

Snakes in the city: understanding urban residents' responses to greening interventions for biodiversity

Abstract: As cities are recognised as hotspots for biodiversity, urban greening interventions are becoming more important. Such initiatives are promoted as having multiple benefits for nonhumans and humans alike, infused with narratives of climate change adaptation and positive health outcomes. Yet little research has critically examined how residents of cities respond to urban greening or rewilding interventions and the potentially increasing numbers, or changing types, of diverse plants and animals in urban neighbourhoods. This paper critically engages with the social dimensions of urban greening for biodiversity by drawing on a case study of Upper Stony Creek, an urban waterway restoration in Melbourne's West. Upper Stony Creek is being transformed from a concrete channel separated from the residential area into an accessible urban wetland and park. Data from interviews with residents living in close proximity to the Creek before the transformation show that while being generally supportive of increased greenspace and vegetation in their local area, perceptions of higher biodiversity of native animals are mixed. For example, while birds and lizards are viewed neutrally or favourably, there are fears about the return of snakes. Turning to concepts of biophilia and biophobia, the paper discusses how urban residents' perceptions of and relations to native animals in urban areas could be problematic for urban greening and other initiatives designed to encourage biodiversity. It concludes by arguing that greater understanding of residents' diverse relationships with urban wildlife is needed if cities are to continue to be transformed into shared habitats.

Key words: Urban habitat; perceptions; human-wildlife relationships; interviews; Melbourne.

Introduction

Greenspaces are important indicators of quality of life in urban areas and as part of the urban fabric are associated with a raft of outcomes for people (Maller et al. 2006; Egorov et al. 2016) including physical (Shanahan et al. 2015) and mental health and wellbeing benefits (Alcock et al. 2014). As well as providing habitat for humans, cities are increasingly recognised as providing habitat for other animal and plant species (Low 2003). Challenging previous assumptions about urban environments and biodiversity being geographically incompatible, in Australia cities have been found to be 'biodiversity hotspots' (Garrard & Bekessy 2014, p. 63).

Some of the ways cities provide habitat is via mosaics of 'ecological niches' formed by street trees, lawns, parks, urban forests, cultivated land, wetlands, lakes and streams and private gardens (Bolund and Hunhammar (1999) in Bretzel et al. 2016). But there are other built structures and substrates that benefit non-human species that might not obviously be counted as habitat. These include landfill and transfer stations, tips, general rubbish (Jones 2002) and waste treatment plants (Low 2003). Other ways cities support non-human species is through supplementary feeding of birds and animals in backyards (Jones 2002).

Cities are now noted to be important sites for threatened species¹, with urban areas of greater importance for conservation than non-urban areas (Ives et al. 2016). This contrasts with the dominant conservation paradigm being the designation of protected wilderness areas, usually remote from human settlements, which 'does not reflect ecological reality' (Ives et al. 2016, p. 118). Relatedly, there are growing calls for moving away from the human-centricity of city planning, design and management to acknowledge, accommodate, and prioritise biodiversity in cities (Houston et al. in press; Garrard & Bekessy 2014).

¹ Those considered at risk of extinction according to the IUCN (International Union for Conservation of Nature) Red List of Threatened Species or considered of national significance by other criteria (e.g. in Australia the Environment Protection and Biodiversity Conservation Act 1999 or EPBC Act) (Ives et al. 2016).

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Yet little research has examined how residents of cities respond to urban greening interventions and the potentially increasing numbers, or changing types, of plants and animals in urban neighbourhoods. This paper critically engages with the social dimensions of urban greening for biodiversity. It reports on a case study of Upper Stony Creek, an urban waterway undergoing restoration in Melbourne's West. Upper Stony Creek is being transformed from a concrete channel separated from the residential area into an accessible urban wetland and park. Among other environmental aims, the project seeks to increase the amount of local greenspace as well as improve local biodiversity. Drawing on qualitative research, the paper reports on how residents responded to the idea of increasing types and numbers of animals and plants in their neighbourhood, and their perceptions of local wildlife.

