IMPACTS OF HABITAT FRAGMENTATION IN AN URBAN ENVIRONMENT

Brigette Sharp
PO Box 750
Petersham NSW 2049
sharpbrigette@yahoo.com.au

Changes in demographics since early 2000 in Sydney, Australia, have seen a number of previously working class and highly industrialised areas become gentrified. This is particularly evident in the centre of the city and the inner western suburbs (figure 1), which have seen increases in house prices, household incomes and education levels coupled with a reduction in unemployment levels (Randolph and Holloway 2005). This change has brought with it a population that appears to be more environmentally aware. This is reflected in the environmental policies endorsed by local councils such as Ashfield, Burwood, Canada Bay, Canterbury, Marrickville and Leichhardt (web-link listed), promoting enhanced biodiversity and replacing exotic street and park plantings with native endemic plants.

Figure 1. Map of the Inner West of Sydney.

Anecdotal reports suggest that wildlife seems to have responded to this change in environment focus with increased populations and greater species diversity in the area. The increase in wildlife densities is also reflected in the increased number of rescues undertaken by members of the local branch of WIRES (Wildlife Information Rescue and

Education Service). Records obtained from the Inner West branch of WIRES show a rising trend of rescues across all species found in the area, with a dramatic increase in birds. This trend can be explained in part by an increase in membership of the group between 2004 and 2008, but figure 2 clearly shows a significant increase in rescues past this point. Animals may come into care for any number of reasons and while the number of rescues cannot necessarily be correlated with the numbers of animals in a local population, it can indicate a general trend.

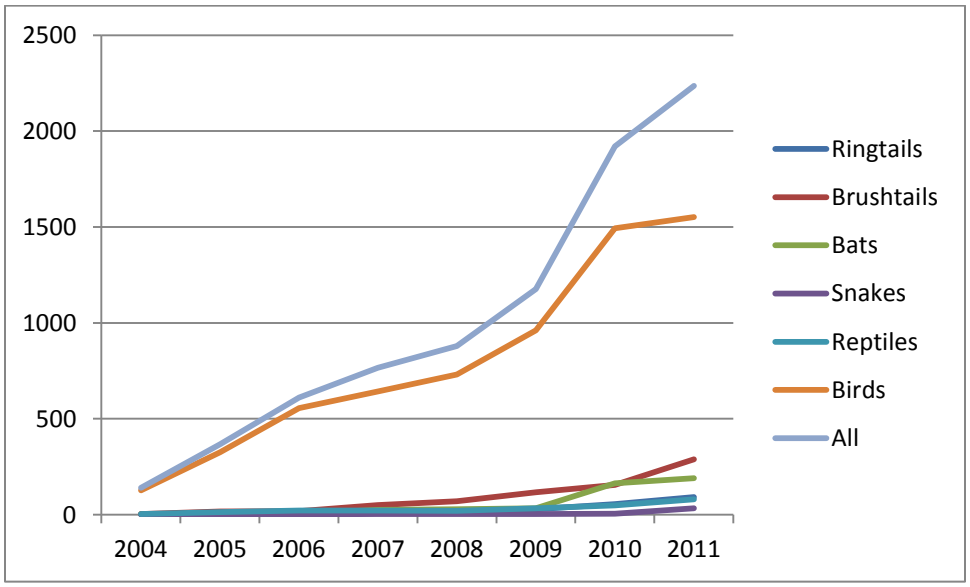

Figure 2. Number of animals by year and number of rescues. WIRES Database.

The sudden appearance in the area of the long-nosed bandicoot (Perameles nasuta) can be used as evidence to further support this trend. Leary et al (2010) studied a population of the species which was last recorded in the Inner West in the 1950s and then suddenly reappeared in 2002, when a number of bodies were discovered on a busy road and a live female bandicoot was accidentally captured in a cat trap in the grounds of a retirement village in 2007. I was present at the release of the animal back into its territory (figure 3) and was advised by residents that it had two young that foraged with it each night.

