Biodiversity Across the Borders

Restoration Challenges for the 21st Century

Conference Program and Abstracts

Centre for Environmental Management

Federation University Australia

9th June 2017

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'*Biodiversity across the Borders*' Conference

Theme: "Restoration Challenges for the 21st Century"

ABSTRACTS

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Mt Helen, Ballarat,
Victoria

Edited by: S. K. Florentine and Penelope Greenslade

9th June 2017

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7th Biodiversity Across the Borders Conference – Program

8:00	**Registration** **VENUE**: **1870 Founders Hall Theatre**, Mt. Helen campus, Federation University Australia	
8:45	**Introduction and Welcome** **PROF**. **ANDY SMITH**, Deputy Vice-Chancellor, Federation University Australia	
8:50	**PROF. HELEN BARTLETT (VC) Federation University Australia** **Opening of '*Biodiversity across the Borders*' conference**	
9:00	**Introduced by: PROF**. **ANDY SMITH**, Deputy Vice-Chancellor, Federation University Australia **Keynote Address:** **EMERITUS PROF. SAM LAKE** AO (Monash University) Ecological restoration of aquatic ecosystems: challenges and prospects	
	VENUE: Caro Main Hall Theatre **CHAIR**: **PROFESSOR ANDREW BENNETT**	
	PLENARY SESSION	
9:35	**DR. TEIN MCDONALD** (Editor, Ecological Management & Restoration) Are we there yet? Drawing lessons from different restoration industry sectors	
9:55	**ASSOC. PROF. PHILIP GIBBONS** (The Australian National University) Can biodiversity offsetting deliver no net loss of biodiversity?	
10:15	**PROF. DON DRISCOLL** (Deakin University) The weed menace; a local citizen-science experiment and global risks	
	Morning tea 10:35 – 11:00	
	SESSION 2	
	Restoration experience VENUE: Caro Main Hall Theatre **CHAIR: CHRIS PITFIELD**	**Restoration perspectives** VENUE: Studio Theatre **CHAIR: DR. JAMES FITZSIMONS**
11:00	**JIM WHELAN** Restoring Coastal Grassy Woodlands: experiences in adaptive management at the Prom	**NATALIE HOLLAND** Using markets and innovative financing to restore wetlands and floodplains in the Murray-Darling Basin for financial, social and environmental outcomes
11:15	**HELOISE GIBB** Impacts of restoration of a mammal assemblage on invertebrate biodiversity and function	**EUAN RITCHIE** Successful restoration requires integrated approaches and socio-ecological perspectives
11:30	**NICK SCHULTZ** Restoration of arid woodlands in a post-mining landscape in south-western New South Wales	**SAM STRONG** How myth and language influence successful restoration and environmental management: Learning from two major bushfires
11:45	**JODI PRICE** What do we know about seed dormancy in grassy ecosystems?	**NICOLE COGGAN** The extinction problem: Attempting to observe the effects of host decline on an invertebrate assemblage
12:00	**JIM RADFORD** Landscape transformation in rural Australia: emerging trends and interventions to increase sustainability	**CECILE VAN DER BURGH** Connectivity conservation: an exploration of practitioner's experiences in Australia
12:15	**JESS GARDNER** Building resilience at the landscape scale	**ADAM BESTER** 'Funds for Fish': does crowdfunding work?
	LUNCH BREAK 12:30 – 1:30, Albert Coates Complex	

	SESSION 3		
	Biodiversity Offset VENUE: Caro Main Hall Theatre **CHAIR**: **A/PROF PETER SPOONER**	**Wildlife Restoration & Recovery** VENUE: Studio Theatre **CHAIR: DR. JOHN WRIGHT**	**Workshop** VENUE: Studio 3 **CHAIR: DR. JIM RADFORD**
1:45	**HEINI KUJALA** Taking the landscape view: from ad hoc to strategic offsets	**KATIE HOWARD** Out-foxing introduced predators and their impacts on native turtles - does landscape-scale baiting work?	Landscape transformation in rural Australia: emerging trends and interventions to increase sustainability
2:00	**ROSS ROWE** Biodiversity offsets under the national environmental law (EPBC Act) i	**DALE NIMMO** Compact cities or sprawling suburbs? Optimal design of growing cities to conserve biodiversity	
2:15	**ROSS ROWE** Biodiversity offsets under the national environmental law (EPBC Act) ii	**MELANIE MASSARO** Long-term genetic consequences of severe population declines: how to avoid pitfalls and find solutions for the genetic recovery of highly endangered species	
2:30	**PENELOPE GREENSLADE** Does the revised vegetation clearing legislation resolve the problems with offsets?	**BRENDAN CHAMPNESS** Restoration or conservation? Conserving or creating suitable habitat for urban birds	
2:45	**PAUL BOON** Biodiversity offsets, ecosystem service valuations and other neoliberal fantasies	**LINDY LUMSDEN** Can artificially constructed hollows help restore habitat for the Critically Endangered Leadbeater's Possum?	
3:00	**PHILIP GIBBONS** Outcomes from 10 years of biodiversity offsetting	**DAVID CHEAL** Can we restore locally extinct mammals to the semi-arid?	
	Afternoon tea 3:15 – 3:45		
	Session 4		
3:45	**Panel Discussion: Restoration Challenges for the 21st Century** **VENUE: Caro Main Hall Theatre** **CHAIR:** PROF. DON DRISCOLL Panel Members: DR. TEIN MCDONALD, ASSOC. PROF. PHILIP GIBBONS, DR. JOHN WRIGHT, DR. CRAIG WHITEFORD, DR. LINDY LUMSDEN & DR. JAMES FITZSIMONS		
4:45	**Five door prizes (donated by CSIRO Publishing and Central Highlands Water)** **and closing Address:** **DR. ADAM BESTER** (GLENELG HOPKINS CMA)		

