the Department of Agriculture.

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. 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. As Director of an environmental NGO and having had a long involvement with Landcare, I am also a strong advocate of community-based natural resource management. I plan to foster links, formal and informal, between the ANU and the Environment Centre.

Selected Publications

Tennant-Wood, R. 2005. "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, due May 2005)

Tennant-Wood, R. 2004. "The role of the media in the public disclosure of electoral funding", *Democratic Audit of Australia*, http://democratic.audit.anu.edu.au

Tennant-Wood, R. 2004. "From wasteland to wetland: creating a community ecological resource in regional NSW", *Local Environment*, Vol.9 No.6, pp.527-539

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

Phone: +61 (0)2 6125 8147
E-mail: David.Tongway@anu.edu.au

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 as 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

Tongway, D J and Hindley, N L.(2004) Landscape Function Analysis: procedures for monitoring and assessing landscapes. CSIRO Sustainable Ecosystems, Brisbane.

Dr Brian J. Turner

Visiting Fellow
Native forest management,
Remote sensing

Phone: +61 (0)2 6125 3548
E-mail: Brian.Turner@anu.edu.au

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 at ANU. 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 a 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.

Selected Publications

Huang, Z., Turner, B.J., Dury, S.J., Wallis, I.R. and Foley, W.J. 2004. Estimating foliage nitrogen concentration from HYMAP data using continuum removal analysis. *Remote Sensing of Environment* 93:18-29.

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.

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.

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., Cary, 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

Mahiny, A. 2004. A Modelling Approach to Cumulative Effects Assessment for Rehabilitation of Remnant Vegetation. (PhD thesis)

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).

Dr Rodney Weber

Visiting Fellow
Bushfire modelling, combustion phenomena

Phone: +61 (0)2 6268 8897
E-mail: r.weber@adfa.edu.au

Career Brief

Rod was born in Geelong and educated at North Geelong Primary School, North Geelong High School, The University of Melbourne and The University of Tasmania.

He did a short stint at University of New England as a Lecturer in Physics, then a Postdoc at UNSW at ADFA. He has been at UNSW at ADFA since 1987 and is now an Associate Professor there working on a range of problems related to the modelling of bushfires and other combustion phenomena.

Selected Publications

Weber, R.O., 2001: Wildland Fire Spread Models, In E.A. Johnson and K.Miyanishi (eds) *Forest Fires*, pp.151--169, Academic Press.

Mercer, G.N. and Weber, R.O., 2001: Fire Plumes, by. In E.A. Johnson and K.Miyanishi (eds) *Forest Fires*, pp. 225-255, Academic Press.

Watt, S.D., Mercer, G.N., Sidhu, H.S. and Weber, R.O., 2003: The Thermal Ignition Problem in a Cube, *ANZIAM Journal* 44:C820-C835..

Dold, J.W., Weber, R.O., Thatcher, R.W. and Shah, A.A., 2003: Flame Balls with Thermally Sensitive Intermediate Kinetics, *Combust. Theory Modelling* 7:175-203.

Gubernov, V., Mercer, G.N., Sidhu, H.S. and Weber, R.O., 2004: Evans function stability of non-adiabatic combustion waves, *Proceedings Royal Society London* A 460: 2415-2435.

Mr Piers Bairstow

Field Services Manager

Phone: +61 (0)2 6125 2656
E-mail: Piers.Bairstow@anu.edu.au

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.

Mr John Boland

SRES Information Services

Phone: +61 (0)2 6125 4473
E-mail: John.Boland@anu.edu.au

Career Brief

As a part of the SRES IT Team, John provides computing support and advice to the students, staff and visitors mainly in the Forestry building. John has been on campus off and on since 1982 and has spent the last 10 years providing IT services to SRES, RSBS and the Law Faculty.

His interests include Programming, Computer Games and Music. He has three young boys which fill the rest of his life.

Ms Tiffany Brown

Research Assistant
WildCountry Science Project

Phone: +61 (0)2 6125 4417
E-mail: Tiffany.brown@anu.edu.au

Career Brief

After completing her Honours degree in Environmental Science at the University of Wollongong in 2003, Tiff began working as a Research Assistant at SRES in 2004. In this position, Tiff assists Dr Brendan Mackey on the *WildCountry* Science Project, a collaboration between ANU and The Wilderness Society Australia. This project aims to create a new, integrated approach towards conserving biological diversity in Australia at a continental scale, with a particular focus on ecological connectivity and off reserve management. Tiff uses her knowledge of GIS applications and her familiarity with spatial data directories to compile and analyse the spatial data used in the project.

Ms Debbie Claridge

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

Phone: +61 (0)2 6125 3795
E-mail: Debbie.Claridge@anu.edu.au

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, The Australian National University.

Mr Mauro Davanzo

Technical Officer
Field Services
Transport, Field Equipment, Technical Support

Phone: +61(0) 26215 4673
E-mail: Mauro.Davanzo@anu.edu.au

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 Andrew Ford

Research Assistant

Phone: +61 (0)2 6125 0348
E-mail: Andrew.Ford@anu.edu.au

Career Brief

Andrew has been employed on a short-term, part-time basis to help Dr Ryde James with the fourth year plantation forestry courses that are offered by SRES in Semester 1 (FSTY4002, FSTY4004 and FSTY8045). Andrew is well qualified to do the tasks required for this project as he has a good knowledge of WebCT and studied plantations courses in 2004 in his final year of the BScForestry degree (Concurrent Honours) at ANU. Andrew's main tasks involve converting lecture materials (including overhead slides and further reading resources) from hard copy into an electronic format, then uploading them to the WebCT course sites. The project has also involved scanning certain materials held in the Forestry Management Collection and uploading them to WebCT to aid students in completing their assignments. Andrew hopes the work he has done will be of great value to future students and wished the material he has been working on had been so easily accessible during his studies.

Mr Clive Hilliker

Senior Drafting Officer
Cartography & Design

Phone: +61 (0)2 6125 3262
E-mail: Clive.Hilliker@anu.edu.au

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 at Murramarang Resort, South Durras, NSW, 2004, "Designing Effective Posters and Graphics"

His focus now is on visual communication in print media, primarily cartographic illustration as well as photography and the creation of 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.

Since 2002, Clive has also been responsible for the management and coordination of infrastructure change within the school.

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
Executive Summary ISBN 0-7315-3338-0
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Maps & Illustrations

Cary, G., Lindenmayer, D.B. and Dovers, S. (Editors). 2003, Australia *Burning*. CSIRO Publishing, Melbourne.

Diamond, J. & Bellwood, P. 25 April 2003, *Farmers and their Languages: the First Expansions. SCIENCE*, pp. 587-603, Vol. 300. ISSN: 1095-9203

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.

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

Dr Susanne Holzknecht

Academic Skills Advisor

Phone: +61 (02) 6125 2541
E-mail: Sue.Holzknecht@anu.edu.au

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 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 Books, 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

Programmer / Multimedia Services
SRES Information Services

Phone: +61 (0)2 6125 8014
E-mail: Steve.Leahy@anu.edu.au

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 a giant igloo in central Greenland. He'd already spent enough time in a chilling environment when 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 further improving the SRES IT infrastructure, and research-related 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; making sensible use of multi-media systems; simplifying the administration of the SRES computer servers; occasionally making the acquaintance of a thesaurus; reading on the bus; 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

Phone: +61 (0)2 6125 0545
E-mail: Mark.Lewis@anu.edu.au

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

Phone: +61 (0)2 6125 2645
E-mail: John.Marsh@anu.edu.au

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

Phone: +61 (0)2 6125 4613
E-mail: Karl.Nissen@anu.edu.au

Career Brief

GIS Consultant in CRES (Thursdays)
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 PCs and servers, and the management of IT finances. He also looks after the undergraduate laboratories run by SRES and the management of SRES's GIS software.

He also provides GIS support to CRES.

http://cres.anu.edu.au/people/nissen.html

Ms Zosha Smith

School Administrator

Phone: +61 (0)2 6125 3709
E-mail: Zosha.Smith@anu.edu.au

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

Phone: +61 (0)2 6125 4499
E-mail: Panit.Thamsongsana@anu.edu.au

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.

Dr Robyn Harris

Education Officer,
CRC for Greenhouse Accounting

Phone: +61 (0)2 6125 3251
E-mail: Robyn.Harris@anu.edu.au

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

Phone: +61 (0)2 6125 9753
E-mail: Eugene.Wallensky@anu.edu.au
Web: http://kioloa.anu.edu.au

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.

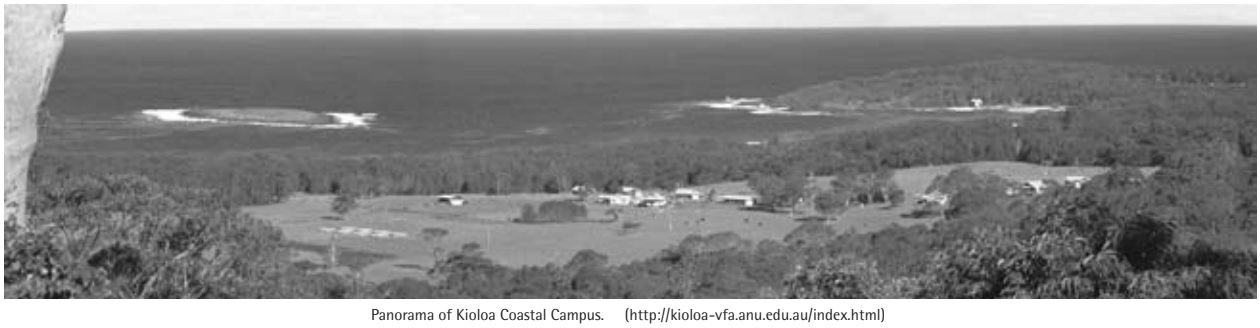
Smithers, S.G., Woodroffe, C.D., McLean, R.F. and Wallensky, E.P. (1993) Lagoonal sedimentation in the Cocos (Keeling) Islands, Indian Ocean. *Proceedings of the 7th International Coral Reef Symposium*, 1: 273-288.

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 environmental assessment, hydrological and water quality modelling, and environmental education and training

Phone: +61 (0)2 6125 4742

E-mail: Tony.Jakeman@anu.edu.au

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, and now comprising 7 research staff, 11 PhD and 2 Masters' students, supported by a small, dedicated group of technical and management staff.

Tony has been President of the Modelling and Simulation Society of Australia and New Zealand (www.mssanz.org.au) since 1987 and is Foundation President of the International Environmental Modelling and Software Society (www.iemss.org). 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 river basin 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 strongly involved in the supervision of Honours students. I am co-convenor of MATH 3133/3134H, a 3rd year course in Environmental Modelling usually offered in second semester.

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. (2004) 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. (2005). 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. (2004) Model development for integrated assessment of water allocation options. *Water Resources Research* 40(5):WO552.

Jakeman, A.J., Letcher, R.A. and Norton, J.P. (in press) Ten interactive steps in modeling. *Environmental Modelling and Software*.

Professor Peter Cornish

Adjunct Professor
Agricultural systems design and management to improve productivity whilst reducing environmental impact

Phone: (02) 4570 1376
E-mail: p.cornish@uws.edu.au

Career Brief

Peter Cornish graduated in Agricultural Science (Honours) from the University of Sydney in 1968 and worked for CSIRO and NSW Agriculture for 25 years as a pasture ecologist then crop agronomist, with a break for his PhD at UNE (1976-9). In 1993 he joined UWS as the Foundation Professor of Agriculture (Farming Systems), a Chair endowed by the Vincent Fairfax Family Trust. His main interests have been in soil/plant water and phosphorus relations, in a broad farming systems context. This led him into the development of soil-conserving tillage systems in the 1980's, and subsequently into the integrated management of farms within catchments for improved environmental outcomes. He has been a member of several research advisory committees including the Wheat Research Council of Australia, Grains Research & Development Corporation, and Rural Industries R& D Corporation. In 2003 he was the joint recipient with GRDC of the Prime Minister's Award for Excellence in Public Sector Administration, for a successful GRDC-funded national programme of farming systems research. At UWS, Peter leads a research group ('Landscape & Ecosystems Mangement') of 4 Postdoctoral Fellows and several PhD students and technical support, all funded by external sources. He is also a member of the CRC-Irrigation Futures.

Research, Teaching & Professional Activities

Main present research interests are in: (i) quantifying diffuse pollutant exports from major rural land uses, understanding the relevant processes, and developing management options for farmers; and (ii) developing less unsustainable farming systems for the rich farming areas of northwestern NSW, with a focus on understanding and managing subsoil constraints (apparently due to subsoil salinity) and optimising crop management strategies. He has supervised 12 research students (most PhD) and assisted with numerous others.

Selected Publications

Wells, A T, Chan, K Y and Cornish, P S (2000). Comparison of conventional and alternative vegetable farming systems on the properties of a yellow earth in New South Wales. *Agriculture, Ecosystems and Environment* 80: 47-60.

Hollinger, E, Cornish P S, Baginska, B, Mann, R and Kuczera, G (2001). Farm-scale stormwater losses of sediment and nutrients from a market garden near Sydney, Australia. *Agric. Water Management* 47: 227-241.

Cornish, P S; Hallissey, R and Hollinger, E (2002). Is a rainfall simulator useful for estimating phosphorus runoff from dairy pasture? A question of scale-dependency. *Australian J Experimental Agriculture* 42: 953-59

Sun, H, Cornish, PS and Daniell, T M (2002) Contour-based digital elevation modelling of watershed erosion and sedimentation. *Water Resources Research* 38: 15-1 - 15-10.

Cornish, PS, Davey, P and Muston, R (2002). Landscape Management in this Millennium: securing enduring relationships between community and country. Proc Fenner Conf on the Environment: Agriculture for the Australian Environment. p 39.

Sun, H, Cornish, PS and Daniell, TM (2002). Spatial variability in hydrologic modelling using a rainfall runoff model and digital elevation model. *J Hydrologic Engineering* 7: 404-412.

Baginska , B, Milne-Home, W and Cornish, P S (2003). Modelling Nutrient Transport in Currency Ck with AnnAGNPS and PEST. *Environmental Modelling and Software* 18: 801-808.

McCallum, R, Cornish, PS and Fettell, N (2003). Model Applications in Farming Systems – the Condobolin Experience. Proc 1st Conf Aust Farming Systems Assoc, Toowoomba.

Cornish PS (2003) Prioritising locations, industries and abatement actions for environmental improvement in a heterogeneous catchment: the Sydney Basin Australia. Bruen, M. (Editor) Diffuse Pollution and Basin Management. Proc 7th International Specialised IWA Conference. Dublin, Ireland. ISBN 1902277767, I (2) 7-12.

Harhcegani, H B and Cornish, P S (2003). A Catchment Approach to Understanding the Sources and Fate of Indicator Bacteria in an Intensive Agricultural Area. Bruen, M. (Editor) Diffuse Pollution and Basin Management. Proc 7th International Specialised IWA Conference. Dublin, Ireland. ISBN 1902277767, III (6): 59-64.

McNamara, LA and Cornish, P (2004). Participative Decision-Making to Identify Nutrient Pollution Sources and Potential Abatement Actions. *J River Basin Management* 2: 71-80.

Sun, H and Cornish, P S (2004). Estimating shallow groundwater recharge in the headwaters of the Liverpool plains using SWAT. *Hydrological Processes* 19: 795-807.

Cornish, PS (2005). Case Study: Australian Approaches to Participatory Development and Adoption of More Sustainable Farming Systems. In 'Sustainable Resource Management in Intensive Agriculture Systems'. Ed. ERSEC/UNESCO (In Press).

Freebairn, DM, Cornish, PS, Anderson, WK, Walker, SR, Robinson, JB and Beswick, AR (2005). Management Systems in Climate Regions of the World – Australia. In 'Dryland Farming'. Monograph of the American Soc Agronomy, Crop Science and Soil Science. (In press)

Selected Student Theses

Hollinger, E (1998) Links between management of a market garden and stormwater losses of sediment, nitrogen and phosphorus.

Harchegani, Habib (2002) A Catchment Approach to Understanding the Sources and Fate of Indicator Bacteria in an Intensive Agricultural Area.

Norrish, S (2003) Soil and water interactions controlling wheat crop response to phosphorus fertiliser in north-western NSW.

Popov, V (2005) A catchment approach to managing agricultural pesticides in the environment – a case study with the herbicide atrazine.

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

Phone: +61 (0)2 6125 0666
E-mail: Barry.Croke@anu.edu.au

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. In addition, research on modelling water quality is being undertaken including estimation of sediment, nutrient and pathogen exports. A key research component is investigating 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. I am one of the co-founders of the Top-Down Modelling Working Group, and co-leader of one of the science themes within the Prediction in Ungauged Basins initiative of the International Association of Hydrological Sciences.

Selected Publications

Letcher, R.A., B.F.W. Croke and A.J. Jakeman, 2004. Model development for integrated assessment of water allocation options. Water Resources Research, 40, W05502, doi:10.1029/2003WR002933.

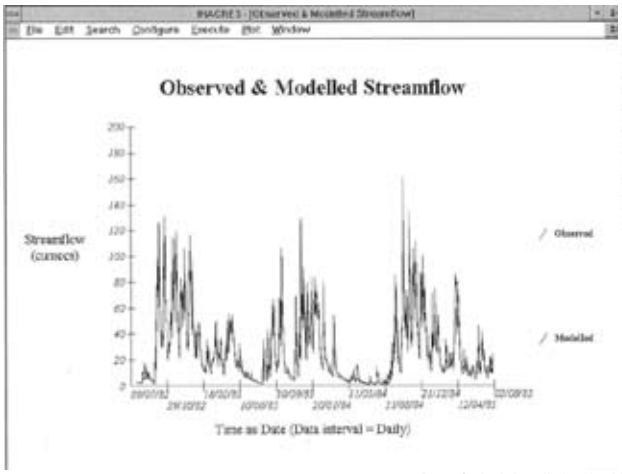
Croke, B.F.W., W.S. Merritt and A.J. Jakeman, 2004. A Dynamic Model for Predicting Hydrologic Response to Land Cover Changes in Gauged and Ungauged Catchments, Journal of Hydrology, 291, 115-131.

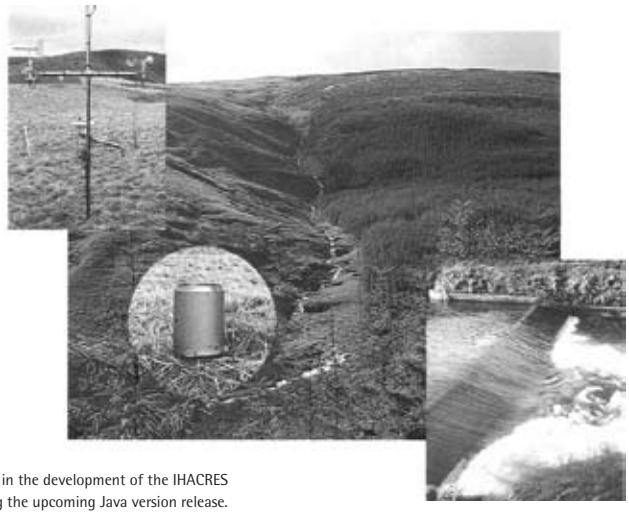
Croke, B.F.W. and A.J. Jakeman, 2004. A Catchment Moisture Deficit module for the IHACRES rainfall-runoff model, *Environmental Modelling and Software*. 19, 1-5.

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





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

Phone: +61 (0)2 6125 8132
E-mail: Rebecca.Letcher@anu.edu.au

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

Rebecca has substantial expertise in the field of model-based assessment of natural resource management issues and has developed innovative new methods for integrating economic and hydrological modelling approaches for considering water allocation management problems. This work has been the focus of co-authored keynote addresses and has been published in the top international water research journal, Water Resources Research. Her current and past collaborations on major international and Australian projects in the area include: Integrated Water Resources Assessment and Management (IWRAM) Project, Northern Thailand (Phases 1 and 2), funded by ACIAR; Management of Diffuse Pollutants in the Ben Chifley catchment, Australia, funded by NSW Environmental Trust; Development of a Decision Support System for the Gwydir and Namoi valleys, Australia funded by the Cotton Research and Development Corporation; Assessment of the Macroeconomic Impacts of Climate Variability in Mali, funded by the World Bank; National Pollutant Inventory projects funded by NSW EPA.

Rebecca has authored more than 40 refereed articles in the areas of integration of models, concepts and approaches from various disciplinary areas, particularly economics and hydrology, for considering management issues such as water allocation, salinity and other water quality (nutrients, sediments). She has developed novel approaches for integrating economic, hydrologic, water quality, agricultural and ecological modelling and assessment research and for considering long-run capital investment costs in water allocation decision-making. She has extensive experience in the use of various participatory methods in integrated assessment projects and in the use and development of economic models and assessment approaches. She also has substantial industry experience in the area of water pricing, regulation and methods for assessing marginal cost of service delivery and has maintained an active research interest in this area.

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

In addition to these activities she is the Secretary of the International Environmental Modelling and Software Society (iEMSs). As part of this commitment she 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 few years she has 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.

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.

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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. (2005). "Model Development for Integrated Assessment of Water Allocation Options." *Water Resources Research*, 40(5): W0552.

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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.

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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

Phone: +61 (0)2 6125 8129
E-mail: Lachlan.Newham@anu.edu.au

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, modelling and management. He works on two closely related projects. The first is titled 'Development of a Catchment Contaminant Cycle Model for Stakeholder Use'. The aim of that project is to develop water quality modelling techniques 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.

The second project is titled 'Integrating Economic Valuation and Water Quality Modelling for Improving Management of Coastal Catchments'. This ARC Linkage project is being undertaken with partners the Eurobodalla Shire Council and NSW Department of Infrastructure, Planning and Natural Resources. It aims to develop and apply an integrated assessment and management tool for managing coastal catchments. The project consists of three core components: development of biophysical models to predict water quality impacts under a wide range of conditions; economic evaluation of those impacts; and the integration of water quality and economic modelling in order to influence policy development and investment in environmental conservation and remediation.

Lachlan is the Treasurer of the Modelling and Simulation Society of Australia and New Zealand.

Selected Publications

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, 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*, vol. 19, pp.1029-1038.

A. Sadoddin, R.A. Letcher, A.J. Jakeman and L.T.H. Newham (in-press 2005) 'A Bayesian Decision Network Approach for Assessing the Ecological Impacts of Salinity Management', *Mathematics and Computers in Simulation*.

L.T.H. Newham, R.A. Letcher and A.J. Jakeman (submitted) 'End-User Participation in Modelling for Integrated Catchment Assessment and Management: An Australian Case Study in Participation', *International Journal of River Basin Management*.

A.J. Jakeman, R.A. Letcher, L.T.H. Newham and J.P. Norton (2005) 'Integrated Catchment Modelling: Issues and Opportunities to Support Improved Sustainability Outcomes. In: Water Capital, 29th Hydrology and Water Resources Symposium, 20-23 February, Rydges, Lakeside, Canberra, pp. 1-15.

L.T.H. Newham, S.M. Cuddy, R.A. Vertessy and A.J. Jakeman (2005) 'Determining Future Directions in Contaminant Cycle Modelling Through an Evaluation of Existing modelling Systems' In Proceedings of the 2005 International Conference on Simulation and Modelling, V. Kachitvichyanukul, U. Purintrapiban and P. Utayopas (eds), 17-19 January, Bangkok, Thailand, pp. 426-433.

L.T.H. Newham, J.L. Ticehurst, D. Rissik, R.A. Letcher, A.J. Jakeman and P. Nelson (2004) 'Assessing the Sustainability of NSW Coastal Lakes Using a Bayesian Decision Network Approach' In Conference Proceedings: NSW Coastal Conference 2004, 9-12 November, Lake Macquarie, pp. 63-69.

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, R.A. Letcher and A.J. Jakeman (2004) 'Integrated Assessment and Modelling for Catchment Management: An Australian Case Study in Participation ', Water Science and Technology, International Symposium: Uncertainty and Precaution in Environmental Management, Copenhagen, June 7-9.

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J. Myŝak, L.T.H. Newham and R.A. Letcher (2004) 'Integrated Modelling and Decision-Making Analysis for Water Quality Management: The Ben Chifley Dam Catchment Case Study' In Integrated Water Management of Transboundary Catchments: A Contribution from TRANSCAT, Venice, Italy, 24-26 March.

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.

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, E. McLean, J.P. Norton and A.J. Jakeman (2005) 'An Independent Review of the Effectiveness of the Lake Macquarie Improvement Project', iCAM Client Report 2005/18 for the Office of the Lake Macquarie and Catchment Coordinator, Integrated Catchment Assessment and Management Centre, The Australian National University.

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.

Selected Student Theses

B. Fu (2005) 'Nutrient Sources and Transport under Different Land Uses: Case Study on the Upper Mogendoura Creek Subcatchment, Moruya River, NSW' (Masters thesis).

W.S. Ng (2004) 'Catchment-Scale Management of Pollutant Delivery to Coastal Lakes' (Honours thesis).

E. Hendy, V. Henley and A. Thomas (2004) 'Development of an Improved Integrated Catchment Model, and Application to Cox Creek, South Australia' (Honours thesis).

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

Phone: +61 (0)2 6125 6751
E-mail: John.Norton@anu.edu.au

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 1979-2004. 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 sensitivity assessment of simulation models for environmental applications and application of ideas from control engineering to environmental problems. 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 140 or so publications include An Introduction to Identification, Academic Press, 1986. 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

J. P. Norton and J. G. Chanat (2005), Linear time-varying models to investigate complex distributed dynamics: a rainfall-runoff example, *Maths.* & *Computers in Simulation* 69, 1-2,123-134.

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.

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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

Postdoctoral Fellow, iCAM

Phone: +61 2 6125 6751
E-mail: Jenifer.Ticehurst@anu.edu.au

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. My employers included CSIRO (Division of Environmental Mechanics), NSW Agriculture and CSIRO (Division of Plant Industry) and the research covered treating sewerage waste water in the Griffith region of NSW by crop irrigation, sustainability of various grazing systems in the central tablelands and wheat and rice breeding in southern New South Wales.

I completed my PhD in conjunction with CSIRO (Division of Land and Water) and CRES (Australian National University) in 2004. The project was an investigation of 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

Since completing my PhD I have been working at iCAM, initially on the groundwater modelling for the ACT, followed by my current research to develop a decision support tool to assist in assessing the sustainability of eight coastal lakes in NSW. This project uses Bayesian decision networks to integrate and identify trade-offs between ecological, social and economic values.

Selected Publications

Croke, B.F.W., Ticehurst, J.L., Letcher, R.A., Newham, L.H., Norton, J.P. and Jakeman, A.J. (2005). Integrated assessment of water resources: Australian experiences, WARM conference, Bonn Germany February 2005

Newham, L.H.T., Ticehurst, J.L., Rissik, D., Letcher, R.A., Jakeman, A.J. and Nelson, P. (2004), Assessing the sustainability of NSW coastal lakes using a Bayesian decision network approach, Proceedings of NSW Coastal Conference 2004, 63-69.

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.

Professor Peter C. Young

Adjunct Professor,
Data-Based Mechanistic (DBM) modelling; recursive methods of nonstationary and nonlinear time series analysis and forecasting with wide ranging applications in areas such as hydrology, climate modelling, volcanic science, engineering, business and economics; automatic control system design

Phone: 44+(0)1524 33558
E-mail: p.young@lancaster.ac.uk

Career Brief

Director, Centre for Research on Environmental Systems and Statistics, Emeritus Professor, University of Lancaster, U.K.

Peter Young obtained B.Tech. and M.Sc. degrees at Loughborough University before moving to Cambridge University, where he obtained his Doctoral degree in 1970. He is a Whitworth Fellow (Whit.F.), a Chartered Engineer (C.Eng.) and the member of a number of Engineering Institutions. Following two years as a civilian scientist, working for the U.S. Navy in California, he was appointed University Lecturer in Engineering and a Fellow of Clare Hall, Cambridge University, in 1970. As a result of his novel research on environmental modelling, he was then invited to become Professorial Fellow and Head of the Systems Group in the new Centre for Resource and Environmental Studies at the Australian National University in 1975. Finally, he moved back to U.K. in 1981, where he was Head of the Department of Environmental Science for seven years, during which time the Department grew from 17 to 25 members of staff and was graded at the highest level in the Earth Science Review. Subsequently, he became Associate Dean in the Institute of Environmental and Biological Sciences at Lancaster (now the Institute of Environmental and Natural Science) before becoming Director of the Centre for Research on Environmental Systems and Statistics. He is now Emeritus Professor at Lancaster but continues to work full-time on a number of research projects at The University, as well as on-going research projects with colleagues in Australia (ICAM and RMIT, Melbourne), France (University of Nancy) and Italy (Joint Research Centre of the EEC, Ispra and Politecnico di Milano, Italy). Peter is Consultant Editor of the International Journal of Control; Departmental Editor of the Journal of Forecasting; and Associate Editor, Environmental Modelling and Software. He is on a number of Working Groups of the International Federation of Automatic Control (IFAC).

