‘Biodiversity Across the Borders’ Conference

Theme: “**VULNERABILITY AND RESILIENCE OF ECOSYSTEMS**”

A symposium presenting research from SE Australian Universities supported by Parks Victoria and other research partnerships.

ABSTRACTS

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Edited by: S. K. Florentine, & G. J. Ambrose

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Program

8:00	**Registration** **VENUE: 1870 Founders Hall Theatre**	
8:45	**Welcome** **Professor Kim Dowling** – Head, School of Science and Engineering, University of Ballarat	
8:50	**CEO – Parks Victoria** **Dr. Bill Jackson** Introductory comments on biodiversity and collaborative research.	
8:55	**Opening of '*Biodiversity across the Borders*' conference** **Professor Andrew (Andy) Smith** – Pro Vice-Chancellor, University of Ballarat	
9:00	**Keynote Address** **Dr. John Williams** Shifting Paradigms: resilience and the NSW Natural Resources Commission.	
	VENUE: 1870 Founders Hall Theatre **CHAIR: Professor Frank Stagnitti**	
	PLENARY SESSION 1	
9:35	**Professor Andrew Bennett** Building resilience in regional ecosystems and landscapes: what does this mean for land management and conservation?	
9:55	**Emeritus Professor Martin Westbrooke** Addressing the lack of regeneration of arid woodland trees: management of total grazing pressure through culling and water point closure.	
10:20	**Dr. Peter Spooner** Conservation values of roadside vegetation in fragmented landscapes of Victoria.	
	Morning tea 10:40 – 11:15 **POSTER SESSION** **Venue: TBA**	
	SESSION 2	
	WETLANDS AND CONSERVATION **VENUE: 1870 Founders Hall Theatre** **CHAIR: Dr. Keely Mills**	**FIRE AND LANDSCAPE ECOLOGY** **VENUE: Studio Theatre** **CHAIR: Assoc. Prof. Alan York**
11:20	**Prof. Paul Boon** Coastal vegetation: critical and ignored, loved and hated – a summary of the Victorian saltmarsh and mangrove study, 2008-2011.	**Dr. Fiona Christie** Life on the edge: how fire influences plant-herbivore interactions.

11:35	**Prof. Peter Gell** Murray-Darling wetlands: responsiveness and resilience to multiple drivers of change.	**Mike Stevens** Mega-fire: investigating small mammal recovery after severe, landscape-scale wildfire.
11:50	**Prof. Geoff Westcott** Barking up the wrong beach: the occurrence and impacts of dogs on Marine Protected Areas.	**Dr. Tom Duff** The response of plants to fire: using quantitative models to recognise change in natural communities.
12:05	**Anne Venables** Wetland classifications and validations: Is there another way?	**Dr. Julian Di Stefano** Using abundance data to define vegetation age class distributions for multi-species conservation.
12:20	**Penelope Greenslade** When are quarantine inspections and surveillance enough? Examples from recent mining development on Barrow Island, Western Australia.	**Justine Smith** Hit me with your best shot: maximising capture rates through a camera trap set-up.
LUNCH BREAK 12:35 – 1:40, Union Building		
Session 3		
	VERTEBRATE ECOLOGY AND MANAGEMENT **VENUE: 1870 Founders Hall Theatre** **CHAIR: Assoc. Prof. Ian Lunt**	**RESTORATION AND MANAGEMENT** **VENUE: Studio Theatre** **CHAIR: Dr. John Wright**
1:45	**Joab Wilson** Effects of artificial watering points on rangeland bird communities.	**Rod White** The Moolapio Grassland Re-establishment Project – a partnership between Greening Australia and Alcoa of Australia.
2:00	**Veronica Champness** Responses of Noisy Miners (*Manorina melanocephala*) to restoration plantings in the fragmented box-ironbark region of north-eastern Victoria.	**Debbie Reynolds** The ecological importance of soil disturbance on the recruitment, growth and reproduction of temperate lowland grassland forbs and implications for rehabilitation.
2:15	**Jemima Connell** The effect of shrub encroachment by *Kunzea* on woodland bird communities in south-eastern Victoria, Australia.	**Dr. Patrick-Jean Guay** How proper monitoring can help management of hybridisation: the Mallard X dabbling duck example.
2:30	**Lisa Smallbone** Passive regeneration following agricultural retirement leads to large-scale conservation gains	**William Terry** The autecology of the Pink-tailed Legless Lizard, *Aprasia parapulchella*.

2:45	**Megan Iskov** Ecological modelling studies of the marsupial genus *Acrobates*.	**Wendy Minato** Social norms and natural resource management.
	Afternoon tea 3:00 – 3:30 **POSTER SESSION**	
	Session 4	
3:35	**Panel Discussion: Building resilience into our ecosystems.** **VENUE: 1870 Founders Hall Theatre** **CHAIR: Professor Peter Gell** **Panel Members:** Karen Alexander, Prof. Mike Clarke, Dr. John Williams, Dr. John Wright, A/Prof. Ian Lunt and Prof. Paul Boon	
4:45	**Awards for Best Student Oral and Poster Presentations, provided by Parks Victoria** **Presented by** Tony Varcoe, Parks Victoria	
4:55	**Closing Address: Prof. Mike Clarke**	

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POSTER ABSTRACTS

KEYNOTE ADDRESS:

Shifting paradigms: resilience and the NSW Natural Resources Commission.

JOHN WILLIAMS

Natural Resources Commission, NSW

Abstract:

For some years now, we have used an established model of thinking in approaching natural resource management. With the complexity and intransigence of natural resource management increasingly clear, the resilience conceptual framework provides a welcome alternative viewpoint. The NSW Natural Resource Commission is incorporating this conceptual framework into its work, to set a new context for examining and communicating on landscape function. While resilience can sit uncomfortably with some aspects of traditional natural resource management, it also presents a significant opportunity for natural resource managers to adopt new ways of thinking.

Building resilience in regional ecosystems and landscapes: what does this mean for land management and conservation?

ANDREW BENNETT[1†], DALE NIMMO[1], G. NEWELL[2], M. WHITE[2], G. HOLLAND[1] AND J. RADFORD[3]

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Abstract:

'Building ecosystem resilience across Victoria' is one of three strategic directions identified in the recent White Paper 'Securing our Natural Future' (2009). An anticipated outcome is that 'Victorian ecosystems are healthy, productive and resilient'. This is an admirable goal, but what does it mean? What is a resilient ecosystem, how do we measure resilience and what kind of management actions will enhance resilience? Resilience is generally defined in the ecological literature as the amount of disturbance that a system can absorb before it changes to an alternative state, which has a different structure and is controlled by a different set of variables. From an operational and management perspective, there are several key issues. To measure the resilience of a system requires knowledge of: a) how it has changed through time and whether (and when) it has crossed a 'tipping point' to an alternative state; and b) which factors determine the relative level of change that a system experiences when faced with disturbance. In this regard, we propose four testable hypotheses concerning factors that potentially influence the resilience of a system. The *productivity hypothesis* predicts that ecosystems in sites or landscapes with a relatively greater primary productivity (e.g. due to soil types, water availability) will have larger populations, less vulnerable to ecosystem disturbance. The *landscape structure* hypothesis predicts that the amount (area) and connectivity of habitat in a landscape will determine the ability of species' populations to withstand disturbance. The *landscape heterogeneity* hypothesis predicts that more diverse landscapes will support a greater range of species, which will ensure that the functional roles in an ecosystem continue despite disturbance. Last, the *biotic interactions* hypothesis predicts that the occurrence of species such as exotic predators, competitors or keystone species will have a profound influence on the stability of a system. These hypotheses are not mutually exclusive and their relative influence may differ for different regional landscapes. The sustained drought and subsequent flooding rains in 2010-11, provide an ideal opportunity to test these hypotheses concerning the resilience of ecosystems to disturbance; and to identify the properties of regional landscapes that can be managed to enhance their long-term conservation value.