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KEYNOTE ADDRESS:

Ecological Restoration of Aquatic Ecosystems: Challenges and Prospects

SAM LAKE

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Abstract

Ecological restoration covers the science and the practice of restoring anthropogenically-disturbed ecosystems—their biota, dynamics and ecological processes. Aquatic ecosystems cover freshwater systems from temporary pools to lakes and rivers. Once a target system has been selected, it is crucial to assess the feasibility of the project. This entails gaining an understanding of the basic ecology, the spatial extent and expected duration of the project and matching this with the committed timespan and funding. A further oft-neglected challenge is to understand the disturbance regime (legacy and current disturbances) of both of the ecosystem and the connected hinterlands e.g. catchments. This step will aid the basic restorative process in strengthening the resistance and the resilience of ecosystem biota and help to decide on the implementation measures and their scheduling.

Targets may initially be historical (the most difficult to achieve) or hybrid or novel ecosystems, but not designed systems. The selection of indicators and the frequencies of their monitoring is a further challenge with preferably, monitoring before, during and after the implementation measures. Monitoring entails measuring both the implementation drivers and the ecological responses (which may range from species, communities to ecological processes). To achieve the target ecosystem(s) further interventions may be required-- “ecological tinkering”. Nevertheless, the challenge remains, that the pace of ecological restoration is set by the timing and growth of key components and processes.

Ecological restoration is growing rather rapidly as a practice and as a discipline. It is becoming increasingly professionalised, with set standards and tertiary courses. The move to restore battered ecosystems is driven by an array of motives from the utilitarian (ecosystem services) to the satisfaction of conserving intact ecosystems in an increasingly turbulent world.

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Are we there yet? Drawing lessons from different restoration industry sectors

TEIN MCDONALD

Society for Ecological Restoration Australasia (SERA)

Email: *tein.mcdonald@seraustralasia.com*

Abstract

The National Standards for the Practice of Ecological Restoration in Australia have drawn lessons from not only science but also from on-ground work conducted over recent decades. Australia is fortunate to have a range of NGOs and industry sectors fostering restoration and improved management, each with a particular speciality whether it be revegetation (both overstorey and understorey), assisting natural regeneration, conservation genetics and seed production issues, aquatic and marine issues or restoration planning or faunal conservation. Has the time arrived when we can combined knowledge from all these separation specialisations to optimise the integrated approaches to restoration called for by the National Standards? We need to ask ourselves how this knowledge is currently being shared and is there room for improvement in knowledge transfer within the broad community of restoration practitioners and researchers?

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Can biodiversity offsetting deliver no net loss of biodiversity?

PHILIP GIBBONS

Fenner School of Environment and Society, The Australian National University, Canberra.

***Email**: philip.gibbons@anu.edu.au*

Abstract

In this talk I will invite audience participation, so if you have a smartphone, laptop or other device connected to the internet then search for 'socrative student' and enter 499529 as the room name. The first question is: "In your opinion, do biodiversity offsets deliver no net loss of biodiversity?" All answers are anonymous.

Despite its widespread adoption as policy, there is little evidence that biodiversity offsetting is delivering no net loss of biodiversity. Here I present results from some biodiversity offsetting programs in Australia to suggest that offsetting is leading to widespread replacement of habitat attributes that are difficult to restore (e.g., native plant species richness, mature trees) with habitat attributes for which restoration or improvement is relatively easy (e.g., establishing tree seedlings, improving the cover of dominant plant life-forms). Further, biodiversity offsetting is replacing losses of native vegetation in fragmented and fertile landscapes with averted losses within more intact and less fertile landscapes. A common theme across jurisdictions that have introduced biodiversity offsetting in Australia is the gradual withdrawal from a no net loss position. Nevertheless, I argue that biodiversity offsetting has brought some welcome changes to Environmental Impact Assessment in Australia and thus we should not throw the baby out with the bath water. Although an enthusiastic advocate for biodiversity offsets 15 years ago, I have come to realise that biodiversity offsets—or any other regulatory instrument for that matter—will deliver no net loss only if introduced as part of a much more holistic package of reforms.

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Restoring Coastal Grassy woodlands: experiences in adaptive management at the Prom

JIM WHELAN

Ecological Restoration Project Manager. Parks Victoria. Park Entrance, 4340 Meeniyan Promontory Road, Yanakie, Victoria.

