Royal Botanic Gardens Melbourne

Urban Spotlight

Newsletter of the Australian Research Centre for Urban Ecology (ARCUE)

For online version and back issues: http://www.rbg.vic.gov.au/research_and_conservation/arcue

Volume 7 **February 2008**

CONTENTS

ARCUE Scientists Close Hume Highway

On a Saturday in June of last year, traffic on the busy Hume Highway near Benalla was diverted for an unusual reason. The first of three rope bridges and three 'glider poles' were being installed to provide a means for squirrel gliders, possums and other native animals to pass safely across the road. The bridge and poles, the first of their kind in Victoria, were the culmination of a three-year research program involving researchers from the ARCUE, Monash University, the University of Melbourne and VicRoads.

The rope bridge and glider poles were mainly installed for the Squirrel Glider, a species threatened with extinction in Victoria and New South Wales. These animals move by gliding from tree to tree; where there are large gaps in tree cover, such as major roads, they are unable to safely cross. Dr Rodney van der Ree, Senior Ecologist at ARCUE, explains why this is of concern to researchers: 'It is crucial to encourage movement of animals across roads and among squirrel glider populations so that they can access food, shelter and mates. What appears to be happening is that those squirrel gliders who are on opposite sides of the highway are effectively different groups. Despite being just 100 metres apart, they might as well be one kilometre or ten kilometres apart. They have become cut off from the rest of their group and we are fearful that this could lead to local extinction.'

Rope bridge installation, Hume Highway

But this is not merely a local problem. The loss and fragmentation of natural habitat is considered one of the primary threats to the conservation of biological diversity around the world. Roads in particular are a major cause of habitat loss and fragmentation. They have

been shown to reduce the quality of nearby habitats, with some effects extending for hundreds or thousands of metres from the road. One of the most obvious examples of the negative effect of traffic is the high rate of animal deaths resulting from collisions with motor vehicles.

The inability of animals to cross the road, due to either high mortality rates or avoidance of the unsuitable habitat, results in the creation of a barrier that prevents or limits animal movement.

To reduce the barrier effect, roads can be located in areas that are less environmentally sensitive. However in many instances, opportunities to re-route roads are limited and in these situations, roads may be designed with engineering solutions to facilitate the safe-crossing by wildlife. The most common measures are tunnels or culverts that enable wildlife to pass under the road, or 'eco-bridges' that direct animals over the road.

Researchers on the Hume Highway project concentrated on finding out how, where and why animals cross the busy freeway. Rodney points out that, as a result, 'The world's ecologists are watching this program closely because we have a good understanding about what has happened before an animal-only overpass has been built.'

Interest in such purpose-built structures is increasing in Australia and internationally, and, as Rodney says, 'This project puts Australia at the forefront of international efforts to determine how effective structures, such as overpasses, culverts and pipes really are in enabling animals to move more easily.'

Meanwhile the use by wildlife of the new bridges and poles will be monitored by ARCUE and Monash University PhD student Silvana Cesarini, and the information gained will be used in planning future road projects.

SEEDBANKS & PLANT INVASIONS IN VICTORIA'S GRASSLANDS

At the end of 2006, Honours student Aaron Dodd finished his investigation into seed banks and plant invasions of Victoria's Western basalt plains grasslands, looking at the effects of landscape on the spatial pattern of the seed banks. He took numerous soil cores from grasslands along a 200 km urban – rural gradient running west from Melbourne and germinated the seeds of these in the glasshouse. His results found that 65 species were present – of these, exotic annual grasses and sedges dominated the composition of the soil seed bank with native species contributing only 13% of the seeds present.

Analysis of the soil seed bank found there was no discrete edge effect related to exotic species invasion at the grasslands. However this pattern was not evident in the above ground vegetation and statistical analysis suggested an edge effect possibly unrelated to exotic species invasion. Similarity between the soil seed bank and the above ground vegetation was low (< 22%) and became even lower as the sites became more rural.

