



# Urban Spotlight

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

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## ARCUE CONSULTANCY SERVICES

*Rodney van der Ree*

ARCUE is recognized across Australia and overseas as a centre of excellence studying the effects of urbanisation and associated developments on the natural environment. It is essential that this knowledge and understanding be disseminated to the community to achieve sustainable human settlements. In the past we have done this by training students, publishing the results of our work in scientific journals and presentations at conferences. We are now expanding this facet of ARCUE by providing a suite of consultancy services to a range of clients.

This is an important next step for ARCUE because it allows us to engage with developers, planners and government agencies and contribute to the decision-making process. ARCUE is in the unique position of having access to current international best practice and being able to deliver products that meet the needs of clients. The consultancy projects vary widely but all focus in one way or another on quantifying the effects of human activities on the flora and fauna and the effectiveness of mitigation or restoration efforts. The client list is increasing rapidly and includes all level of government in Victoria (including the Department of Sustainability and Environment, and the Port Phillip and Westernport Catchment Management Authority) and interstate, not-for-profit conservation groups, developers and other ecological consultants.

For example, ARCUE has worked collaboratively with VicRoads and the NSW Roads and Traffic Authority (and Monash and Melbourne Universities) on quantifying the barrier effects of roads and traffic on wildlife and the use and effectiveness of mitigation structures.

We installed two rope bridges across the Hume Highway near Longwood and Violet Town in mid 2007. We are monitoring their use by possums and gliders via the infra-red

cameras at each end. After 18 months of operation, we have confirmed crossings by



Truck on Goulburn Valley Freeway, near Murchison  
Photo: Rodney van der Ree

Common Ringtail Possums (see photo below), Squirrel Gliders and Common Brushtail Possums. The rate of crossing is continuing to increase which is very encouraging. Dr Rodney van der Ree is also part of a committee organizing a symposium in early May entitled “Breaking the Barriers – Engineering solutions to ecological problems” (see Upcoming Events section for more detail).



Rope bridge and Ringtail Possums  
Photo: Rodney van der Ree

Other current and past projects include: an assessment of urban development plans on the survival of Squirrel Glider populations near Albury in southern NSW; provision of expert advice on a range of matters to local councils; design options for mitigation to road agencies and other ecological consultants; a quantitative evaluation of the persistence of species of birds, mammals, frogs, reptiles and fish across greater Melbourne; the effects of traffic volume on the occurrence of Grey-Crowned Babblers; the effectiveness of

revegetation works on the survival of Grey-Crowned Babblers and population research and monitoring on a range of threatened species.

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## THE ROLE OF STORMWATER RETENTION PONDS IN MAINTAINING POPULATIONS OF BIRDS AND FROGS

*Andrew Hamer, Phoebe Smith and Mark McDonnell*

Stormwater retention ponds are commonly created in new residential and industrial estates, as well as along roads, to mitigate the impact of stormwater runoff on urban waterways. Retention ponds also provide habitat for wildlife and green open spaces for human recreation, and have the potential to mitigate wetland loss in urban areas. However, the factors influencing biodiversity in these systems are poorly understood.

In 2008, we investigated bird and frog diversity at 15 stormwater retention ponds around Melbourne. A total of 68 bird species were identified during field surveys. We found that larger wetlands supported more species of wetland-dependent birds, including ducks, swans, grebes, cormorants, herons and ibises. Retention ponds with greater diversity of edge habitat also supported greater numbers of wetland-dependent birds. Not surprisingly, large areas of parkland adjacent to the ponds supported more species of non-wetland dependent bird species, including Magpies, and Australian and Little Ravens. The most commonly recorded frogs were the southern brown tree frog and common eastern froglet. Ponds that were surrounded by lots of roads had fewer frog species recorded.

Although in the short-term stormwater retention ponds provide habitat for birds and frogs, monitoring is required over the longer term in order to determine their effectiveness as wildlife habitat.