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Abstract

Adaptive management is often promoted as an effective way to manage ecosystems, particularly when there is uncertainty about management outcomes. Despite this, there are few practical examples that managers can draw upon to guide their own work. We provide insight into a collaborative landscape restoration programme that illustrates how to successfully use adaptive management principles to achieve better management outcomes. The Wilsons Promontory Grassy Woodland Restoration project is a large, high profile project that aims to restore landscape structure and function to shrub-encroached grassy woodlands. We first developed a conceptual model as a basis for all management decisions. The model encapsulates past, current and desired future vegetation states. It was refined iteratively as our knowledge of the drivers of the system improved. Developing the conceptual model was a crucial first step because it allowed us to understand which interventions were necessary to achieve the desired vegetation state. Model development is central to adaptive management, and is a major contributor to our subsequent success in implementing effective management. We tested the model through several small-scale studies that addressed critical information gaps, and provided evidence necessary to increase the scale of management interventions to the broader landscape. Our management actions have been used as experimental treatments and continual and frequent review of outcomes has enabled us to take a flexible and responsive approach, adjusting our model and our management as we gathered further evidence. Collaboration has been pivotal in achieving the results we have to date. Researchers, land managers and community have been involved at all stages of the process – from inception to implementation of management interventions and monitoring. This has occurred over several years and has not been tied to a single research or management funding cycle. Importantly, all collaborators have had a long-term vision and commitment that drives the adaptive management process. They have championed the process, and played an active role in its evolution.

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Impacts of restoration of a mammal assemblage on invertebrate biodiversity and function

HELOISE GIBB[1,†], NICOLE COGGAN[1], BLAIR GROSSMAN[1], COLIN SILVEY[1,2], AND MATT HAYWARD[3,4]

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[2]*Museum Victoria, GPO Box 666, Melbourne, Victoria.*
[3]*School of Environment, Natural Resources and Geography, Bangor University, Bangor, Gwynedd LL57 2UW, UK.*
[4]*Australian Wildlife Conservancy, Scotia Sanctuary, CARE P.O., Wentworth, New South Wales.*

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Abstract

Devastating changes in native mammal assemblages resulted from European invasion of Australia, with many medium-sized species with omnivorous diets declining significantly or becoming extinct in the wild. Despite this dramatic change in the trophic structure of Australian ecosystems, little is known about the effects on native invertebrate prey species, either in terms of diversity or the ecological functions these invertebrates perform. This seriously impedes our ability to set meaningful targets for restoration. We compared diversity and function using landscape-scale surveys inside and outside native mammal reintroduction sites at Scotia Sanctuary (NSW), Yookamurra Sanctuary (SA) and Arid Recovery (SA) and a replicated exclusion experiment (n = 10) within Scotia Sanctuary. Our landscape-scale surveys showed that mammals consumed scorpions and reintroductions reduced scorpion abundance, with effects cascading through to spider assemblages. These results were supported by our exclusion experiment. Cross-sanctuary surveys, showed that termites remained at resources longer and consumed more in the absence of reintroduced native mammals, with effect sizes greatest in the wettest environments. Trends from the exclusion experiment were similar, but non-significant. Our results suggest that the ecological extinction of many native mammal species from Australia is likely to have substantially altered native invertebrate diversity and function in Australian ecosystems. Where possible, the replacement of missing fauna should be a key component of any restoration program.

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Restoration of arid woodlands in a post-mining landscape in south-western New South Wales

IAN SLUITER, ALLEN GEOFFERY, NICK SCHULTZ, KARIN SLUITER, SIMON COOK, CORRINE DUNCAN, AND HEATHER SLUITER,

Faculty of Science and Technology, Federation University Australia, Mt Helen, Victoria.

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Abstract

Cristal Mining Australia is the operator of two mineral sands mines in far south west New South Wales. Rehabilitation of mined areas and overburden stockpiles is attempted after mining, with the aim to restore self-sustaining arid-zone woodland systems resembling the vegetation cleared for mining. The rehabilitation program commenced in 2009, and has been conducted in all years since with the exception of 2010. To date, rehabilitation efforts have successfully restored a good cover of indigenous shrubs and sub-shrubs, but trees, however, have been harder to establish. Weeds have proved a major problem in some years as they compete vigorously with native species. We have conducted several on-site rehabilitation trials aimed at improving our ability to restore arid woodlands. One of these trials investigated several methods of hand-planting tube stocks to improve the survival of tree species in the rehabilitation areas. The five treatments were (1) deeper topsoil, (2) drip irrigation, (3) deeper topsoil + drip irrigation, (4) adding water crystals to the soil, and (5) a control. Drip irrigation proved to be the best treatment for all species in the trial, though the management implications varied between species. For *Casuarina pauper* and *Myoporum platycarpum*, there were acceptable survival rates in the control treatments, so drip irrigation might reasonably be argued as an unnecessary expense. However, for *Hakea tephrosperma* and *H. leucoptera*, acceptable survival rates were only achieved in irrigation plots. In this talk we describe and discuss our hand-planting trial, and briefly describe other trials focussing on the soil biocrust, the direct seeding of tree species, and the effect on the soil seed bank of stockpiling soil prior to use in rehabilitation. We will focus on the future challenges for these systems.

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What do we know about seed dormancy in grassy ecosystems?