The next section describes the study site and the semi-structured interviews conducted with residents living near the Creek before the restoration occurred. The methods are followed by the main findings which show that although residents supported the restoration and the improvement to local greenspace, they held mixed perceptions and concerns about the changing diversity of animals. The conclusion discusses what the findings imply for future urban greening and waterway restoration projects and presents some ideas for future research.

Study site and methods

The study is part of a larger research project conducted by the authors and additional colleagues and research partners. It concerns an urban greening intervention to transform a 1.2km section of a concrete stormwater drain and adjacent informal greenspace, in Sunshine North Victoria to a more 'natural' state. No work has yet started, but is expected to commence in late 2017 with a two year completion time.

Located 12 kilometres west of Melbourne's Central Business District, Sunshine North is an established suburb with a population of more than 10,000 people and an average of 2.9 people per household (Australian Bureau of Statistics 2011). With a median weekly household income of AU\$882, the area is considered to have low socio-economic status (Australian Bureau of Statistics 2011). The study area is bounded by Gilmore Road, Furlong Road and Stony Creek (Figure 1). There is one formal greenspace in the area called Lloyd Reserve (Figure 1).

The intervention site for the restoration is known as Upper Stony Creek and the creek and surrounding greenspace currently offer poor amenity (Figure 1). Included in the plans is the restoration of 8.8ha of land through planting of native trees along the Creek, and the creation of wetlands for stormwater drainage that will involve removing the existing concrete structures. It is hoped that the waterway restoration will have health and wellbeing benefits for local residents, improve cooling in summer and general liveability of the area, and encourage the return of native bird and animal species. This paper reports on a subset of baseline qualitative data about local residents' perceptions of animals and plants in the area prior to the urban greening intervention and waterway restoration.

Methods

The second author conducted 20 semi-structured interviews with 23 participants (including partners and spouses) during October 2016 to March 2017. Residents were recruited using flyers delivered to mailboxes, with participation requiring a Sunshine North residential address and a minimum of 18 years of age at the time of recruitment. The process of recruiting and conducting interviews continued until the data was saturated (Richards & Morse 2012). Interviews were digitally recorded and were between 25 to 105 minutes. Interview questions addressed residents' experiences of animals and plants in their backyard and neighbourhood, the sorts of animals and plants they preferred, and their perceptions of Australian native wildlife in general. No prompts were used about particular animals or plants. A professional transcription service transcribed the interviews and these were imported into NVivo (qualitative analysis software) for analysis. Thematic analysis of the interviews was carried out related to the aims of this paper, with a focus on perceptions of the restoration and relations, with and preferences for, local animals and plants.

Figure 1 The area under study

(Source: Nearmap)



Findings and discussion

Participants varied in regard to age, gender and cultural background, and years lived in Sunshine North (Table 2, n=23). The interview sample had approximately even representation of men (12) and women (11), with most participants older than 35 years of age. Cultural backgrounds were varied, with Australian, English or European origins dominant (Table 2). Ten participants had lived in the neighbourhood for 15 years or more, with six having resided near Upper Stony Creek for more than 40 years.

Findings are presented and discussed in three sections: the first presents findings related to general perceptions of the urban greening intervention and waterway restoration; the second covers residents' perceptions and preferences for native wildlife, and; the third section discusses some of the challenges for increasing biodiversity in urban areas. Residents' perceptions of pets and domestic animals are excluded in this paper, except where discussed in relation to interactions with native animals.

Table 1 Participants' demographic information

Code	Codename	Gender	Age	Cultural background	Years lived in the neighbourhood
1a	Alistair	Male	75 plus	Australian	47
1b	Belinda	Female	75 plus	Australian	47
2	Gordon	Male	35-44 years old	English	8
3	Alison	Female	25-34 years old	Mixed European	3
4	Melissa	Female	35-44 years old	Maltese/Australian	13

