



KEY:  talk

 poster presentation

 eligible for student prize

Adams, Maria D.



Institute for Conservation Biology, Dept of Biological Sciences, University of Wollongong, Northfields Ave, Gwynneville, NSW, 2522. mda01@uow.edu.au

Vertical stratification of insectivorous bats in harvested forests: The effects of logging history, vegetation structure and insect abundance

Little is known about the flight responses of insectivorous bats (Microchiroptera) to changes in vegetation structure, such as those that occur on a large scale in logged forests. Bats that normally fly in the gaps between the vegetation in forests may not be tolerant of the increase in vegetation density characteristic of even-aged forest regrowth following logging. The aim of this study was to assess whether activity levels for Microchiroptera were different in forest sites with different logging histories (old regrowth, unthinned young regrowth and thinned young regrowth) and the importance of vegetation structure and insect abundance in determining these levels. From January to April 2001, I measured bat activity and insect activity in logged *Corymbia maculata* forests near Kioloa, NSW, Australia. Shrub, small tree and canopy levels were sampled both on and off tracks. Cover, stem density and height measurements were taken for vegetation. Not considering logging history, bat activity was higher on tracks than in the forest at both shrub and small tree levels. However, this pattern was more pronounced in both thinned and unthinned young regrowth, particularly at shrub level and regardless of insect abundance within the forest. Old regrowth forest sites were characterised by both distinct complex vegetation strata and large vertical and horizontal gaps between the upper foliage layers, whereas young regrowth sites tended to lack these features. The results of this study suggest that the structure of young regrowth forests precludes their use by many bats and the presence of tracks in these forests may compensate to some extent for this less than suitable habitat. Full results of the study will be presented.

Allery, Simon, Leigh Sullivan and Richard Bush



Southern Cross University, PO Box 157, Lismore, NSW 2480. saller10@scu.edu.au

Oxidation and Acidification of Peat Acid Sulfate Soils

Acid sulfate soils (ASS) are sediment that contain oxidisable sulfides or the products of sulfide oxidation. These soils are commonly clay, however they can be sand, loam or peat. When exposed to air, they rapidly oxidize producing acidity, iron and sulfate. There is little known about the oxidation and acidification of peat ASS. In this study the oxidation of 8 peat ASS from northern New South Wales and south-east Queensland were monitored in an incubation experiment over 64 days. Most of these soil materials exhibited little net oxidation of iron sulfides (i.e source of acidity). Results indicate that the peat materials rapidly acidified with minimal net oxidation of iron sulfides because of a low inherent acid buffering capacity, suggesting that these materials are susceptible to severe degradation. Minor changes to floodplain hydrology are likely cause rapid and extreme acidification.

Anderson, Lyn and Shelley Burgin



University Western Sydney, Richmond Campus, Locked Bag 1797, Penrith South DC NSW 1797. LynPAnderson@aol.com

Skinks Eating Out - Observations of food availability for small skinks – edge vs core

Both *Lampropholis delicata* and *L. guichenoti* are generalistic opportunistic foragers, taking prey from a wide variety of arthropod orders. However, both of these small skinks are restricted in prey selection by virtue of its size. The availability of appropriate prey can influence the persistence of these skinks within a habitat. Previous investigations by the authors, have demonstrated a reduction in skink numbers within edge habitats in comparison to core areas within remnant woodlands of the Cumberland Plain, Richmond, New South Wales. Therefore, food resources in both the perimeter and interior of these remnants was examined as a possible causal of skink number variations. The results demonstrated no significant variation in overall arthropod diversity and abundance between the core and the edge. Nor was there a significant difference between preferred prey size abundance between the two habitats. It is therefore, unlikely that either of the two *Lampropholis* species are excluded from inhabiting edge areas on the basis of adequate prey availability.

Andrew, Nigel and Lesley Hughes



nandrew@bio.mq.edu.au Biology, Macquarie University, North Ryde, NSW 2109

Herbivore damage along a latitudinal gradient: Relative impacts of different feeding guilds.

It is generally believed that herbivory increases towards the tropics. It is also thought that the impact of herbivory on plants changes with leaf age and the type of herbivore damage. Most studies of herbivory are based on leaf-chewing damage at one point in time, ignoring other types of damage, such as leaf-mining and sap-sucking/distortion, which can cause relatively high levels of damage at different leaf ages. Few studies have collected comparative data over the lifespan of leaves using standardised measurements to reliably assess herbivore damage at different latitudes. This study compared the rate of herbivory by three types of herbivores (leaf-chewers, leaf-miners and sap-suckers), on the host plant, *Acacia falcata* along an extensive latitudinal gradient from the subtropics to the temperate zone. Three sites at each of four latitudes (Batemans Bay, Sydney, Grafton and Gympie), were sampled on a 1150km gradient from eastern Australia. Young, expanding leaves were marked, and herbivore damage was assessed every three months for two years using digital images. The findings from this study will be discussed in relation to herbivore guild abundance and biomass and the potential impacts of climate change.

Angel, Paul J., J. Doland Nichols and Christine Stone



1. School of Resource Science and Management, Southern Cross University, Lismore 2480, NSW. 2. Research and Development Division, State Forests of NSW, 121-131 Oratava Ave, West Pennant Hills 2125, NSW. pangel10@scu.edu.au

Regulation of outbreaking populations of *Creiis lituratus* Froggat (Hemiptera: Psyllidae) in *Eucalyptus dunnii* plantations

Unstable increases in populations of *Creiis lituratus* occur between March and November in *Eucalyptus dunnii* plantations in northern NSW. Three prime mortality factors have the potential to regulate this unstable population growth: parasitism, host tree decline and the onset of summer high temperatures. Each of these mortality factors has demonstrated a role in defining the spatial and temporal aspects of the outbreaks, however ultimately climatic factors, both direct and indirect are critical. Parasitism displays a complex inversely density dependent relationship with psyllid density with a loss of synchrony in outbreak areas. High levels of foliage damage after several *Creiis* generations causes physiological collapse of the host tree. This can lead to density dependent dispersal and pulse-type outbreak behaviour. This phenomenon is strongly dependent on site quality. Eventually *Creiis* populations collapse from heat stress mortality with the onset of high temperatures, permitting refoliation of the tree, which is also site dependent.

Auld, Tony D. and Judith Scott



Biodiversity Research Group, NSW National Parks & Wildlife Service, PO Box 1967 Hurstville NSW 2220
tony.auld@npws.nsw.gov.au

Detecting plant species richness in a long unburnt endangered plant community: seeds, bulbs and rhizomes that hide in the soil

Fire is a major disturbance element in many plant communities. Where fire has been absent for long periods, relative to the mean fire interval, the floristic composition of the community maybe significantly reduced compared to the immediate post-fire period. We sampled a long unburnt (>25 years) patch of the endangered Duffys Forest ecological community from northern Sydney, and then re-sampled after the site was burnt. A number of species absent above ground in the long unburnt vegetation were abundant post-fire, including the endangered plant *Grevillea caleyi*. Such species were all species killed by fire and had a persistent soil seedbank. Key examples were *Acacia myrtifolia*, *Boronia ledifolia*, *Grevillea caleyi*, *G. buxifolia*, *Lasiopetalum ferrugineum* and *Pimelea linifolia*. Other taxa that could resprout by rhizomes or bulbous rootstocks were also only present post-fire, suggesting that even such species may remain dormant below ground. Examples include *Haemodorum* spp., *Dampiera stricta* and *Scaevola ramosissima*. The work illustrates the importance of temporal changes in above-ground species composition and abundance when sampling fire-prone plant communities. In particular, it has implications for the conservation assessment of small urban remnants of endangered communities.

Bain, David



Dept Biological Sciences, University of Wollongong, Nothfields Ave, Wollongong, NSW, 2522. dwb01@uow.edu.au

Translocation of the Endangered Eastern Bristlebird in south-east NSW

Translocations are increasingly being used as conservation techniques for endangered species, however, very few of these experimentally examine success or monitor the impacts on the source population. The Eastern Bristlebird is a small, semi-flightless and cover-dependant passerine restricted to a number of small, isolated populations along the NSW coast. Only two of these populations exceed 200 individuals. The Bristlebird's current status is linked to habitat loss, fragmentation and fire. Although it lives in fire-prone habitat it is extremely sensitive to fire, unable to fly long distances and unable to survive in recently burnt habitat. My project will (i) translocate Bristlebirds to establish a new population to spread the risk of extinction, (ii) monitor the fates of these founding individuals and (iii) study the impact of bird removal from the source population. Fifteen Bristlebirds were translocated this year. Preliminary results suggest this first phase of translocations was successful, with founding birds radio-tracked following their release and surviving the first weeks after translocation. Translocated birds moved larger distances and utilised a greater area than Bristlebirds radio-tracked in their home territories. Surveys of the source populations are continuing throughout the duration of the project.

Baker, Geoff¹, Gary Fitt² and Colin Tann²



1. CSIRO Entomology & Australian Cotton CRC, PO Box 1700, Canberra, ACT 2601. 2. CSIRO Entomology & Australian Cotton CRC, PO Box 59, Narrabri, NSW 2390 Geoff.Baker@csiro.au

Ecology of *Helicoverpa* spp. (Noctuidae) and their parasitoids, in relation to the use of transgenic cotton and associated refuge crops.

Transgenic (Bt) cotton varieties provide a substantial basis for economically and environmentally sustainable insect pest management within the Australian cotton industry. Whilst the introduction of Bt cotton (in 1996) has significantly reduced pesticide use and encouraged a greater emphasis on the management of beneficial invertebrates in pest control, its impact on the overall abundance of the target moth pests, *Helicoverpa* spp., in cotton growing regions is poorly understood. This paper will present analyses of long-term data sets from northern N.S.W and southern Queensland, including pheromone and light trapping programs, to test if populations have changed in time. In addition, the efficiency of designated refuge crops (no Bt use), which must be grown in partnership with Bt cotton to generate large numbers of *Helicoverpa* that are susceptible to Bt and thus reduce the likelihood of the development of resistance, will be discussed. Finally, the degree to which refuge crops, other agricultural crops besides cotton, and non-agricultural habitats produce significant populations of natural enemies of *Helicoverpa* will be described.