Research, Teaching & Professional Activities

Peter Young is well known for his work on recursive estimation and automatic control system design. His most recent research has been concerned with data-based modelling, forecasting, signal processing and control for nonstationary and nonlinear stochastic systems. The applications of this methodological research are wide ranging, from the environment, through ecology and engineering to business and macro-economics. In ICAM, he has specific interests in rainfall-flow modelling and flood forecasting. Over his career, Peter Young has supervised a large number of successful Ph.D dissertations and he continues to advise research students at Lancaster, in association with colleagues there.

Selected Publications

Taylor, C. J., McKenna, P. G., Young, P. C., Chotai, A. and Mackinnon, M. (2004) Macroscopic traffic flow modelling and ramp metering control using Matlab/Simulink, *Environmental Modelling and Software*, 19, 975-988.

Young, P. C., Chotai, A. and Beven, K. J. (2004) Data –based mechanistic modelling and the simplification of environmental systems. In J. Wainright and M. Mulligan (Eds.), *Environmental Modelling*: *Finding Simplicity in Complexity*, J. Wiley: Chichester, 371-388.

Young, P.C. (2003) Top-down and data-based mechanistic modeling of rainfall-flow dynamics at the catchment scale. *Hydrological Processes*, 17, 2195-2217.

Romanowicz, R. and Young, P.C. (2003) Data assimilation and uncertainty analysis of environmental assessment problems – an application of stochastic transfer function and generalised uncertainty estimation techniques. *Reliability Engineering* & *System Safety*, 79, 161-174.

Young, P. C. (2002) Advances in real-time flood forecasting. *Philosophical Trans. Royal Society*, *Physical and Engineering Sciences*, 360, 1433-1450.

Young, P.C. and Parkinson, S.D. (2002) Simplicity out of complexity (Chapter 13 in M.B. Beck (ed.), *Environmental Foresight and Models*: *A Manifesto*, Elsevier: Oxford, 251-301) 2002.

Young, P. C., McKenna, P., Bruun, J, J. (2001). Identification of nonlinear stochastic systems by state dependent parameter estimation. *International Journal of Control*, 74, 1837-1857..

Young, P. C., & Pedregal, D. J. (2002). Statistical approaches to modelling and forecasting time series. In M. P. Clements & D. F. Hendry (Eds.), *Companion to Economic Forecasting*. Oxford: Blackwell.

Tych, W., Pedregal, D. J. , Young, P. C. and Davies, J. (2002) An unobserved component model for multi-rate forecasting of telephone call demand: the design of the forecasting support system, *Int. Journal of Forecasting*, 18, 673-695.

Young, P.C., Chotai, A., (2001) Data-based mechanistic modeling, forecasting and control, *IEEE Control Systems Magazine*, *Special Issue on Agriculture and the Environment*, 21, no.5, 14-27.

Young, P. C. (2001). Data-based mechanistic modelling and validation of rainfall-flow processes. In M. G. Anderson (Ed.), *Model Validation in Hydrological Science*. Chichester: J. Wiley, 117-161

Young, P. C. (2001). The identification and estimation of nonlinear stochastic systems. In A. I. Mees (Ed.), *Nonlinear Dynamics and Statistics*. Boston: Birkhauser, 127-166.

Taylor, C.J., Chotai, A. and Young P.C., (2000), State space control system design based on non-minimal state-variable feedback: Further generalisation and unification results, *International Journal of Control*, 73, 1329-1345.

Price, L., Bacon, M., Young, P. and Davies, W.J. (2001). High resolution analysis of tomato leaf elongation: the application of novel time-series analysis and techniques. *Journal of Experimental Botany*, 52, 1925-1932.

Fitzgerald, W. J., Smith, R. L., Walden, A. T. and Young, P. C. (2000) *Nonlinear and Nonstationary Signal processing*, Cambridge University Press: Cambridge.

Young, P. C. (2000). Stochastic, dynamic modelling and signal processing: Time variable and state dependent parameter estimation. In W. J. Fitzgerald, A. Walden, R. Smith, & P. C. Young (Eds.), *Nonstationary and Nonlinear Signal Processing*. Cambridge: Cambridge University Press, 74-114.

Young, P.C., Price, L. E., ., Berckmans, D., & Janssens, K. (2000) Recent developments in the modelling of imperfectly mixed airspaces, *Computers and Electronics in Agriculture*, 26, 239-254.

Mr Ray Evans

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

E-mail: Ray.Evans@salientsolutions.com.au

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

Visiting Fellow iCAM
Integrated assessment, bioeconomic modelling, environmental economics and policy

Phone: +61 (0)2 6247 3493
E-mail: nhall@effect.net.au

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

Current 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.

Recent work includes:

Providing the socio-economic modelling input to a study of catchment salinity and land use in NSW. Thailand and Laos with the University of Technology, Sydney funded by Australian Centre for International Agricultural Research (ACIAR). This study involves soil and water management in the Mekong and Murray-Darling basins.

Providing economic analysis for CRC for Water Quality and Treatment, Centre for Appropriate Technology Inc, to carry out on their Mabunji rainwater management project to provide drinking water for aboriginal housing in the Gulf of Carpentaria

Providing the socio-economic modelling for the National Centre for Development Studies (ANU) for a Fiji Sugar project funded by ACIAR

Managing the economic analysis and modelling for the iCAM TARGET project for control of salinity in New South Wales.

Selected Publications

Hall, N., Yongvanit, S., Lertsirivorakul, R., Last, R., Yuvaniyama, A., Anuluxtipun, Y., Milne-Home, W. and Greiner, R., (2004) 'Changing land use to manage salinity in northeast Thailand', 7th International Khon Kaen University-SEAGA Geography Conference, Khon Kaen, Thailand,

Hall, N., Oliver, M., Jakeman, T., Nicholson, A. and Watson. B. (2004). Land Use change for Salinity Management: A Participatory Model. In Proceedings of the International Environmental Modelling and Software Society Conference (iEMSs2004), Osnabrueck.

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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.

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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, The Australian National University, Canberra.

Dr David Post

Visiting Fellow, iCAM
Hydrology, water quality

Phone: +61 (07) 4753-8605
E-mail: David.Post@csiro.au

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. 2005. A new method for estimating flow duration curves: an application to the Burdekin River Catchment, North Queensland, Australia. *IEMSs 2005 Proceedings of the International Environmental Modelling and Software Society*, Osnabruck, Germany, 14-17 June, 2005, International Environmental Modelling and Software Society.

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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.

iCAM Administrative Staff

Ms Susan Cuddy

iCAM Projects Manager

Phone: +61 (0)2 6125 3568
E-mail: Susan.Cuddy@anu.edu.au

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.

Selected Publications

http://www.clw.csiro.au/staff/CuddyS/publications.html

Ms Susan Kelo

iCAM Administrator

Phone: +61 (0)2 6125 0652
E-mail: Susan.Kelo@anu.edu.au

Career Brief

I have been working for the Australian National University for 13 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

Phone: +61 (0) 2 6125 6749
E-mail: Amanda.Letcher@anu.edu.au

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

Phone: +61 (0)2 6125 6749
E-mail: Ambrose.Andrews@anu.edu.au

Career Brief

Casual research assistant at the Integrated Catchment Assessment and Management Centre. Mostly do software development and maintenance. Some server maintenance. Currently mostly developing decision support systems, especially ICMS plugin interfaces.

Mr Felix Andrews

Research Assistant, iCAM

Phone: +61 (02) 6125 4670
E-mail: Felix.Andrews@anu.edu.au

Career Brief

Coder. Honours student. Interests include hydro-ecology and data analysis.

Mr Michael Kehoe

Research Assistant, Honours Student, iCAM

Phone: +61 (02) 61256470
E-mail: Michael.Kehoe@anu.edu.au

Career Brief

Undergraduate Honours in Mathematics. Research Assistant with iCAM.

Philip Alcorn

PhD Scholar

Crown and canopy dynamics in subtropical eucalypt plantations

E-mail: Philip.Alcorn@anu.edu.au

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* 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.

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

E-mail: Glen.Bann@anu.edu.au

Research Description

Dryland salinity and the loss of biodiversity are among the most severe environmental challenges facing Australia. Yet there is surprisingly little research investigating the interaction of these two phenomenon, particularly regarding terrestrial species.

My research will investigate the interaction between dryland salinity, regolith and terrestrial biodiversity in yellow box & red gum woodlands, using a number of survey methods. These methods will employ both biological and geophysical techniques to identify trends, thresholds and relationships. The methods will then be quantified and integrated into an efficient survey and monitoring technique that can be applied to eastern Australian sites currently affected by salinisation. This information will be useful for targeting priority areas for revegetation and remnant retention activities, using perennial vegetation and farm forestry initiatives.

Liliana Baskorowati

PhD Scholar

Reproductive Biology of *Melaleuca alternifolia* and Implications for Breeding

E-mail: Liliana.Baskorowati@anu.edu.au

Research Description

Melaleuca alternifolia (Maiden & Betche) Cheel is the principal commercial source of Australian tea tree oil. *M. alternifolia* occurs in three main chemical varieties (chemotypes); rich in either 1,8-cineole, terpinolene or terpinen-4-ol. The latter is the variety that has undergone most commercial development.

For many producers today, the production costs are higher than their income from tea tree oil sales. Hence, the importance of breeding for increased yields and higher oil qualities to improve production efficiencies and marketability of the oil.

A breeding program to improve the yield and quantity of foliar oils from plantations of *Melaleuca alternifolia* in Australian commenced in 1993.

This study is aimed at defining the key features of the reproductive biology of this species to underpin the development of an efficient breeding strategy for *M. alternifolia* that relies on both open and controlled pollination.

This study commenced in 2004 with the following objectives:

(a) documenting floral morphology and patterns of floral development;

(b) determining the breeding system, including the common pollinators;

(c) testing ways of increasing the efficiency of controlled pollination;

(d) studying potential developing hybrid with closely related species such as *M. dissitiflora* and *M. linariifolia*

This project is being supported by CSIRO Forestry and Forest Product and ANU. I have been involved with an ACIAR collaboration between CSIRO and CFBTI (Centre for Forest Biotechnology and Tree Improvement, Indonesia) in breeding *Melaleuca cajuputi* subsp *cajuputi* in Indonesia. Fundamentally, the knowledge from breeding *M. alternifolia* can be used in breeding *M. cajuputi* subsp *cajuputi* in Indonesia.

Lara Boyd

PhD Scholar

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

E-mail: Lara.Boyd@anu.edu.au

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

E-mail: Matthew.Brookhouse@anu.edu.au

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.

Melissa Burgess

PhD Scholar

A spatio-temporal analysis of what makes people afraid of crime

E-mail: u4020475@anu.edu.au

Research Description

Regardless of whether crime is present, people avoid areas where they feel afraid of becoming a victim of crime. With the widespread adoption of this behavioural response, fear of crime has emerged as a distinct phenomenon that can cause numerous problems for both the individual and community. Research into fear of crime, particularly the geography of peoples' avoidance patterns, has the potential to provide information that could be used to reduce the public's fear of crime and curb the negative consequences that result from this phenomenon. For example, it can allow police and government resources to be targeted at critical areas and those environmental cues that trigger people to feel afraid.

This research provides a spatio-temporal investigation into the avoidance

patterns adopted by people who fear being robbed, beaten or attacked in Kings Cross, NSW.

GIS is used to produce a series of three-dimensional fear maps that represent the number and proportion of survey respondents avoiding areas, and how hard they try to avoid those areas. Specifically, the study will investigate the significant environmental cues that trigger people to feel afraid in certain fear hotspots (areas that a high proportion of respondents avoid). A number of social environmental cues will be mapped, including the presence of 'junkies', spruikers, homeless people, intoxicated persons, prostitutes, gangs, loitering people and the absence of pedestrians. Physical environmental cues will also be mapped, including the occurrence of poor street lighting and vandalism, the presence of rubbish or syringes, rundown or abandoned buildings, offensive or degraded shops, areas to hide, blocked escape and laneways. The surveying of respondents is completed. Further data collection may occur if I chose to compare those areas the respondents identified as containing these environmental cues with the actual occurrence of these cues in the field. Through this study I hope to build upon the ties between geography and criminology and present my findings in a practical manner for use by the community, governments and the police.

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

E-mail: Nicolette.Burford@anu.edu.au

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

E-mail: Paul.Carlile@anu.edu.au

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

E-mail: David.Carpenter@anu.edu.au

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.

Kylie Carman-Brown

PhD Scholar

Environmental and Regulatory History of Selected Ramsar Wetlands in Victoria and Western Australia

E-mail: u4203042@anu.edu.au

Research Description

This topic seeks to explore the history of four Ramsar wetlands from the perspectives of social history, historic and current regulatory and management frameworks and wetland ecology. In particular it will examine how effective the international listing of RAMSAR has been in protecting the identified internationally significant values of each site. Victoria and Western Australia have been chosen as case studies because of comparability in climate and the very great differences between the planning and environmental protection systems.

The history of the wetlands will be outlined in order to give long term social and economic context to the scientific analysis of the current health of the wetlands, and explanation of the threats and pressures which currently exist.

The current state of the wetlands will then guide the analysis of the regulatory tools currently in place to preserve the wetlands values. This will involve an assessment of how the international treaty process to protect the wetlands has been translated into two very different jurisdictions.

The information generated from the historical research, the scientific information on wetland health and the regulatory issues will be combined to produce an analysis of weaknesses in each respective jurisdiction. Recommendations to address these weaknesses will be developed.

Andrew Deane

Master of Philosophy Scholar

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

E-mail: andrewde@sf.nsw.gov.au

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.

Peter Dostine

PhD Scholar

Ecology and management of the Flock Bronzewing *Phaps histrionica*

E-mail: Peter.Dostine@nt.gov.au

Research Description

The Flock Bronzewing is a characteristic bird of the open black-soil plains of northern Australia. This species has suffered a substantial reduction in range and is now absent from large areas that were formerly occupied. However, it remains patchily and periodically common on the Barkly Tableland in the Northern Territory and parts of the Channel Country in south-west Queensland. Currently, the level of ecological understanding of this species is not sufficient to prescribe adequate conservation measures. Key data on resource use, movement patterns and interactions with the dominant land use on the black-soil plains (cattle production) are lacking. This project will redress this deficiency and provide data on distribution, diet, habitat requirements, and movement patterns in relation to variation in resource availability that will serve to derive conservation measures for this and other species with similar dispersal ecologies. The key component will be description of movement patterns at local- and broad-scales. Studies of local-scale movement will identify how they use landscapes currently dominated by the pastoral industry: studying the nature and extent of broad-scale movement will identify the sequence of habitats and resources that are required throughout the seasonal cycle, and the nature of linkages within the broad landscape that are required for maintenance of populations of this species.

Steve Douglas

PhD Scholar

Exploring the scope for interaction between the nominally secular environmental movement and the emergent phenomenon of mainstream Christian environmentalism in Australia

E-mail: Steve.Douglas@anu.edu.au

Research Description

The thesis documents the 'greening' of mainstream religion (the three largest Christian denominations) in Australia based on Internet searches for relevant policy and praxis, supported by other forms of data gathering. It examines the extent and nature of interactions between mainstream Christian environmentalism and the broader environmental movement and seeks to explore how these groups might interact when brought together in a guided but non-directed workshop. Participants are empowered to discover their own common ground and make their own decisions as to how to act on it if at all. The technique employed is a recognised form of experiential learning. As a minimum, the workshop is intended to involve representatives from the peak environmental groups and their Christian equivalents. The focus is on institutional interactions.

A small number of prospective case studies are being investigated and include tracking the progress of a proposal that the denominations act to formally conserve significant natural heritage values on their estate.

The research is situated in the international literature related to the 'greening' of religion, and an emergent literature that discusses the increasingly positive interaction of religious and nominally secular environmental interests.

John Drewry

PhD Scholar

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

E-mail: John.Drewry@anu.edu.au

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 for stakeholder use. While working with Lachlan Newham, Richard Greene, Tony Jakeman, and Barry Croke, my research will focus on these catchment issues in the Moruya and Tuross coastal catchments in the Eurobodalla Shire, NSW.

To assess nutrient and sediment loads and enable management of sustainable practices within these catchments, the integrated catchment model (CatchMODS) is linked with a field data programme. A water quality sampling programme has been designed to help assess loads on an event basis. Simple rising-stage siphon samplers are being used to sample suspended sediment, total and dissolved nutrient loads, also on an event basis, at selected sites in the existing river flow gauge network.

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 researched the effects of sheep, deer and dairy cattle treading on soil in terms of physical properties, pastoral responses to soil compaction, natural soil recovery, sustainable soil physical farm management practices, effects of wintering cattle on *Brassica* forage crops on soil physical properties and nitrous oxide emissions, and agricultural related environmental issues.

Selected Publications

Drewry, J. J.; Paton, R. J. 2005: Soil physical quality under cattle grazing of a winter-fed brassica crop. *Australian Journal of Soil Research 43*: (in press).

Drewry, J. J.; Paton, R. J.; Monaghan, R. M. 2004: Soil compaction and recovery cycle on a Southland dairy farm: implications for soil monitoring. *Australian Journal of Soil Research 42*: 851–856.

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Rory Eames

PhD Scholar

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

E-mail: Rory.Eames@anu.edu.au

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 strategic local landscapes on behalf of Australian Society

E-mail: David.Eastburn@anu.edu.au

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 or inappropriate prescriptions.

The research will examine the 'politics' of sustaining landscapes, and the values that different groups within society ascribe to different landscapes at different times (with special reference to wetlands). In particular, it will investigate current and historical policies relating to river regulation which impact/ed on the sustainability of landscapes. The 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, intergenerational equity, 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

E-mail: Saan.Ecker@anu.edu.au

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

E-mail: Susan.Emmett@anu.edu.au

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

E-mail: Houshang.Farabi@anu.edu.au

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.

[This thesis is currently under examination]

Sue Feary

PhD Scholar

The Role of Forestry in achieving Equality for Indigenous Australians

E-mail: Sue.Feary@anu.edu.au

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

E-mail: Karen.Fisher@anu.edu.au

Research Description

My PhD research is a critical examination of development, and seeks to tease out the links between development theory and water policy in the Philippines. I consider the influence of trends in international development and resource management on water governance in the Philippines as well as national mandates and objectives for development, sub-national implementation and the lived experiences of household consumers. I concentrate on municipal water for domestic household consumption, in particular, water that is provided via a reticulated network operated by waterworks utilities. Notions of ownership, rights and responsibilities as they are attached to common pool resources are scrutinised by way of a literature review on property and institutions in resource management and water resource management. Additionally, water as a commodity and commodification of water is also considered.

The field research was conducted in 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.

Baihua Fu

PhD Scholar

Using fingerprints to trace the sources of suspended sediments in coastal catchments

E-mail: Baihua.Fu@anu.edu.au

Research Description

It is increasingly recognised that information on the provenance of fluvial suspended sediment is essential to assist the design and implementation of catchment management strategies. Sediment fingerprinting technique is one approach to assembling such information, given that 1) potential sources can be distinguished by different geochemistry properties and 2) by comparing the properties in source and mixed samples, the importance of potential sources can be determined. This technique is appropriate for tracing sources of sediment over a range of spatio-temporal scales, while avoiding many constraints associated with direct field surveying. Despite the advantages of sediment fingerprinting, there are several uncertainties and problems associated with fingerprinting: generic guidelines are not available to predict the most suitable fingerprints under different environments; some assumptions need to be further tested; the transformation of tracer properties during sediment delivery may be a potential problem; the uncertainty of mixing models needs to be examined.

This research aims at improving sediment fingerprinting technique, and thus developing further understanding of sediment provenance under different geomorphic environments in Australia (e.g. Moruya and Burdekin catchments), by testing a number of sediment fingerprints and mixing models. Fingerprint properties such as geochemistry, mineralogy, mineral magnetism and environmental radionuclides may be used in the project. The project also aims at linking the fingerprinting approach to numerous catchment management scenarios. The results of the project can also be used to test sediment models such as CatchMODS and SedNet.

Nicholas Gellie

MPhil Scholar

Landscape Susceptibility to Severe Drought, Fire, and Storm

E-mail: Nicholas.Gellie@anu.edu.au

Research Description

Historical susceptibility of landscapes to drought, fire, and storm, has not been studied extensively in Australia. We need to learn more about the incidence and severity of droughts, severe fire weather, and storm patterns of fire-prone landscapes and their potential coincidence in the last 100 years. Is there a regular or irregular pattern to the occurrence of these factors? Also little is known about the likely relationships between these factors in exposing landscapes to severe fires and storms and their post-fire impact on soil erosion, water quality, and post-fire recovery of vegetation. Hence what is the probability of a forested landscape being exposed to one or more of these factors over time?

The aim of my thesis is investigate the patterns of seasonal weather, using a drought index, and daily records of weather, to estimate the potential frequencies and durations of historically severe landscape events in the last 100 years. The seasonal component of landscape susceptibility will be estimated using a soil dryness index model to monitor the daily dryness of soils over a 100 year period. I intend to use time series analysis of soil dryness in catchments with different cover types, such as dry sclerophyll forest, wet sclerophyll forest, plantation, and grassland. The catchments lie within part of the central and northern parts of the Snowy Mountains and Brindabella ranges.

The soil dryness index is embedded within a water balance model of each catchment. Therefore the individual components of the water balance model will be validated using weather and stream flow records. The components of the water balance model to be validated are precipitation, canopy Interception, run-off, and evapo-transpiration.

After completion of the validation work of the soil dryness index in each of the catchments, data of daily fire weather, storm events, and rainfall intensity, will be superimposed on the soil dryness data to build a picture a picture of coincidence of droughts, lightning storms, severe fire weather, and post-fire storms in the Snowy Mountains. Historical research of weather patterns in particular years and months may reveal the incidence of events that have occurred historically, records of which have been buried through time.

A broad picture in spatial and temporal terms will be built of landscape susceptibility to severe events, using the likely coincidence of these factors in my study areas. This interpretation should provide land managers with a historical perspective as a well as a projective view of an impending risk period. In simple terms, what warning signs can be read from the seasonal and daily patterns of weather before a severe landscape event happens.

Martin Golman

PhD Scholar

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

E-mail: Martin.Golman@anu.edu.au

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

Deliberating With Leviathan: Addressing Complex Ecological Problems in the Administrative State

E-mail: Simon.Gordon@anu.edu.au

Research Description

Deliberative democracy is at a crossroads. Heralded for its theoretical potential to both enhance democratic legitimacy and lead to more 'ecologically rational' policy processes, deliberative democracy has yet to consistently deliver on these claims in practice. In this study, I argue that this is largely due to a failure to reconcile tensions between the conditions required for deliberative democracy and the competing practices and imperatives of the administrative state.

As the ability of deliberative procedures to enhance both democratic legitimacy and the 'ecological rationality' of the policy process is contingent upon them being able to influence policy outcomes, it would seem that addressing their failure to do so would stand as an urgent project. Yet, to date, efforts to address the issue of impact have been inadequate. The empirical literature, while full of instances where deliberative procedures have failed to have a significant influence on policy outcomes, has generally ignored this crucial issue. The theoretical literature is equally culpable.

In this study, a possible path to reconciliation between the aforementioned tensions is suggested. In particular, a deliberative procedure, based loosely on the inter-departmental committee model, but with the inclusion of representatives from the public and technical spheres is developed. The practical potential for this type of model to improve both the democratic legitimacy and efficacy of policy decisions is examined in the context of a real-world case study. The case in question is a joint government-citizen working group, the Swan-Canning Cleanup Program Taskforce which, was established to address the highly complex ecological problem of algal blooms in the Swan-Canning river system in Perth, Western Australia.

Quintin Gravatt

PhD Scholar

Phosphorus management in potato soils

E-mail: Quintin.Gravatt@anu.edu.au

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.

Sarah Hemmingsen

PhD Scholar

Indigenous traditional resource management: An Australia and New Zealand Comparison

E-mail: Sarah.Hemmingsen@anu.edu.au

Research Description

For Indigenous peoples, land is an integral part of their spirituality, culture and society. However, the existence of different cultural and environmental attitudes between Indigenous peoples and colonists, led colonisers to consider indigenous peoples to be inferior or lesser races, as they did not use the land in ways the colonists considered agriculturally productive. Over the past few decades, ex-settler countries have begun to create an identity for themselves not granted in terms of the colonial power. This has eventually led to the recognition of issues important to Indigenous peoples within these ex-settler countries and has thrown open many complex issues. The most significant issues are resource sovereignty and the impact of colonisation on indigenous relationships with the environment.

However, while non-indigenous populations are beginning to realise the value of indigenous resource management, the ability of Indigenous peoples to carry out appropriate management methods is often restricted or not recognised. In coastal areas, colonisation was a major obstacle for indigenous ownership, use and management, as coastal areas in all

colonies were viewed as *mare nullius*, a homogeneous water column to be managed as public 'commons'. This framework poses many difficult dilemmas for Indigenous peoples as they face insecurity in their aspirations to control their marine territories and associated resources using traditional management methods and as a result of the general public's perception of their right to access coastal environments.

This research aims to undertake a comparative study between Australia and New Zealand, to investigate the continuing impact of colonisation on indigenous management of coastal environments. Although the experiences of colonialism in both countries was different, with Australian colonists declaring the land *terra nullius*, while in New Zealand, the Treaty of Waitangi was signed with the British Crown renouncing elements of Maori sovereignty. Thus alienation from land and resources was experienced by both Aboriginal and Maori communities. Understanding how colonialism has impacted on environmental relationships in the past and continues to influence the ability of Aboriginal and Maori communities to participate in coastal management today is an important part of redress.

Cameron Holley

PhD Scholar

Governance, the environment and mobilizing local knowledge and capacity

E-mail: u4152043@anu.edu.au

Research Description

In the last three decades the regulation of the environment has shifted from a top-down state-delivered activity to one in which a variety of actors, including public, private and community entities, is required to coordinate their knowledge and capacity. As a part of this process, governmental policy and regulatory initiatives have increasingly relied on notions of 'active citizenship' and 'community' to mobilise the knowledge and capacity of local actors to achieve environmental regulatory goals. Nevertheless, much remains to be done to understand the particularities of what processes and approaches have actually been effective in these ongoing attempts to mobilise local knowledge and capacity to achieve regulatory goals at a local level.

Accordingly, the aim of this research is to analyse the different ways in which community resources have been mobilised to both shape and audit environmental regulatory outcomes. The project also aims to significantly contribute to current theory and practice regarding how best to design the coordination of environmental regulatory resources at a local level so as to achieve environment regulatory goals.

To realize these aims I intend to conduct a comparative case study analysis across three different environmental regulatory initiatives, each of which exhibits different perspectives of the phenomenon of mobilising local knowledge and capacity in environmental regulation. The following three contemporary Victorian initiatives were selected to incorporate a spectrum of approaches that encompassed different stakeholder and environmental contexts, as well as different means of utilising community resources to shape and audit environmental regulatory outcomes:

Environmental Improvement Programs: focus on point source pollution and involve a single large industry or organisation, a community group and governmental representatives;

Neighbourhood Environmental Improvement Programs: focus on a defined geographical area (normally comparative to a local government boundary) encompassing multiple, diffuse environmental problems, and involving an array of stakeholders such as community groups and small and medium enterprises;

Catchment Management Initiatives: focus on multiple, diffuse environmental problems in mostly rural settings that cover the large geographical area of a catchment and involve multiple stakeholders such as farmers, townspeople and business.

I am currently working with the Environmental Protection Agency in Victoria to secure the necessary links with stakeholders in the above initiatives in order to commence the fieldwork component of the project later this year.

Diana James

PhD Scholar

Indigenous Kinship With Country: the cross-cultural performance space of tourism on Indigenous lands

E-mail: Diana.James@anu.edu.au

Research Description

My research aim is to explore the convergence of Western and Indigenous explicit and implicit principles of cultural and natural resource management (CNRM) in the practice of tourism on Indigenous Lands. The specific case study to be explored in depth is Desert Tracks, the first Indigenous owned tourism venture on the Pitjantjatjara Lands of Central Australia. This research will analyze the processes, practices and principles developed in this cross-cultural performance space of tourism between the Anangu and western directors, managers, guides and tourists over the period of 1988- 2004. The expected outcome of this research is a bi-cultural model for cultural and natural resource management of tourism on Anangu Lands that will have relevance for other cross-cultural businesses on Indigenous Lands.