Figure 3. Bandicoot at release site

More bandicoots were subsequently captured at the site during at tracking exercise by NPWS to determine range and population numbers. Additional sightings of individuals being recorded in neighbouring suburbs by local residents following an education program. Leary et al hypothesised that animals were travelling along green corridors such as the “Greenway”, a re-vegetated stretch of land that follows the Inner West goods line, a railway line used to service industry prior to the demographic changes in the area. The authors speculated the bandicoots may have travelled the entire length of this corridor and a population may be now established in Callan Park, the former site of Rozelle Hospital in the Inner West suburb of Lilyfield. Much work has gone into enhancing habitat the only section of remnant vegetation on the site over the last decade. This was in response to the development of a management plan (Context Pty Ltd et al circa 1998).

The Callan Park survey

I was curious to see whether the increased wildlife trend was evident in Callan Park as suggested by Leary et al. and so conducted a survey of reptiles, mammals and birds in the park as my major project for my master’s degree.

Figure 4. Aerial photograph of Callan Park showing survey sites.

Callan Park (aerial view fig 4.) is located in the Inner West suburb of Lilyfield. The site occupies 61ha of land and contains areas of open grass, stands of trees, both native and introduced, and a large number of buildings with a series of roads running through the park. The site was owned and operated by the State Government from 1885 as Rozelle Hospital, a mental health facility. It was decommissioned in 2008 and although there are some community groups still operating on the site, most buildings have been allowed to fall into disrepair. The site is currently managed by the Sydney Harbour Foreshore Authority, which ensures that basic facilities such as seawall maintenance and security are maintained. Local residents are allowed to use the park for passive recreation and access to the park is unrestricted at all times.

Due to the size of the park and the limited time allocated to the survey, the study area was broken down into six sites: A – F (figure 4). The area with remnant vegetation, which had been subject to replanting efforts, was sectioned into three sites, A, B and C. This reflected the differences in vegetation and topography, with Site A consisting of a stand of casuarinas (*Casuarina glauca*) on the northern-most point; east of Callan Point these are replaced by coastal shrubs and stunted Port Jackson figs (*Ficus rubiginosa)* growing out of the rocks. Site B contains thicker, taller vegetation on a cliff and down the cliff-face overlooking King George Park, a heavily used sports oval. This site was replanted in 1998 and has a number of mature trees with a closed canopy. It has an open understorey, especially on the flat section at the bottom of the cliff. While also part of the remnant vegetation and currently undergoing some vegetation efforts on its edges, Site C is overgrown by lantana (*Lantana camara*). The vegetation in this area is complex and consists of ground, middle and upper storey plants, with the lantana forming an impenetrable wall up the cliff-face. This gives way to more open trees at the cliff top but efforts have been made during the revegetation process to ensure multilayer planting, to provide complexity of habitat.

The other three sites (D,E&F) are somewhat isolated patches of habitat with a mixture of native and introduced trees. Site F has a storm-water drainage system running through it and is the only water way in the park.

Survey techniques

Each site was surveyed four times; twice in the morning for a period of two hours and twice in the evening, also for a period of two hours. There was an average of three people on each shift with a total of 144 hours spent surveying the sites. Volunteers from WIRES and the local bush care group were equipped with binoculars, a bird identification field guide (Slater et al 2008) and a data sheet to record sightings of all animals. They were also advised to record any evidence of bandicoot diggings and nests, dreys and fox dens. The survey period was from 27 May 2011 to 26 June 2011. The days on which the survey was carried out were not consecutive due to heavy rain during this period. Surveys were conducted only on rainless days.

In addition to the animals physically present on the site, a number of birds were also seen flying over the site. These have been recorded as F on the table but not recorded in the total number of animals in the sample. Also included in the table are bird calls noted with C. These received the same treatment.