5	Greta	Female	35-44 years old	Australian/English	9
6	Christina	Female	45-54 years old	English	5
7a	Pam	Female	45-54 years old	English	12
7b	Tom	Male	45-54 years old	Australian/English	4
8	William	Male	65-74 Years old	Mixed European	60
9	Carol	Female	65-74 Years old	Maltese	54
10	Adrianna	Female	45-54 years old	English	23
11	Harmony	Female	55-64 years old	Mixed European	33
12	Scott	Male	45-54 years old	New Zealand	6
13	Calum	Male	35-44 years old	Maltese	5
14	James	Male	55-64 years old	English/Irish	1.5
15	Sebastian	Male	35-44 years old	Greek	44
16	Francis	Male	35-44 years old	Irish/Mauritian	15
17	Alex	Male	25-34 years old	European	NA
18	Michelle	Female	35-44 years old	Australian/German	30
19	Don	Male	55-64 years old	Croatian	1.5
20a	Amanda	Female	45-54 years old	English	17
20b	Fred	Male	45-54 years old	European/Croatian	54

Perceptions of the urban greening intervention and waterway restoration

Residents were generally in favour of the restoration which would increase the amount of greenspace in their immediate neighbourhood with most believing it would be beneficial (n=18).

We're very grateful for what's about to happen, and [it] feels like Christmas has come [laughs]. Yeah, I don't know why they chose us... Perhaps we were very needy ... of more green space, but I think it's a wonderful thing. (Scott)

The range of benefits referred to included improvements in walkability, the improvement of access to greenspace, improvements in the character of the area, ecosystem services, and better mental and physical health. A few participants mentioned the potential to improve biodiversity through attracting wildlife.

I reckon in five years, you know, when the trees get more established and the plants are a bit better, you'll get a bigger range of wildlife. (Fred)

Like Fred said, the native plants, the native animals [are] coming back. I think it'll just give the area a much more serene sort of almost countryside effect in the city. (Amanda)

In particular residents were looking forward to the provision of new parkland, believing it would be a destination to walk to, a place for relaxation and somewhere for children or grandchildren to play and explore. Some also commented that the restoration and improvements to the amenity of the local area will add value to their houses.

I think it's going to be a 100% plus ... It's going to transform the area. ... [at] the moment, there's not really a lot of green space. And I think as time goes on and we have more people living more squashed together... So, the greenspace becomes so important, because you need somewhere to go. And whether you're a family with little kids, or you're a teenager, or, you

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know, you may be a 50 plus lady, you still want somewhere where you can go for a walk or just do something different. (Adrianna)

Residents were asked to describe how they use the area pre-restoration. The most common activity described was dog walking with participants describing how they walk their dogs off leash or play 'catch' with them at the site.

I'll go for a walk with the dog by myself...and what that means is I can take the dog off the leash 'cause there's no one else around. The dog runs after the rabbits. She goes into the creek, I let her drink the water 'cause it's running. (Gordon)

Despite these positive responses to the improvement of greenspace and local area amenity, residents' perceptions of local biodiversity were mixed; in particular, concerns were raised about the potential of the wetlands to attract undesirable animal species. The next section discusses residents' perceptions of and preferences for local fauna and flora.

Perceptions of urban wildlife

In general, residents spoke favourably about animals and plants that were perceived as native compared to those that were introduced, particularly birds. As Harmony states 'I'm not happy about introduced species.' She comments further, 'there's a lot of pigeons around. Too many in my opinion. Don't like pigeons, they poo everywhere.'

Gordon, who trapped feral cats in the area, was unhappy about one of his neighbours feeding Indian Mynas and other introduced avian species:

There's a lady at the end of the street that's constantly putting bread crumbs and food on her nature strip to feed the bloody Indian Mynas. I drove past, [the sky] it's black. And I, I want to say to her all the time, "Can you just stop doing that?" Because there are thousands. And so I explained ... I said, "Mate, they're the rats of the sky." I said, "Those are worst birds ever." ... Magpies and the native birds and all that... they're all fine. (Gordon)

Indian Mynas seemed to be particularly disliked and were mentioned by others: 'I just hate those birds. ...they're very aggressive and territorial ... They're introduced, I wouldn't shed a tear if I ran one over' (Pam).

Part of the reason Harmony and other residents disliked pigeons and Indian Mynas is due to their perceived abundance. Non-native species were considered pests and to pose threats to native species. In general, residents spoke vehemently about the threat of introduced species in urban environments:

European trees and, and introduced species shouldn't be allowed. It shouldn't be allowed. It should be stipulated that you plant native trees because that's what's gonna bring Australia back. (Amanda)

Others described the negative impact of land clearing and vegetation loss, including the original de-vegetation and concreting of Upper Stony Creek: 'well, we've completely lost the migration of the cranes and the migration of the ibis. We've lost the creek how it used to be' (Fred).