Stuart Johnston

PhD Scholar

Soil characteristics and processes critical to the sustainability of alpine grasslands

E-mail: Stuart.Johnston@tg.nsw.gov.au

Research Description

Mhe 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.

Bandara Kangane

PhD Scholar

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

E-mail: Bandara.Kangane@anu.edu.au

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).

Stefan Kaufman

PhD Scholar

The role of reflexivity in intentionally achieving social change for sustainability: Social Learning and Social Marketing compared

E-mail: Stefan.Kaufman@anu.edu.au

Research Description

My thesis will focus on environmental social change interventions. Specifically, the study examines how two intervention methodologies, 'social marketing' and 'social learning', respond to the issues raised by reflexivity. These are approaches used for changing individual, organisational and community behaviour. The reflexivity of change agents and key stakeholders involved in the intervention is held to be dependent on the methodology used.

Literally, reflexivity is the action of something back upon itself. In social research methodology for instance, reflexive research methods recognise and attempt to account for the impact of the researcher on data generation and interpretation (e.g. Alvesson and Skoldberg 2000). The concept of reflexivity has had widespread impact across disciplines; e.g. social theory after Giddens and Beck, research methodology following Gouldner, and in organisational change management as explored in triple-loop learning by Argyris. Considered across these research domains, it has considerable salience for understanding interventions for intentional social change. This is because reflexivity highlights the issue of people's awareness their own participation in their surroundings for their learning. The concept promises insight into situations where personal experience and potentially incommensurate types of knowledge (specialist, bureaucratic, community) must be integrated to motivate and achieve change i.e. most sustainability problems (after Brown 2000, 2004).

Social learning is when a network of people learn something they didn't know before, and change their activities as a result. The approach facilitates the people involved building a reflexive awareness of their own learning. This is recognised as a critical step towards gaining their active participation in defining and managing the change process. Overall, it has the potential to harmonise the activities of diverse and even conflicting actors commonly engaged in a given situation. It is theoretically explored in relation to Latour's concept of 'meta-reflexivity'- an open ended attempt to continually account for the knower.

Social marketing is selling people something (a product, activities or idea) that they didn't realise they needed, in order to change their behaviour. This approach to social change similarly involves influencing the reflexive understanding of the people whose behaviour is to be changed, through carefully structured engagement, directed and run by the 'marketeer'. Here the people involved are not the drivers of the design or management of the change process. It has the potential to gain the voluntary engagement of unmotivated people in changing their behaviour. It is theoretically explored in relation to Latour's concept of infra-reflexivity – a carefully constructed attempt to provide a plausible account of reality to the 'reader'.

My research with practitioners and change agents so far, although limited, indicate that current focusing exclusively on social learning or social marketing is insufficient for major and sustained change. This appears to be because, individually, they fail to facilitate strategic shifts between infra- and meta- reflexive learning. Not everyone can or wants to be involved intensively in consciously managing their surroundings, as is implied in social learning, particularly when there are high levels of scientific uncertainty or expert knowledge is required. Conversely, externally manipulating others, as in social marketing campaigns, is neither always desirable nor appropriate to achieving change, particularly in complex and contested areas of human activity, yet social marketing interventions frequently do this. Intervention approaches that are able to negotiate the two extremes offer considerable promise for facilitating intentional and sustained social change for sustainability.

On the social theoretical and systems thinking level, the use of reflexivity by theorists such as Giddens and Beck (reflexive modernisation) offers important insights into how socio-cultural systems reproduce themselves. 'Biohistory' perspectives (e.g. Boyden, Diamond), amongst others (Gunderson & Holling), suggest that socio-cultural reproduction and environmental impact are tightly coupled. In this context, linking concepts on reflexivity at the interpersonal and intervention scale with the broader goal of widespread systemic change for sustainability should suggest how isolated instances of innovative projects can lead to widespread and self-sustaining social change.

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Dana Kelly

PhD Scholar

The role of power in community participation programs for rangeland management

E-mail: Dana.Kelly@anu.edu.au

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.

[This thesis is currently under examination]

Ernst Kemmerer

PhD Scholar

Optimal thinning sequences for solidwood production in eucalypt stands

E-mail: Ernst.Kemmerer@anu.edu.au

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.

Adam Leavesley

PhD Scholar

The response of birds to the fire regimes of central Australian mulga woodlands

E-mail: Adam.Leavesley@anu.edu.au

Research Description

Within the arid zone, mulga (*Acacia aneura*) supports a rich bird fauna. Mulga grows in large continuous stands and in patches that are interspersed with other plant communities in an intergrove pattern. Fire-prone spinifex (*Triodia* spp.) hummock grasslands are thought to influence the distribution of mulga which can be killed by fires which scorch the canopy – i.e. of moderate intensity or greater. Little is known about the way birds respond to the spatial distribution of mulga in the landscape, or the fire-regimes associated with mulga.

Unreplicated evidence from a study of the birds of Uluru - Kata Tjuta N.P. suggests that fire influences the species composition, richness and abundance of birds in mulga. I intend to formally demonstrate how the common mulga species respond to the fire regimes of mulga woodland.

Alex Lee

PhD Scholar

Using airborne scanning LiDAR to measure carbon in Australian vegetation

E-mail: Alex.Lee@anu.edu.au

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

Metal mobility in soils with respect to organic acids and microbial activity in the rhizosphere of mature forest trees

E-mail: David.Little@anu.edu.au

Research Description

As soil and regolith geoscientists we observe patterns in nature at a variety of scales, from global scales right down to individual mineral grains and micro-organisms. Soils and regolith are particularly interesting because of commonly observed emergent patterns that develop over time in response to climate, geology, topography and biological activity. Traditionally, plant-soil interrelationships have been over simplified, few studies have examined the impact of trees on soils in the rhizosphere, and in some cases the rhizosphere is even ignored.

My PhD research examines the influence of the combined activities associated with nutrient uptake, anion exudation, and enzyme secretion by plant roots and their associated micro-flora on metal mobility and mineral weathering in an Australian forest soil. This is being undertaken using detailed chemical, mineralogical and microbiological investigations in bulk soils and rhizosphere under co-occurring eucalypts and acacias in a dry sclerophyll forest at Mulloon Creek, Bungendore (NSW).

This research contributes to the scientific knowledge-base regarding the root-soil interface and has implications for:

- Understanding biological weathering, biogeochemical cycling in Australian forest soils.
- Understanding landscape function, aiding vegetation rehabilitation and bioremediation strategies on degraded or contaminated lands.
- Geochemical exploration, by providing information on how metals move through the rhizosphere to the root, and then how these elements are expressed in the above ground biomass.

Kirsten Maclean

PhD Scholar

Between Spaces - Negotiating Environmental Knowledges at the Environment and Development Interface, Australia

E-mail: Kirsten.Maclean@anu.edu.au

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 involved in environmental management in Australia. I use two case studies - one in Central Victoria and the other in Central Australia as a basis for this investigation. The case studies act as points of access into the localised knowledge networks surrounding environmental management in Australia.

The research methodology takes a 'participatory learning and action' approach. This involves compiling ethnographies of the projects, conducting semi-structured interviews with interested 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.

Chris McElhinny

PhD Scholar

Forest and woodland structure as an index of biodiversity

E-mail: Chris.McElhinny@anu.edu.au

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.

[This thesis is currently under examination]

Angela Newey

PhD Scholar

Organic Matter Decomposition as a Function of Depth in the Soil Profile

E-mail: Angela.Newey@anu.edu.au

Research Description

Moil 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

E-mail: Kate.Park@anu.edu.au

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

E-mail: Daju.Resosudarmo@anu.edu.au

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

E-mail: Jacqueline.Russell@anu.edu.au

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

E-mail: Jacki.Schirmer@anu.edu.au

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

E-mail: Karim.Sabet@anu.edu.au

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.

Birte Schöttker

PhD Scholar

Remote Sensing in Coastal Catchments to Support Water Quality Modelling

E-mail: Birte.Schoettker@anu.edu.au

Research Description

At the end of March 2005 I started with my PhD at ANU iCAM.

Water, is a vital resource critical to Australia's future. It plays a major role in sustainability and economic prosperity and requires smart use and management. Assessing and managing catchments as integrated systems will increasingly be a key for sustaining economic, social, cultural and environmental assets on all scales. This requires amongst others, understanding the processes operating within a catchment and the drivers of change – whether natural or human-induced.

This PhD-study will be imbedded in the framework of the project "Integrated Economic Valuation and Water Quality Modelling for Improving Management of Coastal Catchments" at iCAM, supervised mainly by Tony Jakeman and Lachlan Newham. The project's aims are to develop water quality models capable of simulating the influence of spatially explicit changes in land use and management throughout a catchment in the Eurobodalla region, NSW.

Remote sensing techniques offer extraordinary potential to address the lack of some spatial and temporal information needed to support the development of tools to assess the impacts of changes in land use and land management on water quality, especially, given the major developments in Earth observation during the last decade. Remote sensing has evolved to represent a true multi-scale sampling tool, in both spatial and temporal domains. I am highly interested in contributing, with the use of remotely-sensed data, to the development and improvement of the understanding, sustainable use and preservation of complex ecosystems. My research will contribute to models to predict water quality impacts under various and varying conditions of (the) environmental system. Techniques may

be tested in a second, different kind of coastal catchment in Queensland and the findings of these regional studies could be transferred to e.g. neighbouring catchments.

The experiences I could gather prior to joining the PhD-program at the ANU should be of appreciable use. I finished my studies with the Diploma (Master) in Geography, supplementary subjects Communicational Science and Soil Science, at the University of Bonn, Germany in the Remote Sensing Research Group on "Recording Land Cover and Derivation of Vegetation Changes Using Multi-temporal LANDSAT Data in West Africa (Benin)". Afterwards I enjoyed working at the Centre of Remote Sensing on Land Applications (ZFL), Bonn, Germany on mapping land use changes in the state of North-Rhine-Westphalia with satellite images. When I arrived in Australia at the end of 2003 there was the great opportunity to work as Technical Officer at the Earth Observation Centre (EOC), CSIRO Atmospheric Research and to be involved in the Great Barrier Reef Program node in the Water for Healthy Country Flagship Program.

Sunil K. Sharma

PhD Scholar

A comparison of combinatory methods and GIS based multi-objective land use assessment and allocation

E-mail: Sunil.Sharma@anu.edu.au

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, the growing demand for land to fulfil the development needs of 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, and GIS-based techniques to a hypothetical multi-objective land use assessment and allocation (MOLAA) problem and compare their performance and applicability.

Catherine Simpson

PhD Scholar

The estimation and prediction of dry sclerophyll forest condition on the Southern Tablelands, NSW using spatial data

E-mail: Catherine.Simpson@anu.edu.au

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

E-mail: Sanjeev.Srivastava@anu.edu.au

Research Description

The natural history collections (NHC) across the world hold a huge repository of species occurrence information that can be used for predicting species' distribution. With the setting up of the Global Biodiversity Information Facility by the Working Group on Biological Informatics of the Organisation for Economic Cooperation and Development (OECD), increasingly more NHC data have become digitised and available online. Since the NHC data is not collected through well-designed sampling, such data can only be considered as presence-only data. Prediction from presence-only data is often erroneous when subjected to conventional statistical modelling. For modelling of such data, niche-based techniques are proposed that can use presence-only data. These enable modelling of species' distributions in geo-space, based on the environmental characteristics of known occurrence sites. My PhD study is conducted in the Murray-Darling Basin (MDB) of Australia, one of Australia's most important river basins and occupying an area of 1 million square kilometres, to see how well the distribution of selected fish species can be predicted at this scale using such data.

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 Centre 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. Proceedings of the Second International Symposium on GIS/Spatial Analysis in Fishery and Aquatic Sciences, 3-6 September, 2002, University of Sussex, Brighton, U.K. Nishida, T., Kailola, P.J., Hollingworth, C.E. (Editors): *447-464*

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

Living with risk: the case of tropical cyclone prone communities in Darwin, Australia

E-mail: Geraldine.Teakle@anu.edu.au

Research Description

Resilient human populations have the ability to live with, and adapt to the Earth's variable and uncertain – if not *risky* – environment. However, despite our ability to calculate, assess and *manage risk* associated with future impacts of extreme environmental phenomena, the world trend in disaster-related loss of life continues to increase. To better understand the way people live with, and adapt to risk associated with extreme environmental phenomena, 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. An investigation into the risk perceptions of the general community and the 'experts' in both the government and the private sector, will help to reveal socio-cultural and the technico-scientific risk perspectives emergent in the case study. I hope that this 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. The ultimate goal is to enhance the resilience of communities exposed to extreme environmental phenomena.

Kylie Theakston

PhD Scholar

The Value of Innovation in Business: Regulating Small to Medium-Sized Enterprises (SMEs) to Achieve Real Outcomes for Ecologically Sustainable Development (ESD)

E-mail: Kylie.Theakston@anu.edu.au

Research Description

Ecologically sustainable development (ESD) is an explicit objective for environmental regulators in Australia, at both the national and state levels, yet 'unsustainable business-as-usual' prevails as the status quo for both large and small to medium-sized enterprises. While Australian environmental regulators have achieved credible success since the 1970s, in terms of reducing point-source pollution for example, more substantial progress towards ESD has remained elusive.

Small to medium-sized enterprises (SMEs) present a particular challenge to environmental regulators in Australia. In contrast to larger enterprises, SMEs are more difficult to regulate as a consequence of their large numbers, lack of awareness and sophistication in dealing with environmental issues and wide dispersal. The combined environmental impact of SMEs, however, is said to possibly exceed that of the larger enterprises. So while SMEs present a major challenge to environmental regulators, at the same time there is an urgent need to address their poor environmental performance.

If regulators are to achieve substantial changes in the environmental behaviour of SMEs, it will be necessary to achieve 'internal change' within these enterprises themselves. This suggests accelerating the shift from command and control regulation to a more self-auditing and self-regulatory approach. At the same time, environmental regulation will need to encourage the environmental performance of SMEs to go beyond mere compliance and incremental improvements in order to achieve real outcomes for ESD. Many SMEs are unlikely to achieve the necessary shift without engaging in much more innovative approaches to environmental issues, but are unlikely to engage in such innovation without external encouragement, support and intervention.

The research will explore the value of innovation in relation to achieving real outcomes for ESD and mechanisms through which SMEs can be encouraged to engage in reflexivity and initiative, and strategies to achieve more 'embedded' change. What role does innovation play in improving the environmental performance of SMEs? What are the current motivations for, incentives to and capacity of SMEs to adopt and pursue innovation? How can environmental regulation encourage innovation within SMEs and lead to real outcomes for ESD?

Ha Thi Thu Tran

PhD Scholar

The impact of the renovation policies on sustainable forest management in the Northern Uplands region, Vietnam

E-mail: Tranthu.Ha@anu.edu.au

Research Description

In the late 1980s and early 1990s, the Vietnam Government shifted from a subsidised central economy to a market economy, and transferred land use rights from the state to other users through implementing "Renovation Policies" (*Doi moi*). The government expected that by increasing local income based on forestry activities, deforestation would be stopped and forest and forest land would be managed sustainably. The purpose of the proposed research is to analyse the impacts of the renovation policies on forest and forest land management in Vietnam over the last decade through addressing the question "How have Renovation Policies affected sustainable forest and forest land management in the northern mountain region of Vietnam?"

In Vietnam, sustainable forest and forest land management depends on many factors. The most important are the policy settings, including economic reforms, tenure rights, and sustainable land use practices that achieve both public good and private livelihood goals. Answering the research question requires development of a methodology to assess sustainable forest and forest land management in northern Vietnam. The

methodology will draw from a number of approaches being developed by government (criteria and indicators for sustainable forest management in Vietnam), NGOs (WWF/IUCN's Rapid Assessment and Prioritization of Protected Area Management and Good Forest Management Tracking Tool) and research institutions (CIFOR's Multidisciplinary Landscape Assessment). This methodology will have wider benefits for policy and decision makers in Vietnam and the region as well as immediate application in the research.

The research will be based on a case study approach in three provinces of northern Vietnam. It will draw from secondary data (*eg* economic and social statistics, satellite imagery) as appropriate. The research is based on an interdisciplinary approach; the major disciplines are forestry, human geography, ecology, economics, environmental science, and social anthropology.

Renee Visser

PhD Scholar

An investigation into the role of wild dog behaviour in trophic regulation

E-mail: Renee.Visser@anu.edu.au

Research Description

On mainland Australia the dingo (*Canis lupus* dingo) has been the apex predator since the extinction of the thylacine (*Thylacinus cynocephalus*) 4000 years ago. More recently, the introduction of the domestic dog (*Canis familiaris*) has lead to hybridisation between domestic dogs and dingoes, and now "wild dogs" are the largest predator on the Australian continent.

There has been little research, but much speculation, into the role the wild dog may play in trophic regulation in Australian ecosystems. This research aims to investigate the role of wild dogs in structuring ecological communities through regulation of a smaller introduced predator, the feral cat (*Felis catus*), in the south-eastern temperate forests of NSW. Previous studies have shown an increase in smaller predators (cats and foxes) when wild dogs are controlled and a decrease in small to medium-sized mammalian prey species. However, this relationship or the mechanisms behind it are not clear. There is some anecdotal evidence that the social structure of wild dog populations, rather than their density or abundance, may be a determining factor. Social structure is an important part of canid behaviour, initiating breeding success and defence of territorial resources. Current management strategies that target wild dogs as a pest species may have a direct impact on the maintenance of social structure of wild dog populations. The long-term implications of this for native species are yet to be determined.

The project will explore the potential conservation value of the wild dog to small-medium sized native prey species through their ability to facilitate behavioural change. It will assess the possible impact of wild dog control on social structure, and social structure on mesopredators, through assessing behavioural differences in populations of wild dogs, feral cats and prey species in areas where wild dogs are controlled and uncontrolled. It aims to investigate behavioural interaction as a mechanism behind predator-predator and predator-prey interactions and if so, whether some current management/control measures may promote or hinder this role.

Robert Waterworth

PhD Scholar

Stem profile development in *Pinus radiata (D. Don.)* under differing environmental conditions

E-mail: Robert.Waterworth@anu.edu.au

Research Description

The way trees grow, and in the process distribute and store carbon in the stemwood, is related to site and climatic conditions. This research aims to determine how the stem profile of *Pinus radiata* varies with differences in growing conditions. This will provide a better understanding of the relationships between stem development, 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 main phase of the research involves full stem analysis of sample trees to determine the stem volumes and changes in stem form between the treatments.

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

Coarse Woody Debris Decomposition, Carbon Sequestration, and Management, in Eastern Australian Forests

E-mail: Edward.Webber@anu.edu.au

Research Description

This study is concerned with the decomposition dynamics of decomposing logs lying on the forest floor (known as coarse woody debris; CWD), and the impact this has on carbon sequestration and CWD management. Wet eucalypt forest (New South Wales and Tasmania), eucalypt woodland (central Queensland), and tropical rainforest (far north Queensland) were studied.

The eucalypts from the wet forests exhibited the slowest decomposition rates known for flowering trees. In the relatively undisturbed forests of southern Tasmania, this resulted in the highest accumulation of dead wood for any forest ecosystem reported anywhere. The tropical rainforest CWD decomposed the fastest, and decays at a rate comparable to other tropical rainforest ecosystems elsewhere in the world. The woodland CWD decomposition was so slow, that most loss to the surrounding environment was due to fragmentation and incorporation into the soil; this is undoubtedly due to the prevailing harsh-climate of the region (high temperatures and low moisture availability). Consequently, due to the extremely slow decomposition of the woodland CWD, and the unavailability of old samples, a decomposition rate could not be established.

Modelling of the Tasmanian eucalypt tree-growth and CWD-decay, shows that including CWD in carbon accounting can provide an increase of up to 40% of the long-term carbon that is stored in living trees. If change can be made to the current practice of excluding CWD from carbon trading, then managers of nature parks and reserves, where wood clearing has occurred in the past, may be able to increase their potential income by including CWD-carbon in tradable carbon stocks.

The slow decomposition of the eucalypts poses several management problems. Besides being important as a habitat for many forest organisms, CWD performs other important functions. The logs act as slow-release fertilisers, continually releasing nutrients back to the forest environment as they continue through the slow decomposition process. The logs also act as obstacles to water flowing over the soil, reducing the speed of the water, which in turn reduces erosion, albeit to a limited extent.

Coarse woody debris is an extremely important element in the terrestrial environment, which has generally been ignored by environmental managers in the past. The impact of the slow decay of the eucalypts requires that environmental managers need to take CWD seriously, and formulate extensive management strategies to overcome the effect of environmental degradation caused by extensive log removal in the past, especially in nature parks and reserves, and water catchment areas.

This work is supported by The Australian National University, the Cooperative Research Centre for Greenhouse Accounting, and Forestry Tasmania.

Wendy Welsh

PhD Scholar

GIS and numerical groundwater modelling

E-mail: Wendy.Welsh@anu.edu.au

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 model development using the GIS-based method is 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 late 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.

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Vanessa Wong

PhD Scholar

The effect of salinity and sodicity on soil carbon stocks and fluxes

E-mail: Vanessa.Wong@anu.edu.au

Research Description

Ghis 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 soil organic carbon pool is the world's largest terrestrial carbon sink, with interest 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 health 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, both in the degradation and rehabilitation processes, has the potential to affect the carbon flux in the landscape.

By investigating the microbiological and environmental processes that govern the breakdown of soil organic matter in saline and sodic environments, carbon fluxes in salt-affected soils can be determined, and hence means of reclamation in these soils to promote carbon sequestration can be enhanced. Results thus far have shown increased mineralisation of native soil organic matter when salinity and sodicity are increased in a previously non-degraded soil over a 12 week period. However, soils sampled from scalded profiles indicate very little biological activity with very low soil carbon stocks.

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 for Landscape Environments and Mineral Exploration.

Sunit Adhikari

Master of Forestry Scholar

Incomplete contracts and principal-agent problems in State-Forest User Group relationships in community forestry in Nepal

E-mail: Sunit.Adhikari@anu.edu.au

Research Description

Forests have always been of great importance to the rural people in Nepal; access to forests in many places is closely linked to people's daily survival. Studies reveal that handing over the forests to the user groups is the best way available for achieving sustainable forest management in Nepal. Nevertheless, even after more than two and half decades of community forest management in Nepal, the success of community forestry defined in various ways is not universal. There are some community forests with only limited success and even some that are notably unsuccessful, resulting in further degradation of the forests. Moreover, it seems that the government of Nepal has not given much attention to explore the causes for the lack of success in community forestry.

My research interest is concerned with exploring the application of incomplete contracts and principal-agent problems to understand the success and failure of community forestry. Although, community forestry can be considered the most viable option for controlling and managing their forests by local users in a sustainable manner, there is still doubt about whether the sustainability of forests can be achieved under the existing provisions of the community forestry program in Nepal. Several studies have been conducted on the success of the community forestry in Nepal; however, few studies have been investigated on why the community forestry has been unsuccessful. Therefore, it is necessary to analyse the nature, causes and implications of contractual incompleteness in the success of community forestry, and to understand the types of principal-agent problems that exists in community forestry in Nepal, and analyse to what extent the existing problems can hinder the success of community forestry.

Selected publications

NARMSAP, 2004. *Ban narsary nirman, sanchalan tatha brikshyaropan prabidhi, Sahayogi pustika* (Forest nursery construction, operation, and plantation technique), Natural Resource Management Sector Assistance Programme, Eastern Regional Programme Office, Biratnagar, Nepal (in Nepali).

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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.

Ari Arifah

Master of Environmental Science Scholar

Traditional Knowledge and the Sustainability: The Case of Dayak People in Kalimantan

E-mail: Arifah.Arifah@anu.edu.au

Research Description

The need for studying and documenting traditional knowledge in different ecological and cultural environments has been emphasized regarding its benefits in sustainable natural resource management. Furthermore, the potential contribution of the traditional knowledge to current natural resource management, especially in developing countries, has been agreed upon in the literature (Dumanski, 1997 cited by Pulido, *et.al*, 2003). One of the challenges posed by the modern age is to find ways of strengthening and nurturing the roots of traditional knowledge, so that the fruits of traditional knowledge can be enjoyed by future generations, and so that traditional communities can continue to thrive and develop in ways consistent with their own values and interests (WIPO,).

In my research, I will examine the various practices of traditional knowledge among Dayak community in managing their land, river and forest in a sustainable way and to detect the contribution of local knowledge to potential indicators of sustainable development. Dayak refers to people who are not 'Melayu', known as Kalimantan indigenous people and live in surrounding forests in Kalimantan, Indonesia (King, 1993 cited by Maunati, 2004). Riwut ((1979) differentiate Dayak into 7 sub-ethnics that is scattered in all over rural Kalimantan, *Ngaju*, *Apu Kayan*, *Iban*, *Klemantan*, *Murut*, *Punan* and *Ot Danum*. Dayak community have being lived in harmony for hundred years with the nature as the basis of their living and have developed a distinct management of natural resources (Bamba, 1997).

Jhuma Dewan

Master of Environmental Science Scholar

The process of people's participation in Environmental Management and Development and as well as poverty eradication in developing countries.

E-mail: jhuma.dewan@anu.edu.au

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.

Catherine Gross

Master of Environmental Science Scholar

Community consultation and the greening of business

E-mail: Catherine.Gross@anu.edu.au

Research Description

The business world presents a significant challenge for implementing sound sustainability principles and practices, and this is my area of interest. Environmental, social and economic interests must be addressed, and the importance of stakeholder participation is becoming increasingly valued in strategic decision making.

My current research focuses on community consultation in environmental impact assessment (EIA), and explores how the values and needs of communities are identified and addressed during the process of EIA. This research uses a current renewable wind energy case study and investigates the perspectives of different interest groups.

Throughout my management career in information technology and health care in the UK, Australia and the USA, I have taken a strong interest in studying how

people work together as teams to achieve common goals. There are common and vital characteristics, including respect for differing vantage points that must be incorporated into each approach. This is especially relevant in the consideration of new business developments which have social and environmental impacts.

Dong Khanh Hung

Master of Forestry Scholar

The Role of Landscape Function Analysis in Evaluating the Rehabilitation of Cleared Power Easements

E-mail: u2508846@anu.edu.au

Research Description

The montane ecosystems of the Tumut sub-region, which are located below the sub-alpine area of the Snowy Mountains, NSW, are a significant part of the Australian continent. They make a link between the largest alpine and sub-alpine ecosystems of Australia with the surrounding low land areas. However, these ecosystems have been significantly damaged by clearing vegetation, particularly under power-line easements.

These problems are also experienced in my home country, Vietnam, where huge areas of tropical forests have been cleared for short-term shifting cultivation, leaving the soil exposed. Therefore, my research aims to consolidate the theoretical understanding about solutions to deal with those problems, particularly by using the approach and methods of Landscape Function Analysis for monitoring the success of rehabilitation works in degraded ecosystems.

Ahmad Maryudi

Master of Forestry Scholar

Policy Making of National-based Certification Programs: A comparative study of the Indonesian Ecolabelling Institute (LEI) and the Malaysian Timber Council Certification (MTCC)

E-mail: Ahmad.Maryudi@anu.edu.au

Research Description

For my final Masters research paper, I am looking at the role of governments in forest certification, as this is still controversial. I am doing a comparative study of ways in which the governments of Indonesia and Malaysia have approached this issue. These governments have created national certification programs to secure their lucrative forestry sectors. Having similar backgrounds - support from both governments in the design of the programs and motives to compete with the FSC - the programs are different with regard to their policy toward the FSC. While the Indonesian program and the FSC have converged in terms of mutual recognition between the programs, the Malaysian program still maintains its initial position opposing the FSC. My paper aims to find answers for this puzzle, why similar countries diverge so greatly on this important issue.

Muhammad Zahrul Muttaqin

Mater of Forestry

Forest Economics and Policy

E-mail: U4081093@anu.edu.au

Research Description

Capturing resource rents from natural resource management has long been an interesting issue since it is important as a source of revenues to fund development of a nation. In case of rent capture from Indonesia's natural production forest utilisation, the issue is whether the government has optimally captured the rents and whether the rents are distributed efficiently and effectively to maintain the continuity of benefits derived from the forests. My research is aimed at estimating rent dissipation in the natural production forest management in Indonesia and seeking a better institutional arrangement to enhance the rent capture.