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## FROGS IN URBAN PONDS IN GREATER MELBOURNE

Andrew Hamer

Dr. Andrew Hamer has recently completed the field research part of a project that investigated the effects of urbanisation on frog communities. His main aim was to find out what local habitat variables were responsible for the number of frog species observed breeding at ponds in urban areas. Andrew surveyed frogs and tadpoles between November 2007 to December 2008 at 65 ponds located along an urban-rural gradient, from parks within the Melbourne CBD out to more natural sites in Cranbourne Botanic Gardens. Overall, six frog species were detected breeding at ponds, with up to four species breeding in the same pond. The most common species found breeding was the Southern Brown Tree Frog complex (*Litoria ewingii*, *L. verreauxii*).



Southern Brown Tree Frog Photo: Nick Clemann

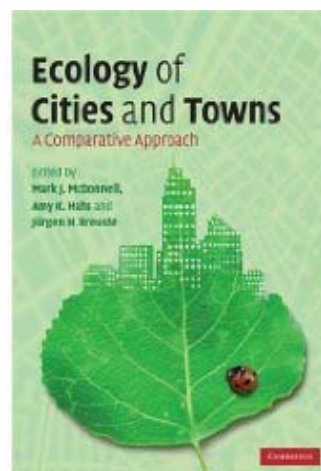
The number of frog species detected breeding at a pond was negatively related to the presence of non-native fish. Previous studies have documented the negative impact of non-native fish on frog populations through their predation on tadpoles. Non-native fish were observed at 30 of the 65 ponds, with Mosquitofish (*Gambusia holbrooki*) and Goldfish (*Carassius auratus*) being the most common species. This result highlights the adverse impact of exotic species on native fauna in urban areas. The coverage of aquatic vegetation in a pond had a positive effect on the number of frog species breeding and may help ameliorate the impact of fish predation on tadpoles by providing shelter in which tadpoles can hide. Water conductivity was found to have a negative effect on the number of species

breeding and conductivity is often higher in urban ponds and catchments.

Andrew is now working in collaboration with Dr. Kirsten Parris (CERF - Applied Environmental Decision Analysis, School of Botany, University of Melbourne) and Dr. Graeme Gillespie (Zoos Victoria) in a project that aims to breed local frog species in captivity and release tadpoles at ponds in Greater Melbourne. The overall aim is to establish populations of frogs in areas where they once occurred but have disappeared because of impacts since European settlement. For example, species may have disappeared because of loss of connectivity between ponds as a result of road construction. Re-established populations will be monitored for several years following the initial release of tadpoles.

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## ECOLOGY OF CITIES AND TOWNS – AN EXCITING NEW BOOK



The unprecedented growth of cities and towns around the world, coupled with the unknown effects of global change, has created an urgent need to increase ecological understanding of human settlements, in order to develop inhabitable, sustainable cities and towns in the future. Although there is a wealth of knowledge regarding the understanding of human organisation and behaviour, there is comparably little information available regarding the ecology of cities and towns.

This new book, edited by Mark McDonnell, Amy Hahs (both from ARCUE) and Jürgen Breuste, brings together leading scientists, landscape designers and planners from developed and developing countries around the world, to explore how urban ecological research has been undertaken to date, what has been learnt, where there are gaps in knowledge, and what the future challenges and opportunities are. It will be published by Cambridge University Press in May 2009 and can be ordered online from Cambridge University press (<http://www.cambridge.org/us/catalogue/catalogue.asp?isbn=9780521678339>) or Amazon.com.

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## URBAN FUNGAL DIVERSITY

*Mark Newbound*

Mark Newbound has been researching the effect of urbanisation on fungi. Over the last three and a half years he has assessed fungal diversity in red gum woodland remnants along an urban-rural gradient to the north of Melbourne. He surveyed fungi using the classical method of collecting fruiting bodies, as well as using the most recently developed molecular tools for investigating soil biodiversity.



*Amanita* sp.

Photo: Mark Newbound

Regression models constructed to find the environmental properties responsible for shaping fungal communities showed that local habitat quality was far more influential than landscape context. In other words, the fact that a remnant was in an urban setting,

or even that the fragment was small, was relatively unimportant. What mattered was the quality of the habitat. The influential habitat properties differed for the two studied functional groups of fungi: saprotrophs, which acquire carbon and energy from dead organic matter; and ectomycorrhizal fungi, which are supplied carbohydrates directly via the roots of living plants.