Addressing the lack of regeneration of arid woodland trees: management of total grazing pressure through culling and water-point closure.

MARTIN WESTBROOKE

Centre for Environmental Management, University of Ballarat

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Abstract:

Many studies have implicated elevated grazing pressure from mammalian herbivores as a causal factor in the lack of regeneration of arid woodland trees. In many conservation reserves within the arid zone of south-east Australia solving the issue of regeneration failure is a key management issue. Implicated grazers include sheep, goats, rabbits and elevated populations of the three abundant large macropods: Western Grey, Eastern Grey and Red Kangaroos. Whilst sheep have been significant historically they are readily removed and rarely survive without husbandry. Goats and rabbits can be controlled to some degree but are difficult to eliminate and control measures may cause environmental damage. As 'protected' wildlife, reduction in populations of the large macropods brings ethical as well as practical problems. Literature suggests that provision of artificial water through bores, dams and ground tanks is a major factor in maintaining high population levels of both native and exotic herbivores. Whilst closure appears an obvious strategy there are practical problems and as yet untested biodiversity implications. Current options for grazing control and issues relating to water point closure are reviewed.

Conservation values of roadside vegetation in fragmented landscapes of Victoria.

PETER SPOONER [1†]

[1] *Institute of Land, Water and Society, Charles Sturt University, PO Box 789, Albury NSW 2640*

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Abstract:

Roadside environments are a ubiquitous component of the Victorian landscape. These remnants of native vegetation often provide the only remaining evidence of extensive forests, woodlands and grasslands that once graced the countryside. As roadsides often constitute a significant proportion of native vegetation remaining in fragmented agricultural landscapes, they provide important refuges for populations of native species, many of which are threatened or endangered. Since the late 1980s, there has been increasing attention given toward the conservation management of roadside environments. Rather than use a grader to remove vegetation for safety concerns, many councils, local communities and government agency groups are endeavoring to better manage these precious biodiversity assets. For example, many councils have used a rapid bio-assessment methodology of some kind to assess the conservation values of each road segment (ranked as High, Medium or Low), and used these to determine appropriate management actions for each road category. However, roadsides also have important heritage values to consider. Many road reserves were first surveyed in the late 19th century, and surveyed at one-chain (20.12m) width suitable for a horse and carriage - which is barely wide enough for modern transportation needs. Major trunk routes were often surveyed at widths from 1.5 to 3 chains (30-60m), which often follow the tracks of our first explorers and settlers. Stock routes are also an integral component of road networks, where evidence suggests some follow previous indigenous pathways. As such – many roadsides have a unique story to tell, which could be a useful approach in interpreting and educating the general public of roadside vegetation values. Roadsides are now gaining new attention for their potential connectivity values in terms of climate change. In this talk, I will discuss past, present and future conservation values of roadside environments and their management options.

Coastal vegetation: critical and ignored, loved and hated – a summary of the Victorian saltmarsh and mangrove study 2008-2011.

PAUL BOON

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Abstract:

After a brief spurt of research investment in the mid 1970 and early 1980s, interest in the ecology and management of Victorian coastal wetlands has languished over the past three decades. The sleepers have awoken, however, with the recognition that coastal wetlands, along with alpine and riparian vegetation, are among the natural environments in Victoria likely to be most affected by climate change. It is also being recognized – belatedly – that far from representing vegetation communities 'of least concern', coastal saltmarsh is a diverse, much diminished and continually threatened type of coastal wetland. We* have recently completed an extensive, State-wide assessment of the mangroves, saltmarsh and estuarine wetlands that fringe the Victorian coast. The presentation will summarise the project's findings on i) the range of plant communities present in Victorian coastal saltmarsh and mangroves; ii) what is known about this vegetation, drawing from the published literature, student theses, and unpublished consultants' reports; iii) the development of a new typology to better describe Victorian coastal saltmarsh (currently described as EVC 9 Coastal Saltmarsh Aggregate); iv) completion of a fine-scale (1:10,000) inventory of the current distribution of coastal saltmarsh, mangroves and estuarine wetland, based on recent aerial photographs and extensive ground truthing; v) an analysis of the ecological condition and major threats to mangroves and coastal saltmarsh (including *Spartina* mapping); vi) an analysis of likely pre-European distributions of coastal wetlands, based largely on early 19th Century data sources (e.g. historical maps); vii) modelling of likely climate-change impacts on distributions in 2100, using the Western Port wetlands as a case study; and viii) community and agency attitudes to coastal saltmarsh and mangroves and the types of communication strategies that are most appropriate to improving public awareness of these areas.

* The study team consisted of Paul I Boon (project manager), Tim Allen, Jennifer Brook, Geoff Carr, Doug Frood, Chris Harty, Jasmine Hoye, Andrew McMahon, Steve Mathews, Neville Rosengren, Steve Sinclair, Matt White & Jeff Yugovic.

Murray-Darling wetlands: responsiveness and resilience to multiple drivers of change.

PETER GELL[1] AND M.A. REID[2]

[1] *Centre for Environmental Management, University of Ballarat, Ballarat, Victoria*

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Abstract:

Lowland Australian rivers and their floodplains have been affected by the progressive introduction of agriculture, flow regulation and invasive exotic species for more than a century. In the context of this complex suite of stressors, our capacity to understand and mitigate the causes of ecosystem change is limited by the lack of historical records of the condition of ecosystems over the past 200 to 300 years. However, records of change over this critical time period can be established through analysis of sedimentary records. Such records can be used to provide benchmarks of the range of natural conditions prior to European settlement and, by providing a long time series of conditions, enhanced capacity to detect trends and trajectories of change. Over the past two decades, more than 50 sediment records from billabongs, lagoons and waterholes throughout the Murray-Darling Basin have been subject to palaeoecological analysis. The picture that emerges from these studies is of ecosystems that have undergone substantial ecological change in response to human activities; however, there are also intriguing differences in the timing and nature of change experienced by aquatic ecosystems in different parts of the Murray-Darling Basin. These patterns of ecosystem response appear to reflect underlying differences in the resilience of these ecosystems in relation to different anthropogenic stressors, which, in turn, may result from contrasting hydrologic, geomorphologic and climatic contexts. This paper presents an attempt to systematically compile and summarise the palaeoecological evidence of change in the aquatic ecosystems of the MDB and, in so doing, shed light on what the principal drivers of change are in floodplain wetlands across the Murray-Darling Basin and hence provide guidance as to how these systems can be best preserved and restored.

Barking up the wrong beach: the occurrence and impacts of dogs on Marine Protected Areas.