Kala Perkins

Master Environmental Science Scholar

Cosmic Ecology

E-mail: Kala.Perkins@anu.edu.au

Research Description

What I call the field of my exploration is "Cosmic Ecology". It is exploring the interface between the newly awakening understandings of our universal origins and environment with the global, social and human ecosystems. Each of these complex systems constitutes an interactive evolving synergy with all the others. Together these constitute the living cosmic organism, within which we and the Earth are integral expressions. At the nexus of these converging fields we are engaged in actualising a new identity and bio-philosophy.

Julia Pickworth

Master of Environmental Science Scholar

Community perceptions of pine plantations

E-mail: Julia.Pickworth@anu.edu.au

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.

[This thesis is currently under examination]

Sue Powell

Master of Environmental Science Scholar

Modelling flood dynamics in a regulated floodplain wetland

E-mail: Sue.Powell@anu.e du.au

Research Description

Floodplain wetlands rely on inflows from catchments to maintain the flooding and drying cycles critical to the ecological integrity of these systems. The development of water resources within these catchments has significantly altered the flow patterns in many river systems. Frequency, duration and timing of inundation are important ecological drivers of wetland systems, as are the drying cycles between floods. Hence balancing environmental flow allocations, or designing water releases and extractions from upstream storages for maximum water user and wetland benefit is a challenge in floodplain wetland systems.

The aim of this project is to develop a flood model of a floodplain wetland, using the Gwydir wetlands located in north-western NSW as a case study. Components of the wetlands include channels, floodplains and flowpaths, distinct vegetation assemblages and waterholes. Spatial and temporal flood characteristics of these components will be assessed using a combination of remote sensing, hydrology and

climatic data. This data will be used in the development of a water balance model of the system to aid in the assessment of water management options.

Liping Rao

Master of Forestry Scholar

Spatial distribution of hydrophobic soils under dry sclerophyll forest

E-mail: Liping.Rao@anu.edu.au

Research Description

Hydrophobic soils (water repellent soils) are widespread in Australia. These soils are resistant to wetting, which results in the uneven distribution of soil moisture and consequent change of water flow within a catchment. The repellence of these soils to water is caused by organic coatings on the soil particles. The organic material inducing soil hydrophobicity is mainly from vegetation, especially eucalypts, and micro-organisms. Dry sclerophyll forests cover many catchments in Australia and are also correlated with soil water repellence. In order to achieve comprehensive understanding of the hydrology in these catchments, the understanding of hydrophobic property of the soil under this forest type is critical. The understanding of the spatial variation in hydrophobcity is particularly important regarding the hydrological and erosional consequences of soil water repellence. My current research aims to study the spatial distribution of hydrophobic soils under dry sclerophyll forest at the micro-scale. The measurement of hydrophobicity is undertaken in five locations along transects around the stems and at various depths of the soil profile of each location. The lateral and vertical changes of the soil hydrophobicity against the distance from eucalypt stems can are measured. The hydrophobic properties of the soils under different forest management regimes, i.e. burning and thinning, are compared. Therefore, the hydrological behaviour, i.e. infiltration, of these soils with water repellence is observed.

Ray Rahayu

Master of Environmental Science Scholar

A Framework for Successful National Parks with Local People

E-mail: U2576318@anu.edu.au

Research Description

Mhere is no blueprint for successful national parks and people since each park is unique one another in term of characteristics, cultures and challenges. This uniqueness certainly defines their (initiative collaborative) management that must be responsive to the needs and aspirations of each stakeholder. Thus to examine what determines success and its major elements, as well as the relevant principles and criteria to measure success, has become the focus of developing a framework for success for national parks with local people. This can be done through constructing a generalized stakeholder analysis in order to determine what may be perceived as success by different people besides identifying a set of principles and criteria of successful collaborative management based national park management's literature. This concludes with assessing a case study of Indonesia's national park, which is Rawa Aopa Watumohai National Park, Southeast Sulawesi province, based on principles and criteria that have been developed.

Michael F. Ryan

Master of Forestry Scholar

Natural expansion of native forests onto cleared agricultural land

E-mail: mfryan@webone.com.au

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.

Laxman Shrestha

Master of Forestry Scholar

Community Forestry

E-mail: Laxman.Shrestha@anu.edu.au

Research Description

My research focuses on social issues within community forestry (CF) in Nepal. CF has been a relatively successful and priority program in Nepal, however there are still many social issues to be resolved. In this context, my paper focuses on the capacity building of FUGs which will enhance equity in CF in Nepal. As Jack Westoby (1967) argued, forestry is not only about trees: it must also serve people's needs. This argument is strongly reflected in the concept of CF and it is only possible to adopt this model if local people are adequately prepared to handle this change. Not only in Nepal, the issue of equity is equally highlighted in many international forums: the Millennium Development Goal, Johannesburg Summit and capacity building are some of the possible ways to address this problem. In this paper, I am looking for some solutions to apply in the Nepalese context.

Niranjan Shrestha

Master of Forestry Scholar

Community Forestry in Nepal: Pro-poor or Pro-elite?

E-mail: u4076028@anu.edu.au

Research Description

I am from Nepal and completed a Bachelor of Science in Forestry from Tribhuvan University, Nepal. I have worked in various positions in different Departments, namely Soil Conservation and Watershed Management, and Forests under the Ministry of Forests and Soil Conservation, since 1989.

Nepal has implemented a participatory forest management approach in the form of community forestry during the last three decades. The main aim of the community forestry policy is to alleviate poverty by providing people's basic needs for food, fuelwood, fodder, timber and other non-timber forest products through sustainable forest management. At present there are more than 13,000 Community Forest User Groups managing over 1 million ha of forest area and involving about 1.5 million people.

It is generally agreed that since the inception of community forestry in Nepal the condition of the forest resource in terms of its quantity and quality has improved along with an increase in people's involvement in the management of these resources. However, the issue of benefit distribution among the users of community forests has become prominent as many studies and much research have claimed that the current community forestry programme is limiting the benefits accruing to poor people while, in most cases, they are being captured by the elite in the community. So, this issue challenges the objectives of the community forestry policy and threatens the sustainability of forest management in Nepal.

In this context, this research will investigate to what extent the poor people are suffering from the community forestry programme in Nepal; it will analyze how

and why this is happening. Moreover, this study will explore ways to overcome this problem to achieve the objectives of the community forestry policy. I am confident that this research will broaden my horizons on sustainable forest management through community participation for poverty alleviation.

Ramkaji Shrestha

Master of Forestry Scholar

Social Exclusion and Community Forestry: Evidence from community forest management in Nepal

E-mail: Ramkaji.Shrestha@anu.edu.au

Research Description

I am currently undertaking Master of Forestry. I did Graduate Diploma in Environmental Management and Development (EMD) from NCDS in 2004. I have been working in the field of community forestry as a community forester for more than 10 years.

In Nepal, community forestry (CF) policy has been in place for last 20 years, mostly in mid hills. Community Forestry Policy has emphasized the inclusion of all concerned stakeholders including people from all classes, genders and marginalised ones with the aim of poverty alleviation and empowerment of these people through sustainable forest management. Most of the community forestry policy documents such as Master Plan for Forestry Sectors -1988, Five Year Plans, Forest Act 1993, Forest Regulation 1995 and Community Forestry Guidelines have stressed to the idea of involving all local people of particular area in the community forestry development processes. However, evidences show that CF policy and programmes further marginalises the weaker section of society: the poor, women and the oppressed vesting the right and responsibilities to a few key individuals in the community. In practice, implementation of these policies are very often influenced by the prevailing socio-culture, religious, geographical and political value and traditions which further increases the risks of social exclusion in CF processes. Thus, the management and utilization decision powers are bestowed on local elites thereby excluding the poor from the forest resources as well as management processes. Ultimately, almost of all benefits from CF goes to elites. Yet, none of policy documents have realised this plight of social exclusion as an issue to be addressed through community forestry processes.

This study aims to address the issues of social exclusion of weaker sections from community forestry in Nepal and fit these issues to the aim of equal access to forest resources in Nepal. The study further seeks to draw the characteristics of social exclusion and assess its social, economic and environmental impact in community forestry Practices of Nepal.

Jodi Smith

Master of Environmental Science Scholar

Resource and Environmental Management

E-mail: Jodi.Smith@anu.edu.au

Research Description

My current research focuses on the post-conflict environmental rehabilitation that has occurred in Vietnam following the Second Indochina war. The specific focus is on how non-government organisations, multilateral organisations and non-State operators are facilitating this.

Simon Travis

Master of Forestry Scholar

Environmental Forestry

E-mail: Simon.Travis@anu.edu.au

Research Description

My background is in Agriculture and Public Sector Industries, the first of which I worked in for 9 years before moving on to the Public Sector as a Postal Worker. From 2001 to 2003 I undertook a Higher National Diploma in Environmental Management (Forest and Woodland) in the U.K.. In 2004 I started a two part Masters course in Environmental Forestry. I am undertaking the research component here in Australia to broaden my academic knowledge of Forestry in general, and in Forest Fires in particular as this is not a common disturbance factor in the U.K.

Alberto Valerio

Master of Environmental Science Scholar

Participatory Resource Management

E-mail: u4082172@anu.edu.au

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 supervisor, and program manager in non-government organizations in the southern part of Philippines. These undertakings were supported financially by official development assistance programmes from the national government and from local government unit. The projects were aimed at poverty reduction, the promotion of peace and development in these conflict-prone areas of southern Philippines. My academic background was that of a 4-year Bachelor of Arts in General Science, with some Philosophy and Humanities courses.

I am now studying for the Master in Environmental Science this year and my interest is looking at mechanisms that will assist local communities find markets for environmental services. My research project therefore is looking at the feasibility of payment for environmental services scheme in the Philippines.

Stephanie Weidemann

Master of Environmental Science Scholar

Using satellite based estimates of net primary productivity (NPP) to monitor vegetation productivity at large spatial scales

E-mail: Stephanie.Weidemann@anu.edu.au

Research Description

Remotely sensed data for global change research is becoming more readily accessible. Monitoring changes in land use and land cover change an important in catchment management. Terrestrial net primary productivity is a key variable for various ecological monitoring activities. Data from the moderate resolution imaging spectrometer (MODIS) provides a continuous satellite-derived measure of global terrestrial primary production. My research will use MODIS and Landsat TM data in order to detect and monitor vegetation change from large spatial scales. The outcomes will have potential implications for catchment modelling.

Francina Kesaulija

Graduate Diploma in Environmental Science Scholar

E-mail: Francina.Kesaulija@anu.edu.au

Research Description

I completed a bachelor of Forestry at Agriculture Faculty, The University of Cenderawasih in Manokwari Irian Jaya (West Papua) Indonesia. I am now working at Faculty of Forestry, The State University of Papua. I am currently undertaking a RES Graduate Diploma by coursework with the aim of gaining entrance into the Master of Environmental Science Program next year.

My main interests are forest biodiversity, GIS, and water and landscape management. I hope to get more knowledge and skill in this course to implement in my university and country.

Sonam Phuntsho

Graduate Diploma in Science Scholar

Forestry

E-mail: Phuntsho.Sonam@anu.edu.au

Research Description

I did my Diploma in Forestry from the Natural Resource Training Institute (NRTI) in Bhutan and have been working as District Forest Extension Officer for 8 years promoting decentralized forestry activities mainly the social forestry programmes (community forestry and private forestry programs).

My intention of undergoing the Graduate Diploma course in ANU is to upgrade my academic knowledge and skills, and explore experiences of forestry programs of different countries, which will ultimately help me in accomplishing my responsibilities to facilitate rural livelihoods in sustainable forest management in Bhutan.

Angus McIntyre

GradDipREM Scholar

Remote Sensing and GIS techniques for the Management of Dry Sclerophyll Forest

E-mail: Angus.Mcintyre@anu.edu.au

Research Description

I am currently enrolled in a Graduate Diploma of Resource and Environmental Management. In 2003 I completed my Bachelor of Spatial Information Systems (Spatial Technology) at Charles Sturt University (Bathurst and Wagga Wagga). After graduation from this degree, I worked with Geoscience Australia assisting with the Geographic Information System computation of Australia's maritime boundaries for the Australian Maritime Boundaries Information System (AMBIS). In my Graduate Diploma, I am completing 3 Independent Research Projects related to GIS methods for Dry Sclerophyll Management and I am also completing coursework subjects in Farm Forestry and Landscape Ecology.

My DSF management research includes investigation into the remote sensing techniques for spatial and categorical identification of Dry Sclerophyll Forest in the Southern Tablelands of NSW. Another part of my research is related to the preparation of remotely sensed multispectral satellite imagery for input into a DSF management toolbox (a problem solving computer application for DSF landholders), which integrates the studies of several SRES postgraduate research students. My GIS and spatial background has involved the use of several GIS and remote sensing software packages. In the future, I plan to follow my GIS and remote sensing aspirations, to become an expert in these fields.

Luke Pinner

Graduate Diploma in Resource and Environmental Management Scholar

E-mail: u2537645@anu.edu.au

Research Description

I am currently studying part-time for a Graduate Diploma in Resource and Environmental Management with the intention of undertaking a Master of Environmental Science. Previously, I completed a BAppSc Resource and Environmental Science (UC 1997) majoring in ecology and statistics and a GCert Applied Science (CSU 2001), majoring in spatial analysis and modelling. My interests are spatial analysis, landscape and fire ecology. In addition, I work full time for the Department of Environment and Heritage as a GIS analyst.

Khandaker Mohammed Toufiqur Rahman

Graduate Diploma in Resource and Environmental Management Scholar

Aquatic Resource Management

E-mail: Khandaker.Rahman@anu.edu.au

Research Description

I received my degree of B.Sc. (Hons) in Zoology (Fisheries) from the University of Dhaka, Bangladesh. I have worked in national and international(Danish International Development Assistance, International Fund for Agricultural Development) organization as an Aquaculture Officer in Bangladesh. I have written two guide books on Zoology for the year thirteen student. My intension in obtaining the Graduate Diploma Course in ANU to upgrade my current knowledge and skills in my respective field.

Arief Setiyo Utomo

Graduate Diploma in Science Scholar

Forest Conservation

E-mail: u4184040@anu.edu.au

Research Description

Currently I am doing the Graduate Diploma in Science leading to Master of Forestry. In my country, Indonesia, many problems are being faced by the government because of the high rate of deforestation. Therefore, conservation is now becoming one of the main issues for the government in the forestry sector.

I hold a Bachelor degree from Department of Forestry, Gadjah Mada University Indonesia, focusing on forest management. Here, I want to develop my knowledge of forest conservation by taking courses that underpin my interest. Since I have been working in the Ministry of Forestry of Indonesia for five years, I hope in the future I will be able to apply my knowledge to the decision making of forest policy in Indonesia, especially in forest conservation.

Karma Tempa

Graduate Diploma in Science Scholar

Environmental Science

E-mail: u4183125@anu.edu.au

Research Description

The mountain Kingdom of Bhutan is at the perpetual stage with low population density and rich biodiversity. However, due to rapid economic development and alarming population growth, optimal resource management is the only viable solution to balance economic development and environment conservation.

Accordingly, I undertake the courses related to people and the resources to bridge the gap between scarce resources and increasing population. It is always challenging to advocate and optimize utilization of resources. Whether we believe it or not, we have reached at the stag, so, to do or die is the question here, (quote from some wise men in the past) "until last tree is being cut down, until last fish is being caught, until last water is being contaminated and the last air is polluted, mankind would never realized that the money cannot be eaten".

In this regard, I have lots of commitments to pursue in order to fulfill at least some environmental concerns through community- based natural resource management. It will certainly make some differences in local level even though it might not make at the global scale.

Nima Tshering

Graduate Diploma in Forest Science Scholar

E-mail: Nima.Tsheirng@anu.edu.au

Research Description

I am from the kingdom of Bhutan. I received my certificate in forestry from Bhutan forestry Institute, Taba, Thimphu on 1/11/1992. Later in 2002, I did up - gradation course in Natural Resources Training Institute,Lobesa, Wangdiphodrang, where I received my diploma certificate in forestry and allied subjects. After obtaining my diploma certificate I was placed in one the districts where I was entrusted to carry out decentralized forestry programmes. I was particularly involved in planning, implementing and monitoring and evaluation of decentralized activities.

Since forest management in Bhutan is driving towards enhancing of the local communities in resource management and protection, more conflicts are witnessed in the management of natural resources. Therefore, to address these problems , Royal Government of Bhutan have nominated me to undergo degree course in decentralization and resource management in Australian National University, Canberra to upgrade my knowledge and skills, which will eventually help me in designing , planning and monitoring and evaluation of resource management in Bhutan. I have confidence that I can perform my work in more efficient and satisfactory manner when I go back to my country, Bhutan.

Suhella Tulsiani

Graduate Diploma Scholar

Resource and Environmental Management

E-mail: Suhella.Tulsiani@anu.edu.au

Research Description

Wildlife Management, Urban wildlife behaviour and exotic/ pest species management in Australia.

Andrew Beard

Adaptive community-based environmental management

E-mail: u3295464@anu.edu.au

Research Description

Adaptive management (AM) is a cyclic learning-based approach to the management of complex environmental systems. Effectively AM is learning by doing, treating all management choices as experiments. The core components include: assess the problem; design a plan; implement; monitor; evaluate; and adjust. Community-based environmental management is a phenomenon that is increasingly playing a crucial role in sustaining our environment. It is often a source of creative and determined responses to local environmental issues, and is an area in which AM could be applied.

The purpose of this thesis is to investigate the appropriateness of adaptive management as a framework for community groups to guide their own environmental management. The following questions will be investigated: What are the core components, strengths and weakness of AM? What are the broad characteristics, strengths and weakness of community-based groups? Can AM be transferred to a community environment?

Two case studies will be examined in order to investigate the reality of AM in communities. The first is a community in the South Australian Murray River Community Wetland Management Program, in which the government has been promoting and facilitating the use of AM since July 2002. Interviews will gauge individual perceptions of their attempts at AM. The second study will examine the use of AM within Canberra's Sullivan's Creek Catchment Group. It is believed that AM is not a core principle of the group; interviews will be used to determine the informal use and understanding of AM by members. Practical recommendations should develop as to how an AM framework could be more formally implemented within the group's operations.

The primary argument is that the core cyclic learning-based processes of AM can be used by community groups to improve environmental management. However, considering community-group characteristics and the requirements for effective AM, the provision of adequate information, the integration of all knowledge and a collaboration of efforts are needed.

Jane Bryan

Comparison of field measurements of foliage with the MODIS NDVI

E-mail: Jane.Bryan@anu.edu.au

Research Description

Seasonal variation in vegetation, and change over time due to disturbance are not captured in standard vegetation maps. Remotely sensed measurements of vegetation allow monitoring of change in vegetation over time, as these satellite-based sensors provide repetitive coverage of areas of Earth's surface. My thesis compares field measurements of foliage recorded as part of a standard vegetation mapping survey with vegetation indices measured by the relatively new MODIS sensor.

(*This thesis is currently under examination]*

Naomi Brydon

The producers' role in marketing the Australian native food industry

E-mail: u3362910@anu.edu.au

Research Description

The pre-European Australian landscape held a vast array of food possibilities, entering the Australian vernacular as 'bushfood' or 'bush tucker'. In the past two decades, several bushfood plant species have been selected for their modern agricultural potential and significant agricultural innovation has enabled an ongoing transition from potentially unsustainable harvesting from the wild ('wild harvest') to commercial cultivation.

The resulting development of an Australian native food industry, still in its infancy, has been problematic. Unlike sister emerging industries of macadamia or Australian wildflowers, the Australian native food plants have no equivalent industry model or distinct market entrance. Currently, wavering consumer acceptance and demand is considered a threat to successful industry development, with the next industry hurdle set to be marketing - producing an image change. The marketing strategy of the industry is ultimately dictated by the industry members and those with direct contact with the consumer.

This thesis is a consideration of the capability of producers as industry members to influence the consumer, based on the structure and organisation of the industry (looking at scale of production) and interviewee responses. I have chosen to focus my research on the primary producers as they offer variable industry influence and consumer relationships depending on the scale of production. How the primary producers consider and implement an image may well be the deciding factor in the success of the industry.

Emma Clifton

Impact of stock on wetland soil characteristics and vegetation composition

E-mail: u3363355@anu.edu.au

Research Description

Floodplain wetlands are an important ecological and agricultural resource. They act as a buffer between land and water systems and are areas of high ecological productivity. Consequently floodplains are highly desired and utilised as an agricultural resource. Unfortunately, wetlands within agricultural systems have become severely degraded. Many studies have shown the effect of stock on vegetation, but little research has been done on the impacts of stock on wetland soil, and how this influences vegetation composition.

This study aims to gain an insight into the influence of stock on wetland ecosystems; in particular soil physical and chemical properties as well as vegetation structure and species composition, and interrelations between the two. This was done by describing differences between areas with varying stocking rates in three floodplain wetlands, in the mid-Murrumbidgee River region between Gundagai and Hay. Fence lines were used to provide contrasts of different stocking rates. Vegetation surveys were conducted, including vegetation structure, species, occurrence of weeds and biomass. Physical and chemical soil tests were carried out to

determine soil type, compaction, infiltration rates, organic matter, pH and electrical conductivity.

Results will be used to suggest land management strategies that aim to minimise the harmful effects of stock on wetlands, such as compaction of soil and reduction in species diversity in wetland ecosystems.

Carola Kuramotto de Bednarik

Determinants of fire severity in the Cotter River Catchment, Canberra Region

E-mail: U4193429@anu.edu.au

Research Description

The geographic extent and severity of the 2003 ACT wildfires was historically unprecedented. These fires burned over 70% of the ACT, resulting in almost complete consumption of ground vegetation over this area, as well as scorching and consuming tree canopies and shrubs in about one third of the affected area. The extent of vegetation mortality due to fire can be used as a measure of fire severity, which in turn is dependent on fire intensity. The resulting patterns of vegetation mortality are likely to be determined by a combination of various environmental factors such as terrain, vegetation type and weather. However, the relative influence of each of these environmental variables is poorly quantified.

My research aims to identify and model the determinants of fire severity in the Cotter River catchment, Canberra region, using fire severity data from the 2003 ACT wildfires and generalised linear modelling (GLM). GLM allows the comparison of multiple variables and the estimation of their potential influence on fire severity. The inputs into this model include spatial information of fire severity, vegetation, terrain, weather and tree height. All these variables will be managed using a Geographic Information System (GIS).

The information gathered from this research will aid the prediction of potential outcomes from fires under different environmental conditions. This in turn can be used to better understand the causes of extant fire regimes and to manage risks in the landscape in a sustainable manner. Further, as determinants of fire severity are identified, areas prone to severe (and thus intense) fires could be identified to prioritise resources for fire prevention, mitigation, public warning and fire-fighter protection.

Robert de Ligt

Determining the probability distribution of intervals between unplanned fires

E-mail: Robert.Deligt@anu.edu.au

Research Description

Understanding patterns of unplanned fire occurrence is an important facet of fire management. Fire frequency and its variability have been identified as important determinants of plant community dynamics and animal populations. Unplanned fires ignited by both natural and anthropogenic agents can also lead to loss of life and significant destruction of property. An understanding of when fires are more likely to occur at a particular point, therefore, provides managers with valuable information for managing both human and natural assets.

Fire occurrence is best described using probability, because it is not possible to predict exactly when a fire will occur at a point, and the variability in occurrence may be described with probability distributions. Using mapped data of fire history, probability distributions of intervals between fires can be determined by fitting a distribution to the processed data. From this the age-specific probability of burning at a point can then be determined. A number of probability models have been presented to describe fire recurrence patterns based on an *a priori* understanding of the processes that influence the probability of fire (for example, fuel accumulation and extreme fire weather). Knowledge of the shape of the probability distribution can therefore be used as an argument for describing the environmental factors which drive fire recurrence.

Using fire history data collected by the New South Wales NPWS since 1963-64, this project has three main aims: (1) to determine the probability distribution of intervals between unplanned fires in the Sydney region; (2) to identify the processes which influence the probability distribution of intervals between unplanned fires; and (3) to relate the findings of the project to management for unplanned fires.

This study represents the first attempt at defining an empirical model of fire frequency for south-eastern Australia. It is hoped that in addition to providing valuable information for fire management, the results will provide a platform for further studies of fire frequency in south-eastern Australia.

Jessica Drake

The long-term effects of dairy farm effluent application to soil

E-mail: u3354519@anu.edu.au

Research Description

Applying waste to soil has become an important method of disposing of and treating wastes. Many different types of wastes are being applied to soil, including those from municipal, agricultural and other industries. There have been various studies done on the implications of applying waste to land, both in the short and long term. Constituents present in the waste can both positively and negatively affect soil properties, animal health, plant productivity and environmental integrity. However, careful management can ensure that risks from application are limited.

Dairy Farm Effluent (DFE) is one waste which is being applied to soils. DFE is derived in milking sheds and includes milk solids, faeces, urine, water, detergents and other contaminants. Although DFE has been studied, some effects of DFE on soil have not been researched. Investigations which have not been completed include the effects of salt, sodium and hydroxides on soil; changes in soil physical characteristics; effects of long term application; and interrelated soil property changes. Using data from farms in the Bega Cheese Co-op, my thesis aims to understand how all constituents of DFE affect soil with long-term application. I hope to be able to provide farmers with simple management tools which will enable the benefits of applying DFE to be utilised, whilst limiting the negative effects DFE causes in the long term.

[This thesis is currently under examination]

Janet Finn

Changing palaeoenvironmental conditions and prehistoric human occupation at Bobundara Swamp, south coast New South Wales

E-mail: janfinn@austarmetro.com.au

Research Description

Bobundara Swamp changed from a saline estuarine system at sea-level stabilisation, about 6000 BP, to the freshwater swamp conditions seen today. With these changes, resource availability would also have changed and altered the swamp's potential use value to Aboriginal people. After ca. 1820, Europeans arrived in the area and their occupation resulted in many major changes around the swamp and its environs. Diatom analysis (and a limited magnetic susceptibility analysis) will be used in a palaeoenvironmental reconstruction, together with an archaeological survey to the south of the swamp to find evidence for Aboriginal occupation. European landscape changes will also be evaluated.

Diatoms are unicellular algae that live in an aqueous environment. They have a siliceous cell wall and survive well in sediments. Diatoms respond quickly to environmental change and are relatively easily identified under a high-powered microscope. However, while they are an accepted method in palaeoenvironmental reconstruction they are an underutilised method in archaeological research although they have the potential to provide information when the archaeological sites have an aqueous component. Previous research at Bobundara Swamp by Coddington (1983) and Hope et al. (in press) used pollen analysis as the main palaeoenvironmental proxy. As pollen is often carried to a site over long distances, the use of diatoms, which are more site specific, will provide a useful comparison.

(*This thesis is currently under examination]*

Ivan Hanigan

Understanding geographical patterns of cardiovascular disease mortality, socio-economic status and air pollution

E-mail: Ivan.Hanigan@anu.edu.au

Research Description

There is considerable epidemiological literature from around the world that identifies a relationship between Cardiovascular Disease (CVD) mortality, Socio-Economic Status (SES) and Air Pollution (AP). The majority of studies have used time-series analysis that aggregates the spatial aspects of these phenomena. This study explores the application of mapping techniques, aiming to improve understanding of the geographical patterns of these diseases and related factors.

A central problem of geographical analysis of environmental health data is that analyses using information collected at an inappropriate scale may obscure or distort any relationships investigated. The National Mortality Database (NMD) protects the privacy of individual records by aggregating the location of usual residence to two kinds of spatial unit: the smaller Australia Post Postcodes (POA) and larger Australian Bureau of Statistics (ABS) Statistical Local Areas (SLA).

Mortality and environmental data for Sydney during the period 1996 to 1998 were integrated using Geographical Information Systems (GIS) and Microsoft Access database software. The statistical program S-plus was used to explore these data using regression trees and stratified linear models.

The modelling approach has identified relationships between rates of CVD mortality, the ABS Index of Relative Socio-Economic Disadvantage and coarse particulate matter (smoke and dust) with aerodynamic diameter less than 10 micrometers (PM10). The relationships observed are different between the two types of spatial units, highlighting the importance of the spatial scale of data in this type of research.