JODI PRICE[1,†], GABRIELLE VENING[1], JOSHUA HODGES[1], DALE NIMMO[1] AND LYDIA GUJA[2,3],

[1]*Institute for Land, Water and Society, Charles Sturt University Albury, New South Wales.*
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Abstract

Grassy ecosystems in south eastern Australia have been greatly reduced in extent since European colonisation, and remaining remnants are degraded. Restoration of these diverse communities is often hindered by a lack of knowledge on the dormancy status and germination requirements of the herbaceous species, limiting the capacity for broad-scale restoration. It is commonly believed that grassy ecosystem species do not possess complex seed dormancies based on studies showing that some species germinate relatively easily, and few species emerged in soil seed bank trials. This suggests that seeds are not long lived in the soil. These findings contrast with the experiences of restoration practitioners who have identified many species are very difficult to germinate, and are therefore not utilised in restoration. We suspect that conflicting results might be due to limitations of different methodologies, specifically that seed bank studies that do not apply dormancy alleviation treatments can only identify the non-dormant components of the seed bank. Indeed, lack of seedling emergence in seed bank trials could indicate that species do have deep dormancies that were not alleviated during the experiment due to inappropriate germination cues. In order to determine how common seed dormancy is in these communities, we conducted a systematic review of all studies that explored seed germination of species from grassy ecosystems in southern Australia. Eighteen studies were found which experimentally examined the germination characteristics of 143 grassy ecosystem species. Germination percentages were used to identify whether seeds were dormant or not, and if dormancy alleviation treatments were successful. We found high rates of dormancy (~60%), which is similar to global averages from other communities, suggesting that dormancy may be higher in these communities that is widely believed. We also reviewed data from seedbank studies and field germination experiments to determine seed longevity and field germination cues. The implications of this for restoration and management will be discussed.

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Landscape transformation in rural Australia: emerging trends and interventions to increase sustainability

JIM RADFORD

Department of Ecology, Environment and Evolution,College of Science, Health and Engineering, La Trobe University, Victoria.

***Email**: J.Radford@latrobe.edu.au*

Abstract

Maintaining and re-creating landscapes with healthy, functioning ecosystems is necessary for maintaining biodiversity, but it is also critical to addressing multiple social and economic goals that depend on the benefits that ecosystems provide to people. Business-as-usual is not an option if are to reverse the ongoing decline in biodiversity, ecosystem services, land condition and productivity but what are the alternatives? How can we design landscapes that provide mutual benefits? Which current activities do we need to focus on? What do we need to change (and how) to increase sustainability for people and nature? What innovations can we introduce to bring about positive change? How will we pay for it? And what are the social, economic and cultural dimensions of such actions? In this presentation/workshop, we will explore these issues and present a suite of options for changing the trajectory of rural landscapes in Australia. These options have been developed in response to the drivers underpinning landscape transformation in rural Australia, and seek to account for, and capitalise on, emerging trends in land use, threats, and opportunities for increasing sustainability.

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Building resilience at the landscape scale – what aspects do we need to consider?

SACHA JELLINEK, JESS GARDNER†, DANNY REDDAN, ELISA RAULINGS, AND ALISTAIR PHILLIPS

†***Email***: *JGardner@greeningaustralia.org.au*

Abstract

Under a changing climate, it is essential that habitat restoration planning to enhance ecological systems take full account of modelled climate futures in Australia.

Scenarios for climate-changed regions can lead to a myriad of restoration planning issues. Using a resilience-planning framework can assist in marshalling thoughts and maintaining clarity on goals and the methods to reach those outcomes. Resilience planning forces attention to deciding which ecosystems are important, whether these systems be saved, or if active stewardship could transform these areas into related but different systems that still maintain their ecological/habitat integrity.

Resilience planning gives metapopulations in restored ecosystems the best chance to respond to a range of perturbations or disturbances by minimising environmental damage and, by means of using a scientifically grounded restoration design, allow a dynamic and rapid recovery.

Resilience planning identifies critical elements in the landscape that are ecologically and/or socially important, and the disturbances that are likely to affect those landscape elements in the future. By predicting the impact of disturbances such as climate change on restored landscapes, and the native communities reliant upon them, we can develop management interventions that ensure their ecological integrity. Here we provide on-ground examples of resilience planning at the landscape scale in a variety of agricultural landscapes in Victoria. They include significant widening of seed provenance to develop climate-adapted plant communities, flora and fauna distribution modelling to predict future dispersal with changing conditions, and connectivity modelling underpinned by species specific habitat requirements. In short, resilient landscapes will need to have the flexibility to self-organise and bounce back from both long-term change and shorter-term disturbances.

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Using markets and innovative financing to restore wetlands and floodplains in the Murray-Darling Basin for financial, social and environmental outcomes

NATALIE HOLLAND[1,†], DEBORAH NIAS[1], JAMES FITZSIMONS[1,3], AND RICH GILMORE[1]

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Abstract

Water reform within the Murray-Darling Basin has given rise to opportunities for private environmental water trusts to be established using corporate and private investment. In late 2015, The Nature Conservancy and Murray Darling Wetlands Working Group began a 10-year partnership through joint ownership of the Environmental Water Trust, which aims to deliver water to stressed wetlands and rivers within the Murray-Darling Basin. This unique model is funded through the Murray-Darling Basin Balanced Fund, the first water fund in Australia with the objectives of generating financial, social and environmental returns. Traditional capital markets investors can support large-scale, long-term conservation works while diversifying their portfolio and earning income through investment in the water market. Annual allocations from water entitlements will be traded on a 'counter-cyclical' basis such that in the dry years when water is scarce and demand is higher, more water is made available to agriculture. In the wet years when water is abundant and agricultural demand is lower, more water is made available to wetlands. The Environmental Water Trust provides opportunities for public/private sector complementarity and watering will complement and integrate with government supported and run programs being undertaken by Commonwealth Environmental Water Office, Murray-Darling Basin Authority and regional NRM organisations. Watering objectives include aboriginal social and cultural benefits and a range of conservation benefits are expected at both a landscape scale (flows to 'harder to water' wetlands on private land or floodplain forests) and local scale (improved health of key assets including tree canopy and frog, fish and waterbird habitat).