The main influence on the differences displayed along the urban - rural gradient was changes in management practices, which changed in response to landscape context. Aaron concluded that the ongoing conservation of Victoria's highly endangered plains grasslands requires a management strategy of frequent burning and the prevention of soil disturbance which facilitates weed invasion.

Aaron gained first class Honours for his research project. He is now working with the Victorian Department of Primary Industries as a Partnerships Project Officer. He is involved in the Tackling Weeds on Private Land Initiative (TWoPL) and a project called Improving Provincial Victoria's Biosecurity (IPVB), and is primarily concerned with encouraging both industry and the community to develop partnerships that address issues relating to weed management.

URBANISATION AND PLANT TRAITS WORKING GROUP

During February and again in December 2007 ARCUE hosted a workshop funded by the Australian Research Council / NZ Landcare Research Network for Vegetation Function to discuss the relationship between urbanisation and plant functional traits. The Network funds researchers to bring scientists from different disciplines together to address high-impact research questions that can benefit from active collaboration.

Dr Nick Williams, with the assistance of ARCUE and Melbourne University Botany School staff, organised the workshop which examined whether plant functional traits (i.e. plant height, dispersal method, lifeform) could explain patterns in the composition of urban floras around the world. Urbanisation can be considered both as an ecological gradient and as a characteristic suite of disturbances that homogenises biodiveristy. In addition, urban habitats around the world are structurally similar and consistent changes in physical and biological characteristics are observed along urbanisation gradients. These features suggest that a plant functional trait framework could be productively applied to urban floras because similar methodologies have led to increased understanding of the response of plant species and vegetation communities to disturbances such as grazing and fire and across nutrient and rainfall gradients.

Participants included: Nick Williams, Mark McDonnell, Mick McCarthy and Amy Hahs (ARCUE); Steve Clemants (Brooklyn Botanic Gardens, USA); Richard Corlett (Hong Kong University); Richard Duncan (Lincoln University, New Zealand); Mark W Schwartz (University of California, Davis); Ken Thompson (University of Sheffield, UK); and Peter Vesk (University of Melbourne). The meetings were very productive and have lead to some important insights regarding the composition of urban floras and how they change over time.

Working Group 22, 20 Feb 2007
Urbanisation and plant functional traits

Left to Right: Richard Duncan, Peter Vesk, Mick McCarthy, Briony Norton, Richard Corlett, Amy Hahs, Mark Schwartz, Ken Thompson, Nick Williams, Steven Clements, Mark McDonnell

STAFF AND STUDENT CHANGES

Dr Mike Harper has finished his PhD under the supervision of Dr. Mick McCarthy and Dr Rodney van der Ree and has joined the Department of Sustainability and the Environment at Heyfield, Gippsland, and is now working as a Forests and Biodiversity Officer.

Dr Nick Williams has taken up a position as Lecturer in Natural Resource Management and Urban Horticulture in the School of Resource Management at the University of Melbourne. Nick was originally a Research Officer, but went on to complete his PhD in 2005 under the supervision of ARCUE's Director, Dr Mark McDonnell. Nick's research focused on the ecology of urban and rural native grasslands. Nick will continue to remain involved with the ARCUE, as an Honorary Associate, and has ongoing and proposed collaborative research projects underway with Mark and Dr Amy Hahs. He intends to continue his research on urban grasslands and plant traits, and he plans to expand his work on restoration ecology, green roofs and the use of plants to reduce the CO_2 emissions of cities.

Dr Mick McCarthy has accepted a position in the School of Botany at the University of Melbourne. His main role is in the new Applied Environmental Decision Analysis (AEDA) Hub, which is part of the

Commonwealth Environment Research Facility. AEDA conducts research on making decisions about how to manage the environment in the face of uncertainty. AEDA is a collaborative research program involving researchers from The University of Melbourne, The University of Queensland, RMIT, The Australian National University, The University of Sydney, and James Cook University. Mick is also now an Honorary Associate of ARCUE. As Senior Ecologist at the Centre he made significant contributions to the success of its programs. He was a very productive scientists publishing over 40 journal articles over the six years he was a staff member.

Two new Post-doctoral Fellows joined ARCUE recently.

