Protecting woodland birds from urban sprawl: the need for population data in evidence-based planning

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How is urban encroachment impacting birds in neighbouring bushland? This was the driving question of our study that took place in woodland remnants around Canberra, Australian Capital Territory.

Most Australians live in a major town or city, and our urban areas are growing. Fast. We know from other scientific research that urban expansion alters fringe environments—where buildings meet the bush. We know that urban areas can introduce new disturbances to ecosystems, including feral species and pollution. And we know that the impacts of urbanisation on biodiversity tend to be negative.

However, most of this knowledge has been gained from short-term studies within, or very near to, urban zones. We don't have a very good understanding of how far the effects of urbanisation extend into neighbouring areas beyond 200 or 300 metres. When that neighbouring area is a nature reserve, or habitat for vulnerable species, it becomes a conservation imperative to know whether encroaching urban development poses additional threats. Furthermore, urban development can occur rapidly, and over large areas (see Figure 1 below). So, it is helpful to know whether the speed and scale of urban development affects species, and whether such impacts are likely to be permanent. For this, we need long-term population data.

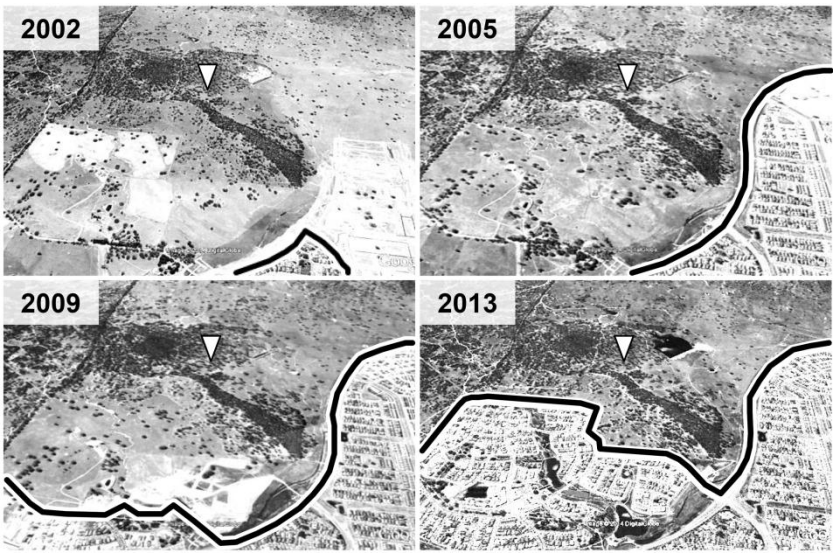

Figure 1. Urban development over 12 years in north Canberra. The urban boundary is indicated by the bold line, with development encroaching into box-gum woodland.

We used long-term bird monitoring records to assess the impacts of urban encroachment on birds in neighbouring bushland through space and time. That is, we looked at how individual species responded to the proximity of their habitat to development, as well as how quickly these developments encroached on their habitat. The survey data that we used were collected by members of the Canberra Ornithologists Group at 92 permanent field monitoring sites in temperate woodland habitats around Canberra. Surveys were 10-minute counts conducted four times a year, every year, from 1999 to 2012. A huge effort!

Our analysis revealed that the occurrence of approximately half of Canberra's birds is strongly linked to the proximity of their habitat to urbanisation, and that the impact of urbanisation on some species changed through time. We identified several species of conservation concern that responded negatively to large annual changes in urban development, irrespective of how close that development was to their habitat. We also found that species responses to urban proximity were linked to their life history traits, with small, migratory, woodland-dependent birds that rely on mid- and upper-canopy structures, clearly disadvantaged by urban development.

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Importantly, our results show that birds respond to urban encroachment over much larger distances than is typically investigated in urban ecological studies. For example, the influence of urban areas on some species extended up to 5 km from the boundary of urban development into neighbouring bushland. In Table 1 (below), we report species that we found to be vulnerable to the impacts of urban development (termed *urban avoiders* and *rapid change intolerant*), and therefore in need of protection and/or ecologically sensitive urban design.