JAMES FITZSIMONS[†1,2], GEOFF. WESCOTT[1] AND M. WESTON[1]

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Abstract:

Marine Protected Areas (MPAs) are specifically set aside for the protection of marine and/or coastal biodiversity. Dog walking is not permitted in most parks under Victoria's *National Parks Act*. However, provision for restricted dog walking was made for some foreshore components of marine national parks and sanctuaries at specific places and times - particularly in urban areas or near rural towns, which were available for dog owners to exercise their dogs in prior to the declaration of these MPAs in 2002. Since then there has been some conflict between people wishing to continue, particularly 'off leash', dog walking and the intent and regulations of the new parks. For example at Ricketts Point Marine Sanctuary it is now illegal to allow a dog to run off leash in the reserve when in the past this was not the case. Over the last five years Deakin University has developed a method for recording recreational use of the intertidal zone in Victoria. This has been used to measure activities inside and outside declared marine national parks and sanctuaries. A pilot project using this template, but specifically aimed at assessing the potential impacts of domestic dogs on the biodiversity, recreational values and aesthetics of MPAs has begun to compare this activity inside and outside MPAs along the Victorian coast. Preliminary results from this project will be presented along with a brief review of the inconsistent regulatory environment that has developed around dogs and protected areas in Victoria.

Wetland classifications and validations: Is there another way?

ANNE VENABLES[1,†], MICHAEL DICKSON[2] AND PAUL BOON[3]

[1] *School of Engineering and Science, Victoria University, Footscray Park*
[2] *West Gippsland Catchment Management Authority, Leongatha*
[3] *Institute for Sustainability & Innovation, Victoria University*

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Abstract:

Despite being the driest inhabited continent, Australia boasts a rich and varied endowment of wetlands. In Victoria, the management and protection of wetlands has been mandated to ten Catchment Management Authorities (CMAs), each of which must oversee the sustainable development of water catchments and associated wetlands within their regions. In setting spending priorities, CMAs need to collect reliable and representative data in order to classify, and ultimately rank wetlands according to their environmental, social and economic values. The task of ranking wetlands for investment decisions is complex and multifaceted, and often relies upon consultation with experts, database interrogation, literature reviews and workshop discussions; thus it is generally expensive in terms of time and resources.

The study we present explores the process used by the West Gippsland CMA to classify and rank wetlands, and aims to determine whether the current resource-intensive approach can be improved through the application of novel computing and statistical techniques. After discussing possible approaches to the problem, we will focus on the use of neural networks (ANNs) to automate the processing of input data, which in the present case consisted of biological, hydrological and physical attributes for 162 wetlands used to infer ecological, social and economic value assessments. Using a sample of 49 sites, three neural networks – one each for ecological, social and economic assessments – were trained to classify wetlands as being very high, high, moderate, low or very low in value. The accuracy of the different neural networks' wetland classifications varied markedly and in general they were poorer than was hoped. The social value ANN assessed 74% of its unknown wetlands correctly over four categories; the economic value ANN achieved 52% exactness over four categories, whereas the ecological value ANN managed only 41%, over five categories correct for its dataset. Alternative approaches to the problem of wetland classification and ranking will be discussed in light of these results.

When are quarantine inspections and surveillance enough? Examples from recent mining development on Barrow Island, Western Australia.

PENELOPE GREENSLADE[1]† AND A. JASMYN J. LYNCH[1]

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Abstract:

Islands are well known as highly significant reservoirs of endemic and threatened species but anthropogenic influences have profoundly impacted on many islands' biodiversities. Here we examine the effectiveness of quarantine inspections and surveillance in protecting a biodiverse, small continental island off the coast of north-western Australia that has been subject to mining development for oil and liquid gas extraction, the latter offshore. Prior to the instigation of mining operations, Barrow Island was in pristine condition, lacking exotic vertebrate predators and comprised a haven for many species of fauna that were rare or extinct in other parts of their original range. Although only 234 km^2 in area, the island and its near shore habitats contain 15 land mammals, seven marine mammals, 120 bird species, 40 reptile species, over 2000 invertebrate species and approximately 227 plant species. Despite strict quarantine controls imposed on all personnel, equipment, building materials and other cargo transported to the island, and strict environmental controls on infrastructure development, there have been breaches of quarantine procedures, native species have been killed through vehicle collisions and habitat loss, and exotic fauna and flora species have been detected. The high cost of border control has led to the suggestion that it would be more economical to eliminate exotic species after their establishment on the island rather than invest in expensive quarantine procedures. We question the assumptions underlying this suggestion and argue instead that more attention be given to removing loopholes that allow incursions and to controlling activities that result in loss of wildlife.

Life on the edge: how fire influences plant-herbivore interactions.

FIONA J. CHRISTIE

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Abstract:

Disturbances, such as fire can directly affect plant-insect interactions. In the post-fire environment regenerating plants may be susceptible to predation from herbivores recolonising from adjacent unburnt areas, with the spatial distribution of herbivores having significant impacts on the spatial heterogeneity and recovery of plant communities. This research investigated how fire alters plant-herbivore interactions in stringybark woodlands of south-western Victoria by quantifying the relative impact of vertebrate and invertebrate predation using cage exclosures. It was hypothesized that fire in the short term would directly depress herbivore abundance, and that the rate of re-colonization by herbivores would depend upon distance from the edge of the recently burned area. Ninety plots were established one month post-fire at varying distances from unburnt edges (0m, 50m, 150m, 300m and 500m) towards the interior of the burn, at six recently burnt sites. Thirty vertebrate exclosures, 30 invertebrate exclosure and 30 reference plots were monitored monthly for plant species richness and cover. After a period of 15 months, plants in all plots were harvested, dried and weighed to obtain biomass estimates. As expected there was reduced biomass of plants in reference plots close to the edges of unburnt vegetation compared to interior plots. There was no difference in biomass for insect or vertebrate exclosures, although overall there was a greater biomass of plants growing within invertebrate exclosures. For ecological burning purposes these findings suggest that larger burns may aid in the management of threatened species and communities through temporal avoidance of herbivory.

Mega-fire: investigating small mammal recovery after severe, landscape-scale wildfire.

MIKE STEVENS[†1] AND JOHN WHITE[2]

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Abstract:

Research into the impacts of mega-fire has become important with the predicted increase in scale, severity and frequency of wildfire associated with climate change. Severe, landscape-scale wildfire events can exacerbate fragmentation effects and compromise conservation dependant fauna. Many studies have found a significant decline of species post-wildfire, however presumptions exist as to where species survive. Much research is often limited by small scale, low severity and large unburnt edge effects within fire study areas. Furthermore, fewer studies investigate the long-term impact and conservation implications to fauna from homogenous severely burnt landscape-scale wildfires with minimal unburnt patches or understand when, from where and how long it will take for surviving species to recolonise. Commencing in 2008, Parks Victoria and Deakin University are collaborating to investigate the impact on native small mammals of mega-fire in the Grampians National Park, Victoria, Australia. Approximately 50% of the landscape burnt in January 2006 during prolonged drought, where 75% of the burnt area suffered complete canopy loss or severe scorch, with only 3.4% unburnt in scattered isolated patches. Study sites are divided into wildfire (burnt) and unburnt areas. Wildfire areas are isolated, peripheral, and low severity study sites, while unburnt areas are control, large patch and small patch study sites. A total of thirty-six long-term sampling units using a focal patch design are being studied between April and July each year with 28,860 combined Elliot and cage trap nights completed between 2008 and 2010. The influence of fire severity, patch size and habitat connectivity with vegetation structure, floristic associations and overall fuel hazard are measured to investigate correlations with small mammals. Five honours projects have been completed, focussed on recovery of native small mammals, with investigation of bird recovery and comparison of camera to live trapping completed in 2009 and with drought refuge investigation completed in 2010.

The response of plants to fire: using quantitative models to recognise change in natural communities.