Banks, Vera



Gunnedah Resource Centre, PO Box 462, Gunnedah, NSW 2380 Vera.Banks@dipnr.nsw.gov.au

Effects of repeated applications of low doses of 2,4-D and glyphosate on young eucalypts in a field trial

Eucalypt dieback has been a concern on the northern Liverpool Plains (NSW) since the early 1990s, coincident with an expanding irrigation industry. In 2000, a tree health survey established significant relationships ($p < 0.001$) between the poor health of *E. populnea* and intensive dryland and irrigated farming. High pesticide use is common in intensive farming and pesticide drift may contribute to tree dieback. Accordingly, a field experiment investigated if frequent exposure to low concentrations of commonly used herbicides affects local eucalypts. For 12 months, *E. melliodora*, *E. microcarpa* and *E. populnea* saplings were sprayed at 6-8 week intervals with glyphosate and 2,4-D amine at 0.1% ('low') and 3% ('high') of the recommended label rates. Poor crown condition was significantly ($p < 0.001$) related to high 2,4-D treatments in all species. *Eucalyptus populnea* was susceptible to both high ($p < 0.001$) and low 2,4-D ($p < 0.05$) applications. Differences in foliage index (FI) were measurable (but not significant) in *E. microcarpa* with high glyphosate exposure. The growth (height, girth) of *E. populnea* and *E. microcarpa* was reduced in the high 2,4-D treatment, but the differences were not significant.

Barmuta, Leon A.¹, William F. Elvey¹ and Peter E. Davies²



1. School of Zoology & TAFI, University of Tasmania, Private Bag 5, Hobart, Tas 7001. 2. School of Zoology & Freshwater Systems P/L, c/o University of Tasmania, Private Bag 5, Hobart, Tas 7001. Leon.Barmuta@utas.edu.au

Effects of brown trout in food webs of small streams in Tasmania

A combination of field surveys and an outdoor artificial stream experiment were used to identify the potential impacts of introduced brown trout on the benthos of small streams in Tasmania. Trout had the strongest impacts on mayflies (especially baetids), but little effect on non-epibenthic prey. Localised, patch-specific phenomena affected the interaction between trout and the benthos. From the surveys, there is some evidence that trout streams support a higher biomass of algae, but this effect depends on the degree of shading. Similarly in depositional habitats, the abundant detritus and low densities of vulnerable epibenthic species resulted showed only weak effects of trout on benthic community structure.

Barnes, Peter



School of Biological Sciences, University of Wollongong, NSW2522. pbb47@uow.edu.au

Impacts of simulated freshwater floods on an estuarine sponge

Assemblages of sponges vary greatly among saline coastal lakes in NSW. While several species have been found in relatively large and or open lakes, sponges are usually absent from relatively small ICOLLs (intermittently closed and open lakes and lagoons). Small ICOLLs often have larger and more rapid fluctuations in salinity than permanently open lakes. To examine the influence of changes in salinity on the sponge, *Suberites*, different intensities of flooding were simulated by mixing saline lake water with fresh water from a nearby creek in a flow through aquarium-system on the shore of Smith's Lake, NSW. Sponges transplanted from the lake (salinity 27ppt), died rapidly in freshwater, survived after short periods in 10 ppt, but died after extended periods and survived for longer periods at 13 ppt. In addition, all sponges placed in conditions with reduced salinity, responded by reducing the number and/or sizes of open oscula (exhalant siphons) compared to control sponges. The results suggest that although, *Suberites* can survive relatively large changes in salinity, it cannot survive through extended periods of low salinity as experienced in small ICOLLs. This suggests that managerial decisions to open artificially or keep open ICOLLs may potentially change the natural diversity of these systems.

Beattie, Andrew



Key Centre for Biodiversity and Bioresources, Department of Biological Sciences, Macquarie University, NSW 2109
abeattie@rna.bio.mq.edu.au

The Global Millennium Ecosystem Assessment

UNEP, the FAO and several other international organisations have funded a four-year project with two key objectives. The first is to clarify the links between ecosystems and human well-being. The second, to assess the capacity of the world's ecosystems to continue to support humanity. Modelled on the IPCC process and reports, the MEA hopes to achieve a similar impact on governments world wide. The process is based upon the three principles of scientific credibility, political legitimacy and salience. To this end many scientists, governments, government agencies, NGOs, publishing houses and the media have been or will be involved. The final reports, due out in 2005, will be written for and directed to a variety of audiences and will include assessments of the condition of ecosystems, possible responses to these conditions and scenario analyses. Australian scientists and economists are among the many participating and the entire project relies absolutely on the very best ecological and conservation science available.

Bedward, Michael and Christopher Simpson



Biodiversity Research & Management Division, NSW National Parks & Wildlife Service, PO Box 1967, Hurstville NSW
2220 michael.bedward@npws.nsw.gov.au

Mapping future landscapes in the NSW sheep-wheat belt: putting policy proposals to the test

In New South Wales, regional groups (Regional Vegetation Committees, Catchment Management Boards) have been given the task of reconciling objectives for agricultural production, social and economic outcomes, and biodiversity conservation. A confusing plethora of policy proposals are being debated to help guide this process including target based schemes, offsetting (mitigation) schemes and market-based approaches. Despite being intended to address sustainability and conservation these proposals typically have little or no scientific content beyond reference to broad generalisations (e.g. possible critical thresholds of habitat loss). In this paper, we investigate one area of recent policy debate, offsets schemes which attempt to mitigate for losses through clearing by setting aside or revegetating other sites. We use simple, highly graphical models in a step-wise approach to illustrate the landscapes that could result under a range of scenarios with ecological and economic considerations. Our hope is to provoke better discussion and more creative policy development.

Bell, Sarah



University of Sydney, Orange, Leeds Parade, Orange NSW 2800 sbell@orange.usyd.edu.au

Intersecting policy, research and practice in the Oil Mallee Project

The Oil Mallee Project involves the development of new commercial tree crops for low rainfall agricultural regions in Western Australia. The development of the Project throughout the 1990s as an option for managing dryland salinity demonstrates the challenges and opportunities of linking policy, research and practice in developing new industries for sustainable production systems. Dryland salinity is a major threat to remnant biodiversity in the Western Australian wheatbelt. Developing deep rooted perennial crops, such as oil mallees, for integration into existing production systems is likely to make a strong contribution to conserving and enhancing biodiversity in these landscapes.

The Oil Mallee Project intersects research, policy and practice in salinity management. The central actors in the Project are the six local and one eastern mallee eucalypt species. Oil mallees have been included in most hydrological studies of salinity management in Western Australia. They appear in all major Western Australian salinity policy documents and several Commonwealth policies and discussion papers. More than 1000 farmers have planted oil mallees as part of their land conservation programs, and some farmers have integrated mallee plantings with their existing production systems. Maintaining the intersections between policy, practice and research has been vital to the Project's success.

Bennett, Andrew¹, Rodney van der Ree² and Daniel Gilmore¹



1. School of Ecology and Environment, Deakin University, 221 Burwood Highway, Burwood, Victoria 3125. 2. Australian Research Centre for Urban Ecology, C/- School of Botany, University of Melbourne, Victoria 3010 bennetta@deakin.edu.au

Gap-crossing by gliding marsupials: thresholds for use of isolated woodland patches in an agricultural landscape

Single trees and small patches of trees are conspicuous components of agricultural landscapes around the world, but their value for biodiversity conservation is unclear. In this study, arboreal mammals were censused with hair-sampling tubes in small patches of woodland (<1.0 ha in size) in cleared farmland adjacent to a linear network of woodland known to support populations of arboreal mammals. Ninety-one small isolates were stratified by size (single trees or small patches) and distance from the linear network to test the capacity of animals to cross habitat 'gaps'. The genus *Petaurus* (small gliding marsupials), the most commonly detected taxon, was recorded in 31% of hair-tubes (98 of 316). It occurred in 21% of sites in isolated trees and patches, and in all linear strips. A statistical model demonstrated that *Petaurus* sp. was most likely to occur in isolates close to linear strips and other patches of woodland. A distance threshold of 75m from the nearest linear strip was evident, in which 95% of detections occurred, corresponding with the maximum glide distance. The size of isolates did not influence utilisation rates. This threshold relationship provides quantitative data to assist landscape design and habitat restoration in rural environments.

Berry, Sandra



CRC for Greenhouse Accounting and Ecosystem Dynamics Group, Research School of Biological Sciences, The Australian National University, GPO Box 475, Canberra, ACT 2601 sandy.berry@greenhouse.crc.org.au

Ecology and physiology of vegetation thickening

The term ‘vegetation thickening’ is often used to describe the increase in the number of stems of woody plants per unit area. This phenomenon is also referred to as ‘woody weed increase’ and ‘woody regrowth’. The vegetation is thickening in many ecosystems and in many parts of the world. The possible causes include changes in the fire regime, impacts of pastoralism, changes in the availability of soil moisture, and increased water and nutrient use efficiency of photosynthesis resulting from the increased concentration of CO₂ in the atmosphere ([CO₂]). Determining the relative importance of these processes at a specific site is difficult. It requires a framework, such as the TMS scheme, that directly links plant physiology, vegetation structure and environment. In this talk I will demonstrate the utility of the TMS ternary diagram as a tool to predict changes in vegetation structure that result from changes induced by land management and [CO₂]. I will show that increasing [CO₂] over the last 200 years should have caused vegetation thickening everywhere. In grazed woodlands, the processes of (i) land clearing and increasing [CO₂], and (ii) land clearing, degradation and subsequent removal of grazing pressure at constant [CO₂], would result in similar vegetation structure.