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Successful restoration requires integrated approaches and socio-ecological perspectives

EUAN RITCHIE[†1], TIM DOHERTY[1], WILLIAM GEARY[2], BRONWYN HRADSKY[2], HARRY MOORE[3] AND DALE NIMMO[3]

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Abstract

Considerable time and money are spent attempting to restore degraded ecosystems and conserve biodiversity. Ecological restoration often focuses on achieving a single goal (e.g. control of pest species or planting trees). However, multiple threats such as invasive predators, habitat loss and modification, climate change, and altered disturbance regimes can impact the structure and species composition of environments. In some cases, these threats may act synergistically, with compounding effects on biodiversity. Improved knowledge and integrated management of these threatening processes could help achieve more cost- and ecologically-effective outcomes that are sustained long-term. We highlight the need to prioritise integrated and whole-of-ecosystem approaches, with reference to both Australian and international examples. This will include the potential application of species reintroductions ('rewilding') and habitat enhancement/supplementation. We will also discuss the critical importance of landscape context and social factors for ecological restoration on the public-private land interface. Great opportunities for adaptive management and advancing ecological understanding are being missed, and would benefit from more coordinated approaches to ecosystem restoration.

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How myth and language influence successful restoration and environmental management: learning from two major bushfires

SAMANTHA STRONG

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Abstract

Influences of powerful language and imagery used during and after major bushfires were the focus of qualitative research in the context of two of the most catastrophic 21st century bushfires in SE Australia. Two case studies —the ACT 2003 and Victorian 2009 bushfires— were explored via print media, public memorials, bushfire and native vegetation management policies, environmental histories and interviews with fire and environmental management agency staff. Findings indicate that perceptions of the environment, and those who manage it, are shared by retelling vivid myths in order to help make sense of the crises. The environment is framed in contradictory and polarising narratives, which result in a range of paradoxical perceptions. Mythic depictions of chaotic post-bushfire conditions, such as a deeply entrenched fear of eucalypts and regeneration, are shown to be embedded in Australian cultural and political understandings of the environment. Consequently, mythic influences transfer into efforts to manage and restore the environment at moments of crisis, such as the Victorian Government's former 5% planned burn targets. Additionally, the associated paradoxical outcomes have significant ramifications for risk management, social learning, and the cultural need to control the environment. The presentation will highlight how understanding myths assists in understanding the evolution of contradictory and reactive environmental management decision-making.

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The extinction problem: attempting to observe the effects of host decline on an invertebrate assemblage

NICOLE COGGAN[†1], HELOISE GIBB[1], AND MATT HAYWARD[2]

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Abstract

Sanctuary-based reintroductions are a valuable method for threatened species conservation and potentially for ecosystem restoration where local extinctions have occurred. The composition and activity of plant and animal communities in habitats with reintroduced species can provide us with important information about ecosystem resilience, as well as the trajectory of ecological recovery following these reintroductions. Although reintroductions return missing interactions to affected systems, there is still a period of time where the remaining community must function in the absence of the locally extinct species. In the case of direct interactions, e.g. between a consumer and a locally extinct host, we might expect changes in the consumer community that reflect the varying responses of obligate and generalist consumers. The activity and diversity of obligate consumers may decline, whereas generalists may remain stable or find alternate resources. We asked whether the composition and activity of coprophilic invertebrate communities differed between sanctuaries and a remnant habitat where their hosts persisted, and compared these to habitats where their hosts were still extinct. Our results suggested that the coprophilic invertebrate communities across the sanctuaries were resilient to their hosts' regional extinction, and we found no evidence of exclusive host-consumer relationships (indicative of potential co-extinctions in sanctuaries) at the remnant site. We discuss the difficulties of comparing community responses to host declines between remnant and reintroduced populations where reliable historical baselines do not exist, and where declining remnant populations may simply provide a baseline of an ecologically undermined target community.

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Connectivity conservation: an exploration of practitioner's experiences in Australia.

CECILE VAN DER BURGH[†,1], PETER SPOONER[1,2] AND CATHERINE ALLAN[1,2]

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[2]*Institute for Land Water and Society*

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Abstract

Habitat loss and fragmentation have resulted in the decline of biodiversity worldwide, and remaining wildlife populations are threatened by isolation, and the modifying effects of human use of landscapes. Global climate change is predicted to interact with these impacts and further challenge species as they are forced to locally adapt or shift their habitat ranges. To maintain healthy biotic populations, regional and continental scale connectivity initiatives have commenced worldwide as a key management response to respond to the effects of fragmentation and climate change. Whilst there is an extensive body of ecological scientific literature measuring "connectivity" in landscapes and discussing various GIS and mapping methodologies to maintain and restore "connectivity" in landscapes, fewer publications have explored the decision processes that practitioners working in connectivity initiatives employ and the key factors influencing these decisions.

The study's objective was to investigate decision making processes within 15 regional and continental-scale connectivity conservation initiatives in Australia, using interview and survey data. The study found that the way connectivity is defined and prioritised in landscapes within these initiatives varies with the framing of the conservation problem(s) at hand, the information and techniques available. Furthermore, the decision-making by practitioners is influenced by a much broader range of factors than those within the ecological realm, including social factors, such as leadership, governance arrangements and funding cycles. The interviews with practitioners also highlighted several key barriers and enablers to implementing large-scale, long-term connectivity initiatives in landscapes.