TOMM DUFF[†1], TINA BELL[2] AND ALAN YORK[1]

[1] *Forest and Fire Ecology Group, Department of Forest and Ecosystem Science, The University of Melbourne, Creswick, 3363, Australia*

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Abstract:

The dry forests of south eastern Australia are typical of Mediterranean-type environments, exhibiting frequent disturbance by fire, low soil nutrients and high floristic diversity. Natural communities are inherently complex and, as a result, predicting the effects of altered fire regimes or climatic patterns is an intricate process. This paper describes an investigation into quantitative changes in vegetation patterns in response to fire and other environmental variation in an area of heathy woodland in Western Victoria. Detailed information was collected on understorey species composition from 194 quadrats surveyed throughout the study area. This was incorporated with existing datasets describing landscape properties, including soil, topography, climate and fire history. Regression models, data mining and information theoretic approaches were utilised to identify relationships between plants and the conditions under which they grow. Fire regime was found to be an important determinant of abundance for the majority of plants present; however there was a wide variety of responses. Under any fire regime scenario, different species increased, decreased or remained constant. In addition, weather and soil properties were found to be strong influences on abundance and there was evidence of interactions between environmental conditions and fire. The wide variety of responses that were observed is indicative that the ecosystem is likely to respond to environmental change, particularly changes in fire regime, by compositional adjustment of plant communities. Consequently no invariant fire regime will satisfy all species and to optimise outcomes, management may need to maintain variation in burning patterns as well as consider the responses of specific species.

The autecology of the Pink-tailed Legless Lizard, *Aprasia parapulchella*.

WILLIAM R. TERRY

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Abstract:

The Pink-tailed Legless Lizard, *Aprasia parapulchella*, is a small, slender, cryptic pygopodid that is found in grassland and open woodland habitats in south-eastern Australia. It is listed as 'vulnerable' by the Commonwealth, ACT and NSW authorities, and as 'threatened' in Victoria. It feeds on ants and is generally found sheltering under partially embedded rocks where the prey and their brood occur. Temperatures are less extreme, and humidity increased, underneath these rocks. Other components of the habitat include sandy, mildly acidic soils that are low in organic matter and nutrients and ground layer vegetation that includes native grasses. Hotspots within the distribution include the Canberra, Albury and Bendigo regions. Based on 192 records, bioclimatic modelling for the species using BIOCLIM defined a climatic envelope that identifies a number of additional areas within the wider distribution that are suitable for the species' occurrence and perhaps should be investigated for their presence. The same model was used to project affects on the climatic envelope based on low, medium and high temperature increases that may result for the years 2030 and 2070 due to climate warming. Core habitat areas are projected to decline substantially with only moderate warming, and disappear all together with high temperature increase scenarios. The potential effects on other biotic components of the realised niche, such as the ants and vegetation, will also be important to take into consideration in projecting outcomes with climate warming, and possible changes in the lizard's behaviour (such as selecting larger rocks for shelter) may also be important.

Hit me with your best shot: maximising capture rates through camera trap set up.

JUSTINE SMITH

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Abstract:

Fire is a potentially valuable management tool for the conservation of biodiversity. It is therefore essential to monitor how fire management actions impact threatened species. Camera traps are increasingly used for ecological research to monitor elusive and threatened species, which are otherwise difficult to study. Traditionally camera traps are set up pointing horizontally out towards a bait station, to capture images of animals as they move past. An alternative set-up, in which the camera faces vertically down towards the ground, has recently been used for small mammals. This study aimed to determine which of these set-ups is most effective for monitoring two rare and cryptic mammal species, the southern brown bandicoot (*Isoodon obesulus*) and the long-nosed potoroo (*Potorous tridactylus*). Cameras were set in pairs, consisting of one camera orientated horizontally and one vertically, both pointed towards the same bait station. Detection probabilities for both species were higher in the vertical camera orientation. To achieve a probability of 0.95 of detecting southern brown bandicoots and long-nosed potoroos, using horizontal camera orientation, would require 30 and 97 trap nights respectively. This is reduced to 15 trap nights for bandicoots and 17 for potoroos by using vertically orientated cameras, which sits well within a standard three week camera trap survey. Vertical camera orientation has now been successfully implemented as a part of pre- and post-fire monitoring for these two species. These findings highlight the need to test camera trap set-ups on target species so that we can make best use of this technology.

Effects of artificial watering points on rangeland bird communities.

JOAB WILSON[1,†], PETER GELL[1], FIONA CHRISTIE[2], SIMON COOK[1] AND GRANT PALMER[1]

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Abstract:

Provision of permanent water in Australia's rangeland regions and the subsequent effects of grazing in these habitats have altered the composition and condition of arid zone bird communities. Some species have expanded their geographic range, mainly those that are water-dependent and benefit from disturbances. In contrast, certain species that are water-independent and are sensitive to disturbance have declined throughout much of their former range. Little is known about the direct causes for these declines or what factors are driving arid zone bird assemblages. This research investigates the effects of artificial watering points (AWPs) and other resources on bird assemblages in the southeast Australian rangelands. This research is being carried out at the University of Ballarat's arid zone research property, "Nanya Station". Bird surveys and habitat assessments have been conducted at each of forty-four sites (ranging from 100 m to 6 km from AWPs) on the property to investigate relationships between birds and environmental variables. Contrary to expectation, preliminary results indicate that there is no relationship between distance to AWPs and bird assemblages. Further research will investigate whether other habitat variables (i.e. vegetation composition and/or structure) have an effect on the composition of rangeland avifauna.

Responses of Noisy Miners (*Manorina melanocephala*) to restoration plantings in the fragmented box-ironbark region of north-eastern Victoria.

VERONICA CHAMPNESS[1], M. GREY[1†] AND D. INGWERSEN[2]

[1]*Departmemt of Zoology, La Trobe University, Bundoora, 3086*

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Abstract:

Many of the restoration efforts aimed at conserving the declining woodland avifauna of the fragmented agricultural landscapes throughout south-eastern Australia have shown promising results for encouraging wildlife back into the region. It is unknown how fragmentation-tolerant species, such as the Noisy Miner, have responded to the provision of habitat through revegetation activities. Given the large investment of both money and human effort into these conservation programs and the potential for Noisy Miners to exclude other birds from remnants, it is important to assess the degree to which Noisy Miners occupy revegetation plots. The aim of this study was to assess which features of revegetated sites were most associated with the presence of Noisy Miners, as determined in surveys conducted by Birds Australia staff and volunteers. We investigated a range of revegetated sites (n = 47) throughout the Lurg Hills and discovered that Noisy Miners were present in restored sites with plantings across all ages examined (0 - 13 years since planting), but were significantly more abundant at sites with very young revegetation (0 - 2 years since planting). Our findings highlight that revegetation may have the potential to reduce Noisy Miner domination throughout the landscape, but that there is a critical period in the very early stages of restoration during which Noisy Miners may need to be prevented from colonising a restored site. Occupancy of a revegetated site was found to be associated with structural features, including bare ground, low eucalypt densities, short planted vegetation and little overstorey canopy cover. We suggest that these structures may facilitate the territorial and opportunistic foraging habits of the Noisy Miner.

The effect of shrub encroachment by *Kunzea* on woodland bird communities in southeastern Victoria, Australia.