Blackwell, Grant¹, Kristy Graham¹, Dieter Hochuli¹ and Paul Meek²



1. The School of Biological Sciences, Heydon Laurence Building AO8, The University of Sydney, Camperdown, NSW 2006.
2. State Forests NSW, North East Region, P.O. Box 535, Coffs Harbour, NSW 2450 gblack@bio.usyd.edu.au

Habitat use by the Hastings River Mouse (*Pseudomys oralis*): Are management prescriptions accurate?

The Hastings River Mouse (*Pseudomys oralis*) is now uncommon throughout its former range, and is listed as a threatened species under the NSW Threatened Species Act. Habitat prescriptions for the species are used to guide management activities in areas where the species is known or thought to occur. The habitat prescriptions describe the species as being adapted to mid to late-successional stages, and poorly suited to disturbance, differing from the known habitat requirements of other *Pseudomys* species. We surveyed small mammals close to a forest/pasture interface in the Marengo/Mt Hyland region in north-east NSW, and found *P. oralis* to be relatively common, exhibiting a preference for early to mid-successional sites with dense ground cover. Spool-and-line tracking of *P. oralis* in this and earlier studies at this site have confirmed this dependence on microhabitat features such as logs, tree crowns and ferns. These findings suggest that the species is well adapted to early successional stages, and that the key habitat requirement is dense ground cover irrespective of composition. The current management prescriptions for the species are discussed in the light of these findings.

Blumenthal, Martin and Jane Lilley



GRDC, PO Box 5367, Kingston, ACT, 2600 m.blumenthal@grdc.com.au

Challenges managing native vegetation in grain growing regions

The Australian grains industry comprises around 42,000 growers. In an average year 20 million hectares are cropped, and the farm gate value of the harvested grain is \$8 billion; wheat remains by far the most important crop by area and value. Growers are faced by many challenges in running a profitable farm business. One of these is the inexorable decline in their terms of trade. Over the past 30 years or so, the value of farm outputs to the cost of inputs has declined steadily by 3% per year. Specialist croppers have responded by increasing their annual factor productivity by 3.6% over the past two decades, a truly remarkable achievement. Growers are now facing new challenges, with increasing scrutiny of their production systems and environmental management. In many parts of the wheatbelt, grain growers have on their land a significant proportion of the remaining native vegetation, and how this is managed is an issue the industry is beginning to address. The presentation will summarise the results of a recent survey of grain growers about their attitudes to and intentions about native vegetation management, and show how this aspect of farming can be incorporated into an industry Environmental Management System.

Boak Miles¹ and Phil Gibbons²



1. National Parks and Wildlife service, PO Box 2115, Queanbeyan NSW 2602. 2. NPWS, C/O CSIRO Sustainable Ecosystems, Gunghalin ACT miles.boak@npws.nsw.gov.au

The importance of Paddock Trees for regional conservation in agricultural landscapes

When assessed in isolation, paddock trees appear to have little value for conservation. The analysis of spot imagery examined the contribution to total tree cover made by paddock trees in a section of Riverina Highlands area of NSW. It found in a regional context paddock trees were important for the conservation of those vegetation communities within the Riverina Highlands particularly those that were highly cleared. For example, over 50% remaining box woodland tree cover was in patches less than one hectare. Failure to protect and perpetuate paddock trees in these vegetation communities will undermine the ability to achieve the conservation objectives in region.

Bouly, Leith



PO Box 7921, Toowoomba, 4352 leith.bouly@mdbc.gov.au

From catchment to kitchen table - achieving outcomes!

There are three things that all Australians have in common:

We all live in catchments.

We all require water to sustain us.

We all have a 'kitchen table' of some kind.

The choices we make at our kitchen tables whether they are urban or rural ultimately determine the health of the catchment and the quantity and quality of the water we have available to sustain us. While the choices made at some kitchen tables have greater impacts than others, collectively they are all important. There are three key questions for scientists, governments and catchment communities to consider.

1. What should the targets for catchment health be?
2. How should they be determined and by whom?
3. When they are determined what mechanisms should we employ to influence the choices made around our kitchen tables?

It is one thing to understand the 'big picture' and articulate an aspirational vision for the future. Changing individual behaviour and providing the knowledge and tools to assist those making choices which will achieve the vision is where the challenge lies. This presentation will explore the roles and responsibilities of scientists, governments and catchment communities in setting targets for catchment health and mechanisms to encourage changes in individual behaviour and choices with regard to natural resource use.

Boulter, Sarah¹, Roger Kitching¹ and Bradley Howlett²



1. Australian School of Environmental Studies, Griffith University, Nathan, Qld, 4111. 2. New Zealand Institute for Crop and Food Research Ltd. Private Bag 4074, Christchurch, New Zealand s.boulter@griffith.edu.au

Reproduction on top- canopy trees and the birds and the bees

The availability of canopy access tools, such as the canopy crane at Cape Tribulation, north Queensland, allows the opportunity to closely examine plant-animal interactions in the little-known rain forest canopy. As part of an on-going study of canopy tree reproductive biology, two congeneric tree species commonly found within access of the crane, have been studied. Very different reproductive strategies were found for these two species. The small white flowers of *Syzygium gustavioides* appear sporadically throughout the year in an almost continuous pattern and have a broadly generalist reproductive biology. Coleoptera, Diptera, Thysanoptera and Hymenoptera were the most abundant flower visitors, although the dominant visitors appear to change with time. Short pollination trials using exclusion traps and scoring the growth of pollen tubes, showed small Hymenoptera as successful pollinators. However, exclusion of different size classes of visitors, suggest a range of insects may affect successful pollination. By contrast, *Syzygium sayeri* flowers for 1-2 months during winter. Dominant visitors switched from bats at night to honeyeaters by day. Exclusion trials on this species suggest some low-level pollination success with insect visitors, but dominance of vertebrates in this pollination system. Importantly, this study emphasises that one-off sampling of flower visitors for some generalist species will fail to identify important pollinators.

Bowcock, Haley and Glenda M Wardle



Institute of Wildlife Research and School of Biological Sciences, Heydon-Laurence Building A08, The University of Sydney, NSW 2006 hbow6196@mail.usyd.edu.au

Visual estimation of projective foliage cover of vegetation: a simple approach to improving accuracy using digital images.

Australian vegetation is frequently classified based on structural features including projective foliage cover. Visual estimation is one of the simplest and most easily accessible methods of describing percentage cover; however as it is subjective, many new to the approach are not convinced it is reliable. Here we investigate the variability in percentage cover for a published compilation of canopy images ranging from 40-70%, that is commonly used for comparison by field observers. The images were transferred to plastic sheets and percentage cover was read using a leaf area meter. Our analyses indicate that there is considerable variation within a given canopy class, overlap in the 50- 60% classes, and therefore, estimation in 5% levels may not be justified. An alternative approach using canopy images taken with a digital camera is presented. Projective foliage cover data collected by students classifying vegetation in the Royal National Park, Sydney were compared to images of the same locations captured by the digital camera. The students' determinations agreed with the percentages in the compilation used as a guide, but were inconsistent with the digital images. This suggests that observers can be reliable but that increased accuracy can be achieved through improved calibration using digital images.

Boys, Craig A.¹, Graeme Esslemont² and Martin C. Thoms²



1. NSW Fisheries Office of Conservation, Port Stephens Fisheries Centre, Private Bag 1, Nelson Bay, NSW 2315. 2. River and Floodplain Laboratory, University of Canberra, ACT 2601 craig.boys@fisheries.nsw.gov.au

Geomorphology and fish habitat use in a large dryland river

There is growing concern over the long-term decline in the abundance of native fish in eastern Australian rivers. The Barwon-Darling River has been highlighted as a diversity hotspot due to the presence of six species of fish that are formally identified by the ASFB and the IUCN as either endangered or vulnerable. Systematic surveys of the Darling River between 1994-1997 failed to collect 33% of the native species reported from the area, with many species caught having undergone reductions in distribution and abundance. While it is believed that a reduction in habitat is largely responsible for the marked decline in native fish stocks, evidence of this link is sparse. In this paper we investigate the mesohabitat requirements of fish in Australia's largest dryland river, the Barwon-Darling River, and the availability of habitat during low-flow conditions.

Brainwood, Meredith and Shelley Burgin



University Western Sydney, Richmond Campus, Locked Bag 1797, Penrith South DC 1797. m.brainwood@uws.edu.au

Homogenous landscapes or hotspots of biodiversity? Conflicting perceptions of farm dams in Australia.

We undertook an intensive study of water quality with concurrent macroinvertebrate sampling in a suite of dams. Results of these surveys showed that despite being closely located, there was considerable variation in water quality among dams. This variation was linked to a combination of impacts from adjacent land use and the local hydrological characteristics. Water quality was seen to be primarily determined by the source of water for the dam, with some sources directly impacted by land use. Different water qualities tended to support different combinations of organisms in a range of macroinvertebrate assemblages. These organisms collectively provided a high level of aquatic macroinvertebrate biodiversity, with some species previously not noted from this type of environment. Community assemblages were further seen to be influenced by habitat characteristics. Current water policies are predominantly resource based, focusing on allocation of water and rights of harvest, particularly in upper catchment areas. Any ecological considerations are aimed towards maintenance of environmental flows in lower catchments, and are generally a trade-off against supplying water for irrigation to farmers in inland areas. Development of cohesive water policies is vitally important, and can best be supported through a comprehensive understanding of all wetland types affect by water management.