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'Funds for Fish': outcomes from a crowdfunding trial with Victorian CMA's

ADAM BESTER

Glenelg Hopkins Catchment Management Authority, PO Box 502, Hamilton, Victoria,

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Abstract

Funds for Fish is a joint initiative between the Australian River Restoration Centre, Glenelg Hopkins CMA, Goulburn Broken CMA and Corangamite CMA that saw the creation of a pilot crowdfunding campaign. The trial was funded by the Department of Environment, Land, Water and Planning. The program sought to raise alternative government funding to help restore fish habitats and increase industry, angler and community involvement in waterway management activities. Funds for Fish consisted of a 30 day pilot crowdfunding campaign utilising the *Pozible* platform. Of the three CMAs selected to take part in the pilot, only one CMA was successful in reaching their funding goal. However, the campaign was highly successful in increasing community awareness and involvement and establishing new and/or improved partnerships with Fisheries Victoria, VRFish, OzFish, Shimano, Merv Hughes Fishing, My Fishing Place, Fishcare, for all three projects. This puts all three CMA's in better positions to engage with the community for future fish rehabilitation projects.

Key factors for success included a focus on local interest rather than targeting a broader, more national audience. Having a variety of rewards, a celebrity ambassador, targeting businesses and a strong focus on social media were deemed important. Significant staff time is required during the campaign to keep on top of social media posts and respond to queries on the website. The community had a greater response to posts that included humour and creativity and were more likely to pledge in response to these posts.

Future campaigns should consider other community groups being the primary driver of projects with CMA's there to provide support, rather than CMA's leading the projects. This may improve the success of the projects as CMA's may be a barrier for people to pledge and they also have greater restrictions with media approvals. Before undertaking a crowdfunding campaign, consideration should be given to whether the small amount of funding received warrants the investment in time required to undertake the campaign. If funding is the primary driver then alternative funding models should be considered.

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Taking the landscape view: from ad hoc to strategic offsets

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Abstract

Sustainable development has a key role in combating ongoing biodiversity loss, as human land use requirements place increasing pressure on species and habitats. In many countries the existing legislation and regulations already stipulate that development impacts on biodiversity are to be reduced through environmental impact assessments and offsetting of unavoidable impacts. Yet, concerns have been raised about the ad hoc evaluation of individual development projects and their offsetting needs, in isolation from other ongoing development projects taking place in the same region. The lack of holistic assessment and accounting of cumulative development impacts mean that species are often faced with a 'death by thousand cuts', where biodiversity is degraded by many small impacts that individually do not appear to threaten species' persistence and, as such, are not met with adequate mitigation or compensation through offsetting mechanisms. In this talk I will give an overview of the benefits of moving from individual project-by-project to landscape level assessment of impacts and offsetting needs. Drawing on findings from various case studies I will show how landscape level approaches allow better monitoring of net biodiversity outcomes and more strategic targeting of offsets.

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Biodiversity offsets under the national environmental law (EPBC Act)

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Abstract

The centre piece of Australia's national environmental law is the Environment Protection and Biodiversity Conservation Act 1999 (the EPBC Act). Within its legal framework to protect and manage nationally and internationally important flora, fauna, and ecological communities are provisions for assessing and approving developments that impact protected matters. The assessment of biodiversity offset proposals associated with development is a key feature of many EPBC Act assessments.

The EPBC Act Environmental Offsets Policy establishes a framework for considering environmental offsets that is based in a hierarchy of avoid, mitigate and offset. In addition to offsets determined on a project by project basis, the legislative provisions for strategic assessments enable landscape scale offsets to be identified early in the planning stages of new developments.

A strategic assessment of urban development in the West Belconnen area of the ACT and NSW will deliver approximately 550 ha of habitat for listed threatened species and ecological communities in a conservation reserve. This assessment has also addressed the challenges of offsetting impacts to an existing offset area.

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Does the revised vegetation clearing legislation resolve the problems with offsets? OR Offsets: the good, the bad and the promise

PENELOPE GREENSLADE

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Abstract

An offset aims to duplicate the biodiversity values of a site for which there is an ongoing application for vegetation clearance. The arrangement aims to be of conservation benefit as the offset will from then on be protected. However, like many good ideas, there are a complex set of difficulties that arise from the application of the legislation and misuse can occur. The revised vegetation clearance legislation goes a little way towards addressing some of the problems, but, despite public submissions, in some respects, it makes it easier for applicants to clear land without a satisfactory offset. For instance, some offsets have been used several times without detection, the assessment processes rely on vegetation type alone and, moreover, is remote-based with little or no ground truthing. Even in the revised legislation, biodiversity assessments entirely depend on incomplete data bases and satellite imagery of vegetation types. Another problem is that although the applicant is required to pay to the owner of the offset for ongoing conservation management, including improvements, the sum involved does not normally include enough for long term management. It is stated that the aim of the legislation is to ensure there is "no net loss of biodiversity values". In the glossary biodiversity is defined as: "The variety of all life forms, the different plants, animals and microorganisms, the genes they contain and the ecosystems of which they form a part". But the legislation uses plant associations as a surrogate for all biodiversity as well as, where possible, consideration of listed endangered and vulnerable species. The problem here is that by no means all such species are listed, especially not invertebrates. In the revised legislation a data base of all offsets is proposed that will address some of these problems. Here I will offer suggestions as to how others could be considered.