[This thesis is currently under examination]

Adrian Hathorn

A quantitative genetic study of spiral grain in *P. radiata*

E-mail: u3245002@anu.edu.au

Research Description

Conservative estimates forecast annual losses to the timber industry in New Zealand of NZ $100million due to spiral grain, and project similar losses for the Australian timber industry. Spiral grain is a deviation of wood cells from the vertical axis of a tree which causes twist in a proportion of sawn timber when dried, degrading wood value. Reductions in harvest rotation lengths necessary to industry profitability have increased financial losses, as the impact of spiral grain is greatest in the younger corewood of the tree. Current research into spiral grain reduction through breeding utilizes sampling techniques which are not cost effective.

Studies show that wood traits are moderately to highly heritable and on this basis a quantitative genetic study of spiral grain is warranted. Data includes *P. radiata* on two sites in South Australia and Victoria from eight year old trees. Genetic parameter estimates will be established for spiral grain in *P. radiata*, including heritability, genetic gain from selection and age:age genetic correlations. These parameters will be used to determine the optimal age for spiral grain assessment. This will allow rapid on-site assessment of trees at an early age without the need for repetitive sampling, and will improve cost effectiveness to industry.

This project forms part of the Juvenile Wood Initiative (JWI). It is a joint venture including Southern Tree Breeding Association (STBA), ensis, Qld DPI Forestry, Forest and Wood Products R&D Corp (FWPRDC) and ArborGen Inc. (US Biotech). The overall aim of the JWI is to integrate quantitative and molecular genetic methods to investigate the potential for genetically improving a range of industrially important wood properties designed to increase the profitability of the Australian softwood industry.

Brad Jackson

Analysis of long-term rainfall trends in the Murray Darling Basin

E-mail: U3595168@anu.edu.au

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 project is designed to determine the chracteristics of rainfall in the Murray Darling Basin (MDB), the powerhouse of Australia's rural economy. The research will attempt to identify the changing seasonality and occurrence of rainfall recorded at 42 locations across the MDB both spatially and temporally and over both the short and long term. It will also attempt to identify the effects of large-scale climate variations, such as ENSO, the Pacific Decadal Oscillation, the Antarctic Circumpolar Wave and anomalous high and low pressure systems, on the changing nature of rainfall in the MDB.

The rainfall and atmospheric data analysed have been sourced from records that start as early as the 1880s and end in 2003. This provides an opportunity to look at longer-term rainfall trends in Australia and it is anticipated that the 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.

Michael Neimanis

Mine site rehabilitation

E-mail: u3237714@anu.edu.au

Research Description

The aim of this project is to develop a rehabilitation strategy for the Mt Boppy Mine, near Cobar, NSW. This will include an investigation of surficial materials, i.e. regolith, of the Mt Boppy Mine and surrounds, in order to maximise the efficacy of future rehabilitation works. Given that a fundamental aim of rehabilitation is to get the site to a state that is most 'natural', it is critical to base any works on an understanding of site regolith type and condition. Determining the distribution and nature of the regolith (including physical and geochemical characteristics) will help ascertain what vegetation would be most suitable for different areas, so as to achieve rehabilitation and environmental outcomes. Revegetation would be aimed at integrating vegetation types at a landscape scale.

The project will establish a 'plan' for rehabilitation of (part of) the Mt Boppy site. The focus of the study/project will be those areas where tailings/waste dumps have been relocated in the past, creating areas available for revegetation. The 'plan' would involve using regolith data to create a regolith map, and then linking this with historical data/ descriptions of the landscape for rehabilitation planning.

Eleanor Sobey

Conserving bird species in dry sclerophyll forests: vegetation attributes as surrogate indicators of diversity for conservation and management

E-mail: u3369410@anu.edu.au

Research Description

Rehabilitation of landscapes, and the biodiversity within landscapes, requires an understanding of the ecological processes underpinning both biotic and abiotic variables. In order to stop the decline in native bird numbers we must understand resource needs for each species and the scale at which these needs operate. This necessitates understanding not only how birds relate to individual variables, but also how these variables interact with each other, and their combined effect on species richness and composition.

The primary aim of my project is to determine relationships between bird species diversity, habitat quality (stand structural complexity), and landscape quality (size, shape, connectivity of stands, and characteristics of the surrounding matrix) in the Southern Tablelands region of NSW. My thesis will argue that stands with a higher index value, based on increasing complexity of structural components, increasing size, connectivity and matrix quality will support a higher diversity and abundance of bird species, in particular those that are declining due to habitat loss and degradation.

Vegetation structural variables that have been previously shown to be significantly correlated with bird diversity will guide the selection of bird survey sites in the Southern Tablelands region. Landscape variables at each site will be categorized using GIS software, aerial photography and field checking for the stand size, shape, distance to nearest like patch, and type of surrounding vegetation. Results will be analysed using generalised linear mixed models to determine the most important variables at both patch and landscape scale. The results will allow a rapid assessment of the conservation value for birds of an individual patch, and help prioritise management designs for vegetation remnants in an agricultural or suburban matrix.

Anna van Dugteren

Temporal and spatial variability of phytoplankton populations in three New South Wales estuaries

E-mail: u3177856@anumail.anu.edu.au

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 development. Temperate estuaries are considered to be the most degraded of all marine ecosystems as a result of human impacts.

Phytoplankton or micro-algae are the free-floating, microscopic flora suspended in marine and fresh waters that photosynthesise inorganic carbon into organic compounds, providing the primary productivity which drives aquatic food webs. Measures of phytoplankton and phytoplankton species dynamics are increasingly being used by environmental managers to understand and explain the health of rivers, dams, estuaries and other water bodies.

This project arose from concern within the New South Wales oyster industry about declining oyster production in the State's estuaries, due in part to environmental factors. My thesis will examine phytoplankton in three New South Wales estuaries – the Tuross, Clyde and Georges river estuaries. I will use data on phytoplankton species and numbers collected by the NSW food safety regulator, Safefood NSW, from these estuaries on a monthly basis between 2002 and 2004. These data may help to explain what may be causing environmentally induced declines in oyster production. Using quantitative and qualitative methods I will attempt to understand and explain the phytoplankton dynamics in each of the estuaries to division/class, genus and species level. I will compare the phytoplankton dynamics in the three estuaries over time, and examine some of the factors that may cause population changes, e.g. salinity, water temperature, rainfall, streamflow, catchment land use, estuarine hydrodynamics, and climate and seasonal influences.

Lyndsey Vivian

The influence of fire on boundaries between subalpine eucalypt stands

E-mail: u4160423@anu.edu.au

Research Description

In January 2003, wildfires swept across vast areas of the ACT, providing a unique opportunity to study landscape-scale ecological processes arising from such an event. Fire is a natural component of the Australian environment, particularly in eucalypt-dominated vegetation. The majority of eucalypt species are able to recover from a crown-scorching fire by resprouting. In contrast, a small number of other eucalypt species, known as obligate seeders, are killed by a crown-scorching fire, but regenerate from the large amount of seed which is released following a fire.

Little is known about the role of fire in influencing the distributions of eucalypt species. It has been suggested that fire may be one of the few opportunities for obligate seeders to expand their distributions via seed shed into adjacent vegetation. This study examines the potential for fire to influence the boundary between subalpine eucalypt stands in the Cotter River Catchment, dominated by the resprouting species *Eucalyptus fastigata* (Brown Barrel), and the obligate seeder *E. delegatensis* (Alpine Ash). It also investigates how the study species respond to variations in fire severity. A major component of this study has been to objectively locate and quantify the pre-fire boundaries between the eucalypt stands from the distribution of adult eucalypts. The potential for these boundaries to shift as a result of seedling recruitment has then been considered from the distribution and health of seedlings recruited after the fires.

[This thesis is currently under examination]

Colin Wiltshire

Opportunities and constraints: managing the health of garment factory labour in China

E-mail: u2566798@anu.edu.au

Research Description

The Chinese garment industry is of critical importance to Australian business interests. Clothing is the most exported good to Australia from China and more than 80 percent of Australian garment manufacturers produce clothing in China due to cheap labour and quality infrastructure. The demand for Chinese manufactured garments is on the rise worldwide, following the removal of WTO export quotas in January 2005, resulting in a dramatic increase in garment orders and production across China. This has placed greater pressure on garment factories to raise production, which has created job opportunities for China's huge 'floating population' of rural migrants seeking higher wages in urban factories.

Since most of China's migrant labour is temporary, these workers often experience poor living and employment conditions. Also, with limited access to healthcare facilities, this highly mobile workforce is more likely to suffer from general illness and is more susceptible to contracting and transferring infectious disease. At the factory level, unhealthy employees increase costs and reduce productivity, whilst placing China's workforce and densely populated communities at greater risk of an epidemic outbreak. Thus, it is essential for garment factory managers/owners to respond to this health risk amongst their workers.

Understanding the capacity for management to respond to the health of garment factory labour in China would not only contribute to business interests in terms of productivity, efficiency and long term return on investment, but also China's social and economic development. Through the lenses of Australian business interests and Chinese health policy development, my research will seek to identify perceptions, management and implications for the health of China's garment factory labour.

Bruce Doran

PhD

A spatio-temporal investigation of the fear of crime in Wollongong, New South Wales, Australia

Considering the amount of research effort that has been devoted to the fear of crime, it is surprising how limited the progress has been towards addressing its negative impacts upon society. A review of the literature on fear of crime suggests the reason for this lack of progress is due to a deficit of studies that provide policy makers, police and communities with knowledge of where and when the fear of crime is a problem. It is argued that behavioral approaches to investigating the fear of crime provide the best means to gaining this type of information and that protective and avoidance behaviors evident at the individual level represent a visible response to fear of crime.

A behavioral approach is used to investigate protective and avoidance responses in relation to the fear of crime in Wollonong, Australia. The results reveal collective avoidance behavior to be spatially well defined and to show considerable temporal variation. Further, in relation to the daily routines of survey respondents, certain situations were found to be characterized by a climate of fear, in which people show high levels of emotion-based fear and adopt greater protective measures. The results are discussed in terms of management implications and the potential for this type of approach to provide new insights into links between crime, fear and disorder.

David Forrester

PhD

Mixed-species plantations of nitrogen-fixing and non-nitrogen-fixing trees

Mixed-species plantations of eucalypts and 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 belowground stratification. However, growth in mixed-species plantations may not be improved compared to that of monocultures when competitive interactions outweigh the effects of improved nutrient availability and resource capture. Careful selection of sites and species is therefore critical to successfully improving stand productivity using mixed-species plantations. This study set out to examine some of the processes and interactions that occur in mixed-species plantations, and the effect nutrient and water availability can have on the growth of mixtures.

In three out of four mixed-species field trials examined in this study, growth was not increased in mixtures compared to monocultures. However, in the fourth field trial, heights, diameters, stand volume and aboveground biomass were higher in mixtures of *E. globulus* and *A. mearnsii* from 3-4 years after planting.

The range in outcomes from mixing species in these four trials shows that a fundamental understanding of the underlying processes is required to enable a greater predictive capacity for the circumstances under which mixtures will be successful. Therefore the growth dynamics, processes and interactions were examined in the mixtures of *E. globulus* and *A. mearnsii*. The difference in productivity between mixtures and monocultures in this trial increased with time up to age 11 years, when 1:1 mixtures contained twice the aboveground biomass of *E. globulus* monocultures. The positive growth response of trees in mixture compared to monocultures was the result of accelerated rates of nutrient cycling, a shift in C allocation and reductions in light competition through canopy stratification.

Nitrogen contents of foliage and soil clearly showed that *A. mearnsii* influenced the N dynamics in this trial. If these changes in N contents were due to N fixation by *A. mearnsii*, then about 51 and 86 kg N ha^{-1} yr^{-1} was fixed in the 1:1 mixtures and *A. mearnsii* monocultures, respectively. Nitrogen fixation was also examined using the natural abundance method. The ^{15}N values of foliage collected at 10 years were grouped according to the mycorrhizal status of the host plant. Therefore the discrimination of ^{15}N during transfer from mycorrhizae to the host plant appeared to vary with mycorrhizal status, and the natural abundance of ^{15}N was not used to quantify N fixation.

Rates of N and P cycling in litterfall were significantly higher in stands containing at least 25% *A. mearnsii* (>31 kg N ha^{-1} yr^{-1} and >0.68 kg P ha^{-1} yr^{-1}) compared to *E. globulus* monocultures (24 kg N ha^{-1} yr^{-1} and 0.45 kg P ha^{-1} yr^{-1}). Rates of litter decomposition and N and P release were about twice as high in 1:1 mixtures compared to *E. globulus* monocultures and were even higher in *A. mearnsii* monocultures. It is therefore important to select N-fixing species that are capable of cycling nutrients quickly between the plant and soil, and that have readily decomposable litter.

The total belowground C allocation was not significantly different between mixtures and monocultures (14 to 16 Mg C ha^{-1} yr^{-1}). However, since aboveground net primary production was greater in 1:1 mixtures, the changes in nutrient availability appears to have increased total productivity (both above- and belowground), and reduced the proportion of C allocated belowground in mixtures compared to *E. globulus* monocultures.

In a pot trial containing mixtures of *E. globulus* and *A. mearnsii* both species grew larger in mixture than in monoculture at low N levels, and mixtures were more productive than monocultures. However, at high N levels, *E. globulus* suppressed *A. mearnsii* and mixtures were less productive than *E. globulus* monocultures. Similar effects were found for high and low levels of P.

Therefore resource availability can have a strong influence on the interactions and growth of mixtures. The productivity of mixtures may only be increased on sites where the resource for which competition is reduced in mixture is a major limiting growth resource. For example, if N is not a limiting growth factor then an increase in N availability from N-fixation may not increase growth, and the N-fixing species may compete for other resources such as soil P, moisture or light.

This study has shown that mixtures containing a N-fixing trees and a non-N-fixing trees can be more productive than monocultures, but that this increase in productivity will only occur on certain sites. Examination of the growth, interactions and processes that occurred in mixtures in this study provide useful information that can aid the selection of species combinations and sites.

Ingo Heinrich

PhD

Dendroclimatology of *Toona ciliata*

Tree ring chronologies have been utilized to reconstruct the variability of past climate in many regions of the world, particularly in North America and Europe. In general, dendroclimatology has not been widely applied in tropical forests and in particular even less so in the Australian tropics due to the extreme rarity of species producing anatomically distinct annual growth rings. Furthermore, most Australian tree species (Eucalyptus & Acacia spp.) exhibit rather strong opportunistic growth with non-annual growth zones that are less suitable for dendrochronology. Only under exceptional circumstances, i.e. when trees grow in mountain regions or in strong monsoonal climate have annual tree ring chronologies been achieved. In mainland Australia, dendroclimatological studies have been conducted with preliminary results indicating that various Australian tree species are suitable for reconstructing climate patterns. But no long-term annually resolved climate proxy tree ring records do exist for mainland Australia yet.

The current study concentrated on *Toona ciliata* because it is one of the few deciduous tree species in Australia warranting a dormant period of the cambium which was confirmed by preliminary tree-ring analysis revealing distinct growth rings. Because so little has been known about the phenology, periodicity of the cambial activity and wood formation of the species it was regarded necessary to conduct growth experiments on juvenile trees and dendrometer band studies before a reliable dendroclimatological study could be achieved.

The forest stands of northeast Australia are situated in the vicinity of the maritime continent and borders the west pacific warm pool zone as one of the centres of the El Niño Southern Oscillation (ENSO), which affects not only the climate in this region but the whole climate system Earth. Therefore, three Toona ciliata site chronologies located near the east coast of Australia have been established and found to be sensitive mainly to precipitation records. Power spectrum analysis of the tree-ring indices exposed several signals at different wave lengths and further examination showed that long-term signals associated, for example, with the pacific inter-decadal oscillation interfere with the correlation between the ENSO signal and the tree-ring indices.

Dana Kelly

PhD

Power and participation: participatory resource management in south-west Queensland

To develop a sustainable future for the rangelands, partnerships are needed – partnerships between scientists, policy makers, visitors, and most significantly, the various communities of people who live and work in the rangelands. The views of these people are as variable as the country about which they care; rangeland communities are not homogeneous. The power relations between these people are at the base of many conflicts. How we handle the relationships between these groups, and manage these conflicts, are crucial for success in land management.

The first part of this thesis reviews the history of both community participation and power theory. While participatory approaches are part of the rhetoric in Australian land management, proponents are generally naïve about the complexities of power and power relations. The philosophical literature highlights that power is a contested concept; and these divisions are epitomised by the works of Habermas and Foucault. Their writings are compared and contrasted to provide a rich understanding of power relations in community participation.

Power relations influence whose voices are heard: those who exercise power, and the sets of rules that define what is seen as true or false at any given time in history. Power relations also determine whose knowledge is incorporated in land management policy and practice. The model proposed in this thesis demonstrates that power relations interact with every dimension of community participation: context, goals, scale, stage, who is involved, the capacity of those involved, and the methods used.

Research was undertaken within agricultural and natural resource management programs and projects in south-west Queensland. A variety of participatory approaches are used by government agencies to encourage grazier participation and the adoption of more sustainable practices, such as Landcare, Bestprac and the regional groups, such as the South West Strategy. While government staff in south-west Queensland purport to share decision-making power with landholders, landholders tend to have different perspectives about the level of power that is being shared.

One of the key findings of this research is that power is not static within any project. Rather, power is ultradynamic, fluid, and highly dependent on context. In terms of land management programs, the levels of power sharing fluctuate over time and between actors. The micro-physics of power, or the power relations among individuals, are often invisible to, or neglected by, the facilitators of land management programs.

Government agencies tend to focus on the processes used, and on finding the best participatory methods, rather than on the individuals who implement the process or the individuals who participate. Greater flexibility is needed in approaches to land management; correspondingly, greater responsibility is needed from all individuals who have a stake in it. To find sustainable solutions for the rangelands and its people, all involved in participatory land management projects need to better understand the dynamics of power, so as to manage any negative effects.

Ernst Kemmerer

PhD

Optimising sawlog production in even-aged eucalypt stands

On a global scale the demand for solidwood products is increasing and eucalypt plantations are becoming an important source of solidwood, instead of just a source of pulpwood. Of continued importance is the development of thinning schedules to optimise the volume of larger diameter (sawlogs) timber being produced.

Sawlog production can be formulated as a multi-stage decision making process and this has traditionally been solved in forestry using the dynamic programming formulation. Alternatively, the forest stand optimisation problem can be formulated as an optimal control system which requires a system of equations, a control variable or input, and an objective function or measure of performance. The system of equations can be described using state-space representation, and in using state descriptors the general assumption is that of Markov independence, where the current state is independent of the previous state(s).

Eucalypts are generally very intolerant to competition within the stand and any past growth restriction can affect future growth. In this case the assumption of Markov independence is likely to be violated because the future stand performance is dependent on previous states (or past silvicultural treatments). A conventional way to overcome this problem is to increase the number of state descriptors or explanatory variables. This may not guarantee state independence unless it can be shown that the same state-space description produces the same future yield given some random variation. This thesis presents an alternative approach to forest stand optimisation, but not for simulation or prediction.

In this thesis the economic concept of a production possibility frontier was used to build a stand based growth model indicating the basal area production possibilities as a function of stocking and age. A suitable proxy for sawlog value was selected as the dependent variable and dynamic optimisation using the gradient search method was applied to find the optimal stocking sequence at each age and how this might vary with site quality.

Karen King

PhD

Simulating the effects of anthropogenic burning on patterns of biodiversity

A process based computer simulation model, FIRESCAPE-SWTAS, was developed incorporating a landscape fire regime simulator and a dynamic vegetation model. Numerous simulations were performed to test the validity of three hypotheses pertaining to fire-vegetation interactions over large spatial and long temporal scales in southwest Tasmania.

Initial simulations demonstrated that the present understanding of the time periods proposed for vegetation succession for the study area, as proposed in the 'ecological drift' theory, are probably too rapid. It is most likely that local variability in the rate of succession exists, with this being dependent on numerous environmental factors including topography, geography, and local variations in climate.

Additionally, simulations demonstrated that it is highly probable that historical lightning fires have had a dominant influence in determining the modern vegetation mosaic, with anthropogenic burning determining the existence of vegetation communities at a local or regional scale. Further, the reduction in the proportion of the landscape covered by rainforest in the present inter-glacial period, when compared to earlier inter-glacial periods, is likely to be a result of a dominant influence from climate variability.

Simulations further indicated that, under the present fire regime, it is unlikely that all the present fire management objectives are achievable. Neither the size nor frequency of wildfires is reduced with the current level of anthropogenic burning. Other studies suggest a much higher level of burning necessary to meet this objective, the extent being dependent on the proportion and distribution of vegetation communities of differing flammabilities in the landscape. Similarly, there was no significant difference in the extent of rainforest and alpine vegetation burnt under each of the simulated fire regimes, implying little protection of these communities from a potential high fire frequency. Importantly, all simulations demonstrated that only a small proportion of these communities experienced simulated fire frequencies not conducive to their long-term survival.

Abdolrassoul Salman Mahiny

PhD

A Modelling Approach to Cumulative Effects Assessment for Rehabilitation of Remnant Vegetation

Revegetation, as an option of impact mitigation, is carried out in parts of Australia today to enhance the sustainability of the native remnant vegetation patches among other objectives. In the Boorowa Region, northwest of Canberra, cumulative effects of development and human activities have significantly affected the structure, composition and function of native vegetation. Cumulative effects result from incremental impact of the human actions when added to other past, present, and reasonably foreseeable future actions. Activities such as vegetation clearing, intensive agriculture involving application of fertilisers, ploughing, livestock grazing and associated developments such as road network expansion have been the main causes of the cumulative effects in the area of study. Cumulative effects assessment is now carried out as a formal requirement in many countries to ensure that cumulative effects are taken into account in decision-making and land use planning. It is not, however, widely used in Australia.

Several methods of vegetation assessment for protection and rehabilitation have been developed and used in Australia and elsewhere. However, these methods often base assessment on the representative fauna instead of vegetation itself. Also, the methods are mostly based on present day assessment, failing to include the past history and future destiny of the assessed vegetation. While producing inconsistent results, these methods do not often clearly depict priority areas for rehabilitation and the best procedure to achieve it. This is partly rooted in not considering the cumulative effects assessment and its concepts and methodologies. Hence, there is a need to appraise the possibility of using cumulative effects assessment to overcome these shortcomings.

This research evaluates the possibility of implementing a modelling approach to cumulative effects assessment for prioritising rehabilitation measures. The rehabilitation measures aim at offsetting cumulative impacts on vegetation structure, composition and function. Geographical Information System and Remote Sensing have been used within the context of cumulative effects assessment to set appropriate geographical priorities for mitigation programmes at the landscape scale. Assessment has focused on 'patch scale' evaluation units of vegetation. External attributes of the patches such as size and shape were used as well as their internal structural complexity and evidence of change over time. In the process, the patches were treated as unique dynamic ecosystems. The inclusion of the cumulative effects concept ensured consideration of the trends over a certain time period and provided a longer time frame for the dynamics of the system to be analysed. Landscape ecology notions and rules were drawn upon in the process to put the appraisal in an appropriate context.

Landsat remotely sensed data obtained for the study area spanned 27 years from 1973 to 2000. Post-classification comparison of 1973 and 2000 classified images showed a decrease in vegetation of 2748 hectares and an increase of 1138 hectares over the entire study area with a size of 220,000 hectares. The detected increase and decrease layers were used as dependent layers for modelling change against 19 independent variables derived from Landsat data, biophysical and socio-economic factors. Using a neural networks method combined with a Markov chain method and cellular automata, the likely vegetation changes over the years 2000 – 2027 were also projected. In the process, two possible scenarios of area of vegetation decrease and increase were constructed.

To deepen the cumulative effects assessment practice and also include the cumulative and synergistic effects in the analysis, the structural complexity of vegetation patches was modelled. CSIRO data on habitat complexity score (HCS) of 48 vegetation patches in the area were used in vegetation structural complexity assessment. By aggregation, patches were grouped into low, medium and high structural complexity. The separability of the groups was demonstrated using discriminant function analysis. The neural networks method showed the relationship between the structural complexities of the patches and patch metrics such as shape and size. The overall changes in patch metrics and structural complexity over the years 1973 – 2027, detected and projected, were integrated to develop an index of the cumulative effects for a period of 54 years. Patches were ranked in relation to cumulative effects to derive ecological priorities and suggested techniques for restoration.

This research demonstrated the potential for prioritising restoration efforts through objective analysis of vegetation responses to cumulative threats and pressures. Integration of the information thus obtained provided a sound basis for offering mitigation plans. When implemented through a decision support system, this approach can be used to provide authorities and landowners with a range of choices and options for achieving sustainable vegetation in conjunction with human use of the landscape. In light of these achievements, future directions for research into making the procedure a routine practice for rehabilitation programmes are suggested.

Peter Deane

Master of Philosophy

A failing science: Understanding private landowners in the forestry milieu

This thesis contributes towards science studies in the forestry milieu, a topic little investigated. In particular, it directs attention to the paucity of theoretical and critical discourse amongst the private landowner research community. While conducting research into private forest landowners, significant difficulties were noted within the forestry milieu over understanding complex socio-material systems. Consequently, an assertion was made that there exists a single research rationality that has epistemic (knowledge) and normative (belief) characteristics which restrict how landowners can be 'known'.

To assess the assertion, thirty-two research reports were analysed from within the landowner literature using insights from epistemology (theory of knowledge) and critical realism (philosophy on the nature of reality). The analysis was conducted through a general assessment of core epistemic and normative criteria across all cases, as well as of a single case showing how the normative and epistemic inter-relate.

It was found that one knowledge framework dominates. As a generalisation, the framework lacks conceptual sophistication and is largely a-theoretical, emphasising data collection by questionnaire and data analysis by statistics. The dominant knowledge framework proves to be objectivist, determinist, dualist, positivist and foundationalist. It is being informed by a normative approach that promotes managerialism to the exclusion of any other relational system regarding people and forests. Although it appears rational, the lack of diversity in 'knowing' and critique, inferred from the literature, suggests the science produced in the research community that studies landowners is irrational.

This thesis may encourage more diversity of theory use in research.

Don Bakat

Master of Forestry

An analysis of the commercial viabiity of forest plantations in Papua New Guinea

Papua New Guinea's 15 million hectares classified as production forest declined rapidly between 1983 and 1998 with less than five million hectares now remaining. The remaining forest resources are in the hinterlands, far from current processing and log export facilities. These forests have been identified by the National Forest Board as priority projects for commercial harvesting to assist PNG through its current economic problems. Research shows that the natural forest yields 0.4m3/ha/year and recommends at least a 75-year cutting cycle under the current selection system of timber harvesting. Under this system, trees with diameter over 50cm are harvested. The planning, in theory, is based on a 35-year cutting cycle, but audits show that the major forest area is fully exploited within five to fifteen years, compromising the principle of sustained yield forest management and the future industrial timber production.

The National Reforestation Programme of 2002 identifies 800,000 hectares of potential land for large-scale commercial forest plantations. The success of these plantations depends on many factors, including the returns, costs and yield of the plantation species. This study on the commercial viability of the forest plantations is aimed at assessing the comparative advantages of commercial forest plantations against the natural forests and to assess the growth and yield of plantation timber species. Furthermore, it analyses the financial viability of forestry plantation.

The study shows that the current rate of timber harvesting exceeds the productive potential of the natural forest and the future yield is being compromised. Forest plantations have many comparative advantages against the natural forests of PNG and is a fundamentally secure investment for PNG as characterised by higher productive capacity per unit area and higher growth rates of timber species. A financial analysis demonstrates higher net benefit that provides a firm base for investment in large-scale forest plantations in PNG.

Van Ngoc Do

Master of Forestry

Conservation and effective utilization of forest tree genetic resources for plantation forestry in Vietnam

The area of plantation forests in Vietnam has increased markedly over the last decade of 20th century, contributing significantly to mitigating negative environmental impacts, and partly satisfying the demand in wood and other services from forests. However, the performance of most plantation forests- in terms of growth and survival rate- is poor. One of the main causes of this problem is the poor quality of planting material. Further, while genetic resources of many valuable indigenous tree species in the natural forests of Vietnam are seriously degraded, little attention has been given to conservation of genetic resources of these species and their utilization for plantation forestry. Therefore, conservation and effective utilization of forest tree genetic resources to increase the value of plantation forests in Vietnam are both important and urgent.

Conceptual frameworks for conservation and utilization of forest tree genetic resources have been well established. These include those for tree improvement, for in situ and ex situ conservation and for dynamic gene conservation- the establishment of a gene conservation/ multiple breeding population system.

Strategies for genetic resource conservation and utilization for valuable forest tree species for plantation forests in Vietnam need to be based on these conceptual frameworks. However, because of the differences in threats, genepools, distribution and reproductive biology between species, adaptation of these conceptual frameworks is necessary for different species. Further, the strategies need to be appropriate to the socio-economic and technological circumstance of Vietnam.