Fire Ecology of the Endangered Perennial Herb *Stemmacantha australis*

Stemmacantha australis is a nationally endangered herbaceous perennial which inhabits grasslands and grassy woodlands of southern Queensland. This presentation describes the short-term life history response of *S. australis* to low-intensity management fire in Bluegrass grasslands. Three populations of *S. australis*, inhabiting grasslands on the Darling Downs, were split into control and experimental sections and fires were applied in September 2002. Vegetative and reproductive life history attributes of the species were monitored over the subsequent spring-summer reproductive season. For each individual, measurements of leaf number, length of longest leaf, number of inflorescences, length of peduncles and diameter of inflorescences were examined. Plant mortality and the proportion of flowering individuals were also analysed in relation to fire treatment and tap-root (plant) size. Results indicated significant fire treatment and plant size relationships and suggested the use of fire to have possible long-term benefits as a management tool for *S. australis* populations on the Darling Downs.

Bridle, Kerry¹, Mick Russell¹, Phil Cullen² and Michael Pemberton³



1. School of Geography and Environmental Studies, University of Tasmania, Private Bag 78, Hobart, 7001, Tasmania. 2. Australian Bush Heritage Fund, GPO Box 101, Hobart, 7001. 3. Nature Conservation Branch, DPIWE, PO Box 44, Hobart, 7001, Tasmania kerry@utas.edu.au

Tasmanian Blanket Bogs - A dry wetland environment

Tasmanian blanket bogs are internationally significant. They are the most extensive blanket bogs in the southern hemisphere, and are botanically very different to their northern hemisphere counterparts. The global distribution of blanket bogs is primarily determined by climatic variables. The shallow nature of Tasmanian blanket bogs is thought to be a result of marginal climatic conditions. This paper describes the climatic conditions under which Tasmanian blanket bogs exist, with reference to a study site in a lowland blanket bog in southwest Tasmania. Air temperature, rainfall, soil temperatures and water-table depths were measured at the study site over a three-year period. Results indicate that mean water-table height affects soil temperature fluctuations. Seasonal drying of the soil profile was found to occur during the summer months. The impact of this seasonal drying is discussed in relation to current site conditions and in the future within the context of global warming scenarios. It is likely that these peatlands are in a state of decay. The impact of fire on the decay process is also discussed.

Brierley, Gary and Fryirs, Kirstie



Department of Physical Geography, Environment and Life Sciences, Macquarie University, Sydney, NSW 2109
gbrierle@els.mq.edu.au

How (dis)connected are our landscapes? Ecological implications of geomorphic coupling and sedimentary cascades in Australian river systems

An ecosystem framework for research and management requires meaningful interpretation of the landscape context upon which biophysical interactions occur. For river systems these interactions or linkages can be viewed from longitudinal (elevation-based, upstream-downstream and tributary-trunk stream connections), lateral (slope-channel, channel-floodplain, edge effect considerations), vertical (surface-subsurface, surface-atmosphere) and temporal perspectives. Each of these forms of linkage has a distinct landscape geomorphic context and are (dis)connected at different positions in landscapes. This reflects the type of river system under investigation and its specific responses to various forms of disturbance (whether natural or human-induced). Patterns of connectivity may range from tightly coupled systems to systems in which various barriers or buffers impact upon patterns and rates of process activity. This paper examines the geomorphic underpinnings of such relationships in an Australian context, highlighting various measures of (dis)connectivity that exert a profound influence on the operation of various biophysical interactions, and associated off-site and lagged responses to disturbance events. Particular emphasis is placed on changes to geomorphic river structure and function in the period post-European settlement, and associated modifications to sediment fluxes (termed sedimentary cascades). Implications for geo-ecological recovery of aquatic ecosystems are outlined.

Britton, David R.¹, Peter Gregg², Alice Del Socorro², Emma Smith³ and Ray Thompson³ 



1. Australian Museum, 6 College St, Sydney, NSW 2010. 2. School of Rural Science and Agriculture, University of New England, Armidale, NSW 2351. 3. SP Exports P/L, 9 North South Rd, Childers, Qld. 4660 daveb@austmus.gov.au

A little bit on the side - the failure of mating disruption to control *Helicoverpa armigera* (Lepidoptera: Noctuidae) in tomato and capsicum crops

Synthetic sex pheromones have been used in pest management as monitoring tools, and as control agents for mass-trapping, attract and kill lures, and as mating disruption agents. Lepidopteran sex pheromones are produced by female moths to attract males. When sex pheromones are used as control agents they act to prevent mating by either attracting and killing male moths, or by preventing males from locating virgin females in the field. Mating disruption involves permeating areas with sex pheromone, so that males are no longer able to locate virgin females. Successful mating disruption requires a good understanding of the ecology of the target species. A full scale trial of mating disruption for *H. armigera* found that the dispersal and reproductive behaviour of this species make it an unsuitable target for mating disruption as a single method of control.

Brooks, Andrew



Centre for Riverine Landscapes, Griffith University, Nathan, QLD 4111 andrew.brooks@griffith.edu.au

Geomorphic changes to catchments and rivers in eastern Australia over the last 200 years: causes, implications, and the future

European settlement in eastern Australia has resulted in widespread vegetation clearance from catchments, often accompanied by a range of river management strategies aimed at simplifying and increasing the predictability of rivers. As a result sediment yield and flux has increased from most catchments, often by orders of magnitude. River channels have generally increased their capacity and become more homogenised and prone to bank erosion.

Sediment is transported by rivers from supply zones, which are generally mountainous areas with high potential energy, to depositional zones such as lakes, estuaries and the sea floor, with low potential energy. In between sediment is stored 'temporarily' for timescales generally ranging from 10^2 – 10^5 years. This residence time is influenced by vegetation on hillslopes and along stream corridors. The removal of such vegetation, coupled with woody debris removal from channels, is the most effective way of reducing the sediment travel time from its point of origin to its ultimate resting place on a lake or sea bed. This paper will review the effects of geomorphic changes to channels across a range of catchment scales, using examples from the Australian east coast, and will provide some suggestions for river management.

Brown, Meredith¹, Susan Carthew¹ and Steven Cooper² 



1. School of Earth & Environmental Sciences, University of Adelaide, PO Box 3169, Norwood SA 5067. 2. Evolutionary Biology Unit, SA Museum, North Tce, Adelaide SA 5000 meredeth.brown@adelaide.edu.au

Social and sexual behaviour of the yellow-bellied glider (*Petaurus australis*) in south-western Victoria

Evidence of social monogamy is often cited for evidence of sexual monogamy. In this study, we examined social structure and paternity in a population of yellow-bellied gliders (*Petaurus australis*). We examined the amount of home range overlap between adult males and females as evidence of social monogamy in yellow-bellied gliders. We also looked at den sharing behaviour between adult males and females as evidence of social monogamy. We then sought to confirm sexual monogamy by analysing paternity using microsatellite DNA technology. Home range analysis was conducted using location points gathered by radiotracking and spotlighting, as well as some trap and den locations. We quantified den sharing behaviour by radiotracking adult males and females to their dens during the day. All members of the eight groups were sampled by skin biopsy, and paternity examined using five variable and polymorphic microsatellite loci. Data will be discussed during the course of this presentation.

Bruce, Nicky¹, Julian Ash², and Ken Hodgkinson³



1. SEIS, Charles Sturt University, PO Box 789, Albury NSW 2640. 2. School of Botany & Zoology, Australian National University, Canberra ACT 0200. 3. CSIRO Sustainable Ecosystems, GPO Box 284, Canberra ACT 2601 nbruce@csu.edu.au

Survivors! Effects of drought and defoliation on five contrasting perennial grass species

Grasslands of south eastern Australia, comprising either, native grasses and forbs, or a mixture of native and exotic grasses and legumes, are a valuable resource. There is a need to incorporate the requirements of grassland species, particularly during times of stress such as drought, into grazing strategies to ensure their long term persistence. The primary aims of this study were to gain a better understanding of the underlying morphological and physiological traits that contribute to perennial grass species persistence during periods of drought and to determine the impact of defoliation following such periods. A range of common grass species were selected from the ACT region, which included three Australian natives: *Austrodanthonia auriculata*, *Bothriochloa macra*, *Themeda triandra*, and two exotic species: *Eragrostis curvula* and *Phalaris aquatica*. During the drought phase of the experiment, increasing drought length resulted in an increase in leaf water potential and a general decline in foliage health. Upon rewatering, all species recovered irrespective of drought length. Defoliation was found to have no detrimental effects on either tiller recovery or growth rates with all species compensating for loss of leaf area irrespective of the drought stress or season of recovery. The findings of this study highlight the tolerance of the five species to drought and defoliation stresses during the cooler months of the year.

Burgin, Shelley and Meredith Brainwood



University Western Sydney, Richmond Campus, Locked Bag 1797, Penrith South DC 1797 s.burgin@uws.edu.au

Those Dam Bugs!

Described as producing a homogeneous landscape, farm dams in Australia have recently been the target of legislation to remove them without assessment of their contribution to biodiversity. We investigated three farm dams in the Raglan area (Central Tablelands, New South Wales), and found that these lentic waters contributed equivalently to macroinvertebrate biodiversity as natural systems. Dams were found to have different macroinvertebrate communities in different regions of the dam and these communities varied with season. Species richness and abundance varied among dams with numbers of recognisable taxonomic units ranging from 28 – 49 for each dam. Comparison of these results with other studies indicated that for natural lentic systems in Australia there was a similar level of biodiversity. The suite of species sampled proved to be additive to those previously identified in this type of habitat. This study showed that rather than producing replicate habitats, dams develop a character of their own with a diverse array of macroinvertebrate communities within a mosaic of habitats. They, therefore, have the potential to add an additional reserve in areas that generally lack free standing waters.

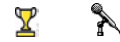
Bush, Richard, Allery, Simon and Sullivan, Leigh



Environmental Science and Management, Southern Cross University, 1 Military Road, Lismore, NSW, 2480
rbush@scu.edu.au

Marcasite in Holocene coastal floodplain peats: Its occurrence and significance.