Scientific name	Common name	Site A	Site B	Site C	Site D	Site E	Site F
Class REPTILIA	**REPTILES**						
Family SCINCIDAE							
Ctenotus taeniolatus	Striped skink	4					
Lampropholis delicata	Delicate skink			6			
Tiliqua scincoides scincoides	Blue-tongue lizard (slide)	1					
Class AVES	**BIRDS**						
Family ARDEIDAE							
Egretta novaehollandiae	White faced heron					1	
Family CHARADRIIDAE							
Vanellus miles	Masked lapwing			1			
Family COLUMBIDAE							
Ocyphaps lophotes	Crested pigeon	1F					
Family CACATUIDAE							
Cacatua galerita	Sulphur-crested cockatoo	2F					
Family PSITTACIDAE							
Trichoglossus haematodus	Rainbow lorikeet	3F	5F	8	5	10	4F
Family PODARGIDAE							
Podargus strigoides	Tawny frogmouth			2			1
Family HALCYONIDAE							
Dacelo novaeguineae	Laughing kookaburra			1			
Family MALURIDAE							
Malurus cyaneus	Superb fairy wren			C			
Family MELIPHAGIDAE							
Manorina melanocephala	Noisy miner	3	8	14	12	7	13
Family ORIOLIDAE							
Sphecotheres viridis	Fig bird				2		
Family ARTAMIDAE							
Cracticus torquatus	Grey butcher bird			2	1	2	2C+1
Cracticus tibicen	Australian magpie	1			1		1C
Strepera graculina	Pied currawong	1F	2				
Family CORVIDAE							
Corvus coronoides	Raven				1	2	
Family HIRUNDINIDAE							
Hirundo neoxena	Welcome swallow	10F	3F	3F			
Family STURNIDAE							
Acridotheres tristis	Common (indian) myna			2			
Class MAMMALIA	**MAMMALS**						
Family PHALANGERIDAE							
Trichosurus vulpelcula	Brushtail possum			4	3	5	1
Family PTEROPODIDAE							
Pteropus poliocephalus	Grey-headed flying fox			11	2		
Family MURIDAE							
Ratus ratus	Black rat			1			
Family CANIDAE				1			
Vulpes vulpes	European red fox						

C – calling, F – flying

Figure 5. Census of vertebrates in sites A–F, Callan Park.

Results

The results of the survey were very poor, with only 146 individual vertebrates recorded across the six sites, representing a total of 23 species. This data is shown in the table above (figure 5).

Conclusions of my study

The results were completely unexpected for such a large established park and unfortunately there was no baseline data available for comparison as all previous surveys had listed species only rather than numbers. It was expected that we would find a large number of animals in the combined area of sites A,B&C but the populations there were small and the absence of mammals in site B was unexpected.

The park is extensively used by local residents for passive recreating with a very high number people exercising their dogs and this may have an impact on wildlife. I recorded the number of walkers and dogs using the pathways on the northern and southern borders of site B which is the re-vegetated area to see if this may be impacting on the wildlife. In one hour 286 people were observed to walk or run past site B. During this period 42 dogs also went past and of these 20% were off lead and ran through the site. Dog droppings were also recorded in the lower section of this site.

In addition to this the on-site security guard advised me that walkers often advised them that their dogs had injured or killed brushtail possums in the park. This communication is backed up by rescues conducted in the park by WIRES volunteers.

The presence of cats and foxes in Callan Park cannot be overlooked as an explanation for low animal numbers, as numerous studies have shown both species to be key figures in the decline of wildlife (Banks 2004, Barratt 1997, Dickman 1996, Dickman 1996a, May & Norton 1996, Priddel & Wheeler 1994, Robertson 2007). It is fair to say that the lack of terrestrial animals may be a direct result of the presence of these mammalian predators, particularly with a cat colony located 100m from Site B, as can be seen in figure 4.