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Abstract:

Woody shrub encroachment threatens the biodiversity and ecosystem processes of vegetation communities worldwide. In south-eastern Australia the indigenous shrub *Kunzea* encroaches into native forest leading to reduced understorey plant diversity. Ongoing removal of woodland *Kunzea* infestations occurs, despite limited understanding about the shrub's role in woodland ecosystems, including its impact on bird communities. This study aimed to address whether invasion of the understorey by *Kunzea* had an impact on bird communities, through comparison of invaded and un-invaded woodland. Nineteen *Kunzea*-invaded sites were compared with twenty control sites throughout the Yarra Valley on private and public land (e.g. Warrandyte State Park and Kinglake National Park). Quantification of floristic and structural elements, line transect surveys and nest counts were conducted at all sites. *Kunzea*-invaded habitat had significantly decreased graminoid coverage, but higher leaf litter coverage and foliage density of the shrub stratum. Bird species richness, incidence and diversity were similar between *Kunzea*-invaded and control sites. However, the composition of bird communities in the two habitats was found to be significantly dissimilar. Foliage searchers were more highly characteristic of *Kunzea*-invaded habitat, whilst granivores and nectarivores were more characteristic of uninvaded habitat. Unexpectedly, bark probers were most characteristic of control sites. Modelling revealed *Kunzea* density contributed minimally to the incidence of either foliage searchers or bark probers. Thus, the presence of *Kunzea* appeared to be a driving factor of overall dissimilarity between communities, but not an explanatory factor for the occurrence of certain guilds. A significantly higher number of nests were recorded in *Kunzea*-invaded habitat. Observational records indicated a different suite of species utilised the two habitats for breeding activities. Findings highlighted that management decisions made regarding the shrub's removal must be done so with caution. It is recommended that an adaptive management approach be adopted.

How proper monitoring can help management of hybridisation: The Mallard X dabbling duck example.

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Abstract:

Biodiversity is threatened worldwide through various processes including habitat loss, pollution, and overexploitation. Competition with and/or predation by introduced species is also a recognised threat to many taxa. One often overlooked outcome of introductions is hybridisation with native species. Many species of birds, mammals, fish, insects and plants have been introduced by humans outside of their native range. In many cases, such introductions have resulted in hybridisation with closely related native species. Although many such hybrid crosses have been described, very often only anecdotal information is available and no true estimation of the scale of the problem is available. Proper management of introduced species and their hybrids requires knowledge of the frequency of hybrids, the distribution of the introduced species and the source of the introduced species. Using hybridisation between Mallards (*Anas platyrhynchos*) and dabbling ducks as an example, we describe five management strategies available to control and mitigate the impacts of hybridisation and describe how proper monitoring will allow decision making for the preservation of species threatened by hybridisation with introduced species.

Ecological modelling studies of the marsupial genus *Acrobates*.

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Abstract:

Until recently, ecological studies of feathertail gliders have been difficult, as these small, nocturnal marsupials are difficult to spotlight and rarely captured in traps. While *Acrobates* is known to be widely distributed through forests along the east coast of Australia, the microhabitat requirements of the genus remain poorly understood. Recent studies have revealed that the genus *Acrobates* includes two morphologically and genetically distinct species; *A. frontalis* and *A. pygmaeus.* Accordingly, the aim of this study was to investigate the distributional limits of these sibling species, using the bioclimatic modelling program BIOCLIM, and to predict how climate change may alter their distributions. Additional GIS-based vegetation modelling was conducted to determine correlation of habitat preferences and morphological differences between the two species. Initial mapping of records showed a significant difference in the distribution of the two species; with *A. pygmaeus* inhabiting a restricted area in south-east Australia, whereas the distribution of *A. frontalis* extends from central and western Victoria up to Cape York. A significant area of overlap exists in the Sydney region. Bioclimatic profiles were produced for both species and for genus, based on museum specimen records and observation records. Six key climate parameters were used to create bioclimatic distribution maps that highlighted the core and marginally suitable climate regions of the *Acrobates* range. The current bioclimatic profiles suggest *A. pygmaeus* should be found further along the south eastern coastlines and at higher altitudes in the Alps, while *A. frontalis* should occur much further inland than current records suggest. These bioclimatic distributions showed complex changes under a variety of climate change scenarios, with both reductions and expansion in range seen. While there are limitations to bioclimatic modelling, it is an effective tool in studying distribution of species, particularly in large-scale studies such as this.

Passive regeneration following agricultural retirement leads to large-scale conservation gains.

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Abstract:

National, state and regional conservation strategies highlight the need to promote revegetation across large areas in agricultural regions. This challenge may be facilitated by land use changes that lead to passive regeneration. We used historical air photos to document the rate of establishment of natural regrowth in the Nagambie-Rushworth-Murchison area in central Victoria, following a change from agricultural to rural residential land use. We then documented bird community composition in sites that varied in age and structural complexity, from open paddocks to young and old regrowth patches and reference box-ironbark forests. Regrowth was abundant in the region. In 2009, regrowth patches occupied 8,185 ha, or 12.3% of the cleared landscape in the study region, mostly on relatively low fertility soils. Most of this area supported *Cassinia* shrubland, with eucalypts and other species encroaching as patches get older. If recent trends continue, regrowth will occupy 20% of infertile soils on private land by 2025. Bird community composition varied among vegetation states, with increasing species richness in more structurally complex and older regrowth patches, particularly for small insectivorous birds. Regrowth may provide valuable habitat for declining woodland birds, such as the Speckled Warbler and Red-capped Robin. This study highlights the value of passive regeneration following agricultural retirement for biodiversity conservation. In some regions, land use change provides an opportunity to obtain major conservation gains at minimal cost. However, since all regrowth occurs on private land, an understanding of landholder values, beliefs and norms is crucial to future regrowth management.

The Moolapio Grassland Re-establishment Project – a partnership between Greening Australia and Alcoa of Australia.

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Abstract:

Victoria's grasslands constitute a highly threatened community now reduced to less than 1% of their pre-European range and are listed as critically endangered under Victoria's Flora and Fauna Guarantee Act and the Federal Government's EPBC Act. Grassland restoration is vital to slowing the decline of Victoria's grasslands. This can be achieved by creating awareness, building knowledge and empowering landholders. Greening Australia, in partnership with Alcoa of Australia and with the University of Melbourne as research partner, has been trialling a range of innovative techniques (such as soil scalping, direct seeding and containerised seed production facilities) to re-establish broad-scale, complex species-rich grasslands on previously weedy agricultural paddocks. To date Greening Australia has successfully re-established eight hectares of grassland on Alcoa of Australia's Point Henry land in Geelong. The initial research phase is complete, and the project is preparing to launch into the next phase: to deliver the proven techniques on a truly broad-scale with a vision to re-establish 150 hectares over a ten to fifteen year period. The Moolapio grassland re-establishment program forms part of a larger ongoing research endeavour- the Grassy Groundcover Research Project (GGRP), which commenced in 2004. The project has placed a strong emphasis on undertaking regular monitoring to ensure that insights to improve ongoing practice have been recorded. In three years the Moolapio grassland re-establishment project has demonstrated that, by using innovative and science based techniques, sustainable and species-rich grassland can be successfully achieved. This outcome will aid the larger restoration sector by providing sound learning and knowledge based on on-ground achievements. This is significant to the Victorian Volcanic Plains region and where other temperate grasslands communities exist.

The ecological importance of soil disturbance on the recruitment, growth and reproduction of temperate lowland grassland forbs and implications for rehabilitation.

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Abstract:

Temperate lowland grassland communities in south-eastern Australia constitute a critically endangered ecosystem (Australian Federal Government, 2007). The role of soil disturbance in these communities is widely debated amongst grassland managers. While soil disturbance is viewed as a formative process in grasslands, the present floristic composition of these grasslands when coupled with soil disturbance favours introduced plant species. It is likely that soil disturbance is important to the recruitment and reproductive ability of native grassland forbs. Recruitment events for many grassland forb species remain undocumented and for many others recruitment is rare.