Peat materials are common in the backswamps of coastal floodplains. Iron sulphides formed in situ by microbial reduction are often abundant in these materials. Pyrite (FeS₂) is the most common iron sulphides mineral in coastal floodplain sediments. However, the rarer iron disulfide mineral marcasite was recently identified in buried Holocene peat layer at Bungawalbin Swamp, a coastal backswamp on the Richmond River floodplain, northeastern NSW, Australia. The sulphide mineralogy of peat layers from three backswamp locations on the lower Richmond floodplain were examined in detail using scanning electron microscopy and X-ray diffraction. Marcasite, recognised by its distinctive platy morphology and iron disulfide composition occurred exclusively within organic remnants in spheroidal and sprawling-dense clusters. The formation of marcasite is highly dependant on environmental pH and forms in preference to pyrite under reducing acidic conditions. Pollen records from the lower Richmond coastal floodplain indicate that fresh-brackish depositional conditions appear to favour the formation of marcasite. The occurrence of substantial marcasite is unusual and may provide a valuable environmental proxy of poorly buffered fresh-brackish depositional environments.



Belah woodland of north west Victoria: distribution, regeneration and condition

The long-term future of Belah (*Casuarina pauper*) woodland remnants is threatened through regeneration failure of overstorey species and perennial understorey. This study was conducted to determine original distribution of Belah woodland in northwest Victoria, regeneration requirements of perennial components and effectiveness and cost of methods for monitoring vegetation condition. Historical survey maps were investigated to determine the likely distribution and structure of semi-arid woodlands and to determine changes since European settlement. Experiments were undertaken to examine regeneration requirements of Belah woodland species. Soil seedbank, seed dormancy and viability were examined. A field regeneration trial explored the affects of watering, fire, and soil disturbance on germination and early seedling survival. Remote methods of condition assessment were compared with field-based assessment to determine cost-effective methods for condition assessment in semi-arid woodlands. More than 90% of the pre-European semi-arid woodlands have been cleared in agricultural areas. Extensive viable *Casuarina pauper* seed (<399 m⁻²) was found in the soil seedbank. No germinants were found in the field, despite watering to replicate rainfall during known regeneration years. Results suggest prolonged high soil moisture is required for seedling establishment. Differences in the broad-scale condition of vegetation were detected using Landsat imagery.

Campbell, Monica L.¹, Peter J. Clarke¹ and David Keith²



1. Botany, University of New England, Armidale, NSW 2351. 2. NSW National Parks and Wildlife Service, PO Box 1967, Hurstville, NSW 2220 mcampbe6@pobox.une.edu.au

Herbivory limits seedling establishment in montane wet forests

Montane wet forests of north-east New South Wales typically form an ecotone between rainforest and dry-open forest. Fires are an infrequent, yet intense disturbance in these forests and changes in understorey composition have been tied to the length of fire free periods. The completion of the life-cycle of understorey plants may therefore be directly linked to the passage of fire. Demographic surveys of four key understorey species have shown that populations are comprised mostly of adults that produce viable seed annually, yet seedlings are sparsely distributed in the field. Germination trials have shown that most species will germinate readily under glasshouse conditions. Furthermore, a field germination experiment demonstrated that once dormancy was broken, establishment was successful under a range of environmental conditions. Hence, seedling survival was thought to be the critical stage in recruitment. A multi-factorial field experiment was designed to test for the effect of herbivory, competition and the post-fire environment on seedling survival. Survival was lowest in burnt forest with water stress and herbivory proving to be limiting processes. Surrounding plants apparently facilitated survival by providing refuge from herbivores in both burnt and unburnt forest.

Cant, Belinda¹, James Kimberley² and Ryan Tom¹



1. Arthur Rylah Institute for Environmental Research Freshwater Ecology Research 123 Brown St Heidelberg Vic 3084. 2. School of Ecology and Environment, Deakin University Burwood Victoria 3125 Belinda.Cant@dse.vic.gov.au

Salt Impact Model

Loss of productive land and functioning ecosystems due to dryland and secondary salinity is a worldwide phenomenon with salinity and associated desertification increasing at a rapid rate in many countries of Africa, Asia, Europe, the near East, North and South America and in particular, Australia. While loss of urban infrastructure, and decreased agricultural production are often the main focus of salinity management in Australia, loss of biodiversity and ecosystem function are also major problems. Aquatic ecosystems are likely to be most vulnerable to the impacts of salinity because they are low lying and receive effluent and runoff from adjacent salinised agricultural land. This paper provides an overview of the mechanisms by which salinity affects aquatic ecosystems. It then reports on the application of Ecological Risk Assessment (ERA) methods to quantify the risks of loss of aquatic biodiversity due to increasing salinity and discusses how ERA supports decision making to protect rivers, streams and wetlands of high conservation value.

Carr, David



Greening Australia Ltd, PO Box 74, Yarralumla, ACT 2600 dcarr@greeningaustralia.org.au

Incorporating commercial products into revegetation and adapting farm forestry to increase biodiversity.

Farm forestry is broadly defined as growing commercial perennial vegetation on farms. It is a production system capable of delivering significant biodiversity benefits in degraded and fragmented landscapes, where revegetation is often necessary to increase vegetation area and diversity. In some instances farm forestry can have negative biodiversity impacts, although many of these can be ameliorated or eliminated by using local species and careful design. Establishment costs and displacement of productive land are two major impediments for landholders to increase the area revegetated for biodiversity. Landholders often undertake revegetation for altruistic reasons, or to gain indirect benefits such as shade and shelter. The use of a diversity of native species is not incompatible with these goals, as species with commercial products can be included in revegetation and managed for commercial outcomes. Landscape scale planning will deliver increased biodiversity benefits using a spectrum of revegetation models - from those that replicate pre-existing vegetation through to industrial monoculture plantations. The systems between these two extremes currently present the most challenges. Sound ecological science, an understanding of commercial vegetation management and landholder needs, must be employed in planning these systems. More revegetation, with a greater contribution to biodiversity, can be the result.

Carter, Dean



Ecosystem Management, University of New England, Armidale, NSW, 2351 dcarter3@metz.une.edu.au

Do honeybees impact on reproductive success of the endangered shrub *Grevillea beadleana*?

Honeybees were introduced in the 1800s and have since dispersed and occupied most areas of temperate Australia. Honeybees visit many native plant species and recently concerns have been raised of their effect on native plant/pollinator relationships. Honeybees have the potential to reduce the reproductive success of native plants by displacing native pollinators and reducing pollen supplies. These negative effects are likely to be more pronounced in fragmented landscapes where floristic abundance is low.

The first stage of this study examined foraging patterns of honeybees and birds to flowers of the endangered shrub *Grevillea beadleana* in northern NSW. Visits by birds were infrequent throughout the flowering season whereas honeybees were a constant presence at inflorescences. Honeybees foraged primarily for nectar although pollen harvesting was observed. Nectar collecting honeybees rarely contacted stigmas. Pollen collecting bees would generally remove pollen from all open flowers of an inflorescence in a single visit. Natural levels of fruit-set were low (5%) and inflorescences caged to exclude birds whilst permitting access to honeybees produced no fruit. Removal of self-pollen from pollen presenters occurred rapidly (100% within 4 hrs) and was most likely attributable to honeybees. This may reduce fruit set and exacerbate pollen limitation in small populations where birds are infrequent visitors. The second stage of the project will attempt to quantify the effects of honeybees by introducing hives intermittently to the area. It is expected that when honeybees saturate the area temporarily, plants will be pollen-limited and experience reduced fruit-set.

Carthew, Sue and Georgina Haynes



University of Adelaide, School of Earth & Environmental Sciences, Benham Building, Adelaide, SA 5005
susan.carthew@adelaide.edu.au

Does dust inhibit reproduction in roadside populations of *Grevillea lavandulacea*?

The southern agricultural regions of South Australia have been extensively cleared, and in many areas any remaining native vegetation is confined to roadside strips. These linear corridors may be extremely important in providing habitat for resident populations and acting as corridors linking other isolates. However, we have little insight into the functioning of these communities. This study investigated the influence of dust on reproduction in roadside populations of *Grevillea lavandulacea*, by i) measuring the amount of dust deposited at different distances from a dirt road as a function of traffic density and vehicle speed, ii) comparing pollen tube growth in open-pollinated flowers located at different distances from the road, and iii) assessing fruit set derived from cross-pollination following the application of varying amounts of dust to stigmas. Road dust was found to travel at least 16m into the vegetation, regardless of traffic volume and speed. As expected, the amount deposited declined with distance from the road, and increased with traffic volume (as measured by the number of passes made by a car). Percentage of flowers with pollen tubes and mean number of pollen tubes per flower increased with distance from the road edge. However variability between sites was high, confounding the results

somewhat. Percentage of fruits initiated varied from 60% for the high dust treatment to more than 75% for the other three treatments. Fruit abortion was high in all treatments.

Castor, Carmen



University of Newcastle, Biology Building, University Drive, Callaghan, NSW, 2308 Carmen.Castor@newcastle.edu.au

Secondary seed dispersal in a high mountain community

Alpine plants are exposed to high levels of stress and perturbation. Under these circumstances at the level of vegetation regeneration processes, two seed dispersal strategies are predicted: low dispersal allowing species to exploit a known and less stressful environment close to the mother plant, and long distance dispersal which would permit the exploitation of newly generated sites.

On a South American site 42% of species disperse by wind (W) while 42% lack morphological adaptations for dispersal (NDS). When comparing alpine dispersal spectra, differences are attributable to site related effects and growth form. Asteraceae seeds moving over the soil show that NDS do not move relative to W. Within a selection of other NDS seeds, morphological characters can explain absence of movement down-slope through incorporation into the soil. Upon extrapolating results to a sub sample of the andean community (51 species) 75% would be expected to avoid down-slope movement through incorporation of seeds into the soil. Germination phenology can also explain absence of down-slope movement. Persistence in perturbed alpine ecosystems of plants with NDS can be explained by the capacity of seeds to avoid being washed down-hill.