The findings of my survey are consistent with previous studies on habitat fragmentation. Harrison & Bruna (1999) and Quinn and Harrison (1988) show that fragmentation of habitat is a major contributor to the reduction of biodiversity. Callan Park has large open spaces with pockets of habitat scattered around the site and often not connected. Sites A, B and C had the greatest level of connectivity of the six sites but they too were isolated from other areas of the park.

Elsewhere in the inner west

The results of the Callan Park survey were incongruous with our WIRES rescue data and observations of other parks in the Inner West were teaming with life in comparison. As an example in 2009 the master's degree students sampled bird life on the main campus of Sydney University and in Victoria Park which adjoins the University to the east. In total 24 person hours were dedicated to the task and in that time we recorded 14 species of birds with a total of 760 individuals.

My Hypothesis

The highly urbanised nature of the Inner West would seem uninviting to wildlife and in previous decades this held true. As a long time resident of the area I have seen the wildlife go from a landscape of introduced birds to one that now includes bandicoots, possums,

reptiles, frogs and countless species of birds. My hypothesis for why this is happening is that Council have increase native street plantings and residents are planting more natives in their yards. So although houses are close together there is a network of habitat linking each residential space and providing habitat and a wildlife corridor for vertebrates. I am not alone in this hypothesis with a locals often speaking about “the greening of the inner west”

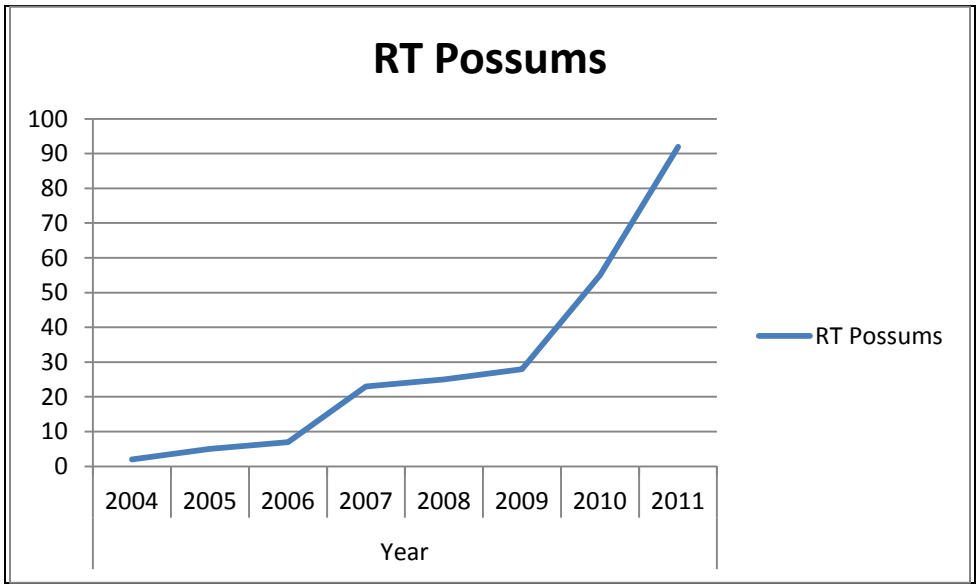

Figure 6. Ringtail rescues in the Inner West 2004 – 2011. WIRES Database

The appearance of bandicoots cannot yet be taken as evidence of this theory due to their low numbers however I believe that the sudden appearance in the inner west of the ring-tailed possum in the area can. Figure 6 shows a steady increase of this species in our rescue records, particularly over the last three years. Initially an occasional animal was found in the suburbs closest to the city prompting us to think the animals were coming via cars from north of the harbour. Since 2007 however the animals have been appearing in more westerly suburbs. The local ringtails are lighter in colour and their fur is less dense than those from the north: resembling possums found in the suburbs south of the city. Contrary to the feeding guides from our possum care manuals, the rehabilitating ringtails also favour lilly pilly plants, which are now a common species used in street planting and garden hedge, over eucalyptus. This alone seems to indicate a species which is adapting and dispersing in a new environment.