This study investigated the effects of soil disturbance on the recruitment, establishment, reproductive output, root architecture (of tubestock and seed) and viability of five grassland forb species (*Podolepis* sp. 1*, Ptilotus spathulatus, Pycnosorus chrysanthes, Velleia paradoxa* and *Rutidosis leptorrhynchoides*) of the Victorian volcanic plains.

Seed on disturbed soil germinated more readily and in greater numbers, while tubestock plants grew larger and their seed production, weight and viability was significantly higher than treatments on undisturbed soils. Two species *(Ptilotus spathulatus, Podolepis* sp.) of tubestock-grown individuals developed a greater root biomass in disturbed soil but observations suggest that plants germinated *in situ* had improved root architecture and depth. These improvements in recruitment, growth and seed production indicate that soil disturbance plays a critical role in maintaining grassland health and the improvements in root architecture indicate that seed-grown individuals will have an increased long-term survival advantage over tubestock-grown individuals.

In summary, the combination of seed germination and soil disturbance in the field resulted in improved root architecture. Also, tubestock individuals were more productive and contributed many viable seeds to the soil for future germination. Thus, soil disturbance plays a critical role in recruitment success and survival of grassland forbs.

Using abundance data to define vegetation age class distributions for multi-species conservation.

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Abstract:

Loss of species due to human practices is a global problem, and facilitating species persistence in human-managed landscapes is an objective of many governments. It is argued that in some ecosystems, fire can help meet this objective by creating a diverse array of environmental states that facilitate the survival and reproduction of species with different resource requirements, dispersal capacities and competitive abilities. In south-eastern Australia, regimes of planned fires are used to manipulate the age class distribution of vegetation communities to meet the dual objectives of fuel reduction and biodiversity conservation. Current practice is to use a negative exponential model parameterised with data from a few species of fire sensitive plants to calculate an 'ideal' age class distribution that managers aim to create. Here, we outline a number of problems with this approach, and present an alternative method for determining an age class distribution that meets the needs of multiple species. The method uses a theoretical relationship between mean time to extinction and the geometric mean of species abundance expected under deterministic conditions. An optimization routine is applied to determine the vegetation age class distribution that maximizes the geometric mean of species abundance, thus minimizing the time to extinction of any species in the community. We apply the method to birds, small mammals and vascular plants surveyed in the heathy woodlands of southwestern Victoria, and show that the optimal age class distribution differs among taxa.

Social norms and natural resource management.

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Abstract:

This research examines the influence of social norms on the management of native vegetation on private land in a small rural community in North-east Victoria. The findings are based on a qualitative study that aimed to establish cause-and-effect relationships between NRM investment, changing land-ownership, and vegetation change. During the course of the project the focus shifted to the role of social norms and their influence on land management practices. The literature indicated that social norms were a mechanism for change not previously studied in this context. Examining land management from a social norms perspective was therefore a novel way to explore the influence of government NRM programs and the interaction between farming and non-farming landholders in a particular setting. The results show that, although this particular community is changing, there does not seem to have been a decrease in the level of trust and neighbourliness between new residents and old; this is a positive finding, given that the level of social capital in changing rural communities may well determine the success or failure of future investment in community based NRM. The local Landcare group was instrumental in fostering relations between farming and non-farming residents and establishing a new norm of annual tree planting. Well established farming norms are influencing newcomers to the area and these norms are actively maintained. The research has implications for future NRM policy and investment; we suggest that a better understanding of social norms in different natural resource management contexts may lead to the development of more effective policy instruments aimed at improving the management of native vegetation on private land.

Poster Abstracts

Biology of the potentially alien invasive holoparasite *Cuscuta* Yunker in Brunei Darussalam.

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Abstract:

The genus *Cuscuta* (Convolvulaceae) have been poorly acknowledged in Brunei Darussalam, and often mistaken as *Cassytha filiformis*, an unrelated species in the family Lauraceae. At present, the two *Cuscuta* species that have been positively identified in Brunei Darussalam to the species level (based on their floral morphology) are *Cuscuta australis* R. Brown and *Cuscuta campestris* Yuncker, well known to infest economic crops. Our extensive field studies show that these particular flowering dodder species are rather localized to a few disturbed habitats. Studies conducted during the past three years have shown that another *Cuscuta* 'species' that exclusively spreads by means of perennation is widespread mostly along the waterways and low lying areas in Brunei Darussalam. Due to lack of floral characters commonly used to identify indiscernible *Cuscuta* species worldwide, the identity of this particular perennating *Cuscuta* population found in nearly all parts of the country had remained a mystery; which called upon molecular and phylogenetic study using DNA sequence data from the nuclear ribosomal internal transcribed spacer (ITS) and chloroplast intron *trnL-F* region. By using a bar coding procedure to identify these sterile *Cuscuta* populations using sequence data from published *Cuscuta* phylogenies worldwide, all sterile *Cuscuta* populations sampled formed a clade with published accessions of *C. australis* and no molecular differences were found between flowering and sterile *Cuscuta* populations in Brunei. The persistent sterility of the majority *Cuscuta* populations in Brunei Darussalam still remains unknown. A large number of native plants and agricultural crops in Brunei Darussalam have shown vulnerability to infestation of *Cuscuta*. The widespread sterile populations of *C. australis* in the Sultanate are indeed troubling from an agronomic and conservative perspective; if sterile populations were to simultaneously flower and set seeds due to an environment cue, infestations of this noxious weed would expand virulently and likely to impact Bruneian food sustainability and food security programs.

Investigating the extent of hybridisation between introduced Mallards (*Anas platyrhynchos*) and Pacific Black Ducks (*Anas superciliosa*) in Australia.

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Abstract:

Dabbling ducks are subject to many threatening processes. However, a threat that is generally overlooked is hybridisation with introduced Mallards (*Anas platyrhynchos*). Mallards are often larger and more aggressive than the native, sexually monomorphic dabbling duck species with which they co-occur and may hybridise with them through forced extra-pair copulation. The Pacific Black Duck (*Anas superciliosa*) is a sexually monomorphic dabbling duck native to the southern Pacific whose three subspecies are all listed as endangered or vulnerable due to hybridisation with introduced Mallards. The New Zealand Grey Duck has hybridised with introduced Mallards to the extent that it has been considered endangered since the late 1970s. In Australia, however, the degree of hybridisation between introduced Mallards and Pacific Black Ducks is unknown. Unlike Mallards released in New Zealand, Mallards in Australia are typically of a domestic origin and occur mostly in and around cities and thus were thought to pose no threat to rural Pacific Black Ducks. However, phenotypical studies have shown that hybridisation is spreading to rural areas of South Australia, Victoria and Tasmania. It is thought that hybrid backcrosses with Pacific Black Ducks, rather than F1 hybrids, are dispersing from urban areas to rural locations, where the integrity of pure Pacific Black Ducks are threatened by spreading Mallard genes. To determine the extent of hybridisation throughout Australia I will develop a genotyping system using microsatellite markers that will permit genetic identification of hybrids. This will then be used to measure hybrid frequency in various parts of the country. This research will help to determine the distribution of Black Ducks, Mallards and their hybrids and will assist the management of feral Mallard populations as well as preserve the Australian Black Duck.

The roles of chemical and other signals in mate choice in the highly variable Crimson Rosella (*Platycercus elegans*) complex.