Chalmers, Anita



Centre for Sustainable Use of Coasts and Catchments, School of Applied Sciences, The University of Newcastle, Central Coast Campus, PO Box 127, Ourimbah, NSW 2258 anita.chalmers@newcastle.edu.au

Seedling root morphology of five temperate grassland species

The root morphology of five grassland species, common to the Northern Tablelands of NSW, was investigated under glasshouse conditions using glass-fronted root observation tubes. The roots of the native warm-season grasses (*Aristida ramosa* and *Sporobolus creber*) elongated to a similar depth, but *S.creber* had greater root numbers at shallower depths. The roots of the exotic cool-season forbs (*Acetosella vulgaris* and *Hypochaeris radicata*) elongated at similar rates, and both had high root numbers in the deeper layers. At shallow depths, the root number of the exotic cool-season annual grass (*Vulpia bromoides*) was greater than that of the exotic cool-season perennial forbs. By the end of the experiment, only the annual grass had not reached the bottom of the root-tubes (90cm). *H.radicata*, *A.ramosa* and *S.creber* all developed herringbone root systems, whilst *V.bromoides* had a random, dense pattern of fine roots. *A.vulgaris* had a somewhat herringbone pattern, but also had several thick axis roots running parallel to each other. Differences in root morphology and distribution between species could be explained in terms of protection against moisture stress, and an ability to explore and exploit soil resources.

Chilcott, Chris¹, Alison Lawrence², Valerie Debuse³, Giselle Whish⁴, Teresa Eyre⁵, Melanie Venz⁵, Jian Wang⁵, Annie Kelly⁵ and Dave Taylor³



1. Queensland Department of Natural Resources and Mines, QCCA Building, 80 Meiers Rd Indooroopilly 4068. 2. Environmental Protection Agency, Indooroopilly Qld 4068. 3. Queensland Forest Research Institute, Gympie 4570. 4. Department of Natural Resources and Mines, Toowoomba 4068. 5. Environmental Protection Agency, Indooroopilly Qld 4068 Chris.Chilcott@nrm.qld.gov.au

The quest for landscape thresholds in southern Queensland

Clearing remnant vegetation for agricultural development has led to habitat loss, fragmentation and the disruption of important ecosystem processes. This project aims to improve the knowledge of ecological thresholds for habitat retention and management in southern Queensland. A suite of environmental markers of ecological condition, genetic diversity, and vegetation and soil health will be utilised to determine indicators of status and condition, measures of viability and, where possible, threshold values. Data collected from sixty *Eucalyptus populnea* remnants were analysed against landscape metrics. Metrics were derived at: paddock (500 ha); property (8000 ha); and subcatchment scales (275,000 ha), reflecting different management regimes. Landuse of the surrounding matrix, distance to neighbouring remnants and historical disturbance (1988 to present) were also determined. The results of landscape classification and relationship to measures of ecosystem function will be presented. The analyses will guide future interpretation of thresholds. By developing scientifically defensible thresholds for landscape function, this project will inform planning processes and

deliver more robust, sustainable and equitable outcomes for conservation and farm production. It is also hoped to develop rapid assessment techniques for remnant vegetation condition in relation to thresholds, allowing assessment of condition by landholders, vegetation management officers and other land managers.

Christian, Nereda and Fritz Geiser



Zoology, Centre for Behavioural and Physiological Ecology, University of New England, Armidale, NSW 2351
nchrist2@pobox.une.edu.au

Frequency of torpor in sugar gliders (*Petaurus breviceps*): foraging difficulties or winter food shortages?

Studies on daily torpor in the field are scarce and information on how differences in food availability affect torpor patterns is not available. We conducted a 2-year field study to determine differences in torpor patterns among free-ranging sugar gliders. Temperature telemetry was employed to compare: (i) gliders from a dry year with published information from a wet year; and (ii) food supplemented (FS) vs non-supplemented (NS) areas in a dry year. Torpor occurred in conjunction with low ambient temperature and/or rainfall; gliders in the dry year employed torpor less often than in the wet year (dry: 4% of all observations, 34 torpor bouts, N=10, 323 animal nights; wet: 17% of all observations, 103 torpor bouts, N=11, 614 animal nights). Although declines in body mass over winter at the NS site were more pronounced than at the FS site, food supplementation had no effect on frequency of torpor. Despite this, significantly lower post-winter masses and lower resting body temperatures indicate that gliders at the NS site likely suffered greater energetic constraints than gliders at the FS site. This implies that torpor is used to offset energetic hardship associated with cold and wet conditions, rather than winter food shortages in general.

Clarke, Peter, Kirsten J. E. Knox, and Monica L. Campbell



Botany, University of New England, Armidale, NSW 2351 pclarke1@metz.une.edu.au

Landscape patterns of plant persistence in response to fire

Fire related flowering, seed release and germination commonly occur in the Mediterranean southern floras on nutrient deficient soils. Less is known about the fire stimulated recruitment of species occurring in other regions of Australia with no pronounced seasonal rainfall or on more fertile soils. The fire response of c. 300 shrub taxa were recorded from research burns and wildfires on the New England Tablelands Bioregion over four years in five habitats; grassy forests, shrubby forests, rocky outcrops, wet heaths, and wet forests. Fire stimulated recruitment was found in >80% of taxa across all habitats. Wet sclerophyll forests had the lowest proportion of shrubs with fire related recruitment whilst the other habitats had very high proportions of species that had fire stimulated demographic response. The ratio of obligate seeder to sprouter species differed among habitats with the highest ratio occurring on rocky outcrops (c. 80%) and wet forests (c. 60%) and the lowest in wet heaths (c. 20%). This pattern is maintained at congeneric and confamily phylogenetic levels suggesting a strong selective effect of fire in different habitats.

Collard, Stuart¹, Charlie Zammit¹ and Andrew Le Brocque²



1. Land Use Research Centre, The University of Southern Queensland, Toowoomba, Qld 4350. 2. Department of Biological and Physical Sciences, the University of Southern Queensland, Toowoomba, Qld 4350 collard@usq.edu.au

The contribution of bird communities to ecological services in agricultural lands surrounding Brigalow remnants

The majority of studies on bird communities in fragmented landscapes focus on the presence and community composition of birds recorded within vegetation patches. However, research presented here describes the effects of vegetation patch attributes on bird communities in a surrounding matrix of cultivation and grassland. Study sites were located in, and adjacent to small remnant patches of brigalow (*Acacia harpophylla*) / Belah (*Casuarina cristata*) vegetation in southern inland Queensland. Bird species richness in matrix sites of grassland and cultivation was significantly correlated with the area of adjacent brigalow remnants. Other vegetation attributes such as structural complexity did not significantly influence species richness of birds in the matrix. Division of birds into positive, neutral and negative service categories based on foraging behaviour enables inferences regarding the 'value' of vegetation remnants in terms of ecological services provided by native birds. These findings will be discussed in the context of a current research project on ecosystem services in agro-ecosystems of the southern Brigalow Belt.

Collier, Neil and Duncan Mackay



Flinders University, PO BOX 2100, Adelaide, SA 5100 neil.collier@flinders.edu.au

Community involvement in conservation: volunteers monitor the butterfly fauna of Adelaide, South Australia.

Community involvement in conservation programs is becoming increasingly popular. In Adelaide, South Australia, we have established a community based monitoring program, using volunteers to monitor the temporal trends and spatial differences in the abundance and diversity of butterflies. The program is modelled on other such programs such as the British butterfly monitoring scheme. Volunteers received training through a series of workshops and field days. Volunteer kits containing information on butterflies, data sheets, and instructions for conducting surveys were provided to each volunteer. The volunteers are currently surveying a total of 12 sites in and around the city of Adelaide. 'Pollard walks' are used to record the abundance and diversity of butterflies in urban locations, as well as areas of native vegetation such as conservation parks, national parks, and vegetation remnants. Counts from the Pollard walks will be analysed to investigate the effects of weather and observer experience and to compare the relative abundances derived from Pollard walks with estimates of the abundance of butterflies derived from mark-recapture studies.

Conomikes, Melanie, Amina Rawal and Cassandra McLean



Institute of Land and Food Resources, University of Melbourne, Burnley College, 500 Yarra Blvd, Richmond Vic 3121
melaniec@unimelb.edu.au

Genetic fingerprinting techniques for use in determining provenance delineation in *Epacris impressa* (Labill.).

Delineation of plant populations with genotypic similarities, or provenances, is often a contentious issue in disturbed site revegetation. This study looked at two simple and relatively economical genetic techniques to categorise populations of *Epacris impressa* (Labill). Identification of genotypic variants in endemic populations of *E. impressa* was achieved using Random Amplified Polymorphic DNA (RAPDs) and Inter-Simple Sequence Repeat approach (ISSRs). These two genetic fingerprinting techniques distinguished differences in short base-pair repeat sequences in genomic DNA from flower and leaf samples. ISSR and RAPD primers located base pair sequences and amplified them using Polymerase Chain Reaction (PCR). The located base pairs appeared as bands that were compared with band patterns from other sampled individuals.

Data was analysed by scoring bands that replicated for the same sample as 'dominant' and those that appeared only once as 'recessive'. Individual plants from different locations were compared by their dominant banding patterns and scored for similarity.

These techniques may prove useful in identification of plant provenance boundaries for gathering of both seed and clonal propagation material for revegetation. Both techniques are relatively low-cost and use primers that work across many plant species.

