BACKYARD BIODIVERSITY:

COMMUNITY AND WILDLIFE GARDENER ATTITUDES AND PRACTICES

AMY E. SHAW

Backyard Biodiversity:

Community and wildlife gardener attitudes and practices

by

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Submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

Deakin University January, 2014



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DEDICATION

I dedicate this work to my children. For Evie, who pretends to be the Lorax and shouts 'I am the Lorax. I speak for the trees!' For Loddy, who squeals with unparalleled delight at the sight of any animal. I hope this work will help un-pave the way to a greener future for you both.

ABSTRACT

The greatest threat to global biodiversity is the actions of humans, and one of the biggest contributors to biodiversity loss is urbanisation. This thesis is concerned with how members of the community and wildlife gardeners view nature in the backyard, and their attitude toward wildlife in urban areas. In doing this, this thesis examines the role that wildlife gardening, defined as any actions undertaken in gardens to encourage and provide habitat for wildlife, may be able to play in improving biodiversity in urban areas.

A mixed methods approach was employed, incorporating postal and online questionnaires and face-to-face interviews. A total of 5536 questionnaires were distributed to members of the general public, with a total of 704 useable questionnaires returned. In addition, 2199 wildlife gardeners were sent links to an online questionnaire by their wildlife gardening program, which resulted in 261 useable questionnaires returned. Face-to-face interviews were held with 10 wildlife gardening program members. In total 965 participants provided information analysed in this thesis.

The study found that members of the general community are supportive of planting native vegetation in their gardens and are generally in favour of having wildlife in the suburbs and in their backyards. The sense of connection to nature that both the general community and wildlife gardeners feel was examined and it was found that having a sense of connection to nature was not essential to being involved in wildlife gardening. Also, the degree of connection to nature varied across the general community and wildlife gardeners and almost a quarter of current wildlife gardeners felt less of a connectedness to nature than the average member of the general community. Based on these results this study suggests that there is scope among the wider community to increase the use of native or indigenous vegetation and encourage wildlife in yards. Despite this potential, this research shows that wildlife gardening programs are currently not succeeding in recruiting unengaged individuals in large numbers, and their membership predominately consists of people who were planning to create wildlife gardens of their own accord.

Self-reports from those currently involved in wildlife gardening programs suggest that their actions can succeed in attracting native wildlife to yards. It was found that the use of native and indigenous plants is more likely to result in participants reporting they had attracted wildlife. Features offered by programs, such as newsletters and native plant giveaways, were analysed to see if they had an influence on the reported attraction of wildlife, as well as the recruitment of previously unengaged individuals. No program features were found to impact upon the likelihood of wildlife being reportedly attracted, however some features were found to positively impact upon the recruitment of previously unengaged members. These features were site assessments and the provision of native or indigenous plants. Despite these features being shown to increase the recruitment of previously unengaged individuals, such individuals still represent a very small proportion of total program members. The study identifies a series of barriers, benefits, and community involvement strategies that may be useful in marketing wildlife gardening to the broader community and overcoming the current lack of previously unengaged individuals.

This study concludes that there is community support for the use of native vegetation being planted in gardens, as well as support for sharing the urban environment with wildlife. However, in their current form, wildlife gardening programs are not succeeding in attracting the broader community to the cause; therefore they are not reaching their full potential as tools to significantly enhance local biodiversity. Despite this, the results do suggest that there is the potential for programs to engage the broader community in wildlife gardening activities, and this study provides recommendations that those working in the field of urban conservation could implement to hopefully enhance the benefits to local biodiversity.

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CHAPTER 1 INTRODUCTION

1.1 BACKGROUND

We live in a rapidly urbanising world where approximately 50% of the global population currently lives in urban landscapes. For industrialised countries the figure is higher, for example the USA has 82.4%, Australia has 89.2%, and the United Kingdom has 79.6% of their respective populations residing in urban areas (United Nations, 2012).

Research indicates that despite the long held view that urban areas have low biodiversity, they can in fact contain relatively high levels of biodiversity (Alvey, 2006; Gilbert, 1989; Luck, 2004, 2008; Luck et al., 2004; Öckinger et al., 2009, Ricketts & Imhoff, 2003). This is likely due to the fact that humans tend to develop cities in fertile areas to which native wildlife are also attracted (Luck, 2008; Ricketts & Imhoff, 2003). Despite evidence that urban areas can be home to relatively high levels of biodiversity, it is well known and accepted that urbanisation affects biodiversity by fragmenting and reducing native vegetation, typically resulting in dramatic losses of indigenous species (Collinge, 1996). Dramatic losses of biodiversity have already occurred worldwide (Alvey, 2006) and estimations suggest that possibly half or more of all current species could be at risk of extinction in the near future (Myers, 1996; Sax & Gaines, 2003). Efforts to conserve ecosystems are generally aimed at either large bio-diverse and relatively untouched areas or at individual animal or plant species that are endangered or threatened with extinction (Chiesura, 2004). This type of conservation is generally not feasible in urbanised locations where little wildlife habitat remains, and very little attention has been given to conserving nature in urban and suburban areas (Chiesura, 2004). However due to urbanisation, a large proportion of a city's vegetative cover is actually comprised of 'urban forests', which include all the vegetation present in urban woodlands, along streets, in vacant blocks, as well as in public and private parks and gardens (Konijnendijk & Randrup, 2002).