Therefore, in this paper, four different genetic resource conservations and utilization strategies are developed for four valuable tree species, both indigenous and exotic, for plantation forests in Vietnam. For Pterocarpus macrocarpus, the strategy proposed is to establish ex situ gene conservation/multiple breeding populations for future plantation forests. For Shorea falcata, conserving the remaining genepool and increasing genetic variation for the species through controlled crossing between genetically unrelated families are the main objectives of the strategy. The breeding strategy for Dipterocarpus alatus, a valuable indigenous species in Vietnam, concentrates on developing an effective regime of sampling the gene resource population of the species in natural forests, and establishing breeding populations in eco-regions where the species occurs naturally. In contrast, the breeding strategy proposed for Casuarina equisetifolia, a valuable exotic tree species in Vietnam, is to establish breeding populations in target planting zones and different multiplication populations – seedling seed orchards, clonal seed orchards and cutting multiplication areas- for stakeholders with different capital resources and scales of operation.

Van Thao Duong

Master of Forestry

Conservation strategies for eight threatened tree species in Vietnam

Despite the recent trend of increasing forest area in Vietnam, the quality of forests is still degrading significantly. In particular, parallel with the development process and an increasing population, especially of poor rural people, many valuable plant species are under threat of extinction. Responding to those issues, in 1996, the IUCN Red Book of Vietnam was compiled by Ministry of Science, Technology and Environment. The book comprises of two volumes; animals and plants. In the plant volume, the main characteristics and conservation status of 356 plant species were listed. The situation will have deteriorated since 1996, as a result of exploitation for both livelihood needs and by illegal logging. Consequently, many valuable plant species, some of which are endemic to Vietnam, will disappear forever in the very near future if appropriate conservation strategies are not implemented.

Conceptual frameworks for conservation strategies are well developed. Strategies need to consider the basic genetic processes relevant to genetic conservation: natural selection, genetic drift, migration and mutation. They also need to address human impacts on genetic resources - deforestation, fragmentation, exploitation, demographic alteration, domestication and translocation – which often have much greater impacts in a short time than natural forces. Dynamic conservation, with the objective of creating the best conditions for species' future evolution, is a key concept underpinning conservation strategies. Establishing protected areas with minimum viable populations of a species using restoration ecology, and adopting multiple population breeding systems are key element of dynamic conservation strategies.

The development of conservation strategies in this work started with identifying priority tree species for urgent conservation. Based on the criteria of high economic value, critical conservation status, and endemism to Vietnam, eight species were identified from the IUCN Red Book. These species are: Cinnamomum balansae, Craibiodendron scleranthum, Dalbergia annamensis, Dalbergia mamosa, Drepananthus filiformis, Vitex ajugaeflora, Pinus dalatensis and Pinus kempfii. Relevant tree characteristics were sourced from the IUCN Red Book, and other data were assumed based on the best available information.

Conservation strategies proposed vary among species depending on their characteristics. The major threat for most species is illegal logging and habitat loss. Threatened species generally exist in small fragmented populations with low regeneration capacity. Ex situ conservation appropriate to each species, therefore, is urgent as protection against species extinction. For the long term, establishment of protected areas and implementation of restoration ecology approaches are recommended for most species. Depending on the species' economic value and its natural distribution, multiple population breeding systems are recommended for some species. Finally, the five million ha reforestation programme is seen as a vehicle to help conserve some of the priority species in both the short and the long terms.

Cheryl Edridge

Master of Environmental Science

Cross-cultural management of national parks in Western New South Wales

This paper investigates different approaches to the proposed return of public lands in New South Wales to Aboriginal ownership under the NSW National Parks and Wildlife Amendment (Aboriginal Ownership) Act 1996. This Act provides for return of lands on condition that they retain protected area status, and that a joint management arrangement be established between Aboriginal owners and NSW NPWS. The primary research focus of this paper is case study material of Mutawintji and Mungo National Parks in Western NSW, which were listed for return to Aboriginal owners under the 1996 legislation and where different models of joint management have been established. Together with the Commonwealth-administered Booderee National Park, these case studies illustrate some of the complexity involved in the cross-cultural management of national parks in the densely settled regions of southeastern Australia.

This study concludes that under joint management arrangements in NSW, Aboriginal groups have substantially more input than previously into land and resource management and management of cultural heritage. However, these arrangements are limited to the extent that they only apply within national park boundaries, while further change in management practices may still be needed in order to better accommodate Aboriginal people's interests. Institutional arrangements in NSW for the return of lands to Aboriginal owners and establishment of joint management arrangements have not progressed as fully as the 1996 legislation intended; however, Aboriginal groups in the two case study areas appear satisfied with the different models of joint management that have evolved in their communities, even where return of lands has not taken place.

This paper suggests that while institutional arrangements are important, it is informal relationships of trust and good will that are built between Aboriginal groups and the Park authority as well as real involvement in communities that make these arrangements work. Further research needs to be conducted into other joint management arrangements in southeastern Australia, with a focus on increasing understanding of Aboriginal cultures in this region and the complex nature of Aboriginal identity among different groups. A fundamental aspect of this research would be to examine ways in which joint management arrangements can contribute to the social, economic and cultural development of relevant communities in ways that reflect the needs, goals and aspirations of communities themselves.

Baihua Fu

Master of Environmental Science

Nutrient sources and transport under different land uses: case study on the upper Mogendoura Creek subcatchment, Moruya River, NSW

Outlining nutrient sources and transport can assist in identifying critical management areas and best management practice for catchments. This study uses an integrated field sampling and modelling approach to identify critical nutrient source areas. A case study of the upper Mogendoura Creek subcatchment, Moruya River, on the south coast of NSW is used. The literature on sediment yield and nutrient sources in Australia demonstrates a strong relationship between suspended sediment load and nutrient export. This means that it is possible to model nutrient load using a suspended sediment model. The Catchment-scale Management Of Diffuse Sources model (CatchMODS) is selected for the project and its framework includes hydrologic, sediment and economic submodels. Nutrient sources are identified from field sample and subsequent laboratory analyses of soil nutrient concentrations under different land uses. Three land uses, dairy effluent site, beef grazing pasture and forest, and erosion areas along each of two gullies and two stream banks, were sampled. Laboratory analyses of total nitrogen, total phosphorus, total and extractable cations, and soil organic carbon concentrations show that:

- intensive land use is associated with high nutrient concentrations;
- nutrient effluent has onsite and offsite implications, and the concentrations decrease downstream from a point source (dairy effluent discharge point); and
- subsoil from gullies and stream banks contributes higher nutrient inputs than topsoil at a catchment scale.

The suspended sediment yields from several erosion processes under different management scenarios were estimated using the CatchMODS model. Scenarios selected in the project include land use change and erosion management of stream banks and gullies. By multiplying the nutrient concentration by sediment yield, the annual nutrient exports under different scenarios are presented. Different land management scenarios contribute differently to sediment and nutrient transfers. Stream bank erosion is highlighted as the most important sediment and nutrient input in the upper Mogendoura Creek subcatchment. Accordingly, management practices applied to stream banks, employing either engineering and / or revegetation techniques, are the most hydrologically effective and economical ways to reduce water quality impacts in the subcatchment.

The limited number of samples indicates that this is a pilot or reconnaissance project. More samples are required for a thorough statistical analysis. Moreover, due to the complex relationship between soil nutrient concentration and water nutrient concentration, the nutrient enrichment ratio and nutrient release rate are suggested as avenues for further investigation. Some parameters in the CatchMODS model also need to be modified. Nevertheless, this project provides a useful case study by which to investigate the nutrient sources and transport under different land uses, to identify critical management areas and then to recommend improved management practices for the subcatchment.

Simon Greenaway

Master of Forestry

Forest Certification: an opportunity to improve livelihoods for some forest communities

Long-term livelihood benefit for forest communities will be determined by the ability of the community to manage the forest sustainably harnessing the diverse array of benefits that the forest produces in a manner that maximizes community benefit. This will include management for commercial utilization as well as for 'safety net' needs. If livelihood options can be increased through commercial endeavors and these benefits can be equitably distributed through the community the reliance on the 'safety net' attributes of the forest may be reduced thus leading to real and sustained livelihood benefits for the communities existent within or neighboring the forests. To maximize market access and increase livelihood opportunities forest certification (FC) with a particular focus on community forest certification (CFC) and subsequent certified product processing may be an appropriate mechanism for forest communities to pursue in the management of their forests and to progress community development.

This paper presents an overview of forest certification and its interrelationship with SFM and identifies the characteristics associated with community forestry comparing them with those of industrial forestry within the market-based mechanism of forest and forest product certification. This comparison provides a valuable insight into the complexity associated with community forestry highlighting issues that must be addressed if CFC is to be considered a viable forestry development option for forest communities to increase livelihood options through certifying their forests and then marketing certified forest products. The fundamental differences between industrial and community forestry expressed through globalization and localization, suggest an explanation for the mixed results achieved by CFC thus far. Mechanisms such as stepwise or phased approaches to FC, group certification, the Small and Low Intensity Managed Forests (SLIMF) initiative and partnerships are currently being employed to bridge the localization – globalization divide for communities interested in pursuing FC.

In essence, if CFC is to be successful in achieving improved forest management practice and to provide lasting livelihood benefits for forest communities and the individuals within these communities, increased management capacity focused on complying with certification requirements, complemented by successfully linking with the market to meet it's demands is essential.

William Marthy

Master of Environmental Science

Mixed-species bird flocks of Sumatra's Lowland Forests

Rapid disappearance of Sumatran lowland forests has generated considerable attention to conserve these forests. Mixed species foraging flocks are an important phenomenon in forested areas and involve significant proportion of birds. Understanding the importance of this social behavior will provide benefits in pursuing biodiversity conservation. Only a few studies have dealt with mixed flocks in Sumatra. Therefore, from June to November 1997 a study was conducted to examine

the structure and composition of mixed species bird flocks. Two data collection methods were used: bird count and mixed flock sampling. Descriptive statistics were used to explain the structure and composition of mixed flocks. Interspecific association analysis was used to find out whether the degree of attendance of one species was influenced by other species.

Most of the insectivore species found in the study area participated in mixed flocks. There were 183 mixed flocks encountered, comprising 77 species. Three bird families dominated: Timaliidae, Pycnonotidae and Picidae, which also dominate the avifauna in Sumatra. Mixed flock members consisted mostly of insectivorous species, small to medium sized birds, and foraged either in the canopy or the understorey. Searching was the dominant foraging technique. The number of species per mixed flock ranges from 2 to 15 species, with average flock size of 10.32 $\pm$ 0.39 SE birds.

Fifteen species occurred more than 10% of the mixed flocks observed and were used in interspecific association analysis. There were 34 significant positive associations and 21 significant negative associations. There appear to be two types of mixed flocks in the study area, based on the positive association: canopy mixed flocks, centered on Blue-winged leafbird and mostly consisted of canopy species; understorey mixed flock, centered on the Scaly-crowned Babbler and mostly consisted of understorey species. Interspecific competition seemed to be avoided through differences in foraging location, foraging technique or body mass.

Five species of birds of prey were observed in the study area, most include birds in their diet and several attacks on mixed flocks were witnessed. Hence, the enhance protection from predation is perhaps an important benefit conferred by mixed flock foraging. Foraging facilitation may also be involved in conferring a selective advantage from flocking but perhaps not as great as the predator avoidance benefit. There is a relatively minor benefit enjoyed by mixed flock members, mainly observed toward kleptoparasitizing species, such as drongos.

Fourteen near threatened species were observed to participate in mixed flocks, with three babblers species participating in at least in 28 of the mixed flocks. This shows, to a certain extent, the importance of this social behavior for these species.

Julia Pickworth

Master of Environmental Science

Community perceptions of pine plantations: A report based on a sample survey of residents in the Bombala region of NSW

Pine plantations are expanding in Australia, with this expansion often surrounded by controversy within the community. Understanding people's responses to pine plantations is the focus of this research, which explores the community's perceptions of plantations in the Bombala region of NSW through a survey of a random sample of 261 residents.

This research reveals that most respondents (42.5%) see the disadvantages of plantations as outweighing the benefits of plantations for their region. However, the results also show that the majority of respondents see both positive and negative impacts from plantations. Plantations are seen by the majority of respondents to have positive economic impacts particularly related to employment; predominantly negative environmental and social impacts; and as having mixed impacts on the region's population. The current governance of plantations is viewed poorly with most respondents believing that current government management and community participation in plantation planning is inadequate. The central role of governance in people's views of plantations is reflected by the majority of respondents believing that with appropriate planning, plantations are a positive industry for their area.

Perceptions of plantations varied significantly ($\chi 2$ tests with significance level of $p<0.05$ in this study) by whether respondents lived in a town or a rural area, and by whether they lived in the Bombala locality or in a surrounding locality. This spatial unevenness is apparent in the perceptions of the risk of negative impacts from plantations in the future; the probability of positive impacts in the future; plantation impacts on respondent's quality of life; and most statements on economic, social, environmental and population impacts. This indicates that perceived plantation impacts are strongly spatially uneven, suggesting actual impacts may also be spatially uneven.

The perceptions of plantations varied in other ways across the community, with perceptions of the relative benefits or disadvantages of plantations being significantly related to gender, education level, occupation groups and whether the respondent adjoins a plantation. Contrary to common conceptions, views of the relative benefits or disadvantages of plantation are not significantly related to years or generations lived in the area; reported levels of plantation knowledge; or age.

The research shows a high level of support for community participation in plantation planning, with face-to-face meetings involving information exchange being reported as the most useful and most attended participation activities. Results also show that reported plantation knowledge is concentrated in the areas of forestry practices and economic and environmental impacts, with a low level of reported knowledge about government policies and management practices. This research highlights several issues for further research, as well as implications for governments and industry arising from the results of this research.

Michael Poesi

Master of Forestry

Early results from a provenance/progeny trial of Kalopilum (Calophyllum euryphyllum Laut.) and implications for a breeding program in Papua New Guinea

Kalopilum (C. euryphyllum Laut.) is an important tree species in Papua New Guinea, and was identified by ACIAR's PNG Domestication Project as a priority species for genetic improvement and conservation. Wood is the major commercial product, and is valuable for processing for various end-use products. The present supply of wood, particularly for export, is mostly from PNG's natural forests, the genetic resources of which are under threat from commercial logging. It is therefore necessary to genetically improve this species to meet potential demand for, quality planting stock for reforestation and small to medium scale industrial use. However, no genetic information is yet available for this species. This major essay reports the early performance of a Kalopilum provenance/progeny trial established at Markham Bridge, Morobe Province, PNG in May 2002.

Performance is examined for three growth traits - at 3, 7 and 20 months - and two form traits and three health traits at age 20 months. The trial consisted of 5 PNG provenances, representing 33 families and 7 bulk seedlots. Significant provenance variation was detected for all growth traits (height, diameter at breast height and diameter at ground level), stem straightness, and three health traits. However, no significant provenance variation was detected for branching.

The provenances with superior height and diameter growth were Open Bay and Rambutso. Umboi was superior in stem form, but poorly ranked in other growth and form traits.

Significant family variation was detected only for growth traits. Ten families from Open Bay (1), Kaut (4), Kapou (3) and Rambutso (2) were superior in height and diameter. There was no significant family variation detected for any form traits ($p > 0.001$).

The open-pollinated family structure within each provenance collection was used to estimate genetic parameters. Heritability estimates for growth traits were moderate to high (0.31 ± 0.01 to 0.96 ± 0.03), but zero for stem form and all health traits. Heritability estimates decreased with aging of the trees; estimates for height decreased from 0.96 ± 0.03 at age 3 months to 0.48 ± 0.02 at 7 months, and to 0.31 ± 0.01 at age 20 months; estimates for dgl decreased from 0.91 ± 0.03 at 3 months to 0.41 ± 0.02 at age 20 months. The estimate for dbh at age 20 months was 0.36 ± 0.02.

Genetic correlations between growth traits were high and positive at 20 months. However, correlations among growth, stem form and health traits were mostly negative, and of varying magnitudes, low with high standard error. These estimates were not precise, probably due to the early age of the trial.

A breeding strategy was developed to address the immediate deployment of superior plant stock, long-term breeding for wood production and improvement of the success of vegetative propagation.

Emma Soraya

Master of Forestry

Management models for Rattan Gardens of Kedang Pahu, West Kutai, East Kalimantan, Indonesia

Rattan is a climbing palm that is one of the most important forest commodities after timber. With solid, strong, uniform, light, and flexible cane characteristics, rattan has high commercial value. Rattan has long been used by rural people who live in or near forests. Rattan has also been traded for centuries around the world; the annual trade is worth more than US$7 billion.

However, the commercial value of rattan is likely causing the wild rattan resources to be over-exploited. While indigenous people in Borneo have cultivated rattan for centuries, optimal management of this traditional cultivated rattan might overcome the issue of the decrease in raw rattan supply. However, optimal management needs information on how much rattan can be harvested from a particular area over a given period of time.

In order to define how much a rattan garden is growing annually, knowledge of its population structure and dynamics is required. This information can be utilized for determining optimal management strategies (i.e. annual allowable cut (AAC)) that would ensure the sustainability of cultivated rattan resources. Using available single inventory data of rattan gardens managed by the people of Kedang Pahu, West Kutai, East Kalimantan, Indonesia, a simple growth and yield model for planted rattan was developed. Based on predicted yield, management models for planted rattan were then developed. Sensitivity analysis through simulating the management models was done to test the adequacy of the models and identify the significant parameters.

The conversion factor for length to weight based on sampled canes was 11.65m/ kg. Assuming that there is no elongation growth of mature canes, the resulting yield predictions adequately represent reality and correspond to the results from previous studies, thus sufficiently accurate to be used for management model purposes. Management strategies resulting from optimization techniques suggest cutting the gardens to convert them to the optimal MAI age. The gardens were converted into two even-sized age classes to keep the gardens producing at the same maximum levels of production annually. The sensitivity analysis shows that yield at age class two is highly significant in affecting the prediction of total yield. However, there are still uncertainties inherent in the models' prediction. Thus, to enhance the performance of the management models proposed, the information on yield should be prioritized to obtain higher precision in model prediction.

This preliminary study was not comprehensive; therefore further studies are still needed to refine the management models proposed by developing more accurate estimations of input parameters of the management models. This could be done by more detailed, effective and continuous inventory that involve the community, particularly to refine growth and yield models used in the management models.

Karen Chwee Peng Teo

Master of Geographical Science

Conservation Issues in Bukit Timah Nature Reserve, Singapore

The 164-hectare Bukit Timah Nature Reserve is the largest remaining tract of primary rainforest in Singapore (Collins et al., 1991). It is a coastal hill forest dominated by the family of Dipterocarpaceae. The tropical rainforests of Asia are rapidly being cleared and logged resulting in massive species loss. Bukit Timah Nature Reserve has also gone through extensive species loss –large mammals like the tiger and leopard no longer roam the forest. The Reserve is also under threat of the effects of forest fragmentation as it is now cut off from the larger adjacent forest (Central Catchment Area) by the eight-lane Bukit Timah Expressway. The rapid urban developments surrounding the Reserve have gradually encroached on the edges of the forest. There are now concerns that the Reserve might not survive.

The objective of this study is to investigate the ecological and genetic implications of forest fragmentation on the Reserve and identifies the principal challenges faced by the Reserve. This was done through literature review of ecological and genetic theories of forest fragmentation and then applying these theories to the situation in Bukit Timah Nature Reserve.

The analysis of the theories for Bukit Timah Nature Reserve resulted in four main challenges. They are firstly, there appears to have been no significant invasion of the Reserve by exotic plants and animals, though most tropical rainforest studies on similar fragments shows their vulnerability to invasion from exotic species; secondly, loss of seed dispersers for large-seeded plant species, like the hornbills which are locally extinct, makes the survival of large-seeded plant species uncertain; thirdly, the increase in the population of small mammals within the Reserve is of concern because there has been insufficient study to assess their effects on the forest community's structure; and lastly, the survival of the dominant tree family, the Dipterocarpaceae, is uncertain because of the lack of studies on its pollination, seed dispersal and regeneration.

Recommendations in the fields of research, management and involvement of the community are suggested for the conservation of the Reserve.

Felicity Anderson

Effects of time controlled grazing and set stocking on soil and pasture: Southern and Central Tablelands, NSW

The aim of this research was to investigate Time Control Grazing (TCG), as a specific method of rotational grazing, by quantifying soil properties and pasture composition under this system, and comparing them to the more conventional method of Set Stocking (SS). The study was conducted using paired transects across five sites in the Central and southern Tablelands, in the High Rainfall Zone of NSW. The impetus for this study was concern about grazing in these areas relying on unsustainable, high levels of external inputs,, which can lead to problems of landscape degradation such as soil acidification, erosion and declining pasture productivity.

The study consisted of field and laboratory work that investigated a range of soil physical and chemical properties that are impacted upon by grazing, as well as a field investigation of pasture composition. This research continues the work of Ticehurst (1996) that found strong anecdotal support for the TCG system but lacked scientific support, as the systems being investigated had only been in place three years. Benchmark soil properties that were established by Ticehurst (1996), were used for a comparison with this study so as the effects of the system over time may be measured.

The most significant differences between the two grazing methods were seen in pasture composition and compaction in the soil profile. The TCG grazing method resulted in greater perenniality and also had less weeds and legumes present within the system than the SS method. Differences in a range of other soil physical and chemical properties varied between sites. Sites with well drained soils were found to be the most responsive to the TCG method (ie. Farms D and E), and had faster infiltration rates and more stable aggregates in the TCG treatment. Overall there were slightly higher levels of organic carbon, macroaggregates and aggregate stability, and infiltration in the TCG treatments. The pH was also higher under TCG and had increased since the previous study across both treatments and farms. Farm C was the exception with the above properties more favourable in the SS treatment on this farm. This result was related to the low stocking rate under the SS method on this farm.

Under TCG, perenniality increased significantly and a more desirable pasture composition was reached. Therefore this suggests TCG has the potential to correspondingly improve soil physical and chemical properties. Whilst no significant differences between the two treatments could be found, after the systems had been in place 10 years the majority of soil properties showed strong trends towards improvement under TCG, with significantly less compaction being recorded under TCG compared to SS.

Suzie Bond

Do woodland birds breed in revegetated sites?

It is known that woodland birds are able to occupy revegetation patches, but it is not known whether they have the ability to breed in them. The principal aim of this study was to ascertain whether woodland birds, many of which are declining, were attempting to breed in small remnants and revegetated patches across the ACT and surrounding NSW. This aim was addressed using source-sink theory, whereby revegetation patches were viewed as either potential sources (good quality habitat in which birds could breed successfully and from which excess individuals could disperse), or sinks (inferior quality habitat where birds were unable to breed successfully, and to which excess individual from source populations might migrate). A supplementary aim was to determine whether the revegetation age bore any influence on the number and type of species that were occupying and attempting to breed within that revegetation.

During the spring 2003 breeding season, 16 revegetated sites and four remnant sites were surveyed for bird species richness, bird abundance and for breeding attempts. Habitat variables were also recorded. All bird species, woodland species (birds dependent on woodland habitat) and obligate hollow-nesting species were identified. The results were analysed using regression analysis and multivariate statistics.

18 woodland bird species, including four declining and one threatened species, were recorded attempting to breed in revegetation patches. The age of the revegetation was found to affect the pool of species that could potentially occupy, and were therefore able to breed, in the patches. Woodland birds responded mostly to landscape variables, especially connectivity. For all bird species, species richness was mostly influenced by landscape attributes, while bird abundance was affected by tree attributes, and breeding results by tree health and patch attributes. Obligate hollow-nesting species responded to tree attributes, and were only observed attempting to breed in revegetation which incorporated hollow-bearing remnant trees. Despite woodland birds bring able to initiate breeding in revegetation, insufficient data were collected to conclude whether these patches were acting as sources or sinks in the landscape.

Gabrielle Breen

Global warming, local responses: An integrative inquiry into the ACT residential sector

Human forced climate change poses an immense challenge to global sustainability. Local communities offer significant opportunities for greenhouse gas emissions 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 decision-making system of the ACT residential sector was responding to the greenhouse challenge, and what opportunities existed for a better response. In view of the complexities of the residential sector, and a mission-orientated interpretation of research for sustainability, an integrative research approach was developed to guide the inquiry. A case study employed participant observation, informal interviews, a document review, and a group workshop to 'map out' greenhouse gas abatement responses by decision-makers within the residential sector. A Decisions-into-Practice framework provided the integrating concepts for the study.

The case study found there was no cohesive, whole-of-sector response to the greenhouse issue. Instead, there were differences between and within four key decision-making groups: government, industry, householders, and advocates of change. The decision-makers were differentiated by their interpretations of greenhouse, values and agendas, information sources, and actions taken. Notwithstanding these differences, there were some similarities, including that most decision-makers interpreted greenhouse indirectly, in terms of other concerns such as international and national factors, environmental sustainability, economic viability, and social equity. A further finding was that relationships within the residential sector partially structured its overall response to greenhouse, and, together with economic disincentives, created a structural and ideological dynamic that may have posed a barrier to action on greenhouse. Finally, the research identified a range of opportunities to better respond to greenhouse, including strategic priorities, visions, increased education, cultural changes, addressing disincentives, and leadership by government.

These findings contribute to the literature by providing an analysis of the dynamics of the decision-making system of the residential sector in one local urban population. Such research is lacking, and this study offers a pilot for future research.

In light of these findings, the conclusion was made that opportunities for communication could assist in bridging the differences between decision-makers in the ACT residential sector identified through the research. This could 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 opportunity for such dialogue.

At a broader level, my experiences in designing and conducting this research revealed challenges in ensuring the design, method, and

process adhered to the principles of a mission-orientated interpretation of research for sustainability. While partly reflecting the time and skill limitations associated with honours research, these challenges also exposed more systemic problems in current approaches to knowledge for sustainability. Future research might usefully explore this area further.

Jane Bryan

Comparing vegetation field measurements of foliage and cover with a MODIS-derived greenness index: A case study in the Eyre Peninsula, South Australia

The aim of this study was to examine the relationship between the fraction of photosynthetically active radiation (fPAR), derived from the MODIS NDVI, and field measurements of vegetation cover and PFC. FPAR recorded on the field survey date as well as a long-term mean fPAR were compared to both PFC and vegetation cover. The vegetation cover measurement was partitioned initially into woody and herbaceous cover, as the relationship between fPAR and these vegetation types has been shown to differ. The woody category was further partitioned into tree and shrub cover in order to compare the PFC with the tree vegetation cover measure, and to assess the influence of understorey vegetation on the fPAR signal. The mean fPAR was estimated from a 3-year NDVI time series to assess the importance of matching the fPAR to the date that the field plots were surveyed.

The results indicated that fPAR was sensitive to PFC, grass and tree cover, but not shrub layer cover. Generally, the correlations were weak. Correlations generally decreased with increasing levels of vegetation in other strata suggesting that understorey as well as overstorey contributes to fPAR. Field measurements were more highly related to fPAR recorded on the field survey date compared to the mean value. PFC was more strongly related to fPAR than was tree cover, indicating that fPAR is sensitive to foliage rather than vegetation per se. Shrub layer cover may not have been related to fPAR due to the high level of woody compared to leafy tissue, and the low level of photosynthetic tissue in shrub leaves. Grass cover was more strongly related to fPAR than PFC, tree and shrub cover, possibly due to the higher levels of photosynthetic (green) tissue in grass compared to woody vegetation. FPAR may be sensitive to photosynthetic properties of leaves rather than foliage or vegetation cover per se. These findings were limited by the difference in size between the field survey plot and the MODIS pixel. The results suggest that fPAR cannot be used as a surrogate for PFC or vegetation cover, but can seen as complementary.

Melissa Burgess

Fear of Crime: Spatio-temporal patterns of avoidance in Kings Cross

Regardless of whether crime is present, people avoid areas where they feel afraid of becoming a victim of crime. With the widespread adoption of this behavioural response, fear of crime has emerged as a distinct phenomenon that causes numerous problems for both the individual and the community. Research into fear of crime, particularly peoples' avoidance behaviours, has the potential to provide information that could be used to reduce the public's fear of crime and curb the negative consequences that result from this phenomenon.

This thesis provides a spatio-temporal investigation into the avoidance patterns adopted by people who fear being robbed, beaten or attacked. It presents a preliminary exploration demonstrating the appropriateness and capacity spatial analysis of crime-specific avoidance-based data has for providing new information.