Cosier, Peter 

[Symposium: Wentworth Group Opening Plenary](#)

[Presentation title:](#)

Craigie, Andrew¹, M. A. Whalen¹ and D. A. Bass²



1. School of Biological Sciences, Flinders University of South Australia, GPO Box 2100, Adelaide, S.A. 2. School of Geography, Population and Environmental Management, Flinders University of South Australia, GPO Box 2100, Adelaide, S.A. andrew.craigie@flinders.edu.au

Effects of shade and water stress on plants of *Asparagus declinatus* (Asparagaceae)

Two experiments were conducted to investigate the effects of shading and water stress on the weedy species *Asparagus declinatus* (Asparagaceae). *Asparagus declinatus* is commonly found growing under tree canopies in woodland communities where it invades in Australia. Several vegetative characteristics and root and shoot biomass were examined to investigate responses of *A. declinatus* to shading. The effect of different light conditions on the pattern of shoot growth was examined, and significant effects on a number of vegetative traits including leader length and the number and length of internodes were found. Root weight was negatively affected by deep shade. These results indicate that light availability affected growth of *A. declinatus* under experimental conditions and may influence the environments into which this species can potentially spread. The response of *A. declinatus* to water stress under experimental conditions was also investigated. Biomass, some vegetative characteristics and phenology were examined. Above-ground growth and root biomass were negatively affected by water stress. The phenology of plants growing under different water regimes was also examined. It is concluded that water stress had a significant effect on growth of *A. declinatus*, and that this may affect the ability of this species to spread into more arid areas.

Cramer, Viki and Richard Hobbs



School of Environmental Science, Murdoch University, South Street, Murdoch WA 6150 vcramer@essun1.murdoch.edu.au

Salinity and terrestrial vegetation: are we asking the right questions?

Early studies on the effect of secondary salinity on native vegetation focussed largely on understanding the eco-physiological responses of species, particularly with regard to tolerance of salinity and waterlogging. The potential enormity of the impact of secondary salinity on natural ecosystems has led to the focus of research shifting from understanding the responses of species to understanding the responses of vegetation communities. It may not be possible, or perhaps necessary, to understand the responses of all species within a community, as plant responses will vary depending on a suite of factors that extend beyond water table characteristics. Hence, ecological concepts that focus on ecosystem dynamics (eg alternative stable states, thresholds) have increasingly been used to understand the ecological risk from secondary salinity. However, these concepts are as difficult to prove both observationally and experimentally as it is to understand the responses of every species to salinity. Further, our understanding of the temporal component of community response to secondary salinity is severely lacking, as “space for time” studies are unlikely to resolve questions related to rates of change. We will discuss our changing understanding of the ecological risk from secondary salinity, and what may be the crucial questions to ask next.

Cranston, Nicole¹, Alaric Fisher², Michael Douglas¹ and Samantha Setterfield¹



1. Northern Territory University, Faculty of EH&S, Darwin, NT, 0909. 2. Department of Infrastructure, Planning and Environment, Biodiversity Unit, PO Box 496, Palmerston, NT, 0810. nicole.cranston@ntu.edu.au

The effectiveness of riparian fencing for biodiversity protection

Riparian zones are vital elements of the savanna landscape. Although they only occupy a small area, their contribution to biodiversity, cultural values and the economy of the savannas is substantial. They are highly vulnerable to a range of disturbances, including fire, feral animals and weeds. Thus there is a need for management options for riparian zones that allow landholders to meet their objectives while maintaining riparian health. Extensive riparian areas have been fenced-off throughout the Northern Territory, but there has been no evaluation of the potential benefits for biodiversity. This project will measure sample flora and fauna in riparian sites in the Victoria River District with a range of fencing histories. Pastoral managers will also be interviewed to determine their attitudes towards riparian management, and to determine if fencing is a viable management strategy for them. This poster will present the proposed methodology for the study.

Creese, Bob¹, Peter Gehrke² and Andrew Brooks³



1. NSW Fisheries, Port Stephens Fisheries Centre, Private Bag 1, Nelson Bay, NSW 2316. 2. CSIRO Land & Water, 120 Meiers Road, Indooroopilly, QLD 4068. 3. Centre for Catchment and in-Stream Research, Faculty of Environmental Sciences, Griffith University, QLD 4111 Bob.Creese@fisheries.nsw.gov.au

Experimental fish habitat rehabilitation in a coastal NSW river.

River training works undertaken in the Williams River for flood mitigation involved removing structural woody habitat, removing channel bars, gravel armour and boulders, stabilising the bank with wire mesh and planting exotic trees. The stream channel subsequently experienced bed instability and bank erosion, evidenced by erosion of riffles and infilling of pools with fine sediment. These changes produced a relatively homogeneous habitat for riverine biota. A trial rehabilitation was undertaken in 2000 by placing 430 logs in the channel to create 19 log structures engineered to deflect flow from the channel banks, prevent channel incision, and to trap sediment. Hydraulic and geomorphological changes in the river, and responses of fish populations, were assessed by comparing the test reach with an upstream control reach before and after the rehabilitation works. Initial post-rehabilitation changes in the test reach compared to the control reach included increased complexity of channel morphology, increased amplitude of the pool/riffle sequence by aggradation of riffles and scouring pools, and reduced wavelength of the pool/riffle sequence. The bed material in the test reach was finer after rehabilitation, reflecting a net accumulation of sediment in this reach and a reduction in downstream sediment transport. In the 6 month period following introduction of the logs, the mean number of fish species increased in the test and control reaches, but more so in the former. Fish abundances were up by approximately 50% in the test reach, compared to virtually no change in the control reach. Additional sampling at yearly intervals since introduction of the logs has confirmed that the fish assemblage in the test reach is more stable post-rehabilitation. This suggests that the increase in habitat complexity provided a refuge for fish during high flow events. Findings from this pilot study in the Williams River are being further tested in a larger rehabilitation exercise currently underway in the Hunter River.

Croft, Peter¹, Phil Spark², Chris Nadolny³ and Ian White⁴



1. NSW National Parks and Wildlife Service, Northern Tablelands Region, PO Box 281, Glen Innes, NSW 2370. 2. "Tarcoola" Back Nundle Rd, Woolomin, NSW 2340. 3. DIPNR, PO Box U245, Armidale, NSW 2351. 4. School of Environmental Sciences and Natural Resource Management, University of New England, Armidale, NSW 2351 Peter.Croft@npws.nsw.gov.au

Impacts of Coolatai grass (*Hyparrhenia hirta*) on biodiversity in grassy native vegetation in north-west New South Wales

Coolatai grass (*Hyparrhenia hirta*) is an invasive grass from Africa and the Mediterranean, which is widespread in North West NSW. It is capable of spreading from infested toeholds on roadsides and other disturbed areas into undisturbed native vegetation. It forms dense swards, which appear to displace native understorey and might also affect ground-dwelling animals. A study was initiated to assess the impacts of infestation by Coolatai grass on the flora and fauna in grasslands and grassy woodlands. Two sites were selected (1) a Grassy White Box Endangered Ecological Community on a travelling stock route near Manilla and (2) a derived native grassland at Arakoola Nature Reserve north of Inverell. Both with infested and uninfested areas with matching landscape positions and disturbance histories. Vascular plants were recorded and ground-dwelling vertebrates collected in large pit traps and Elliot traps. Small pit trapping for ground-active invertebrates was undertaken at Manilla only. Coolatai grass had large impacts on the cover of native species and species richness of vascular plants to a degree that the ground cover of the endangered ecological community could no longer be considered native groundcover. Abundance of ground-active invertebrates was reduced by infestation. Initial trends indicate that infestation might cause a decline in the combined diversity of reptiles and frogs. The results highlight the threats to biodiversity and endangered ecological communities posed by this environmental weed.

Cullen, Peter



Peter_Cullen@enterprise.canberra.edu.au **POSTAL ADDRESS**

Reflections on rippling the waters

The Australian water industry has been developed by engineers for engineers and is based on profound ecological illiteracy. Bringing some ecological realities to this area has only been possible after substantial degradation has become obvious to all. The Wentworth group has demonstrated the power of ecologists focusing on what they know and agree upon, and presenting that in a clear, simple and persistent manner to a variety of audiences.

The group achieved national prominence by taking on a major “shock jock” radio presenter who wanted to turn back the rivers and make the deserts bloom. Contradicting these long held myths of the Australian landscape was newsworthy, and what the group said made sense to many people. That we were not posturing to get research funds, and had clear solutions to the problems we identified was critical in getting standing on these issues.

Cummings, Jason¹, Nick Reid¹, Ian Davies², Carl Grant³ and Martin Smith⁴



1. Ecosystem Management, University of New England, Armidale, NSW 2351. 2. School of Mathematics, Statistics and Computer Science, University of New England, Armidale, NSW 2351. 3. Alcoa, Applecross, WA. 4. NSW National Parks and Wildlife Service, Coffs Harbour, NSW jcummin2@metz.une.edu.au

Restoring native woody cover to sand-mined sites in Bongil Bongil National Park - A transition threshold discovered?

Before the establishment of Bongil Bongil National Park, the Bongil peninsula was mined for mineral sands. Rehabilitation of this mined strip failed in several areas resulting in a stable *Imperata cylindrica* dominated grassland. Monitoring of an initial attempt to restore sclerophyll forest at the site indicated abiotic parameters were 28% of adjacent fully functional systems. Wallaby browsing and competition from *I. cylindrica* were other potential factors limiting regeneration. A split-plot experiment using fencing, organic mulch and seedlings was implemented to test the hypothesis that a transition threshold, comprising abiotic and biotic components, was restricting restoration of native woody cover at the site. Native woody and *I. cylindrica* cover and seedling growth parameters were sampled 20 months after planting. Mulching improved seedling survivorship by 49%. Health of *Banksia integrifolia* seedlings was enhanced 127% and growth of *Acacia sophorae* and *Casuarina glauca* was increased by 45 and 71%, respectively, in mulched treatments. Planting, irrespective of mulch application, minimised *I. cylindrica* cover. Manipulation of the abiotic environment, in concert with planting and wallaby exclusion, was integral to establishing native woody cover. This research supports state and transition models of ecosystem restoration through identification and overcoming of a transition threshold.