Domestic gardens make up a significant proportion of urban forests (Loram, Tratalos, Warren, & Gaston, 2007). Estimates of the area covered by gardens differ among cities, but have been reported to be as high as 47% in Leicester, England (Loram et al. 2007), 36% in Dunedin, New Zealand (Mathieu, Freeman, & Jagannath, 2007), 35% in Edinburgh, Scotland (Loram et al. 2007), and as low as 16% in Stockholm, Sweden (Colding, Lundberg, & Folke, 2006). Due to their generally vast distribution, domestic gardens are seen as essential to developing wildlife corridor connectivity in urban areas (Doody, Sullivan, Meurk, Stewart, & Perkins, 2010; Parker, Head, Chisholm, & Feneley, 2008; Rudd, Vala, & Schaefer, 2002). The way in which gardens are managed can have a large influence on urban biodiversity (Goddard et al., 2013) and therefore the practice of wildlife gardening in private gardens has been put forward as a tool for enhancing the connectivity and viability of wildlife corridors (Rudd et al., 2002). Although most domestic gardens are not large enough to support viable populations of most species, even small gardens can be beneficial in fragmented urban areas as they provide habitat links to create a valuable habitat network (Rudd et al., 2002; Smith, Gaston, Warren, & Thompson, 2005).

Wildlife gardening involves any action undertaken to increase an area's suitability for wildlife (Davies et al., 2009). Such actions can include planting native/indigenous vegetation and providing a water source, among others. Goddard et al. (2010) put forward that there are two main ways that the community can be encouraged to undertake wildlife gardening: top-down approaches (for example regulation or financial incentives) or bottom-up approaches (for example community initiatives). Whilst top-down approaches can lead to pro-environmental actions, such strategies are usually not successful in altering a person's values and attitudes (Maiteny, 2002). Wildlife gardening programs, which are voluntary programs that members of the community can join to help them in their efforts to increase native biodiversity, are a bottom-up approach.

Across the globe, numerous programs aim to encourage people to become involved in wildlife gardening, some examples include, from Australia: Gardens for Wildlife (Knox City Council, 2013) and Backyards for Wildlife (Department for Environment and Heritage, 2012), from the USA: Certified Wildlife Habitat (National Wildlife Federation, 2013) and from the UK: Wild about Gardens (The Royal Horticultural Society & The Wildlife Trusts, 2011). However, is the community

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interested in undertaking wildlife gardening and do they want more biodiverse residential areas? This study attempts to answer these questions, while also investigating how well current wildlife gardening programs are engaging with the community to bring about potential net increases to biodiversity in their local area. Before delving into these questions, a review of the potential contribution that wildlife gardening can make to biodiversity is required to provide evidence that this strategy should be considered in urban vegetation and wildlife renewal initiatives.

1.1.1 POTENTIAL CONTRIBUTION TO HABITAT LOSS

The available evidence suggests that private gardens can play a significant role in supporting wildlife populations through the provision of food sources and habitat (Baker, Ansell, Dodds, Webber, & Harris, 2003; Bland, Tully, & Greenwood, 2004: Daniels & Kirkpatrick, 2006b; Davies et al., 2009; Dickman & Doncaster, 1987; Doody et al., 2010; Goddard, Dougill, & Benton, 2013; Rudd et al., 2002; Saville, 1997; Vickery, 1995). Subsequently they are seen as essential to developing wildlife corridor connectivity in urban areas (Rudd et al., 2002), and hence contribute to overall biodiversity conservation. Furthermore, wildlife gardening in particular can create backyards that provide valuable food and habitat sources for a range of urban species (Thompson, Greenwood, & Greenaway, 1993; Chamberlain, Cannon, & Toms 2004; Goddard et al., 2013; French, Major, & Hely 2005).