Interestingly, a ringtail was rescued a suburb away from Callan Park last year and is the first recorded in the area. So whilst that historic park with all its potential sits silent, the rest of the inner west is alive with wildlife travelling the new green urban highway.

References

Ashfield Council, *Environment* Viewed 2 July 2011
http://www.ashfield.nsw.gov.au/page/environment.html

Banks, P.B. 2004. Population viability analysis in urban wildlife management: modelling management options for Sydney's quarantined bandicoots. pp 70–77. *in* Lunney, D. and S.

Burgin, (eds). *Urban wildlife: more than meets the eye.* Royal Zoological Society of New South Wales, Sydney, Australia.

Barratt D.G. 1997 Predation by house cats, *Felis catus (L.),* in Canberra, Australia. *Wildlife Research* **24:** 263-277

Burwood Council, *Our Environment* Viewed 2 July 2011 http://www.burwood.nsw.gov.au/environment/our_environment/our_environment_landing_page.html

City of Canada Bay Council, *Environment and Enforcement* Viewed 2 July 2011 http://www.canadabay.nsw.gov.au/environment_and_enforcement/09_general_information/environment_and_enforcement_landing_pg.html

City of Canterbury Council, *Environment and Health* Viewed 2 July 2011 http://www.canterbury.nsw.gov.au/www/html/32-environment-and-health.asp

Context Pty Ltd, Greening Australia and Kate Sullivan and Associates Pty Ltd circa 1998 *Conservation management plan for Callan Point, Rozelle 1998-2002.* Report prepared for the Callan Point Resource Management Group.

Dickman, C.R. 1996. Impact of exotic generalist predators on the native fauna of Australia. *Wildlife Biology* **2:** 185-195

Dickman, C.R. 1996a. *Overview of the impact of feral cats on Australian native fauna*. Report prepared for the Australian Nature Conservation Agency.

Harrison, S. and Bruna, E. 1999. Habitat fragmentation and large-scale conservation: what do we know for sure? *Ecography* **22:** 225-232

Leary, T., Kwonk, A., Khan, B. and Ibbetson, P. 2010. "Yuppie bandicoots of inner western Sydney – in hiding or urban renewal?" in *The Natural History of Sydney,* Royal Zoological Society of NSW, Sydney, Australia

Leichhardt Council, *Environment and Sustainability* Viewed 2 July 2011 http://www.leichhardt.nsw.gov.au/Environment.html

Marrickville Council, *Environment* Viewed 2 July 2011. http://www.marrickville.nsw.gov.au/environment.html?s=1216071993

May, S.A. and Norton, T.W. 1996. Influence of fragmentation and disturbance on the potential impact of feral predators on native fauna in Australian forest ecosystems. *Wildlife Research* **23**: 387-400

Priddel, D.A. and Wheeler, R. 1994 Mortality of captive-raised malleefowl, *Leipoa ocellata*, released into a mallee remnant within the wheat-belt of New South Wales. *Wildlife Research* **21** (5): 543-551

Quinn, J.F. and Harrison, S.P. 1988. Effects of habitat fragmentation and isolation on species richness: evidence from biographic patterns. *Oecologia* 75: 132-140

Randolph, B. And Hollow, D. 2005. The suburbanization of disadvantage in Sydney: new problems, new policies. *Opolis* **1**(1): 49-65

Robertson, S.A 2007. Review Article: A review of feral cat control. *Journal of feline medicine and surgery* **10**: 366-375

Slater, P., Slater, P. and Slater, R. 2008. *The Slater field guide to Australian Birds.* Reed New Holland, Sydney, Australia.

Bridget Sharpe: Brigette has recently graduated from Sydney University with a masters in wildlife health and population management. Her final research program was focused on habitat fragmentation in an urban setting impacting on wildlife.