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Biodiversity offsets, ecosystem service valuations and other neoliberal fantasies

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Abstract

Biodiversity offsets and the monetary valuation of ecosystem services are dominant features of contemporary nature conservation and environmental management in Australia. Both result directly from the intrusion of a neoliberal mindset into all aspects of civil life that, since the early 1980s, has shaped a new paradigm for nature conservation in Australia with its own language, tools and institutions. Through this process, neoliberal ideology has redefined nature in its own terms. Conservation biologists have largely acquiesced to the principles of this ideology, without it seems to us, being fully aware of their involvement − tacit or explicit − or of the likely connotations of that participation and its practical implications. In this presentation we show how the provision of complementary areas to offset losses of high-quality habitat and the associated monetary valuation of biodiversity and of ecosystem services have come to dominate policy development and on-ground activities in wetland management and conservation in Australia. We demonstrate the many internal contradictions of the economic valuation of ecosystem services and the deeply flawed concept of offsetting high-value natural areas by rehabilitating corresponding degraded areas. Although both are a direct result of the neoliberal economic and political ideology, they are incompatible bed mates; the offsetting process is inherently irreconcilable with the economic valuation of ecosystem services. Hedging the future of wetland conservation to 'market-driven environmentalism' is simply an expected overreach in the broader context of neoliberal economic and political ideology, and provides rich grounds for a critique in support of a more considered approach to nature conservation.

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Out-foxing introduced predators and their impacts on native turtles – does broad-scale baiting work?

KATIE HOWARD[1, 2, †], RICKY SPENCER[1], ALAN ROBLEY[2], TIM BARLOW[3], LUKE WOODFORD[2], LINDA BROEKMAN[4], MURPHY[4], AND MALCOLM THOMPSON[5]

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Abstract

In south-eastern Australia Red Foxes are responsible for up to 93% of predation on turtle nests. High, ongoing nest predation rates by foxes have contributed to significant declines in two of three native turtle species. Currently, land managers are implementing fox control programs to target the turtle nesting season. As foxes occur throughout the range of freshwater turtles in the Murray-Darling Basin a consistent approach to fox management is desirable. The aim of this study was to test a targeted fox baiting program that can be implemented during the turtle nesting season. We trialled the effectiveness of a range of fox baiting strategies at Barmah National Park (NP) and Hattah-Kulkyne NP over the 2014 and 2015 nesting seasons. We adjusted bait type, placement and density, and expanded the area baited. Only the 2015 baiting program in Barmah significantly reduced turtle nest predation. At two targeted wetlands predation declined from 100% to 35% and from 68 to 18% respectively, with a significant treatment*time effect (p=5.245e-09).

This program was repeated in Barmah and replicated at Hattah-Kulkyne NP and Koondrook-Perricoota State Forest in 2016. These trials are in their final phase and full results will be presented at the conference. Currently, nest predation rates are lower at baited sites compared to unbaited sites in Koondrook-Perricoota Forest. At Barmah and Hattah-Kulkyne baiting success is highly variable between target wetlands and between years. Current data suggests that, following targeted fox control, nest predation rates can be significantly reduced, but results can be highly variable. The reasons for this variability need to be investigated further. The feasibility and cost effectiveness of developing and implementing a consistently successful baiting program to protect turtle nests will be discussed.

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Compact cities or sprawling suburbs? Optimal design of growing cities to conserve biodiversity

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Abstract

Urban areas house half of the world's population, and will house an additional 2.5 billion people by 2050. As urban populations grow, it is critical to understand how biodiversity conservation can be achieved in urban landscapes. The concepts of 'land sharing' and 'land sparing' provide a useful starting point. Land sharing emphasises the 'sharing' of land between humans and nature. In an urban setting, this is achieved by sprawling, low-intensity urbanisation that allows for more vegetation to be retained within urban areas (e.g. in large household gardens). By contrast, land sparing emphasises the spatial separation of the human population and biodiversity by dedicating some land to high intensity urban land-use, sparing other parts for biodiversity conservation (e.g. as conservation reserves). We used optimisation to test whether the optimal allocation of land for people and nature was more similar to land sparing or land sharing, and how this might change under different scenarios of population growth. We surveyed birds in 28 'landscapes', each 25 ha in size, along a gradient of human population density (zero to ~1600 persons/25 ha) in the Greater Melbourne region, Australia. Species responses to human population density were used to determine the optimal allocation of land among different categories of human population density based on maximising the geometric mean of relative abundance (G) of bird species. For the current human population in the study area, the optimal allocation of land included elements of both land sharing and land sparing, but was more similar to land sparing. For scenarios of increased population size, optimal allocations converged upon a land sparing design. Leafy sprawling suburbs in Melbourne are not a substitute for native forest habitats, which will become increasingly important for safeguarding nature as the populations of urban areas grow.