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Abstract:

Animals use a wide range of phenotypic traits to recognise one another and select mates. When traits used for mate choice diverge among individuals and populations, they may promote pre-mating reproductive isolation and ultimately speciation. Despite the plethora of studies on mate choice, little is known about olfactory signals in birds, or the signals used by parrots for mate choice or recognition. The Crimson Rosella complex is considered an example of a ring species, where two divergent reproductively isolated populations are connected by a chain of intermediate, interbreeding populations that form a geographical ring. In our study, we will ask (a) whether Crimson Rosellas use chemical or other signals, such as colouration and calls, for mate choice and individual/species recognition, and (b) whether this contributes to population divergence. We will also investigate whether rosella odours indicate individual/population differences, sex, age, condition or health (beak and feather disease virus), and how they relate to coloration and calls. We will use behavioural tests of the signalling function of traits, and gas chromatography-mass spectrometry to characterise the odours of feathers and preen oil. Our study will provide important information on the mechanisms of sexual selection in birds and their role in population divergence. With approximately 41% of Australian and 37% of worldwide species considered at risk of extinction, parrots are of great conservation concern. There is an urgent need to understand their patterns of mate choice, as these have direct implications for genetics of populations and risk of extinction. The experimental processes that we develop, as well as our findings, will be valuable in understanding and predicting the effects of health and disease issues, habitat change and fragmentation, population changes and human disturbances. Knowing how individuals select mates is crucial in finding solutions to conservation problems.

Beak and feather disease virus in *Platycercus elegans*: a cause of host sympatric speciation?

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Abstract:

Beak and feather disease virus (BFDV) is currently listed as a key threatening process to biodiversity by the Australian Government. This is recognised as it has the potential to devastate populations of Australia's native Psittaciformes (parrots, lorikeets and cockatoos), approximately 40% of which are under threat. Currently the majority of research has been on captive birds, and our knowledge of BFDV in wild populations is limited. Using quantitative real-time PCR I have screened 399 wild *Platycercus elegans* including the 4 main subspecies and birds within the hybrid zone. This species is common in south eastern Australia and are often considered one of the few examples of a ring species. My results indicate that BFDV prevalence and intensity is extremely variable between the phenotypic and genetically distinct subspecies. *P .e. elegans* and *P .e. flaveolus* both had 100% prevalence with extremely high intensity, whereas the phenotypic intermediates *P. e. adelaidae* and *P. e. fleurieuensis* had significantly lower prevalence and intensity. Most interestingly the hybrid population between *P .e. elegans* and *P .e. flaveolus* displayed the lowest BFDV prevalence with 19%. Consequently, this disease may explain plumage colour diversity in the *P. elegans* species complex, which has been an unresolved evolutionary puzzle. Age was also an important determinant of infection in *P .elegans*, with juveniles showing the highest prevalence.

Linking climate induced water deficit with canopy dieback on a forested scoria cone in Victoria's basalt plain.

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Abstract:

Since 1997, members of the local community have expressed concern over canopy dieback on the northern aspect of Mt. Warrenheip in Victoria's western basalt plain. To address these concerns, this study investigated the current status of canopy defoliation and a range of potential causes of canopy dieback, including fungal disease, soil moisture and nutrient levels, as well as climatic variables including temperature, rainfall and wind, and groundwater. Tree and soil surveys were conducted to compare the degree of defoliation, soil moisture content and nutrient levels on the northern and southern aspects. A desktop study was undertaken to investigate climatic variables and groundwater. The frequency of recent stem mortality based on canopy defoliation scores in *Eucalyptus spp.* on the northern aspect was 24% compared with 5% on the south. All soil nutrient element concentrations and soil moisture levels were significantly lower ($P<0.05$) on the northern aspect. Since 1997, annual rainfall remained below the long term average and since 1998 mean maximum temperature has shown an increasing trend. In addition, hot northerly winds occurred most frequently between January and March during periods of low rainfall. In 2006, the region experienced a sharp drop in the water table, probably in response to the marked dry period during this year. This study suggests that the recent shifts in temperature and rainfall, combined with the drying effects of hot northerly winds during summer, have reduced water availability on the northern aspect. It is also possible that hot northerly winds striking the abrupt edge of this fragmented forest accelerated the rate of canopy dieback in a large number of already water stressed trees.

Diurnal and nocturnal foraging behaviour of Black Swans at the Western Treatment Plant, Werribee.

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Abstract:

Studies have shown that some waterfowl frequently forage at night, while others lengthen foraging into nocturnal periods when food is limited or day length is short. The nocturnal foraging behaviour in Australian waterfowl, however, has not been extensively studied. Some research suggests that minor nocturnal foraging exists in Black Swans (*Cygnus atratus*), although it is not known to what extent they forage throughout the night. We studied the foraging behaviour of Black Swans in various lagoons at the Western Treatment Plant, Werribee, Victoria. Using night vision equipment, we collected nocturnal and diurnal data documenting the frequency of swans foraging, resting, preening and swimming. We found that Black Swans foraged throughout the night and day; however, nocturnal foraging was significantly less than diurnal foraging. Swans spent on average 26% of their time foraging during the day, but only 14% during the night. Our results suggest that, whilst foraging frequently occurs during the day, the nocturnal period also plays an important role in the foraging behaviour of Black Swans. This should be considered for land management purposes when reviewing human activities that can potentially impact on the Black Swan's key foraging times.

Does cereal crop agriculture in dry swamps damage aquatic plant communities?

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Abstract:

In many highly utilised agricultural landscapes wetlands represent isolated remnants of native vegetation and provide habitat for rare and restricted plant, bird and amphibian species. Production of cereal crops (cropping) has replaced livestock grazing through large parts of western Victoria in Australia, and this has resulted in the cultivation of temporary wetlands (locally known as 'swamps'). The response of swamp vegetation to cropping was measured by analysis of the seed bank present in the soil of cropped and uncropped swamps. Samples of seed bank were exposed to a germination stimulus, the plants that germinated and established were identified, and the density of emergent vegetation was assessed. Twelve wetland plant species established from cropped swamp seed bank samples under the conditions provided (an average of 3.6 species per sample, 1.7 of which was non-native). A further 19 species established from the seed bank of uncropped swamps (an average of 5.8 species per sample, 0.7 of which was non-native). The density of vegetation (on a scale of 0-5) in cropped wetland samples averaged 3.3, and for uncropped wetlands averaged 4.5. The results indicate that cropping results in a reduced diversity and density of plants germinating from the seed bank, although swamp plant communities retain some resilience to such disturbances. The degree to which cropping is a threatening process to swamp communities and their dependent fauna will depend on the return of vulnerable elements to swamps, which in turn depends on swamp management, connectivity and landscape level processes. As the climate changes and wetlands become more temporary and flooding less reliable, recognition and conservation of the processes that maintain biodiversity in the landscape will become more important.

Long-term studies highlight management issues in Wimmera Buloke woodlands.

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Abstract:

Buloke woodlands are listed as an endangered vegetation community. In the Wimmera, Buloke woodlands occur as small remnants on both private and public land within a largely agricultural landscape. Problems facing these remnants include limited post 1880s Buloke regeneration and the presence of many introduced plant species. Relatively little is known about the medium and long-term outcomes of the current management practices in these woodlands. This project investigates both species composition and structural changes since 1992 in four rabbit-proof grazing exclosures and associated controls. It will also look at species composition and cover change since the early 1990s in small woodland patches across the Wimmera. The results will be used to provide advice to land managers, including development of a state and transition model for Wimmera Buloke woodlands.

Introducing a little-known field of science – subterranean biology & stygofauna.