The research was conducted in Kings Cross, New South Wales, an area historically associated with crime and fear of crime. A total of 399 survey respondents were interviewed using a modified version of Doran and Lees' (2003) and Darcy's (2003) fear of crime surveys. The data was analysed using a decision tree, which showed that the respondents' sex is the most significant variable explaining fear of crime, with females being more fearful than males.

A three-dimensional visual-diagnostic technique (using a Geographic Information System) was developed to visualise the spatial aspects of the data. Maps were produced to represent the number and proportion of respondents avoiding areas and how hard they tried to avoid those areas. Male and female respondents were mapped separately to demonstrate the different levels of fear and the additional information provided through spatial visualisation.

Spatial crime records, obtained from the New South Wales Police, were also integrated with the avoidance-based survey data to demonstrate the distinct mismatch between the incidence of, and fear of, crime in Kings Cross.

Using a single dataset, this thesis also shows how global cognitive-based approaches to measuring fear of crime and crime-specific avoidance-based questions produce dissonant results. This dissonance provides some useful insights into the measurement of fear of crime. The results highlight the appropriateness and capacity these methods of surveying and spatial analysis have for providing new information on fear of crime.

Rachel Clarke

Landholder perceptions of salinity and the implications for management

Salinity is currently one of the greatest environmental threats facing Australia. Although salinity is a natural phenomenon in the Australian environment, clearing of native vegetation since European settlement has caused water tables to rise, bringing salt deposits to within the capillary zone, in the process known as dryland salinisation. Solutions to land degradation problems such as dryland salinity have traditionally been addressed using technical solutions. However, as management induced land degradation continues to increase, it is becoming progressively more apparent that land degradation problems need to be addressed through examining the underlying social processes.

This thesis examines the way landholders' perceive salinity; in order to determine the influence this has on the way they manage their land. An investigation of other factors effecting salinity management was also carried out, in order to determine the extent to which perceptions affect management, and to allow recommendations for future management of salinity to be developed.

A case study of landholders in the Boorowa region was undertaken in order to ascertain how landholders' perceive salinity. As salinity has been recognised in the Boorowa region for over fifteen years, lessons learned from the evolution of perceptions' of salinity, and 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 research involved in-depth interviews with sixteen landholders in the Boorowa region, as well as interviews with several local government representatives involved in salinity management.

Landholders' perceptions of salinity were found to play a role in the management they were carrying out for salinity. Landholders interviewed generally saw salinity as being of moderate threat; although it was acknowledged that salinity could potentially affect their continued viability, they felt confident in their ability to contain and reduce the effects of salinity. It was also found that landholders in the Boorowa region highly value their ability to be self-reliant and autonomous, and are consequently highly opposed to regulatory approaches to salinity management. Other factors found to be limiting landholders' ability to manage for salinity were a lack of finances, and a lack of time. The inherent difficulties in salinity management, due to the off-site nature of the problem, also limited landholders' ability to manage salinity effectively.

The results suggest that the way landholders perceive a land degradation phenomenon will influence their management, and as a result of this, management for land degradation is not always a high priority: a revelation that policy makers need to understand. Policy to promote management for land degradation also needs to appreciate the limitations imposed on landholders', as well as their opposition to regulation.

Alex Cribb

A Useful Intervention in Waste: An application of Soft Systems Methodology in waste management and recycling behaviour at FaCS

This thesis presents the application of Soft Systems Methodology (SSM) as a way of undertaking action research linking interpretative science with systemic intervention. The primary aim was to explore systemic intervention, using SSM, as a reproducible action research approach in the context of employee waste management and recycling behaviour at one site of the Department of Family and Community Services (FaCS), Canberra. As action research, the secondary aim of the project was to change this behaviour to achieve the outcomes of minimising waste and increasing recycling rates at this site. This thesis argues that the structuring of this problem situation as systemic intervention, as SSM cycles of action and learning, was a more effective approach to changing employee behaviour. It is further argued that by structuring the problem systemically the employees were able to undertake purposeful actions that were suited to their particular circumstances and culture. It was found that the systemic intervention approach led to significant improvement in the employee behaviour in respect to recycling commingled waste and, furthermore, a reduction in the total amount of waste produced at a trial site. In addition to the interventions producing such material improvements, employees reported that they were more aware about the recyclability of materials and broader ecological issues surrounding solid waste. In conclusion, this paper provides reflections on systemic intervention as a tool for scientific inquiry, the management of change and purposeful action for improvement.

Jessica Drake

Dairy Farm Effluent: Effects of Long Term, Continuous Application to soils, Bega Valley, NSW

There is increasing pressure to find alternative methods for disposing of wastes, including application to land. Dairy Farm Effluent (DFE) is one waste which can be re-used on land as a valuable resource. However, little is understood about the positive and negative effects that land application of DFE may have on soil properties and productivity. Therefore, the aim of this research is to determine the effects of long term continuous application of DFE on soil properties, and how to best manage these effects.

Farms in the Bega Valley, NSW were chosen based on length of time DFE has been applied to land. This included sites with 1, 5, 15, 25, 50 and 100 years of cumulative DFE application. The treated sites were paired with an environmentally similar control for comparison. Measurements were carried out on soil properties that DFE constituents can potentially affect. Soil physical, biological and chemical properties were measured, including infiltration, soil respiration, bulk density, pH, electrical conductivity, organic matter, exchangeable sodium percentage (ESP) and total nitrogen and phosphorous.

Soil types on control and DFE sites were found to be similar. This indicated that measures of difference were caused by DFE application, and not due to inherent soil type differences. The results demonstrated changes in soil properties with the long term application of DFE. Soils accumulated organic matter over time, which improved soil physical properties, especially infiltration and bulk density. However, total salinity, total nitrogen and phosphorous also accumulated over time, potentially limiting pasture productivity and environmental health. There was little to no inhibiting change in pH and ESP. A high level of in site and between site environmental variability limited the interpretation of the results regarding pasture productivity and management implications.

Pasture productivity was shown to be both positively and negatively affected from long term DFE application. Therefore, precautionary management strategies were described to deal with these issues. Management strategies included increased rotation of DFE applied paddocks; separation of solids (high in P) and liquid (high in N) DFE, so providing more appropriate fertiliser regimes, and continual monitoring and adaptive management. Further research is necessary to more precisely determine an optimum long term management strategy, and the exact implications of long term DFE application to soil.

Janet Finn

Diatoms: Palaeoenvironmental Reconstruction and Archaeology. Bobundara Swamp, Southern coastal, NSW

Diatom analysis in palaeoenvironmental reconstruction is a potentially useful but often neglected tool to further the understanding between the environment and archaeology. This thesis takes the opportunity to explore the potential of diatoms as the primary analytical proxy together with a limited magnetic susceptibility analysis. The results are compared with previous case studies using pollen analysis at Bobundara Swamp, southern coastal New South Wales.

The research is grounded on the theoretical and practical dimensions of such an investigation. Australian archaeology is frequently limited by the Australian environment which often does not preserve signs of human occupation. This, together with hunter/gatherer people living within their landscapes, makes the understanding of societal development difficult. A multidisciplinary approach supplies complementary information relevant to sequences in both environmental analysis and archaeology.

The study analysed diatom species representation from fifty samples at 20 cm intervals from a 977 cm core from Bobundara Swamp. The core was also examined for magnetic susceptibility between 100 cm and 700 cm.

Diatom analysis is effective in aquatic environments at local levels while pollen, with its wider range of dispersal, provides information on a broader regional scale. Diatom analysis provides insights into the history of Bobundara's development not previously shown by pollen. For example, Bobundara became a deep freshwater lake for 3000 years from c. 3900 BP (3.9 ka) rather than the brackish lake previously described. Diatoms also show freshwater events occurred in the estuarine stage that were not shown by pollen. Where analyses coincided, magnetic susceptibility results often correlated to the sedimentary influences. These results show some important regional differences in estuarine evolution.

There are implications for the changing use of swamp resources by Aboriginal people. The environment stabilised earlier than previously thought with a probable corresponding stabilisation of resource availability. The presence of brackish shellfish species and stone artefacts in middens around the northern edge of Merriwinga Swamp, the southern drainage of Bobundara, suggests they were locally exploited.

Changes were also seen in the diatom assemblages and the landscape after European arrival.

When the data is compared to previous Bobundara studies, diatoms have effectively allowed a greater understanding of both environmental change and the potential change in human resource use and cultural development.

Emily Jennifer Flowers

The effect of salinity on *L. tasmaniensis*

Freshwater ecosystems in Australia are being exposed to increasing landscape salinisation, however the impact on freshwater biota is relatively unknown. I examined the effect of salinity on the breeding and development of *Limnodynastes tasmaniensis* in the Boorowa region NSW, through fieldwork and a laboratory experiment. I investigated the concentrations of salinity populations of *L. tasmaniensis* were exposed to in the Boorowa region and their reproductive success at those concentrations. In the laboratory I examined the effect of increasing salinity (up to 5880uScm^{-1}) on the growth and development of larval *L. tasmaniensis* to determine whether they were utilising the mechanism of phenotypic plasticity. The concentrations were based on salinity

measurements derived from the fieldwork. The fieldwork showed that temporary water bodies experienced both significantly higher salinity and a greater range of concentrations than permanent water bodies. Salinity concentrations at sites where no eggs were detected (yet males were calling) were significantly higher than sites where eggs were detected. This potentially indicates a behavioural response by female frogs to select breeding sites within the salinity tolerance of egg masses. In the laboratory experiment there was no significant difference in growth (body weight or body length), rate of development, or mortality between the salinity treatments (up to 5880uScm^{-1}). This indicates that tadpoles are not using the mechanism of phenotypic plasticity in response to salinity at these concentrations. Previously, these concentrations of salinity have been shown to impact on mortality and growth, which indicates that there may be some level of tadpole acclimatisation with gradual exposure. This research inicates that water bodies with salinity concentrations below 1300uScm^{-1} are preferred breeding sites for *L. tasmaniensis*. Salinity literature recognises a general freshwater biota threshold of 1000mgL^{-1} (~1500uScm^{-1}), which correlates with the results from this research.

Andrew Ford

Site quality for *Pinus radiata D. Don*: Southern Tablelands, NSW

A number of models have been developed to assist in spatial growth predictions for plantations. However, the input data and technical requirements of many models restrict their application. The Forest Productivity Model, developed by the Australian Greenhouse Office for native forest growth across Australia, is trialled as an indicator of site quality for plantations of *Pinus radiata D. Don* on the Southern Tablelands, New South Wales. Site Index and volume at age 15, calculated using mean dominant height and basal area, are compared to long term average, 25 year average and 20 year average Forest Productivity Index (FPI) values. Significant correlations were found between Site Index and both the long term average and 25 year average Forest Productivity Indices. No significant correlations were found between volume at age 15 and the Forest Productivity Indices.

Strong regional variations occur in the relationship between Site Index and the Forest Productivity Model. In particular, there is a significant positive correlation between Site Index and FPI value for the Tumut, Tallaganda, Lake George, and Bombala Tablelands regions. A regression model including parameters for FPI value and region yields a high correlation for these regions ($r^2 = 0.82$). However, the cause of the regional variation is unknown, thus definition of regional boundaries is problematic.

The Lake George, Bombala Tablelands and greater Southern Tablelands regions are similar in their relatively low rainfall and undulating topography, in comparison to other regions studied. The variation in relationship for the Tallaganda region may be due to the significantly higher rainfall along the range. Under these assumptions, regional boundaries were proposed, and the relationships found using existing plantation stands are extrapolated across the Southern Tablelands region. The resulting map indicates land capability for *P. radiata*, in terms of Site Index, across the Southern Tablelands region. This will assist potential plantation growers in growth forecasting, and may form the basis of a land suitability and profitability assessment for Radiata Pine plantations. The variation between regions suggests that the regressions found in this study should not be used in regions other than those studied in southeast NSW. Further research is recommended to determine the relationship between the Forest Productivity Model and Site Index in other regions and for other species.

Michelle Gilbert

Trends in urban tree removal on leased land across Canberra, ACT

The appropriateness of the current approach to urban tree protection on leased land across Canberra has been evaluated through the analysis of urban tree removal trends. Exploratory analysis of requests for urban tree removal and their outcomes from 29 March 2001 to 29 March 2004 have been quantified using data pertaining to the Tree Protection Act (Interim Scheme) 2001. The Tree Protection Act 2001 was introduced to protect urban trees classified as significant using size-based criteria from unwarranted removal, while still protecting leaseholders from hazardous trees.

The ACT Government approved 88% of requests for the removal of significant trees. This high percentage is not reflective of inadequate tree protection, rather it indicated that many trees met the approval criteria for the removal of a significant tree under the Tree Protection Act (Interim Scheme) 2001. Even though requests for tree removal were normally granted, the justifications given by leaseholders when applying for the removal of a significant tree were not always consistent with those provided after examination by the ACT Government.

Removal trends of significant trees were variable across Canberra with high pressure for tree removal in suburbs established between 1920-1929 and 1960-1979. Although 60% of trees requested for removal were native, there were similar proportions of requests approved for native and exotic trees. Implications of the tree removal trends were limited by the unavailability of an inventory of trees on leased land.

Canberra's legislative approach to urban tree protection needs to simultaneously consider the composition of the urban forest and leaseholder property rights. Since the urban forest is uneven-aged, requests for tree removals will be continuous and hence proactive management and long term planning of the removal and replacement of urban trees should occur. Encouraging leaseholders to plant trees and recognise their value through incentives will maintain the urban forest character of Canberra rather than an onerous approach to urban tree protection.

Ivan Hanigan

Cardiovascular Disease Mortality, Socio-Economic Status and Air Pollution: Understanding the Geographical Patterns

There is a considerable amount of epidemiological literature identifying relationships between Socio-Economic Status (SES), ambient Air Pollution (AP) and Cardiovascular Disease (CVD). Processes determining these relationships are elements of the physical and social systems in human ecology. There are numerous studies that show a negative gradient of this category of disease between populations with increasing levels of SES. The influence of air pollutants on CVD mortality is not yet conclusive, however results are suggestive and plausible cardiovascular mechanisms are known. This study investigates the geographical pattern of socio-economic status and air pollution across Sydney and the relationships with CVD mortality.

The mortality data are available from the Australian National Mortality Database (NMD). These data aggregate the locations of usual residence at time of death to spatial units. There are two kinds of spatial unit currently available: Postal Areas (POA) and Statistical Local Areas (SLA). A central problem of geographical analysis of environmental and health data is that analyses using information collected at an inappropriate scale may obscure or distort the relationships investigated. The observed relationships may differ substantially between types of spatial units because of the issues of scale and zonation. These issues are known collectively as the Modifiable Areal Unit Problem (MAUP) in geographical terminology. The scale issue has an effect by varying the size of the aggregation units used, while the zonation issue has an effect by changing the shape of spatial units at the same scale. A key aspect of this study is the exploration of the effect of the scale of the spatial units used in these small area data, aiming to improve understanding of the geographical patterns of the relationships.

CVD mortality data were extracted and environmental data were processed and integrated for Sydney for the period 1996 until 1998. Four consecutive six-month seasons were used to account for the strong seasonal variation of these diseases. Regression tree models and stratified linear regression were used to explore relationships shown by these data. Regression trees are a data-mining approach that allows many variables to be assessed and key relationships identified.

The tree model results identified similar variables in the analysis at the two levels of aggregation. The winter season, ABS Index of Relative Socio-Economic Disadvantage and particulate matter with aerodynamic diameter less than 10 micrometers (PM10) defined regions with different rates of CVD mortality in both sets of spatial units. These variables were explored using linear regression models that were stratified to control for the interaction between these such that only the winter rates were regressed against the disadvantage index. Then the winter rates for the most disadvantaged areas were analysed for a relationship with PM10. It seems that the mortality rates in the most disadvantaged areas are influenced by this pollutant more than the less disadvantaged areas.

The relationships observed are slightly different between the two types of spatial units. The POA-level regression slope for winter rates against the disadvantage index was not as steep, but more statistically significant than that found at SLA-level. The relationship with PM10 observed in the disadvantaged areas in winter at the POA-level was not significant whereas those at the SLA-level were. From these results it can be concluded that scale of analysis does influence the understanding of geographical patterns of Socio-Economic Status, Air Pollution and Cardiovascular Disease mortality.

Bronwyn Higgins

Planning, Perceiving and Acting. Irrigators and the NSW Water Reforms in the Upper Namoi Valley, NSW

Despite underpinning much of Australia's economic growth for the most part of last century, agriculture is coming under increasing environmental scrutiny. Practices associated with agricultural water management have been found to be the cause of many of the significant environmental problems facing Australia's catchments today. Salinity, blue-green algal blooms and 'dying' rivers have become symbolic of past management practices gone wrong. Water management has therefore become a political 'hot potato' as urban communities, reeling from their own water restrictions, question what is being done to curb water use by irrigated agriculture, Australia's largest use of water. A rare demonstration of Federalism has emerged out of this concern for the sustainability of Australia's water resources and a National Water Initiative has spurred State water management reforms.

This thesis focuses on the water reform process in NSW. In particular, it explores the planning perceptions of irrigators in the Upper Namoi Valley and the expression, in their water management, of their responses to water policy readjustment. Socio-cultural attitudes towards water use, water ownership, and agricultural stewardship are directing irrigator responses to increasing government regulation of their access to and use of water resources.

Extension officers and irrigators were interviewed to gain an understanding of the perceptions and management strategies that can be expected to impact upon the effectiveness of the implementation of Water Sharing Plans in the Upper Namoi Valley. The outcomes of these interviews highlighted that the State government is intending to implement a policy that is grounded in post-productivist ideologies. The perceptions of irrigators however indicated a significant ideological and perceptual mismatch when compared to the strategies of the Water Sharing Plans. These mismatches were based around notions of property rights, socio-cultural infrastructures, and the productivist/post-productivist transition. Ultimately, farming sub-cultures and past policies and water management practices have influenced the socio-cultural context of the Upper Namoi irrigation community. The implementation strategies for the Water Sharing Plans aim to re-adjust these deeply embedded notions in just 10 years.

Whilst this study was limited to a tightly focussed subset of the Upper Namoi irrigation community, the interpretations arising from it indicates the need for further research to provide greater understanding of the social factors influencing policy effectiveness.

Irrigator perceptions reflect that they are not ready or willing to accept these changes. The gulf between irrigator planning perceptions and the implementation strategies of the Water Sharing Plans must be considered as a serious threat to the capacity of the Plans to achieve sustainable re-allocation of over-allocated water resources in the Upper Namoi Valley. The outcomes of this research highlight that there are three key mismatches that are perpetuating this gulf between irrigator perceptions and water reform strategies. These mismatches are anticipated to seriously undermine the potential for the Water Sharing Plans to achieve their objectives in the Upper Namoi Valley.

Mark Imber

The influence of time since fire on species richness in a Danthonia sp. dominanted natural temperate grassland in the Australian Capital Territory

The Majura Training Area (MTA), in the Australian Capital Territory contains approximately 142 ha of natural temperate grassland, one of Australia's most threatened ecosystems. Having been included as part of the MTA since 1911, the grasslands have not been subjected to the mechanical manipulation that the grasslands on the adjoining properties have and therefore remain largely undisturbed. Anthropogenic impact has included domestic grazing and post-colonisation fire regimes. The use of fire in the area by Aboriginals cannot be confirmed. Notwithstanding, the grasslands of the MTA are classified as having the highest botanical significance in the ACT (ACT Government, 1997).

There is a significant body of literature regarding what management is appropriate for ensuring grasslands retain their integrity (Lunt, 1990, 1991, 1995, 1997, Morgan 1995, 1996, 1998, Stuwe and Parsons 1977). Be it for conservation, or for grazing benefit, there is a trend towards the anthropogenic manipulation of grasslands to enhance species richness. Most discussion relates to the need for management in the form of controlled domestic stock grazing, prescribed burning regimes or a combination of both. The MTA grasslands have had limited stock grazing or prescribed burning, although the grasslands are influenced through herbivory from macropods.

This thesis compares the species richness within the Danthonia sp. Dominated grasslands at the MTA that was subjected to a fire in February 1997 with an adjoining area of the same grassland that has not been burnt since at least 1979. Furthermore, prescribed burns were implemented in each area in November 2002, January and April 2003, together with further comparison of the vegetation to ascertain if the different timings of the fires resulted in different germination responses at the species level. Noting the desired outcome from disturbance is increased bare ground to increase germination within the inter-tussock spaces, the percentage of bare ground in each quadrat was also measured.

At least 51 vascular plant taxa were identified during the study between October 2002 and November 2003 comprising a total of 35 native species and 16 exotics. There was no significant difference the in species richness between the burnt and burnt sectors of the MTA with 47 species being identified both sectors. Floral composition was not significantly different with the same 43 species being identified in each sector, with an additional four species being unique to the burnt sector and another four species being unique to the unburnt sector. When prescribed burns were implemented in both sectors in November, January and April, significant differences in species richness were found at the quadrat level after the November and April burns. In both instances species richness was greater in the burnt sector quadrats, although this effect appears to be short lived.

When comparing the relationship between bare ground and species richness, again species richness was significantly greater in the burnt sector than the unburnt sector with increased bare ground. This result highlights the strong relationship and importance of maintaining inter-tussock space to support germination in grasslands.

This study found that time since fire does not have a significant impact on the species richness or floral composition of a Danthonia sp. Dominated grassland in the ACT. This study does confirm though, that species richness can be increased when seasonal fire regimes are applied. In agreement with the literature, November (replicating a warm season burn) and April (replicating a mild season burn) are more effective in

increasing species richness then hot summer burns.

Care must be taken when considering the data and results of the study, as the study area was under the influence of a ling-term term drought and the findings therefore must be considered in this context.

Lucinda Keane

Climate change views in the Australian wheat industry

The thesis reports an investigation of the views of some Australian wheat growers regarding climate change and associated issues, and how people learn about climate change in three grain-growing regions of Australia, using a case study approach. The relationship between the growers and information providers at the institutional level is also considered using semi-structured interviews. With the assistance of the Western Australian and Queensland departments of Agriculture, and the Victorian-based Birchip Cropping Group, a self-administered questionnaire is used to gain an understanding of the growers' views. Themes drawn from the literature provided the basis for the questionnaire structure. The findings from the questionnaire are compared with interviews with institutional representatives to assess the consistency between the institutional understanding of growers' views, and the views reported by the growers. This investigation aims to better understand the current stance taken on climate change and associated issues within the wheat industry, and provides a starting point to assist in improving on-farm adaptation and mitigation measures. The institutional understanding of the information growers want influences the kind of climate change information forwarded to growers and the method of delivery, and thus growers' views regarding climate change issues. Information to assist in management decision-making may be better directed to growers if current views are accurately understood. The results yield reasonable consistency across the states, and between the questionnaire and interview responses. It appears that growers accept: that climate change is occurring (although attribution of cause was not considered); a collective responsibility (that is, of themselves, governments and international agencies); that there are mitigation and adaptation options available to address climate change; and that as a general statement climate change needs to be addressed. Personal contact is central to the preferred methods of learning for growers surveyed, including field days and talking with other growers, agricultural consultants and researchers. The results reveal some shortcomings in the research design, and suggest future lines of inquiry to verify the conclusions and further explore these issues.

Christine Kelly

The effects of fire frequency on the understorey of a subalpine Snow Gum forest

The effects of fire has been studied in a range of plant community types from arid desert regions to alpine grasslands, each study generally focussing on one component of the fire regime and how it impacts on the floristic composition. This study focussed on the fire frequency component of the fire regime and how it has affected the understorey of an Australian subalpine plant community. Fire is relatively uncommon in subalpine and alpine regions of Australia and usually occurs when severe weather conditions are coupled with drought conditions. For this reason, there is limited knowledge on fire events in these regions and how they impact on the vegetation. It is important to have knowledge on the effect that different fire frequencies have on the vegetation so that it may be integrated into management and conservation plans. This thesis made use of a longer-term study established in the Namadgi National Park. As a part of this study, there exists a forty-two year data set of various low intensity fire frequency treatments that have been applied to the subalpine understorey community. The aim of this study was to assess the effect of the different fire frequencies on the species richness, abundance of individual species and the ratio of the dominant grass to shrub species and also, whether the influence of the overstorey was interacting to cause a change in the ratio of grass to shrub species. A recent unplanned fire at the site allowed a direct measure of the effects of fire frequency, with the confounding effect of time since fire having been removed. At the site, there was found to be no difference in the species richness across the fire frequency treatments and only one of the fourteen species displayed a significant trend with the fire frequency. This was Daviesia mimosoides, which was found to be declining in abundance as the frequency of fire increased. There was also a significant relationship between the ratio of the grass to shrub across the fire frequency treatments. These results indicate that the low intensity prescribed burns can result in the decline of certain species and also cause a shift in the dominant species present.

Gayle J. Kennedy

Variation in wood density and diameter growth between inter- and intra- provenance crosses of *Pinus radiata D.Don*

Pinus radiata, commonly known as radiata pine, is the most significant forest 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 Australian breeding population comprises predominantly genetic material sourced from just one of the five naturally occurring geographically disjunct populations - the Monterey provenance. Although the wood properties of radiata pine are well suited to structural timber and pulp production, there remains scope for further improvement in wood density in relation to growth. The objectives of this study were to investigate variation between inter- and intra- provenance crosses of radiata pine in radial growth and wood density traits, and assess the performance of inter-provenance hybrids relative to that of intra-provenance crosses.

This study was based on X-ray densitometric assessment of breast height increment cores from fifteen inter- and intra-provenance crosses sourced from a 29 year-old CSIRO progeny trial (PT57) in Buccleuch State Forest, NSW, Australia. The cores were assessed for whole-ring density, earlywood density, latewood density, minimum density, maximum density, latewood ratio, and ring width. Three additional traits were derived: area-weighted cumulative average (AWCA) whole-ring density, AWCA latewood ratio, and cumulative ring width. Analysis of data for all traits indicated that the full suite of traits could be represented by a small subset of traits which adequately reflects the patterns of variation in the larger suite. Reporting and discussion of results was limited to this subset of traits.

Four analyses were conducted to address the objectives of the study: testing significance of differences between cross annual means, testing significance of differences between annual parental provenance means, testing significance of difference between inter-provenance hybrid and intra-provenance cross performance, and testing the predictability of inter-provenance hybrid performance.

Comparison of provenance crosses indicated that there are significant differences between the crosses for radial growth and density. The Cambria/Cedros cross was consistently highest for density but lowest for growth. The Guadalupe/Guadalupe cross combined relatively high density and good growth characteristics.

The performance of individual provenances, when individuals from them were used as either a male or female parent, was inconsistent for radial growth and density. When provenances used as a female parent were considered, differences in both traits were significant. However, when provenances used as a male parent were considered, differences were not significant. When used as a female parent, the Cambria provenance produced progeny of consistently highest wood density, but also of lowest radial growth. Progeny of the Guadalupe provenance combined relatively high density with radial growth when it was used as either a male or female parent.

There was no significant difference between the performance of inter-provenance hybrids and intra-provenance crosses, for either wood density or radial growth. However, there was a consistent trend of greater radial growth and lower density in the hybrids. Inter-provenance hybrid performance could be predicted for some years, but could never be predicted for radial growth.

As the hybrids tended to have lower density and very similar growth to

non-hybrids, the development of inter-provenance hybrids in radiata pine would not be of any particular advantage to genetic improvement for wood density or radial growth. Rather, the infusion into an existing breeding program of genes from particular provenances, and families within provenances, would offer the best strategy for capitalising on the desirable characteristics of the other provenances.

Emily Kilham

Aboriginal communities and government agencies partnerships in natural resource management

Aboriginal people demonstrate unique approaches to land management which reflect their holistic understandings of ecological systems and the place of humans within them. As such they have a vital contribution to make to sustainable natural resource management (NRM) across Australia. This thesis explores the question of how Aboriginal people might be more effectively involved in NRM. In recognition of diversity in both Aboriginal society and ecological systems, it is argued that the above question is addressed most appropriately at the local level. The geographical setting for this research is the Eden-Monaro region in south east NSW. Two case studies of partnership models between Aboriginal people and government agencies in NRM are analysed with reference to the specific historical and contemporary experience of Aboriginal people in this region.

Findings from the case studies identify major barriers to the effective involvement of Aboriginal people in NRM. These include: the continued socioeconomic disadvantage of Aboriginal people and ineffective representative and consultative structures. Positive outcomes identified in the case studies suggest that appropriate tools to address these barriers would include effective communication, cross-cultural understanding and capacity building. In reference to lessons learnt from an in-depth literature review and analysis of case studies, a hypothetical model is presented which demonstrates possibilities for involving Aboriginal people in collaborative and cross-cultural NRM approaches on a local scale. This is intended to demonstrate the benefits of moving beyond the narrow parameters of current NRM frameworks.