Long-term residents were able to comment in detail about the changes they had observed in the area over time, including the arrival or return of some bird species they had not seen before.

We've slowly seeing ...a lot of our native birds coming back to this area. When I was a kid ... the main birds that was always around here was starlings and sparrows. You know, you wouldn't, you wouldn't get a wattle bird, you wouldn't get a honey-eater of any sort... And now my whole property, because I have Australian natives, it gets full of them now. ... This was never like this years' ago. Thirty years ago, 40 years ago there was never parrots in this area.

Yeah, native [species] are slowly coming back. Thanks to people like me that plant Australian natives. You plant the tree, they will come. (Amanda)

As Amanda explains, the arrival or return of some bird species was attributed to local residents planting native vegetation. Compared to introduced species, native ones were perceived as belonging in urban neighbourhoods and to have a right to habitat. The parrots Amanda refers to are Rainbow Lorikeets, not traditionally found in Victoria but over recent years they have colonised urban areas such as Melbourne due to the availability of food sources (Shukuroglou & McCarthy 2006; Low 2003). The changes in species distribution and abundance in urban areas are associated with human activity and modified habitats such that urban environments are said to comprise 'novel ecosystems' (Morse et al. 2014; Kowarik 2011) and to present an 'ecologically hybrid reality' (Trigger & Head 2010, p. 233).

Despite Pam disliking Indian Mynas with a passion, she spoke in a concerned manner about some nesting Blackbirds in her front yard:

Yeah, so we've got ... a little nest of Blackbirds, you know, as you walk in from the car. We hadn't noticed a nest until last week. And I'm pretty sure when I first saw it there were three little fledglings in there, one of which I've noticed is now dead on the on the driveway. ... There's another one that keeps on jumping out of the nest, and there are people in the area with cats who don't keep cats indoors ... So actually we got home last night and two cats were... hunting around that area where the nest is. So annoying. (Pam)

Pam's affection towards the Blackbirds, despite their introduced status, may be because they do not occur in large numbers or in communal groups like Indian Mynas. As they have more furtive behaviour, they are also less visible. The apparent contradiction in Pam's testimony highlights that narratives of native versus non-native do not represent how residents perceive, interact with and respond to urban wildlife in an everyday context. Further, although some introduced species negatively impact populations of native species, not all are harmful (Low 2003). In some cases, some introduced species have proved highly beneficial to native ones, for example the food sources provided by non-native flowering plants to bats and birds.

Similar complexity was found in residents' perceptions and responses towards native wildlife. Although there was an overall preference for native species, not all species were viewed favourably; 'I don't particularly like spiders or snakes, but they've all got their place' (Alison). In 16 of the 20 interviews, concerns about snakes were mentioned frequently. Some residents cited a number of snake species had been observed at the Creek including Tiger and Brown snakes. Long-term residents in particular worried about the increasing numbers of snakes that might occur with the waterway restoration.

To plant trees in a wildlife corridor environment I like, particularly from the birds point of view, but we are a little fearful of what it might do to the Tiger Snakes. Tiger Snakes are not territorial, they are vagabonds, they are gypsies, they are wanderers. And whether that [the restoration] will create an avenue [for them] and perhaps we create some of the problem we had. (Alistair)

I don't like the idea that snakes could come in [the house]. There are snakes everywhere, so you pretend you don't know that they're around... Guy down the street, his dog was bitten by a snake and died. (Tom)

Snakes will come, and I've got grandchildren. (Carol)

Despite concerns and declarations of fear for themselves and others, some residents were more accepting of snakes. A few had suggestions for how they might be able to live with snakes in the neighbourhood:

You'd probably get a lot of snakes and lizards. I wouldn't be out there trying to get rid of them because it's a part of this area, yeah? But on the paths ... Shouldn't be like a normal footpath. It

should be a little bit wider so if a snake or something ... is on the side, you're not going to step on top of it. Like you're a good little distance away from it. ... It's about safety, yeah? ... I mean, if a kid gets bitten by a snake, well, it'll probably change everything. Well, it's a part of Australia, it can happen. (Fred)