YVONNE INGEME

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Abstract:

Stygofauna are generally tiny aquatic animals that live in a variety of groundwater systems, including limestone, alluvial and fractured rock aquifers from a variety of geological histories, and are clearly part of groundwater-dependant ecosystems. They are likely to be negatively impacted by activities that reduce groundwater tables. Western Australia is currently leading the way in Australia, in both surveys and taxonomy, and has identified a great diversity of subterranean fauna, with some areas now regarded as global hotspots. Over recent years, South Australian researchers have undertaken extensive surveys of groundwater bores and discovered many new stygofaunal species. A recent survey in Lake Condah in western Victoria found a further two new species. The poster features a variety of stygofauna that have been found in Australia and provides a map showing the results of the South Australian surveys. A map of the karst systems in Victoria is included which, in effect, indicates potential subterranean fauna habitat that could form the starting point to also set Victoria on its path of discovery of the diversity of stygofauna within this state.

Trends in water quality and heavy metals in an Australian urban lake: a response to the use of reclaimed water?

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Abstract:

Urban wetlands are of economic and social importance, and the drying of such areas has a large effect on local economies and communities in terms of a reduction in revenue from tourism and recreation as well as associated environmental and aesthetic issues.

Lake Wendouree is an example of a hydrological system highly modified by surrounding land-use activities and anthropogenic disturbance since European settlement in the early 1800s. A sediment core taken from the lake was analysed for diatom species composition, major ions and trace heavy metals. The results from these analyses were used to provide information on past water quality conditions of the lake, and to understand the impact of modification of the lake system by Europeans.

The diatom stratigraphy from Lake Wendouree indicates a change over time from species that prefer fresh, low nutrient conditions in the earliest part of the record, to a diverse planktonic assemblage with several indicators of elevated nutrient concentrations. The most recent sediments contain an assemblage dominated by epiphytic species and species that indicate nitrogen heterotrophy, suggesting changes in pH and/or an increase in the nutrient supply.

The major statistical change in the diatom assemblage data and the recent changes in heavy metal concentrations occur between AD 1965-1970 and are concomitant with the use of reclaimed water in the 'topping up' of water levels during summer months in Lake Wendouree.

Allelopathic interactions of *Phragmites australis* in ecosystem processes.

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Abstract

There is anecdotal evidence that *Phragmites australis* may contain allelochemicals that assist in colonisation of wetlands. To test this, an experiment was conducted for the allelochemical toxicity of *Phragmites australis* tissues with the seeds of two standard test species (lettuce and radish) to evaluate allelopathic potentiality. Laboratory bioassays were conducted with 10% dry aqueous extract of different organs of *Phragmites australis*. The study showed that leaf and rhizome extract significantly inhibited all germination indices (total germination, speed of germination, speed of accumulated germination, coefficient of the rate of germination, percentage of inhibition), biometric parameters (biomass, root & shoot length) as well as biochemical parameters (electrolyte leakage, dehydrogenase enzyme activity, lipid peroxidation, sugar content). The relative degree of phytotoxicity of different organs can be ranked in the following order: leaf > rhizome > root > stem. Among the tissues, leaves and rhizomes contain higher amounts of phenolics than roots and stems. *Phragmites australis*-infested soil exhibited higher phenolic levels than the rhizosphere and control soil.

Biodiversity data and planning: threats and gaps in local government.

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Abstract:

The Koala Connect project aim at the outset included "better quality planning applications from a more informed public". The objectives to achieve this aim included: "to conduct an analysis of biodiversity data threats and gaps", and "develop planner and community biodiversity toolkits". The target audience is "members of the public before they lodge an application to remove native vegetation". Thus the purpose of the project is to trace a line from a potential applicant's first phone call to customer service, or visit to the council website, to the conversations with the planning liaison officer, and on to the planning staff or environmental planner. What information is available to the potential applicant? How much do planning staff know about biodiversity and native vegetation, and what tools do they use? What biodiversity data is being used to make decisions, and are there any gaps? And finally, can we use real estate agents as potential delivery mechanisms for information on native vegetation? The biodiversity and native vegetation sector is extraordinarily complex, and continuous effort must be made to stay focused on small, achievable outcomes that will go a long way towards addressing some of the gaps and barriers faced by local governments in this area. Many of the gaps and barriers illustrate the need for improved engagement and information flow from State Government and the Federal Government to local government and the wider community.

Burns, beetles and bark: impacts of a new fire regime on bark invertebrates.

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Abstract:

The Victorian Government is substantially increasing its fuel reduction burn programme in response to the 2009 Bushfires Royal Commission. However, the potential impacts of new, altered fire regimes remain unclear. One component of the ecosystem which may be impacted under new regimes is the bark habitats of eucalypt trees, and the fauna they support. This project intends to identify responses of south-east Australian bark biodiversity to evolving fire regimes.

Genetic evaluation of population connectivity in Black Swans.

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Abstract:

The Black Swan is a species of waterfowl endemic to Australia, which can be found throughout the country, with the exception of the Cape York Peninsula. The extent of migration between local and interstate populations within Australia is currently unknown. The species is also found throughout New Zealand, however, whether its presence there is the result of introduction post-European settlement or self-colonisation from Australia remains unclear. We investigated the genetic differentiation between populations of Black Swans from different locations throughout Australia and New Zealand using microsatellite markers to evaluate the level of connectivity. This information is of interest as the Black Swan could potentially play a role in the geographic spread of a disease such as avian influenza, in the event of an outbreak. Blood or tissue samples were taken from a total of 269 swans from seven different locations within Victoria, Western Australia, Tasmania, Queensland, and New Zealand. These samples were genotyped using 13 microsatellite loci and analysed to determine the relatedness of populations and therefore the extent of migration between them. The New Zealand population was found to be similar genetically to the Tasmania and Western Treatment Plant populations, which suggests that the swans introduced to New Zealand may have originated from south-eastern Australia. Within Australia, significant differentiation existed between most populations. In contrast, no differentiation between the Tasmania and the Western Treatment Plant populations was detected, suggesting that migration between the mainland and Tasmania may be occurring. Our results suggest swans can disperse over long distances and thus have the potential to spread diseases across Australia.

Assessing the effects of riparian vegetation management on vegetation condition in Northern Victoria, Australia.

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Abstract:

Understanding the trajectory of native vegetation change in response to past and present management actions is crucial to maximising future management success. Land clearing and development for agriculture is the major cause of vegetation change in Victoria. Remnant native riparian vegetation exists along some streams within this highly modified landscape. Two commonly used management tools for protecting and restoring these areas are fencing and licensing to control/exclude livestock. Millions of dollars are spent each year in Victoria on vegetation management and assessments. To keep time and resource costs down sensitive monitoring programs are avoided, while vegetation condition survey protocols that use subjective and categorical estimation of variables are very common. Such assessments have limited application for vegetation monitoring. Categorical variables can be insensitive to change detection and there is often large observer-driven variation. However, categorical assessments' utility may be increased by evaluating change using data calibration. Benefits of this approach include increasing the value of previous investment and expanding the monitoring time period captured. We examined this process by resurveying sites of remnant riparian vegetation in northern Victoria that had also been surveyed 15 years earlier by Robinson and Mann (1996). For the resurveys we used the same subjective categories used in the original surveys and an additional set of more objective and continuous measures. By calibrating both methods used in the resurveys we approximated continuous estimates and associated uncertainties for the original surveys. Results showed that this method is able to measure change between the two different data sets. The primary drivers of change in this system were found to be the grazing level, distance upstream, tree cover and fencing. An assessment of management showed that removal of grazing from a site resulted in a range of vegetation responses across a selection of vegetation condition attributes.