Kate Lea-Perry

Water quality dynamics in an oyster growing area of the lower Tweed River estuary NSW

The sustainability of the Sydney rock oyster (Saccostrea glomerata) industry in New South Wales is inherently reliant on consistent high quality water around oyster leases. Estuarine areas suitable for the cultivation of oysters frequently coincide with large or increasing human populations and associated development. Inputs resulting from catchment development, such as stormwater discharge, sewerage outfalls and/or agricultural runoff, have been linked to high 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 was 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 characterization contributes to an understanding of the behaviour of the estuarine system in response to inputs from a heavily developed catchment. The findings of the water quality analysis also augment existing knowledge of the suitability of the estuary to the production of healthy oysters.

Water quality data collected by the Tweed Shire Council and the NSW Food Authority provided the basis for this research. Findings indicated water quality in the lower estuary declines significantly after heavy rainfall events, and recovers rapidly to within acceptable levels, specified by the 2000 ANZECC and ARMCANZ water quality guidelines. Point source inputs appeared to be dominant for all parameters examined except following large rainfall events.

Background concentrations of faecal coliforms, phosphate and nitrogen were higher than the 2000 ANZECC and ARMCANZ recommended trigger value, and accordingly could pose an ongoing risk to the sustainability of the local oyster industry. Despite intensified catchment development over the period for which data was available, estuarine water quality did not significantly decline over the sampling period. This may be due to recent upgrades of effluent treatment facilities, or improvement of stormwater management in the catchment. The high levels of tidal flushing throughout most areas of the lower estuary may have also reduced the effects of catchment inputs.

Lindsay Morgan

Sustainable grazing practices in the NSW Monaro region: The landholders' perception

Without society sustainably 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 wants to continue in healthy living environment.

As the dominant land use in Australia, agriculture plays a central role in sustainability. For the pastoral 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" approaches 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 was to explore the often-lacking social dimension of sustainable grazing practices within a locally specific project – The Monaro Grassland Project. The purpose was to investigate landholders' social and personal perceptions towards adopting sustainable grazing practices, and develop social indicators that will assess the likely future prospects of natural resource management projects within the region. Through qualitative research, the thesis examined what attributes influence landholders' adoption, what attributes affect uptake and how this can be related to enhancing the region's biodiversity.

Given the lack of previous social research on the Monaro, this thesis will provide important insight into the social aspects of land management in the region. It will not only supply information for successfully implementing the Monaro Grassland Project, but will also help to produce a more realistic and applicable catchment and regional plan for the Monaro.

Wing Sze Ng (Prudence)

Catchment-scale Management of Pollutant Delivery to Coastal Lakes

This study is to investigate the effectiveness of land use management and practices on improving water quality in South Coast catchments of NSW, Australia. Two case study catchments were chosen from the Eurobodalla Shire, Moruya-Deua River and Coila Lake catchments. These estuaries and their catchments have been under increased development pressures from population growth and tourism. The alteration of land use threatens the catchments and their estuaries by increasing sediment and nutrient yields.

Adaptive management is an approach to constantly revise management plans and learn how the catchment responds to the management changes. Modelling can play an integral part in the approach to predict the outcomes of management plans. Understanding input data requirements, outputs, structure, functions and the limitations of each sediment and nutrient transport models can help to choose an appropriate model. Most of the available models have been extensively reviewed elsewhere, so in this study only USLE, EMSS, WEPP and CatchMODS are re-examined as

candidate models representing a wide range of types. Based on needs and relevance, CatchMODS was applied in this study.

Most of the development is located in the lower part of the case study catchments. The development pressures in these catchments were used as a guide to setup four management scenarios to be tested in CatchMODS. Two twenty-year climate periods were compared against the current situation in terms of land use (base case). As might be expected, it was found that the higher rainfall period generated the higher sediment and nutrient yield. Changes in land use management were closely related to changes in sediment and nutrient. Gully and riparian remediation was predicted to reduce the contribution of sediment and nutrients to the catchment significantly. These and other management options were tested and costed using CatchMODS.

However, insufficient available water quality and other data limited the model testing and decreased the accuracy of the model. Further improvements in the model can increase its utility for Moruya-Deua River and Coila Lake catchment as well as its application in the other catchments. Nevertheless, predictions from the model can assist decision making to target and prioritise management options and funding. In fact the results provide a good indication of the relative changes that can be expected if land use and its management are altered.

Catriona Ockwell

The Interrelationship between the Concept of Heritage and Australia's National Heritage Legislation

The meaning and value of the concept of heritage embraces ideas and ideals, notions of identity, and connections with and relevance to the past. With origins of the concept dating back many centuries, heritage has developed to the point where today it is a widespread and familiar phenomenon. While the concept of heritage is readily recognised and appreciated, the term evokes numerous values, responses and interpretations as to its meaning and significance. Prominent in attempts to define and express the concept of heritage has been the development and application of legislative frameworks to regulate the identification and protection of places considered to have heritage value, significance or worth.

The purpose of this research was to examine the nature of the interrelationship between the concept of heritage and the legislative response, as explored through the recent inclusion of national heritage within the legislative framework of the Environment Protection and Biodiversity Conservation Act 1999 (Cth). Within this context, the research investigated the way in which heritage values and their significance are articulated in the legislation together with the implications this legislative construction of heritage raises for the definition, identification and protection of Australia's heritage.

This thesis argues that within the Australian context the nature of this interrelationship between the concept of heritage and legislation is complex, evolving and circular. The legislation is both a response to the concept of heritage and a significant influence on the processes shaping and defining heritage and its continued evolution as a concept.

The research and thesis conclude that the concept of heritage has significantly influenced the development and nature of legislative frameworks; that heritage legislation has significantly influenced the evolution, shape and understanding of the meaning and values attaching to the concept of heritage; and the interrelationship between the concept and legislation is complex, evolving and circular.

Alex Packer

The use of eucalypt regeneration, as a bio-indicator, for assessing the effectiveness of cording in southern Tasmania

Ground-based harvesting is widely used throughout Australia in a range of forest types. This type of harvesting system is commonly employed on low relief terrain, where it has been proven to be economical, uses simple haulage techniques and is highly efficient. However despite its benefits, the concentration of vehicle traffic along timber extraction tracks (snigtracks) has been reported to have major impacts on soil structure and chemistry. Areas along snigtracks have been found to suffer significant declines in soil hydraulic conductivity and profile porosity as well as increases in soil density and soil disturbance. This inturn has lead to reduced seedling growth, stocking and an increased incidence of poor form and mortality compared to the untrafficked sections of the coupe, independent of the forest or soil type.

In Tasmania, 'cording' has been introduced to reduce these negative effects of machine trafficking on site productivity. Cording involves the construction of temporary roads along snigtracks to spread the weight of harvesting machines over an area greater than the machine footprint. These corded tracks are made of large logs laid perpendicular to the flow of harvesting traffic, which eliminates any contact between the soil surface and the tyre or tracks. This process effectively reduces the incidence of rutting and soil displacement along snigtracks, which contribute to site productivity declines. Cording also maintains machine floatation, improving the overall efficiency of the harvesting operation.

Despite the proven benefits to harvesting efficiency and wide application throughout Tasmania there is little evidence to demonstrate that cording does protect site productivity. Field evidence suggests the contrary, with seedling stocking, growth and form on corded snigtracks still significantly poorer than in untrafficked sections of the coupe. This honours project aimed to investigate the ability of cording to maintain a range of soil and regeneration properties critical for the overall site productivity. To achieve this seedling numbers, height and form of the main timber species, Eucalypt obliqua, were used as a bio-indicator of soil nutrient concentrations and site quality of two coupes in southwest Tasmania. These variables were measured across major and minor snigtracks and adjacent untrafficked areas to identify any changes induced by the ground-based harvesting traffic.

The results presented in this thesis indicate that cording did not maintain the site productivity of snigtracks. Seedling height declined 61% on major and 49% on minor snigtracks, compared to adjacent untrafficked areas. Seedlings on snigtracks were also significantly more likely to be browsed, diseased and have poor form. The incidence of seedling suppression, suggested by the reverse-J height distribution, was also significantly correlated to trafficked areas and contrasted strongly to untrafficked areas which had a skewed normal height distribution.

Seedling stocking rates decreased 79% on major and 20% on minor snigtracks. Stocking reductions were not attributed to soil compaction or displacement as previously reported, but correlated to the quantity of residual cording remaining on the snigtracks. This residual cording also induced anaerobic soil conditions on major snigtracks, by limiting oxygen diffusion between the atmosphere and the soil surface. Anoxic soil, combined with the poor eucalypt regeneration, make it unlikely that major snigtracks, especially, would ever support timber of similar quantity or quality to that of the untrafficked areas of the coupe.

All chemical properties measured (organic carbon, total nitrogen and phosphorus) also declined on snigtracks compared to the untrafficked controls. Organic carbon and total nitrogen suffered the most significant declines as these elements were directly affected by soil displacement in the absence of cording. Soil chemistry was positively correlated to seedling height and strongly influenced seedling vigour. This implied that the condition of regenerating seedling could be used as a bio-indicator of site productivity in the two coupes studied.

This project strongly suggests that cording, as currently practiced, does not maintain site productivity along snigtracks. Permanent corded tracks are a possible alternative to the current post-harvest management regime. By leaving cording along major snigtracks intact at the completion of a harvesting operation, the difficulties encountered in removal the material may be avoided. The effect of permanent cording will be to reduce the total area available for timber production by the total area of the skid tracks, but will ensure the remainder of the coupe remains in production. Trees are likely to grow right up to the edge of the corded track, which will potentially minimise reductions of productive area following harvest to a tolerable level. This is especially relevant when the difficulty and general lack of success in rehabilitating the skid tracks is considered.

Kyra Peake

Household Food Security in Dili: The Role of Subsistence Production

Timor-Leste suffers a chronic food security problem, which must be rectified if the new nation is to maintain social stability and succeed as a democracy. To achieve food security is ensure that all people have sufficient food at all times. This presents as a complex challenge for any government, amplified for Timor-Leste by the condition of the nation as it emerges from a chaotic past.

In Dili, almost 40% of households experience food shortage. As there generally exists enough food for the urban population, the problem may be seen as one of household capacity to access food, whether by purchasing or producing. Subsistence production, while usually associated with rural lifestyles, is commonplace in Dili. Theoretically, the practice has merit as an alternative food access strategy enabling households to bypass the cash economy and retain greater control over their circumstances.

This thesis is concerned with understanding Dili's food security problem through a focused investigation of the role subsistence production plays in achieving household food security. The research is based upon analysis of ten household case studies and is firmly located in place and grounded in the experiences and actions of Dili residents.

Food security for Dili households was found to be primarily a problem of financial security. In Dili, recent urbanisation has outpaced development of the urban economy and financial security is very difficult to attain. Urban subsistence production, as an alternative means of accessing food, is critical for the survival of some and improves the situation of many. However it rarely enables a household to achieve food security. The contribution of subsistence production is limited by inherent risks and seasonal constraints, the spatial confines of the city and the preference of households for food types that cannot be produced locally.

An emergent finding was that achieving food security is also constrained by the perspectives of the food-insecure themselves, who typically lacked knowledge of nutritional principles. The food security problem must therefore be addressed through a multi-dimensional strategy that recognises the importance of subsistence production for survival while simultaneously improving nutritional knowledge and building financial security such that true food security might be achieved.

Jean Rivard

Linking landscape productivity and habitat in space and time, a case study of the Northern Territory, Australia

In recent years biodiversity reports have identified a need for assessments based on remotely sensed data. In this study I investigated the use of MODIS satellite imagery to address this need. A four-year monthly time series of Normalised Difference Vegetation Index (NDVI) at a pixel resolution of 250m over the Northern Territory constituted the primary dataset for this investigation.

Remote sensing provides avenues for developing measures quantifying aspects of landscape productivity over large tracks of land, rapidly and repeatedly. In turn, vegetative resource dynamics can provide spatio-temporal information relevant to understanding potential habitat and wildlife distributions.

In the context of a simplified light use efficiency model, measures of the fraction of photosynthetically active radiation absorbed by the canopy (fPAR) were derived as an index of landscape resources available to wildlife. The derived fPAR measures were used to gain a quantitative insight into the variability, in time and space, of landscape resource production. This provided a means of investigating the suitability of MODIS data for revealing the phenomenon at this scale.

Time series summary statistics for fPAR as well as localised phenologies were shown to portray variation in vegetation response across a regional gradient, along with the ability to localise patches with significant vegetative resources. The 250m scale was able to simultaneously reveal spatio-temporal variations reflecting both climatic and landscape-level effects. The study also produced new NDVI to fPAR estimate coefficients for MODIS, and explored related data precision issues.

Peter Somerville

The contribution of mineral weathering to stream salinity in the Boorowa River, New South Wales

Dryland salinity is a major environmental problem in the upland catchments of the Murray-Darling Basin in south-eastern Australia. A study of the contribution of mineral weathering to stream salinity was undertaken in the Boorowa River catchment in central New South Wales. In some previous studies, atmospheric salt deposition has been assumed to be the source of salt accumulation in the Boorowa landscape. However, the relationship between the regolith materials, particularly their formation by weathering, and the salt load in the creeks and rivers in the catchment is currently not well understood. The Woolpack Creek and the Breakfast Creek sub-catchments of the Boorowa River catchment were chosen because of the contrasting lithology between, and within, the two sub-catchments. The lithology comprises Ordovician Kenyu metasediments and volcanics, Silurian Douro felsic volcanics and Silurian-Devonian Wyangala granites within the two sub-catchments. Stream water, groundwater, regolith and parent rock samples were collected. Groundwater was collected to depths of 25 m. Electrical conductivity (EC), pH and concentrations of major cations and anions were measured in stream water and groundwater. Regolith was collected to depths of 6 m using hydraulic auger at a depth below the root zone to isolate the influences of parna and evapotranspiration in the soil layers. Regolith 1:5 soil water extracts were prepared to measure the concentration of major ions in the regolith. X-ray fluorescence spectroscopy (XRF) was undertaken on regolith and parent rock samples to determine bulk composition and the degree of weathering in the samples. X-ray diffraction (XRD) was undertaken to identify the clay mineralogy in the regolith. The relative proportion of 1:1 and 2:1 clays at various depths within the regolith was determined.

In this study, the concentration of the major cations and anions in the rainfall data was approximately 100 times less than in stream water. It was concluded that the atmospheric accession of salt was negligible in the two sub-catchments, and that other processes had contributed salts to stream water. In stream water, there was a significant increase in EC and in concentrations of major ions at the breal of slope of the creeks where groundwater with high EC intercepted the stream water. Groundwater chemistry in both sub-catchments indicated that the concentrations of ions in the groundwater was often an order of magnitude higher than in stream water, indicating mineral weathering of the parent material in the sub-catchment which contributed ions to the groundwater.

Clay mineralogy confirmed that the storage capacity of the regolith varied according to the lithology of the sub-catchment. In the Woolpack Creek sub-catchment (Silurian Douro volcanics), the 1:5 soil water extractions showed high concentrations of Na^+ and Cl^- ions in upper layers and increased concentrations of Mg^{2+} and to a lesser extent Ca^{2+} with depth in the regolith. The 1:1 clay kaolinite was the dominant clay at the surface and the 2:1 clay smectite, was the dominant clay in the lower layers of the regolith. Smectite has high cation exchange capacity (CEC) which is consistent with the increased Mg^{2+} and Ca^{2+} in 1:5 soil water extracts. It was concluded that the Woolpack Creek sub-catchment has a high potential for storage of salts in the lower slopes of the sub-catchment, and releases saline groundwater into the stream water, confirmed by the high EC of stream water downstream from where groundwater intercepts the stream water

In the Breakfast Creek sub-catchment (Ordovician metasediments and volcanics), the EC of the 1:5 soil water extracts was generally very low. The 2:1 clay vermiculite was the dominant clay in the upper layers and the 1:1 clay kaolinite was dominant in the lower layers. Ion exchange processes in 2:1 vermiculite clay contributes surface runoff of Na^+ and Cl^- ions to stream water, but kaolinite has a low CEC and little potential to store salts.

From the evidence collected in this study it was concluded that the source of salts in the stream water was the result of mineral weathering processes in the regolith. The different catchments have a different capacity to store salts and that the storage/release of these salts was related to the 1:1 and 2:1 clay phases produced by weathering.

John Tabor

Colonisation of clearfelled coupes by rainforest tree species from mixed forest edges

Mixed forest, defined as forest with a eucalypt overstorey and an understorey of rainforest tree species, is an important forest type in Tasmania. It is maintained by wildfires at intervals of 100 to 350 years, and in wood production areas is typically managed with clearfell, burn and sow silviculture on 80 to 100 year rotations. This management acts to reduce the abundance of rainforest tree species and could lead to the local elimination of these species after two or more rotations. Little research has been carried out on the colonisation distances of rainforest tree species from mixed forest edges, which are the most important seed sources for the regeneration of harvested areas following clearfelling.

To address this situation the regeneration of four rainforest tree species (Nothofagus cunninghamii, Eucryphia lucida, Atherosperma moschatum and Phyllocladus aspleniifolius) was studied in five clearfelled, burnt and sown mixed forest coupes in southern Tasmania. The influence of distance from mixed forest edge, orientation of edge in relation to the prevailing wind direction and coupe age on the density of rainforest tree species regeneration was assessed. This was done by placing transects upwind and downwind of mixed forest edges in coupes of varying ages; 8, 12, 14, 15 and 22 years since clearfelling. Within each transect, plots were placed 10, 20, 50, 100 and 200 m from edge to reflect expected seed dispersal distances. Within each plot detailed measurements of rainforest tree species regeneration, floristic composition and site information were recorded.

The abundance of regeneration declined with increasing distance from edge for all four rainforest tree species. The density of N. cunninghamii and E. lucida - species with restricted seed dispersal - declined most steeply with increasing distance from the edge. Expected densities declined from over 1300 and 2500 seedlings ha^{-1} at 10 m from edge, to around 30 and 70 seedlings ha^{-1} at 200 m from edge for N. cunninghamii and E. lucida respectively. A. moschatum - a species with the potential for long distance seed dispersal by wind - was more abundant than N. cunninghamii and E. lucida in plots greater than 20 m from coupe edge. More than 500 seedlings ha^{-1} were found at all distances from coupe edge for P. aspleniifolius, probably due to its capacity to germinate after disturbance from soil-stored and bird-dispersed seed. As a group, rainforest tree species were found in densities greater than 1000 stems ha^{-1} at all distances from edge between 0 and 200 m. It was assumed that in the absence of further disturbance, mixed forest would therefore reform within the lifetime of the dominant eucalypts with all rainforest tree species present, although the relative abundances of these species may have changed.

While no significant differences were found in seedling density between transects downwind and upwind of coupe edges, the potential for dense regeneration of N. cunninghamii and E. lucida and long distance dispersal of A. moschatum appeared to be greatest downwind of edges. The abundance of rainforest tree species regeneration appeared to increase with increasing coupe age for the first 15 years following clearfelling before levelling off. Growth rings, counted for a sample of 75 seedlings in the 22-year-old coupe, indicated that new regeneration declined with increasing time and that most regeneration (84%) occurred in the first 13 years following clearfelling.

The height and cover of rainforest tree species in the edge vegetation and the cover of eucalypts within the coupe also appeared to be important variables affecting the abundance of rainforest tree species regeneration. Vegetative regeneration formed a small part of the regeneration of rainforest tree species (3.1%) and was positively correlated with regeneration from seed. This suggests that vegetative regeneration contributes less to stocking than suggested by other studies.

The vascular plant species composition of plots was analysed indicating that clearfelled and unlogged vegetation were floristically different. This difference declined with increasing time since clearfelling and this process seemed to be facilitated by close proximity to mixed forest edges. It implies that the proximity of retained vegetation is important to the resilience and floristic recovery of mixed forests following clearfelling. Management that recognises the importance of retained mixed forest edges is likely to result in greater levels of rainforest regeneration and a more rapid shift towards preharvest composition following logging. Variable retention harvesting systems, where mixed forest seed sources are retained within a coupe, are more likely to deliver this outcome than the current clearfell, burn and sow silviculture.

Nick Travers

Modelling residential water consumption in Canberra

Residential water consumption accounts for the largest proportion of all water consumption in Canberra. Future population growth will exacerbate this residential demand for water, emphasising the need to identify the variables of influence. Identifying these variables, and the relationships between them, will allow the prediction of consumption in coming years based on the socio-economic characteristics of suburbs and their historical responses to rainfall. This investigation modelled the influence of rainfall and socio-economic status on residential water consumption during 1993-2003.

The temporal pattern of consumption was disaggregated into seven suburb consumption classes using cluster analysis. These consumption classes revealed considerable variation in consumption among suburbs. Comparing rainfall to consumption an inverse relationship was observed. Scatter-plots of rainfall versus consumption for each class revealed that rainfall influenced consumption more in low consumption suburbs than in higher consumption suburbs. To explain the variation in the influence of rainfall, Decision-Tree Analysis (DTA) and Loess Local Regression (LLR) was used to identify and then model the key socio-economic variables influencing consumption. It was found that Weekly Family Income (WFI) of $2000+, average household size and suburb age (a proxy for block size) were the most important socio-economic variables explaining consumption. Rainfall therefore explained the temporal variation in consumption, while socio-economic status explained the spatial variation in consumption.

Socio-economic status in Canberra is manifest in the built environment. High-income households prevail in suburbs with bigger blocks, and have much higher water consumption than suburbs with small blocks and greater proportions of low-income households. High consumption was purely the result of high income, and explains why rainfall is not

as important in high-consumption suburbs. Considering socio-economic status will be critical in the accurate prediction of water consumption in coming years. The temporal consumption model provides the basis for these predictions, based on both socio-economic and rainfall-response characteristics of individual suburbs.

Lyndsey Vivian

Influence of Fire on Boundaries Between Subalpine Eucalypt Stands

Eucalypts are widespread throughout Australia, and are particularly prominent in the forests of south-eastern Australia. The overstory of these forests often consist of a mosaic of different eucalypt species. The distribution of each eucalypt species is strongly controlled by environmental factors, however, there is evidence to suggest that these distributions may be also affected by fire. This thesis investigated the influence of fire on eucalypt distributions by examining the potential for boundaries between subalpine eucalypt stands to shift following the fires of January 2003. The majority of eucalypts are facultative resprouters, as they are able to resprout after a canopy scorching fire, and regenerate from seed. In contrast, a small number of eucalypts, known as obligate seeders, are killed by a crown scorching fire, and can only regenerate from seed. For obligate seeders, fire may provide one of the few opportunities to increase their distribution, via seed shed and seedling recruitment in adjacent areas. In this study, boundaries between stands dominated by an obligate seeding eucalypt, Eucalyptus delegatensis, and a facultative resprouter, E. fastigata, were examined after the fires of January 2003 in the Cotter River Catchment, ACT. The response of the study species to variations in fire severity, measured as the degree of crown-scorch, was also investigated. Boundaries that had been exposed to either a high or low severity fire were located using vegetation and fire severity maps of the area. Transects were placed across the boundaries, and the basal area of adult eucalypts, and the density and size of seedlings which had been recruited since the fires, were measured. The post-fire response of each species was found to be influenced by fire severity. E. delegatensis and E. fastigata recruited seedlings after both higher and lower severity fires, however, the density and height of seedlings were significantly greater at higher severity sites. The width and centre of the pre-fire boundary at each site was defined and quantified as the maximum rate of change in overstory species composition. However, there was no evidence indicating the potential for these boundaries to shift due to seed shed and seedling recruitment into adjacent stands, suggesting that the boundaries between stands of E. delegatensis and E. fastigata will remain stable after the fires of January 2003.

Meghan Whitbread

Direct seeded windbreaks on the Southern Tablelands of NSW; Effectiveness and Development

The importance of having trees on farms has been recognised by landholders for centuries. Trees can offer shade and shelter for the protection of livestock, crops and pastures, reduce soil losses from erosion, stop unwanted weeds from neighbouring properties, reclaim barren landscapes and offer the potential for the production of farm timber, to mention some advantages.

Direct seeding of windbreaks in Australia has been used as an efficient and economic way of revegetating the landscape to deal with a wide range of objectives. Direct seeding is a way of directly sowing seeds into prepared ground. In this study, direct seeding has been used to establish native mixed species windbreaks to provide shade and shelter, with the possibility of obtaining timber from the stands.

Previous research has shown that the maximum shelter benefit of a windbreak is related to porosity and tree height. Porosity is the proportion of space that is taken up by vegetation or left as open gaps. To achieve an optimum windbreak there needs to be a balance between the vegetation and open gaps. If the windbreak is too dense (all vegetation) it acts as a barrier and turbulent eddies form on the lee side. If the windbreak is too porous (many gaps) it does not reduce wind speed to a great extent and stock and pastures will not be as protected. Optimal windbreak porosity for reducing wind speed is one that has uniform porosity across the windbreak to a value of approximately 35% - 45% (optical porosity).

Experimental sites were established in windbreaks on farms at stand ages of 4, 5, 6, 8, 9, 12 and 16 years old. Photographs were taken to obtain an estimate of optical porosity, total tree height and Diameter at Breast Height measurements were taken, and presence / absence data was collected on each species sown at each site.

It was demonstrated in this study that none of the windbreaks had uniform optical porosity across the upper, middle and lower layers of the windbreak. Vegetation was concentrated in the middle layer and did not occupy multiple growing spaces across the height ranges. The consequence is the creation of gaps. Over time the windbreaks are not maintaining sufficiently even stand structure to optimally provide shade and shelter for pastures and livestock, while still maintaining the possibility of farm timber.

The sample of windbreaks used in this study is small, however it does demonstrate that the age classes sampled do not follow the usual successional trend in native forest stands of acacia species dominating early, slowly being replaced by eucalypts. Although this trend occurs distinctly between the 4 and 16 year old windbreaks; others between these ages do not follow this trend. Possible differences in site factors and environmental conditions at the time of sowing could be reasons. Thus a manager cannot assume that because acacias are usually pioneer species and faster growing than most eucalypts, that acacias will dominate a stand early on.

The younger age classes (years 4, 5 and 6) have a distinctly different species composition, than the older windbreaks (years 8, 9 and 12). Essentially the species composition change occurs around age 7. Younger sites are dominated by Acacia mearnsii and Eucalyptus ovata. Whereas older sites are dominated by E. blakelyi, E. mannifera, E. melliodora, A. implexa, A. cardiophylla, A. boormanii, A. falciformis and Callistemon citrinus. However, Eucalyptus viminalis and Acacia decurrens occur in every site.

Revegetation programs should take into account the competitive aggressiveness of the latter two species if the outcome is to encourage a diversity of species. The ability of these species to out compete all other neighbours provides evidence of their capacity to dominate revegetation areas. When determining species mixes the competitive nature of some should be considered and they should be sown at lower densities to ensure the resulting plant communities are diverse.

In direct seeding projects the resultant vegetation is not completely representative of the seed mixture. Dominance by any one species varies from site to site. This may be influenced by rainfall events in combination with environmental and site conditions (availability of light, water, soil and nutrients) both at time of sowing and subsequently.

There is the potential for farm timber options in direct seeded windbreaks. However, whether the farm timber operations will be economically viable or not is another matter and needs to be the subject of further research on farms. Important factors include access for management options, particularly harvesting, access to markets and potential buyers.

Windbreaks can be planted for multiple benefits including shade and shelter for pastures and livestock, enhancing farm aesthetics, increasing biodiversity, creating a fodder resource and can be used to diversify income through farm timber. This study has shown that all of these outcomes are unlikely if the stand is left unmanaged. Early management will be critical to maintain the integrity of the windbreak so that the original goals set by the landholder can be achieved during the later stages of stand development. Future research on management of direct seeded windbreaks of native Australian plants is needed, particularly on optical porosity and thinning trials.

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The *School of Resources, Environment & Society Yearbook* is published annually by The Australian National University's School of Resources, Environment and Society.

ISSN 1449-5856 (Print & CD)

ISSN 1449-5864 (Online)

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SCHOOL OF RESOURCES, ENVIRONMENT & SOCIETY
FACULTY OF SCIENCE

CANBERRA ACT 0200 AUSTRALIA
T: +61 2 6125 2579 F: +61 2 6125 0746 E: sres@anu.edu.au
W: http://sres.anu.edu.au
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