A pathway for the kids and [then you] don't have to worry too much about snakes and things like that because you can keep an eye out easier. (Adrianna)

I think we might see more snakes which I'm slightly scared of. But I'm thinking we'll buy some solar powered sort of snake vibrator machines and put them along our back fence. (Scott)

Notwithstanding both being reptiles, there were stark differences between how lizards were perceived compared to snakes. Blue Tongue lizards were regularly observed in the area, and were popular with residents:

We have a blue tongue lizard in our yard, a big one and a little one. (Belinda)

They're not pets. We find snails. You put them down there and sort of stand back and listen. [It's] crunch crunch crunch as they munch them up. They love snails. (Alistair)

Blue Tongue lizards were not only considered benign but provided a protective role against other species considered harmful:

We are of the belief that Blue Tongue lizards eat tiny snakes so that's a good sign. We've got a couple of Blue Tongues there to protect us. As well as snails, they eat mosquitoes and insects. (Alistair)

I don't mind the Blue Tongues because they keep the mice away. So they're very welcome under my house. (Fred)

Other complexities in residents' perceptions of native species arose in regard to where wildlife was located, with residents reportedly being content with most animals and insects being outside, at some distance from their property, but not in their backyard (aside from Blue Tongue lizards), or inside their house:

If I find a spider there [inside the house] I step on it, because I think that if I let it live, it can breed, and then I'm lying on the couch and I get bitten and kick the bucket. But whatever is 50 metres away from that or 20 metres away, I believe that's ... their environment. So if I see a spider on a footpath, I don't step on it. If there's a snake, I don't step on it. I feel that I have kind of invaded their own privacy then. (Scott)

The positive and negative responses described above, particularly in regard to the like of some species and fear of others, can be explained by notions of biophilia and biophobia.

Biophilia vs. biophobia

The Biophilia Hypothesis, or the human affiliation for nature or non-human species, was developed by Harvard biologist E. O. Wilson and others (Kellert & Wilson 1993; Wilson 1984). Biophilia asserts early humans had an evolutionary advantage in knowing about the natural world, contributing to survival (Kellert 1993). Advocates of biophilia argue humans continue to rely intellectually, emotionally, physically, and spiritually on affiliations with other species (Kellert & Wilson 1993; Suzuki 2007).

The fact that there may be a biophilic basis for the adaptive responses humans have for certain natural stimuli is used to explain both positive/approach (biophilic) responses and negative/avoidance (biophobic) responses people have to nature (Ulrich 1993). It is likely that a predisposition in early humans for biophilic or biophobic responses to certain natural elements and settings contributed to survival (genetic

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fitness) (Ulrich 1993). Examples include the virtually universal attraction humans have for the round faces and large eyes of infant animals, and the widespread fear of snakes and spiders (Kellert & Wilson 1993; Ulrich 1993).

However biophilia and biophobia are high level concepts that may capture general tendencies in the human population but they do not always translate on an everyday level in regard to how people experience other species in their homes or neighbourhoods. As shown above, some residents don't mind snakes and spiders, but just not inside their houses. Such concepts are therefore less useful when it comes to understanding how residents might interact with and respond to increasing biodiversity in their neighbourhoods.

The next section discusses how residents' perceptions of and responses to urban wildlife can present challenges to attempts to increase biodiversity in urban neighbourhoods.

Challenges for increasing urban biodiversity

There are a number of challenges in regard to increasing or maintaining biodiversity in urban areas. Drawing on the findings above this section focuses on residents' receptivity towards wildlife in cities.