Cunningham, Paul



University of Queensland, St Lucia, Brisbane 4072, Qld p.cunningham@uq.edu.au

Learning, odour preferences and flower foraging in moths

Floral odours play a major role in plant-insect communication. We examined the influence of a number of single floral odours on the innate and learnt foraging behaviours of the moth *Helicoverpa armigera*. In wind tunnel tests, adult moths showed innate preferences for particular odours. Preferences changed when exposure to these odours was paired with a feeding stimulus. In subsequent studies we showed (1) moths could distinguish between flowers augmented by single odours (2) moths could learn single odours present in flowers on which they had foraging experience, which occurred regardless of whether the flower had a relatively simple or complex odour blend and (3) moths showed the ability to learn more than one component from a single flower, with equal preference for the learnt odours. The results imply that moths can learn odours within complex floral blends and may be able to discriminate among odour profiles of individual flowers from the same species. We discuss this behaviour within the context of nectar foraging in moths and odour signalling by flowering plants.

Cunningham, Saul



CSIRO Entomology, Box 1700, Canberra, ACT, 2601 saul.cunningham@csiro.au

I feel like Toona tonight: feeding preferences of *Hypsipyla robusta*

Larvae of the cedar tip-moth (*Hypsipyla robusta*) feed on a structurally diverse range of plant parts, from large woody fruits of the “Cannonball” mangrove to flowers and shoots of the Australian rainforest tree, *Toona ciliata*. It is, however, a systematic specialist, feeding only on plants from species in the Swietenioideae sub-family of the Meliaceae. We examined host preference of *H. robusta* when choosing among five potential hosts in field trials in Australia, Laos, Thailand and the Philippines. All potential hosts were used. The least preferred species were those from outside the natural range of *H. robusta* (*Swietenia macrophylla*, *Khaya senegalensis*, *Cedrela odorata*). The most preferred species was *T. ciliata*. *Chukrasia tabularis* was heavily damaged in trials within its native range (Laos and Thailand) and relatively less damaged in sites outside its native range (Australia, Philippines). This pattern, supporting a hypothesis of adaptation to local hosts, was unlikely to occur by chance alone ($P=0.016$). We also examined host preference variation among *T. ciliata* of the same age but various

heights. Regression models reveal a strong positive effect of height (insects prefer taller trees) and a transient negative effect on recent change in height (*H. robusta* damage does, nevertheless, reduce height growth).

Curran, Timothy J., Peter J. Clarke, Nigel W.M. Warwick and Jeremy J. Bruhl



Botany, Centre for Ecology, Evolution and Systematics, University of New England, Armidale, NSW 2351
tcurran2@pobox.une.edu.au

Effects of drought on dry rainforest species on two contrasting soils: a test of the edaphic compensation hypothesis

Many Australian ecologists have reported the occurrence of rainforest on basalt-derived soils in climates considered drier than the recognized limit for rainforest. It was hypothesized that inherent soil properties facilitate the occurrence of rainforest at this climatic extreme; this phenomenon has been termed edaphic compensation. This hypothesis was tested by examining the effect of soil type on the water stress (as measured by pre-dawn xylem water potential Ψ_{PD}) experienced by dry rainforest species near Warialda, NSW, during a severe drought and subsequent non-drought periods. The study also compared the differences in Ψ_{PD} of four dry rainforest species and examined some of the mechanisms that these species use to resist drought. During the drought there was no significant difference in Ψ_{PD} between sandy loam and clay soils; hence, there was no support for the edaphic compensation hypothesis. After the drought had broken, plants growing on sandy loam soils had significantly higher Ψ_{PD} (i.e. were less stressed) than those on clay soils. There were significant differences in Ψ_{PD} between species: this can be partly attributed to stomatal closure at different water potentials and differences in certain leaf traits.

Curtis, David



Institute of Rural Futures, University of New England, Armidale, NSW, 2351 dcurtis@pobox.une.edu.au

Using the arts to create an ecological ethic

Australia faces several major ecological and environmental challenges that will require the engagement of the whole of mainstream society to be reversed. Existing programs from the government, non-government and private sectors appear to be failing in making significant inroads into many of the more intractable challenges such as soil salinity, urban sprawl, the greenhouse effect, declining water quality, and the loss of biodiversity, and new methods are called for.

This paper introduces the concept of the visual and performing arts being useful in affecting environmental behaviour at the individual, community and societal level. The arts appear to have special qualities at helping increase understanding and knowledge, aiding in communication and enabling more people to be engaged, provoking changes in individuals, communities or society, affirming beliefs, evoking an emotional response, and providing a spiritual dimension that makes people more connected with the natural environment.

The paper presents examples of where the arts and sciences have met historically and contemporaneously, focusing on examples involving ecology such as wildlife and botanical art. It will give some practical ways that the music, theatre and the visual arts can be included in extension and community education programs on ecology, such as in the preparation of educational materials, music concerts, street theatre, artworks, festivals and events, and will present elements from a training kit that is currently in preparation.

Curtis, David & Williams, Jann

THEATRICAL PRESENTATION

dcurtis@metz.une.edu.au Institute for Rural Futures, University of New England, Armidale NSW 2351
jann.williams@latrobe.edu.au Centre for Sustainable Regional Communities, La Trobe University, PO Box 199, Bendigo, Victoria 3552

A PERFORMANCE that INDICATES ways for managing profitable and biodiverse production systems

Developing indicators to measure the performance of environmental management in agricultural landscapes is much-debated. Generally the focus is on biophysical, social or economic measures, but there is another approach that examines the links between performance - in the literal sense - and environmental management, and that is ... theatrical performance itself!

This presentation will use theatrical performance as a medium to explore the issues associated with the management of agricultural production systems that are both profitable and biodiverse. This is an exciting and

challenging issue and our performance attempts to incorporate a range of values and views, as well as different ways to communicate about landscapes. As an example, our actors will introduce research models that emphasise working closely with farmers and producer-initiated projects.

The performance will provide an introduction and overview of the range of approaches being covered in detail by other presenters in the symposium on profitable and biodiverse farming systems. Linking science, practice and policy in this area is challenging and the solutions will need some thinking and action outside the box. The performance aims to encourage that kind of thinking and attempts to provide an alternative method of communicating information about environmental management and science generally.

Curtis, Peter



P.O. Box 465, Wangaratta Vic 3676 pcurtis@netc.net.au

Flowering patterns in *Xanthorrhoea australis*

A flowering pulse (masting) in *X. australis* is usually reported as an adaptive response to fire and little is known of flowering in the inter-fire period. The study from 1991-2001, examines the annual flowering patterns of 969 adult *X. australis* (plants with aerial stems) growing in sites burnt in 1976, 1991 and a site unburnt for c.100 years. Also, flowering frequency of individual plants is reviewed.

In all sites there was a major masting in 1995 which was significantly greater than in other years and minor pulses in 2000 and 2001. In the site burnt in 1991 the flowering pulse in 1995 was significantly greater than in the first post-fire spring. In 1995, in the unburnt site, temperature maxima and minima and the number of rain days per month had a significant effect on flowering, and in the site burnt in 1979 temperature maxima and minima had a similar effect.

The study questions the accuracy of using flowering patterns of *X. australis* to determine a site fire history. It also examines the different conditions of substrates and light, for the germination of seeds resulting from post-fire and inter-fire flowering.

Cutler, Seraphina and John Morgan



Department of Botany, Latrobe University, Bundoora, VIC, 3083 seraphina.cutler@telstra.com

Spatial Patterns of Snow Gum (*Eucalyptus pauciflora*) at the alpine tree line in south-eastern Australia

The study aimed to infer the population dynamics of *Eucalyptus pauciflora* at alpine treeline in south-eastern Australia by describing spatial patterns of trees across the treeline ecotone using belt transects at four sites. Basal circumference was used as an indicator of tree age. Seedlings and saplings were destructively harvested to determine year of establishment. Treelines were characteristically abrupt at all sites with few seedlings or outpost trees present above treeline and appear to be relatively long-established as evidenced by the presence of trees with girths >200cm within 5m of upper treeline boundary. The spatial distribution of *E. pauciflora* did not show directionality in size-class within the area 40m directly below treeline. Seedling establishment in subalpine forest was patchy suggesting it is tied to disturbance events that may form localised canopy openings. Recent (i.e. post 1981) establishment above treeline remains a relatively local rather than regional phenomenon. No seedlings or saplings were observed more than 20m above treeline with most (83%) found within 5m of treeline suggesting a positive or facilitating relationship between seedlings and tree canopies. Local establishment patterns suggest regeneration of *E. pauciflora* may be tied to factors other than climate warming such as seed availability, facilitation, competition and disturbance.

Davies, Richard, Duncan Mackay and Molly Whalen



School of Biological Sciences, Flinders University, GPO Box 2100, Adelaide, South Australia 5001
richard.davies@flinders.edu.au

Conservation genetics of the nationally endangered mound spring endemic plant, Salt Pipewort (*Eriocaulon carsonii*)(Eriocaulaceae)

Salt Pipewort, *Eriocaulon carsonii sensu lato*, is a nationally endangered perennial forb endemic to the mound springs of the Great Artesian Basin. *E. carsonii s.l.* has a range of over 1200km from northern Queensland to central Australia. However, populations are highly clustered into nine spring “Supergroups”, up to 500km apart. Previous studies have noted large morphological variation between populations. The current study extracted DNA from 272 samples of *E. carsonii s.l.* collected from all Supergroups. This DNA was analysed using AFLP

markers and five primer combinations. Following gel electrophoresis, AFLP fragments that could be observed unambiguously for every sample were scored resulting in a total of 308 AFLP loci. Cluster Analysis of the resulting data indicated that *E. carsonii s.l.* comprises four discrete groups that may warrant recognition as species or subspecies. Levels of genetic diversity varied from moderately high on one central Queensland Supergroup to very low in one South Australian Supergroup, despite the latter containing one of the largest populations. However, high levels of seed set and germinability were measured in the latter population.