Table 1. Species that were negatively affected by urban development in adjacent woodlands throughout Canberra. *Urban avoiders* are species that respond negatively to urban proximity – that is, the closer urban development is to a site, the fewer individuals will be seen at that site. *Rapid change intolerant* are species that respond negatively to the annual rate of urban encroachment – that is, the faster urban development encroaches toward a site, the fewer individuals will be seen at that site. The latter response implies a response to the initial disturbance associated with development (i.e. clearing and construction). Introduced species are marked with asterisk (*).

Urban avoiders	**Rapid change intolerant**
Sacred Kingfisher	Brown Treecreeper
Superb Fairy-wren	Tree Martin
Dusky Woodswallow	Grey Currawong
White-plumed Honeyeater	Red-rumped Parrot
Common Bronzewing	Varied Sittella
Noisy Miner	White-naped Honeyeater
Western Gerygone	Mistletoebird
Willie Wagtail	Brown-headed Honeyeater
Scarlet Robin	White-winged Chough
Brown Treecreeper	Common Starling*
Striated Thornbill	Golden Whistler
Tree Martin	Galah
Brown-headed Honeyeater	
Rufous Whistler	
Golden Whistler	
Mistletoebird	
Weebill	

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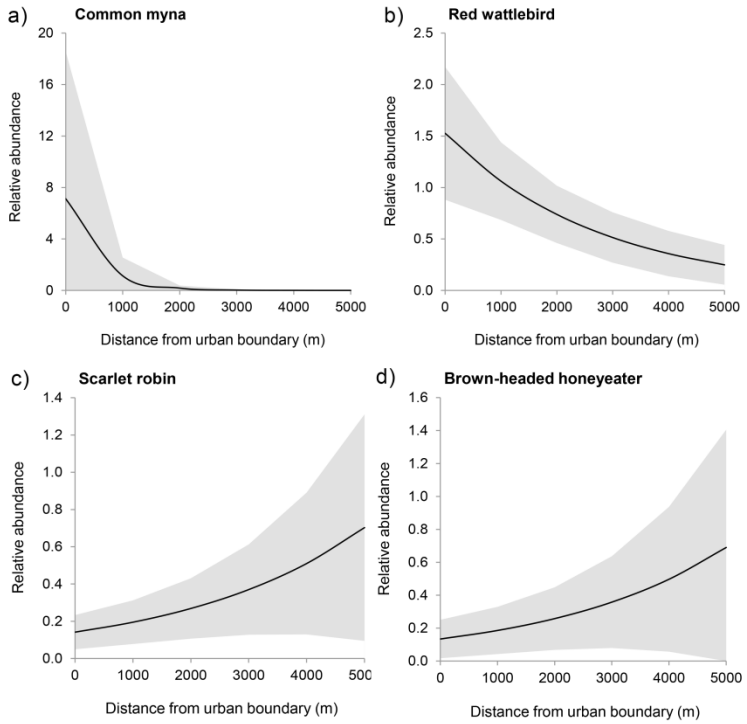

Figure 2. Examples of two species responding positively to urban proximity (a-b), and two species responding negatively to urban proximity (c-d). Plots show trends in species occurrence as surveys move from the urban boundary (0m) into neighbouring woodland (5000m), with 95% confidence intervals (shaded grey).

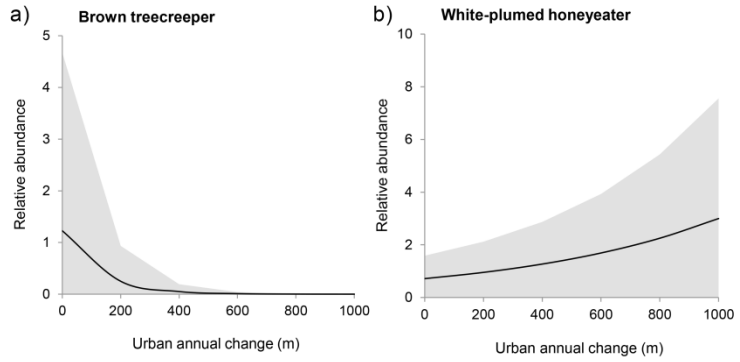

Figure 3. Examples of two species responding to increasing urban annual change: one negatively (a) and one positively (b). Plots show trends in species occurrence as surveys move from sites where urban encroachment is occurring slowly (0m/year) to sites where urban encroachment is occurring rapidly (1000m/year), with 95% confidence intervals (shaded grey).

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