At the outset, if residents are unaccepting or opposed to urban greening for biodiversity the success of such programs is thrown into doubt. Hence if cities are to be places where wildlife is welcomed, popular support is crucial. Projects perceived to be imposed from outside that do not take account of local interests and can cause resentment, resistance and are likely to fail (Lorimer et al. 2015). From the findings presented above, resident responses to urban wildlife — both native and non-native — are complex. How residents perceive wildlife in urban areas is also likely to be place-dependent, and involve entangled histories and past experiences, as the data from Upper Stony Creek demonstrate. This means that adequate consultation to understand resident experiences and perceptions is important prior to any intervention taking place. Residents of Upper Stony Creek communicated their dissatisfaction with the consultation process for the waterway restoration:

We had no opportunity to protest if we wished to and we felt that ... two of the original reasons, mosquitos and snakes, which [formed the basis for] a petition from the residents here had been long forgotten. (Alistair)

Although they were generally very positive towards the change, residents held real concerns about safety and wellbeing, largely due to the expectation of increasing numbers of snakes. Despite rhetoric and notions of biophilia, multispecies interactions are not always nice or pleasant. There are real possibilities of 'ecosystem disservices' from urban greening interventions (Lyytimäki et al. 2008) that may include allergies, asthma, bites and other unpleasant, unhealthy or disruptive encounters. There are also the possibilities for human-wildlife conflicts (Soulsbury & White 2015) as evident in Magpie attacks in most cities around Australia (Jones 2002).

As demonstrated in the findings, binaries of biophilia and biophobia, although useful in understanding human responses to other species at a population level, do not translate well onto residents' everyday experiences of wildlife in the city. In general, residents were supportive or at least largely accepting of having local wildlife nearby, even species they didn't like or were afraid of such as snakes, as long as there were provisions made (such as wide paths) and these animals were not in their backyards or inside their homes. As Scott says, 'Because even things that are harmful for a human being, they can be dangerous, I appreciate their importance. I don't go and kill a snake because it can kill me.' Biophilia and biophobia are also less useful in helping to explain residents dislike (or like) of introduced species. Instead, more nuanced ways of understanding urban human-wildlife interactions are needed. This means moving past binaries and generalised assumptions to understand everyday, localised connections and encounters with wildlife that draw on local knowledge and bio-histories of places. Findings from Upper Stony Creek show that residents were keen observers of changes in the populations, occurrence and abundance of local wildlife over time. Approaches that engage with residents to co-create knowledge

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could also inform the design and implementation of urban greening projects as well as improving residents' receptivity towards them.

Conclusions

As our cities grow and densify, and as urbanisation expands across the planet, further pressure will be placed on all species found in urban environments, including humans. Urban greening and restoration projects are becoming more prevalent with increasing evidence that cities are important for biodiversity. In Australia, the National Environmental Sciences Program and other government initiatives (such as the '20 Million Trees' Landcare program) have invested heavily to promote and understand biodiversity in cities, but social science perspectives on these issues has lagged behind. There is a general lack of research on how human residents of cities respond to urban greening interventions, particularly those that seek to increase biodiversity. This paper explored some of the social dimensions of urban greening for biodiversity through presentation of findings from a qualitative study of residents' responses to a waterway restoration and greening intervention in Melbourne's West. The aims of the intervention are to improve the health and wellbeing benefits of residents and encourage the return or establishment of native species. Data from interviews with residents living in close proximity to the Creek before the intervention show that while being generally supportive of increased greenspace and vegetation, perceptions of higher biodiversity of native animals were mixed. In general, while native birds and lizards were viewed neutrally or favourably by residents, there were fears about the return of snakes.

Although residents' responses could be considered as biophilic towards some animals (such as birds and lizards) and biophobic towards others, namely snakes, the paper argued such high level binary concepts are not sufficient to understand the complex relationships urban human residents have with plants and animals in cities. Instead more nuanced approaches that draw on everyday encounters and interactions are needed. These would involve localised and historicised approaches that identify any potential issues or concerns and provide insights into areas of possible conflict or 'backlash.' Such approaches would also enable local knowledge to inform the design and implementation of urban greening projects.

There remains a need to understand better the potential so-called 'ecosystem disservices' and conflicts that might arise from urban greening. This involves accepting that any intervention will be experimental and may have unpredictable or unfavourable outcomes. But such experimentation will also help build detailed knowledge of how multi-species encounters impact on human health and wellbeing and the lives of other urban species. In conclusion greater understanding of residents' diverse relationships with urban wildlife is needed if cities are to be transformed into shared habitats.

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