Estimates of canopy cover taken across sites corresponded far more strongly than any other site property to the number of saprotrophic species. This is probably because vegetation cover leads to more plant debris, which is the food source of many saprotrophs. Ectomycorrhizal fungi were more dependent on soil conditions: lower soil phosphorus and pH favoured species richness.

It was perhaps surprising that urbanisation had little effect. One conclusion that can be drawn from the results is that a small urban remnant can have an equally active and rich fungal community as a large woodland in a rural setting. This is good news for those who feel that urban remnants are worth preserving for their diversity and ecological function. However, across sites the number of saprotrophs outnumbered the ectomycorrhizal species by 4 to 1. This is unusual, as this ratio is usually lower or even reversed. As a shift in fungal communities towards saprotrophic species can be viewed as a sign of disturbance, it could be that the communities were depauperate across the whole gradient.

This research project was the subject of Mark's PhD, which he has now successfully completed.

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## TRAFFIC NOISE CHANGES FROG CALLS AND BIRD SONG

*Kirsten Parris*

Many animals use sound to communicate with each other – to attract mates, defend territories, beg for food, or warn of danger

from approaching predators. Background noise makes it harder for animals to hear a song or a call. The number of roads and the volume of traffic that travels on them have been increasing in Victoria, and many habitats are impacted by traffic noise. A team of researchers led by ARCUE Research Associate Dr Kirsten Parris has been investigating how traffic noise interferes with animal communication in urban areas.

Male frogs call to attract females for mating and to defend territories from rival males. Female frogs of some species prefer lower-pitched calls which indicate larger, more experienced males. Honours students Meah Velik-Lord (based at ARCUE and the University of Melbourne) and Joanne North (based at Deakin University) found that southern brown tree frogs around Melbourne are calling at a higher pitch where traffic noise is louder. This helps the male frogs to be heard by females, by moving their call further away on the frequency spectrum from the low-pitched traffic noise. The change is enough to increase the distance a frog can be heard by 24%, but not enough to overcome the effect of the traffic noise completely. It's possible that a second species of frog, the common eastern froglet, is also calling at a higher pitch in traffic noise, but more information is required to be certain. If females of these species prefer lower-pitched calls, the males could be faced with an intriguing trade-off between being heard and being attractive to potential mates.

Kirsten Parris and Angela Schneider (Department of Zoology, University of Melbourne) have also investigated how birds respond to traffic noise in roadside habitats on the Mornington Peninsula. A number of researchers have looked at this question in Europe and North America, but this is the first study of traffic noise and birds in the southern hemisphere.

After recording bird song at 60 sites next roads (ranging from very quiet dirt roads to freeways), Kirsten and Angela found that the grey shrike-thrush is singing at a higher pitch

at sites with more traffic noise. In addition, the grey shrike-thrush and the grey fantail were much less likely to be encountered at noisy sites, suggesting that traffic noise may be making some roadside habitats unsuitable for birds.



Angela Schneider recording bird song Photo: Australia Network

While both of the study species are common and widespread, this research has important implications for endangered species (such as the grey-crowned babbler) that use roadside habitats. Two articles on this research are published in the free online journal *Ecology and Society* (<http://www.ecologyandsociety.org>).

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## STAFF AND STUDENT CHANGES

### Marnie Ireland



Marnie Ireland joined ARCUE on a part-time basis in April 2008 as our Environmental Business Development Manager.

Marnie is currently completing her PhD researching sustainable freight logistics in desert Australia. Marnie combines her academic pursuits (she has previously completed a B.Eng (Environmental) Hons. and an MBA) with a strong background in strategic planning and sustainable business

development roles in the Australian water industry and support of indigenous economic development. Marnie has experience working with a range of organizations ranging from Government departments and utilities to international consulting firms and, more recently, operating her own consulting business.