Dr Zoë Smith started at ARCUE in July last year as a Post Doctoral Fellow, with a Ph.D. in Resource Management from the University of Melbourne in July 2006. During her studies she was employed as an orchid researcher at the Royal Botanic Gardens Melbourne, and also held an internship at the Royal Botanic Gardens, Kew, UK, where she conducted research on species extinction modelling. Zoë was employed as an environmental consultant prior to undertaking her current post doctoral position. She has research interests in landscape genetics in urban habitat fragments, extinction modelling, mycorrhizal ecology and translocation of rare and threatened species.

Her PhD research focused on the taxonomic status, genetic diversity, fungal ecology and systematic relationships, and reintroduction of the threatened terrestrial orchid *Diuris fragrantissima.* Her future research will investigate the breeding system, cytology and population genetics of remnant and re-established *Senecio macrocarpus* populations in Victoria. This research will provide important information on the genetic diversity of this endangered plant which will serve as a model for understanding the effects of landscape fragmentation and urbanisation on plant populations.

Dr Andrew Hamer joined ARCUE in August 2007 as a Post-Doctoral Fellow. His PhD research focused on the ecology of the endangered Green and Golden Bell Frog *Litoria aurea* in New South Wales. This research contributed to wetland restoration

projects and the management of extant populations. He is currently modelling the determinants of patterns and dynamics in wetland usage by bell frogs. Andrew has 12 years experience as an environmental consultant and has completed numerous flora and fauna assessments and monitoring projects in New South Wales and Victoria. More recently, he applied information-theoretic methods to improve the ability of a long-term monitoring program to assess the status of a population of the Green and Golden Bell Frog in an urban setting at Sydney Olympic Park. Andrew's current research interests include the role of local and landscape factors in determining the distribution of frogs in urban areas.

Recent changes with current staff are that Dr Rodney van der Ree has been promoted to ARCUE's Senior Ecologist and Dr Amy Hahs is now the Centre's GIS Ecologist.

Ph.D., M.Sc. AND HONOURS GRADUATES

PhD Students

Briony Norton started her PhD at ARCUE in 2007 and is working under the supervision of Dr. McDonnell. Her research will address the

ecology of coarse woody debris and litter in cities.

MSc Students

Zoë Metherell successfully completed her Master of Environment degree comparing Melbourne's freeway planting designs and biodiversity. Her project was done under the supervision of Dr. McDonnell.

Honours Students

A number of students have successfully completed their Honours projects over the last couple of years. Ashley Herrod and Shannon Troy both researched the effects of roads and traffic as a barrier to the Yellow-footed Antechinus and Nadine Gulle researched the movement of the Brushtailed Possum in relation to roads and traffic. Aaron Dodd investigated seedbank dynamics and plant invasions of grasslands (see earlier article), Rowan Ewing researched the spatial patterns of urbanisation in Melbourne and their influence on vegetation and avian species, and Sarah McCall investigated the inclusion of prior information in researching the effect of major roads on survival rates of squirrel gliders. Christabel McCarthy researched the ecology of Melbourne's roadside environments and Micaela Lee Main investigated the effect of highways on the population dynamics of lizards in Victoria.

VISITORS

There have been numerous international visitors to ARCUE since the last newsletter.

Dr Hiroyuki Yokomizo, a post-doctoral fellow at the University of Queensland, visited ARCUE in October 2006. He is a theoretical biologist from Yokohama National University and is interested in the establishment of basic theory of optimal management strategies and application of theoretical studies to actual wild populations.

Professor Tim Seested from the Department of Ecology and Evolutionary Biology at the University of Colorado, Boulder visited ARCUE in October 2006.

Richard Forman from Harvard University, USA, visited ARCUE for a few days in November 2006. Dr. Forman is the PAES Professor of Advanced Environmental Studies in Landscape Ecology and his primary scholarly interests are landscape and regional ecology, road ecology, land-use planning, and linking science with spatial pattern to mesh nature and people. He also studies land transformation, patch-corridor-matrix theory, and the ecology of urban regions.