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Long-term genetic consequences of severe population declines: how to avoid pitfalls and find solutions for the genetic recovery of highly endangered species

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Abstract

Even if hands-on conservation measures are successful in reversing severe population declines and averting extinction, these population bottlenecks can have long-term genetic consequences impairing the recovery of threatened species. The Chatham Island black robin (*Petroica traversi*) declined to five individuals in 1980, including only a single successful breeding pair. Hands-on conservation measures rescued the species from the brink of extinction. However, 30 years after the species survived this severe population bottleneck, genetic diversity is extremely low due to high levels of inbreeding and the random loss of gene variants over time (genetic drift). By using an exceptional, species-wide pedigree, we show that inbreeding and strong genetic drift contributed to the spread of an odd egg-laying behaviour that first occurred in 1984, when a female laid an egg on the rim of her nest, rather than inside it. Such "rim eggs" left in place always failed to hatch, but to expedite population recovery, rim eggs were repositioned inside nests by conservation managers, yielding viable hatchlings. Repositioning resulted in rapid growth of the black robin population, but by 1989 over 50% of all females were laying rim eggs. Data collected after intervention ceased in 1990 shows that the frequency of rim laying has strongly declined, and that this behaviour is maladaptive. This episode yields an important lesson for conservation biology. As the management of critically endangered species can artificially increase reproductive success, it may unintentionally relax natural selection by allowing the 'survival of the not-so-fit'. This risks the spread of maladaptive traits and could render small threatened populations completely dependent on humans for reproduction, irreversibly compromising the long-term viability of populations that humanity seeks to conserve.

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Restoration or conservation? Conserving or creating suitable habitat for urban birds

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Abstract

Most restoration projects aim to restore habitat for fauna in non-urban areas. However, as capital cities and regional centres expand, landscape managers must deal with the compromise between conserving urban remnants and encouraging the creation of new urban landscapes conducive to biodiversity conservation. This study investigated the effects of local streetscape and residential garden vegetation and landscape scale factors on bird community structure and composition across 98 1ha transects in a regional city. Transect sites were randomly selected within the urban footprint of Ballarat, Australia, and included locations near remnant bushland, as well as in new 'designer' suburbs. Linear regressions were used to identify local vegetation and landscape-level predictors of total and native bird species richness and abundance across the transects. Native plant species richness within the transects was the most important predictor in models of native bird species richness (beta=0.77, $p<0.001$), native bird abundance (beta=2.5, $p<0.01$), total bird species richness (beta=0.73, $p<0.001$) and total bird abundance (beta=2.0, $p<0.001$). Total plant species richness in the transects was also a predictor of total bird species richness (beta=0.32, $p<0.01$). Since the composition of urban landscapes depends upon the actions of public land managers and residents, this highlights a benefit of encouraging residents to plant diverse native gardens, and local government to plant diverse native streetscape vegetation. Although residential landscapes cannot be fully 'restored', prioritising diversity in residential urban landscapes can create suitable habitat for many native (and exotic) birds. Combining diverse native plantings with the conservation of urban remnants could contribute to better outcomes for biodiversity conservation in expanding cities.

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Can artificially constructed hollows help restore habitat for the Critically Endangered Leadbeater's Possum?

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Abstract

The Critically Endangered Leadbeater's Possum (*Gymnobelideus leadbeateri)* occurs in the montane ash forests of Victoria's Central Highlands, nesting in hollows of large, old trees, which can take up to 220 years to develop. However, the majority of the ash forest within the species range is less than 78 years old. Because of landscape-wide bushfires, historical timber harvesting and natural attrition, there is expected to be a bottleneck in the availability of suitable nesting trees over the next 50 years, putting the species at greater risk of extinction. Developing options for active conservation management to increase nesting habitat during this critical period is therefore urgently needed. We are currently investigating the feasibility of mechanically creating hollows in younger trees. These have been specifically designed to mimic the dimensions of natural Leadbeater's Possum nesting hollows, where a small entrance hole leads to a large internal cavity. We constructed 72 hollows at 18 sites known to be occupied by Leadbeater's Possums, and have monitored them for 18 months. Leadbeater's Possums have built their characteristic shredded bark nests in 39 (54%) of the hollows (at 78% of the sites), with some hollows occupied within a month of installation. Remote cameras set at half of the hollows are providing novel information on nesting behaviour, revealing that hollows are used regularly, including for breeding. The impact of the constructed hollows on the structural integrity of the trees, and the trees growth response are being monitored. The promising early success of these artificial hollows suggests they may provide an additional option to nest boxes for restoring hollows to regrowth montane ash forest. They are likely to be most beneficial when supplementing declining natural hollows at occupied sites, and should not be viewed as replacing the need for retaining natural hollow-bearing trees.

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Can we restore locally extinct mammals to the semi-arid?

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Abstract

The semi-arid zones of southern Australia are highly degraded from pre-settlement conditions. Clearance for agriculture has been extensive and inadvertent clearing due to a long history of stock and rabbit grazing have left only a small proportion as healthy native habitat. The medium-sized terrestrial fauna is substantially disrupted, everywhere rare and has perhaps the highest extinction rate in the country.

Hattah-Kulkyne National Park in north-western Victoria has been the focus of an extended (+/- 20 years) and intensive program to control grazing and vermin. As a result, local habitats have substantially improved. Although ~50% of the former terrestrial mammal fauna is locally extinct, most of these species still occur elsewhere in Australia (in protected refuges such as offshore islands).

Parks Victoria commissioned a feasibility study for reintroductions of these now rare and endangered medium-sized mammals. Species have been prioritised using a variety of criteria and focal areas of varying suitability for reintroductions have been identified.

We discuss the various considerations that govern the likelihood of success for reintroduction programs, and the staged methods that must be used for maximum likelihood of success. As a working example, highest priority species and locations within Hattah-Kulkyne are identified. We can take substantial steps towards repairing some of the damage, towards restoring natural habitats and filling faunal gaps.

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