At ARCUE Marnie is keen to develop strong partnerships with a range of clients based on robust research. "It is an exciting time for urban biodiversity with the upcoming release of the White Paper: Land and biodiversity at a time of climate change. There are great opportunities emerging with this white paper to generate positive changes if leading researchers, such as those we have at ARCUE, can team with policy makers and land managers to implement a new era in how we protect and enhance urban biodiversity".

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

### PhD Students

Mark Newbound has successfully completed his PhD degree 'A study of ectomycorrhizal fungi associated with native Eucalyptus species along an urban to rural gradient.'

### Honours Students

Natasha Kreitals successfully finished her Honours project 'Resource utilisation by the spectacled flying-fox (*Pteropus conspicillatus*) between savannah and rainforest habitats using stable carbon and nitrogen isotopes, in Atherton, Australia'.

Phoebe Smith also successfully completed her Honours project, 'Stormwater retention: ecology and physio-chemical properties'.

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## RECENT ARCUE PUBLICATIONS

Baxter, P.W.J., Sabo J.L., Wilcox C., **McCarthy, M.** and Possingham H.P. (2008)

Cost-effective suppression and eradication of invasive predators. *Conservation Biology* 22: 1 89-98

Chadès, I., McDonald-Madden, E., **McCarthy, M.A.**, Wintle, B., Linkie, M., and Possingham, H.P. (2008) When to stop managing or monitoring cryptic threatened species. *Proceedings of the National Academy of Sciences* 105: 13936-13940.

Cilliers, S.S., Williams, N.S.G. Barnard, F.J. (2008) Patterns of exotic plant invasions in fragmented urban and rural grasslands across continents. *Landscape Ecology* 23, 1243-1256

Garrard, G.E., Bekessy, S.A., **McCarthy, M.A.**, and Wintle, B.A. (2008). When have we looked hard enough? A novel method for setting minimum survey effort protocols for flora surveys. *Austral Ecology* 33: 986-998.

Gibbons, P., Zammit, C., Youngentob, K., Possingham, H.P., Lindenmayer, D.B., Bekessy, S., Burgman, M., Colyvan, M., Considine, M., Felton, A., Hobbs, R.J., Hurley, K., McAlpine, C., **McCarthy, M.A.**, Moore, J., Robinson, D, Salt, D. and Wintle, B. (2008). Some practical suggestions for improving engagement between researchers and policy-makers in natural resource management. *Ecological Management and Restoration* 9: 182-186.

**Hamer, A. J.** and **McDonnell, M. J.** (2008). Amphibian ecology and conservation in the urbanising world: a review. *Biological Conservation* 141: 2432-2449

**Hamer, A.J.** and Organ, A.K. (2008). Aspects of the ecology and conservation of the growling grass frog *Litoria raniformis* in an urban-fringe environment, southern Victoria. *Australian Zoologist* 34:393 – 407.

**Hamer, A. J.**, Lane, S. J. and Mahony, M. J. (2008). Movement patterns of adult green and golden bell frogs *Litoria aurea* and the implications for conservation management. *Journal of Herpetology* 42: 397-407.

**Harper, M.J., McCarthy, M.** and **van der Ree, R.** (2008). Resources at the landscape

scale influence possum abundance *Austral Ecology* 33: 243–252

Lavorel, S., Grigulis, K., McIntyre, S., **Williams, N.S.G.** et al. (2008). Assessing functional diversity in the field – methodology matters! *Functional Ecology* 22: 134-47

**McCarthy, M.A.**, and Parris, K.M. (2008). Optimal marking of threatened species to balance benefits of information with impacts of marking. *Conservation Biology* 22: 1506-1512.

**McCarthy, M.A.**, Citroen, R., and McCall, S.C. (2008). Allometric scaling and Bayesian priors for annual survival of birds and mammals. *American Naturalist* 172: 216-222.

**McCarthy, M.A.**, Thompson, C.J., and Garnett, S.T. (2008). Optimal investment in conservation of species. *Journal of Applied Ecology* 45: 1428-1435.