Dr Tom Spies visited ARCUE in April last year. Tom is a Research Forest Ecologist with the USDA Forest Service and Professor, Oregon State University in Corvalis, Oregon, USA. He is interested in forest and landscape ecology as well as long-term ecological studies.

Marie-Josée Fortin (University of Toronto, Canada), a specialist in the use of spatial statistics visited ARCUE in July 2007 and gave talks both for the ARCUE seminar discussion meeting and for the School of Botany.

Dr. Steve Clemants, Vice President of Science, Brooklyn Botanic Garden, New York, USA; Prof. Richard Corlett, Hong Kong University; Dr. Richard Duncan, Bio-Protection and Ecology Division, Lincoln University, Canterbury, New Zealand, Professor Mark Schwartz, University of California Davis, USA and Dr Ken Thompson, Dept of Animal and Plant Sciences, University of Sheffield, UK visited ARCUE for the Plant Trait Workshops described above.

MEETINGS, WORKSHOPS, TALKS, and CONFERENCES

The fifth Southern Connection International Conference was held at The University of Adelaide, South Australia on the 21-25 of January 2007. The conference brought

together scientists, from a diverse range of fields, such as Systematics, Evolution, Ecology, Palaeontology and Biogeography, who all shared a common interest in the biology and geological history of the southern hemisphere. As such, it provided a fantastic opportunity to interact with other scientists from different fields, and to learn more about the similarities and differences between the northern and southern hemispheres.

One of the concurrent sessions during the conference was a symposium on 'Progress in developing methodologies for studying southern urban ecosystems', chaired by Glenn Stewart from Lincoln University, New Zealand. The symposium had several speakers from Australia and New Zealand who presented their work on urban ecosystems. Amy Hahs presented a paper during this session entitled 'Application of the urban-rural gradient concept to investigate patterns of biodiversity within cities', which she co-authored with Mark McDonnell and Rodney van der Ree. Amy enjoyed the opportunity to present her work to an international audience, and found the feedback very rewarding.

Adelaide was a great location for the conference, with one of the highlights being the conference dinner, which was held at the Adelaide Zoo. All of the participants enjoyed the opportunity to dine out to the roar of the lion and the many bird calls.

Mark McDonnell attended the 2007 International Association for Landscape Ecology Conference (IALE), in Wageningen, the Netherlands. He gave a lecture at a Symposium entitled 'Urban Ecology and Greenspace', and attended an all day Symposium on Urban Ecology held at Alterra Research Centre in Wageningen.

Rodney van der Ree also attended the 2007 International Association for Landscape Ecology Conference. In collaboration with Dr Jochen Jaeger from the Institute for Terrestrial Ecosystems in Zurich, Switzerland, Dr Edgar van der Grift from Alterra in Wageningen, The Netherlands and Dr Tony Clevenger from the Western Transportation Institute at Montana State University in USA they organised a specialist symposium entitled "Effects of roads and traffic on wildlife populations and landscape function." The list of speakers included 15 of the top international research scientists investigating road effects on the natural environment. A key objective of this symposium was to highlight approaches and advances in evaluating effects at "higher-order" levels, such as for populations and ecosystems. While still in The Netherlands, Rodney was invited to attend a second workshop with a small group of people from IALE to further explore methods and approaches to advancing the field of road ecology. We expect to produce a paper from the workshop that will address issues around understanding population-level and ecosystem-level effects of roads and traffic and effectiveness of mitigation systems.

Andrew Hamer and Zoë Smith both presented at the Ecological Society of Australia conference in Perth, 26-40 November 2007. Andrew's talk was entitled 'Determinants of Patterns and Dynamics in Wetland Usage by the Green and Golden Bell Frog *Litoria aurea*', and Zoë's was 'Using Sighting Data to Infer Extinction Risk and Assess Conservation Status'. Both talks were well-received.