**McDonnell, M. J.** and **Hahs, A. K.** (2008). The use of gradient analysis studies in advancing our understanding of the ecology of urbanising landscapes: current status and future directions. *Landscape Ecology* 23: 1143-1155.

**McDonnell, M. J.** and **Holland, K. D.** (2008). Biodiversity. In: *Transitions: Pathways Towards Sustainable Urban Development in Australia*. P.W. Newton (ed). CSIRO Press, pp 253-266

Moore, A.L., Hauser, C.E., and **McCarthy, M.A.** (2008). How we value the future affects our desire to learn. *Ecological Applications* 18: 1061-1069.

**Parris, K.M.**, and **McCarthy, M.A.** (2008) Toe clipping of anurans for mark-recapture studies: acceptable if justified. *Herpetological Review* 39: 148-149.

**Parris, K. M.**, **Velik-Lord, M.** and **North, J. M. A.** (2009) Frogs call at a higher pitch in traffic noise. *Ecology and Society* 14(1): 25.

Rout, T., Salomon, Y., and **McCarthy, M. A.** (2009). Using sighting records to declare eradication of an invasive species. *Journal of Applied Ecology* 46: 110-117

**Smith, Z. F., James, E.A.** and McLean, C.B. (2008) *In situ* morphometric study of the *Diuris punctata* species complex (Orchidaceae), with implications for conservation *Australian Systematic Botany* 21, 289-300

Spring, D.A., Kennedy, J., Lindenmayer, D.B., Mac Nally, R., and **McCarthy, M. A.** (2008). Optimal management of a flammable multi-stand forest for timber production and maintenance of nesting sites for wildlife. *Forest Ecology and Management* 255: 3857-3865.

Thompson, K. and **McCarthy, M. A.** (2008). Traits of British alien and native urban plants. *Journal of Ecology* 96 853-859

Thompson, C.J., and **McCarthy M.A.** (2008). Alternative measures to value at risk. *Journal of Risk Finance* 9: 81-88.

**Williams N.S.G.**, **Hahs, A.** and Morgan, J. (2008). A dispersal-constrained habitat suitability model for predicting invasion of alpine vegetation. *Ecological Applications* 18:2 347-59

**Williams, N.S.G.**, Schwartz, M.W., Vesk, P.A., **McCarthy, M.A.**, **Hahs, A.K.**, Clemants, S.E., Corlett, R.T., Duncan, R.P., **Norton, B.A.**, Thompson, K., **McDonnell, M.J.** (2009). A conceptual framework for predicting the effects of urban environments on floras. *Journal of Ecology* 97: 4-9.

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## VISITORS

**Greg McPherson visited ARCUE** on 26 February, and met staff and students to exchange information on his and our current research work. Greg is a Director of the Centre for Urban Forest Research at Davis, California, USA (part of the US Forest Service) which he joined in 1993. His research investigates the benefits and costs of urban forests. Greg was invited to Melbourne by the University of Melbourne to present a public lecture on urban forests and climate change.



Greg McPherson Photo: Not known

**Dave Roberts, a Senior Research Fellow from the Royal Botanic Gardens Kew, England, visited ARCUE between 7-13 August and 5-10 September 2008.** Dave had recently spent a sabbatical year at Harvard University in the US and then had a 3-month secondment at Kings Park and Botanic Gardens, Perth, WA. Dave assisted Zoë Smith, Post-doctoral Fellow in ARCUE, with the development of several statistical models for predicting species extinction risk from sighting data, such as herbarium records. They are using these models to explore extinction risk in plant species across Victoria. Dave also gave a departmental seminar on these models during his stay.



Dave Roberts and Zoë Smith, at ARCUE Photo: Julia Stammers

**Centre for Urban Greenery and Ecology (CUGE) staff from National Parks, Singapore visited ARCUE on March 23 and 24 2009.** Mark McDonnell, Director of ARCUE, and Catherin Bull, Landscape

Architecture, University of Melbourne, hosted the visit. During the visit they discussed the urban ecology projects currently happening in Melbourne and Singapore and they explored areas and projects they can work together on in the future. CUGE are world leaders in urban horticulture and have been very successful at increasing the amount of plant cover in Singapore.



ARCUE, Centre for Urban Greenery and Ecology (Singapore) and University of Melbourne Workshop Photo: Briony Norton

From left: Amy Hahs, Puay Yok Tan, Marnie Ireland, Teva Raj, Rodney van der Ree, Catherin Bull, Andrew Hamer, Fook Chyi Yong, Kelly Holland, Neil Power, Mark McDonnell, Zoë Smith

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## MEETINGS, WORKSHOPS, TALKS, and CONFERENCES

Ecological Society of Australia 31<sup>st</sup> Conference, Sydney, 1-5 December 2008 - Mark McDonnell, Zoë Smith, Andrew Hamer, Mark Newbound and Briony Norton all attended this conference and the following research was presented:

Hamer, A.J., McDonnell, M.J. 'Inferring the persistence of herpetofauna in response to urbanisation'

Briony A. Norton and Mark J. McDonnell. 'The Sanitisation of Urban Ecological Systems: a study of the effects of leaf litter removal on urban invertebrate communities' (poster).

Mark McDonnell, Amy Hahs, Briony Norton, Nick Williams and Mick McCarthy all were

participants in the 2<sup>nd</sup> Urbanisation and Plant Functional traits workshop, hosted by the ARCUE and funded by the ARC-NZ Research Network for Vegetation Function, 15-19 December 2008.

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## UPCOMING EVENTS

**Breaking the Barriers - Engineering solutions to ecological problems** is a symposium targeted towards engineers, planners, consultants and government agencies concerned with reducing the effects of linear infrastructure (roads, railways, utility easements) on the environment.

The symposium will be held in **Brisbane** from the **6<sup>th</sup> – 8<sup>th</sup> May 2009** and is being co-organised by Rodney van der Ree with colleagues from the Environmental Institute of Australia and New Zealand, Griffith University, Brisbane City Council, and Queensland Main Roads. Further information on this symposium is available at <http://www.eianzseq.org/BreakingtheBarriers.htm>.



East Evelyn Road culvert, Atherton Tablelands, N. Queensland  
Photo: Rodney van der Ree

**Biennial International Conference on Ecology and Transportation, Duluth, USA, 13-17 September 2009.**

<http://www.icoet.net/ICOET2009.asp>

**Urban Wildlife Management Conference**, of the Wildlife Management Society - **Massachusetts, USA, 21-24 June 2009**

[http://www.people.umass.edu/sdestef/urban\\_conference.html](http://www.people.umass.edu/sdestef/urban_conference.html)

**10th International Congress of Ecology, Brisbane, Australia, 16-21 August 2009**, hosted by the Ecological Society of Australia in partnership with the New Zealand Ecological Society. <http://www.intecol10.org/> Dr Kirsten Parris, Honorary Research Associate of ARCUE, is organising a symposium for the Congress: **'Maintaining biodiversity and ecosystem function in expanding urban habitats'**.

The **IALE (International Association of Landscape Ecology) European Conference 2009** will be focused on "European Landscapes in Transformation - Challenges for Landscape Ecology and Management". It will be held over **July 12 - 16 2009** in **Salzburg, Austria**. <http://www.iale2009.eu/>

Jüergen Breuste is organising a symposium for the Conference on: **"Transformation of rural – urban cultural landscapes in Europe – Integrating approaches from ecological, socio-economic and planning perspectives"**.

Jüergen is also organising a post conference symposium on July 17 in Salzburg. Philip James, Salford UK - Urban Nature, will be the co-organizer of the symposium on Urban Ecology with the title: **"Identifying challenges for urban ecological research and urban ecosystem management - international perspectives"**. [http://www.els.salford.ac.uk/urbannature/outputs/others/salzburg/salzburg\\_home.htm](http://www.els.salford.ac.uk/urbannature/outputs/others/salzburg/salzburg_home.htm)

**VI Southern Connection Congress** is to be held in **Bariloche, Argentina** on **February 15-19, 2010**. The organisers have planned an urban ecology symposium for the meeting. <http://www.sccongress2010.com.ar/php/index.php>

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