RECENT ARCUE PUBLICATIONS

Hahs, A. and **McDonnell, M.** (2006). Selecting independent measures to quantify Melbourne's urban-rural gradient. Landscape and Urban Planning 78: 435-448

Hahs, A. and **McDonnell M.J.** (2007). Composition of the plant community in remnant patches of grassy woodland along an urban-rural gradient in Melbourne, Australia. Urban Ecosystems 10: 355-77

Hamer, A. and Mahony, M.J. (2007). Life history of an endangered amphibian challenges the declining species paradigm. Australian Journal of Zoology 55: 79-88

Holland, G.J., Bennett, A.F. and **van der Ree, R.** (2007). Time-budget and feeding behaviour of the squirrel glider (*Petaurus norfolcensis*) in remnant linear habitat. Wildlife Research 34: 288-95

Holland, K., McDonnell, M. and Williams, N.S.G. (2007). Abundance, species richness and feeding preferences of introduced molluscs in native grasslands of Victoria, Australia. Austral Ecology 32: 626-34

McCarthy M.A. and Lindenmayer D.B. (2007). Info-gap decision theory for assessing the management of catchments for timber production and urban water supply. Environmental Management 39: 553-62

McDonnell, M. (2007). Restoring and managing biodiversity in an urbanizing world filled with tensions. Ecological Management & Restoration 8 (2): 83-4.

Shukuroglou, P., and **McCarthy, M.A.** (2006). Modelling the occurrence of rainbow lorikeets (*Trichoglossus haematodus*) in Melbourne. Austral Ecology 31: 240–253.

Smith, Z. F., James, E. A., McLean, C. B. (2007). Morphology and molecules confirm the taxonomic status of *Diuris fragrantissima*, a threatened terrestrial orchid. Australian Network for Plant Conservation **16** (1) June-August.

van der Ree, R., and McCarthy, M.A. (2005). Inferring the persistence of indigenous mammals in response to urbanisation. Animal Conservation 8: 309-319.

van der Ree, R., M. J. McDonnell, Temby, I. D., Nelson, J. and Whittingham, E. (2005). The establishment and dynamics of a recently established camp of flying-foxes (*Pteropus poliocaphalus*) outside their geographic range. Journal of Zoology 268: 177-185.

Williams, N.S.G. (2007). Environmental, landscape and social predictors of native grassland loss in western Victoria, Australia. Biological Conservation 137: 308-318.

Williams, N. S. G., McDonnell, M. J., Phelan, G K., **Keim, L., van der Ree, R**. (2006). Range expansion due to urbanisation: increased food resources attract grey-headed flying-foxes (*Pteropus poliocephalus*) to Melbourne. Austral Ecology 31: 190 -198.

Williams, N. S .G., Morgan , J. W., **McDonnell, M. J., and McCarthy, M. A.** (2005). Plant traits and local extinctions in natural grasslands along an urban-rural gradient. Journal of Ecology 93: 1203-1213.

UPCOMING EVENTS

Third Conference of the Competence Network Urban Ecology: Urban Biodiversity & Design - Implementing the Convention on Biological Diversity in town and cities", Erfurt, Germany 21-24 May 2008.

Ecological Society of Australia Annual Conference, University of Sydney NSW December 1-5, 2008.

Intecol X, hosted by the Ecological Society of Australia and the New Zealand Ecological Society, Brisbane, Australia. 16-21 August 2009.

To begin subscribing to *Urban Spotlight* or to change your details, please email us or fill in the details below and send to the address at the bottom of this page

- ☐ I do not currently receive *Urban Spotlight* but I would like to subscribe *
- ☐ I would like to continue receiving *Urban Spotlight* but my address has now changed (please provide new address below)*
- ☐ I do not want to receive future issues of *Urban Spotlight*

*Subscription is free of charge

Name: _____

Address: _____

_____

_____

If undelivered return to:
ARCUE
SCHOOL OF BOTANY
THE UNIVERSITY OF MELBOURNE VIC 3010

Royal Botanic Gardens Melbourne

Australian Research Centre for Urban Ecology
C/- School of Botany
The University of Melbourne VIC 3010

Telephone: +61 3 8344 0146
Facsimile: +61 3 9347 9123
Email: arcue@rbg.vic.gov.au
Internet: http://www.rbg.vic.gov.au/research_and_conservation/arcue