Large urban green spaces such as parks can help sustain urban wildlife populations as they tend to support high levels of biodiversity and can provide important habitat for a range of species (Rudd et al., 2002). However, preserving isolated urban green space may be of limited biodiversity benefit, as without connections between them, dispersal and gene flow is restricted (Hobbs, Saunders, & Hussey, 1990). Wildlife gardening has the potential to provide this connectivity as domestic gardens comprise a geographically widespread proportion of urbanised areas (Loram et al., 2007). Given that the world is becoming increasingly urbanised, with approximately 50% of the world's population currently living in urban landscapes (United Nations, 2012), the percentage of vegetative cover attributed to private gardens, and their value will increase (Daniels & Kirkpatrick, 2006a). However, the current planning trend in Australia (and other western nations) is that of urban consolidation, which is resulting in minimal yard space in new residential developments (Hall, 2007), which may limit the extent to which private gardens can fulfil this role in the future. Urban consolidation does however result in less land being developed and therefore is of benefit to biodiversity outside urban areas. The topic of urban consolidation is discussed in Chapter 3 in more detail.

1.1.2 THE VALUE OF NATIVE VEGETATION

Across the developed world, non-native ornamental plant species have come to dominate domestic gardens and the urban/suburban landscape due to their popularity amongst homeowners and landscapers (Burghardt, Tallamy, & Shriver, 2009). For example, approximately 70% of vegetation in UK gardens is not native (Loram, Thompson, Warren, & Gaston, 2008). This is concerning as indigenous, or native vegetation, has numerous benefits to ecosystems and is thought to better support native wildlife (Barrett, 2000; Burghardt et al., 2009; White, Antos, Fitzsimons, & Palmer, 2005). French et al. (2005) support this in their finding that Australian suburban nectarivorous birds prefer to forage in native plant species compared to the exotic species, and that the native species were a more valuable food source. White et al. (2005) studied differences in urban bird assemblages in Melbourne, Australia and found there to be lower bird species richness and abundance in streetscapes characterised by exotic vegetation. The authors explain that urban environments dominated by non-native vegetation are able to support simplified bird communities consisting largely of non-native species but that environments dominated by structurally diverse native vegetation are able to support more complex bird communities consisting largely of native species. They concluded that 'the implementation of effective strategies and incentives that encourage the planting of native vegetation in streetscapes and gardens should be paramount' (White et al., 2005, p. 133).

Other studies have also shown that the volume and species diversity of native vegetation positively influence the species richness of native bird species in Australia (Daniels & Kirkpatrick, 2006b; Munyenyembe, Harris, Hone, & Nix, 1989 White et al., 2005) and North America (Sears & Anderson, 1991).

There is concern regarding the effect of non-native vegetation on insect herbivores (Tallamy, 2004). Evidence suggests that up to 90% of all insect herbivores rely on plant species that they have adapted to in order to reproduce successfully (Bernays & Graham, 1988). A study in New Zealand found that the percentage of native insect species was positively correlated with the percentages of native plant species present (Crisp, Dickinson, & Gibbs, 1998) and it has been shown that indigenous eucalypt trees support a greater arthropod biomass compared to non-indigenous eucalypts and non-native tree species (Bhullar & Majer, 2000). It has been suggested that because non-native plants may be unable to support the same diversity and biomass of herbivorous insects as indigenous or native plants can, there may be conservation implications for insectivorous species such as certain birds (Burghardt et al., 2009). However, not all studies support these findings. For example, Matteson and Langellotto (2010) evaluated the effect of the addition of 70 native wildflowers (from 7 different species) on the species richness of insects over two years in New York City community gardens. The addition of the plants was not found to strongly influence the species richness of insects (Matteson & Langellotto, 2010).

Even if native vegetation is not essential to support wildlife populations in urban areas, there are other reasons that support the use of native plants. Non-native species can contribute to the spread of invasive weed species into remnant bushland, and a major cause of invasive weeds spreading to remnant vegetation is through domestic gardens (Smith & Smith, 2010). The impact of weed species on native vegetation and wildlife is often detrimental, as noted in the case of *Mimosa Pigra*, a legume species from South America, in the Australian tropics (Braithwaite, Lonsdale, & Estbergs, 1989).

Wildlife gardening generally utilises native/indigenous plants, so has the potential to help in the areas identified here.

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1.1.3 NATURE DISCONNECT

An often underestimated effect of urbanisation is that it reduces our ability to connect with nature in our daily lives .In addition to reduction in vegetation associated with urbanisation, current urbanisation trends mean that for many people, private gardens and public open spaces provide the main opportunity for contact with nature (Head, Muir, & Hampel, 2003; Kinzig, Warren, Martin, Hope, & Katti, 2005). This puts us at risk of developing a nature-disconnect, which has been hypothesised to greatly impact upon our empathy for other species and our willingness to help with conservation efforts outside urban areas (Dunn, Gavin, Sanchez, & Solomon, 2006; Luck, 2008; Rohde & Kendle, 1997). Given that we live in a rapidly urbanising world (United Nations, 2012), nature-disconnect is a potentially significant threat as it could lead to less support for wildlife conservation in the future, putting more species at risk. Wildlife gardening by its nature increases people's access to natural environments, so therefore it has the potential to address the risk of nature-disconnect.

1.1.4 WILDLIFE GARDENING AS AN EDUCATION TOOL

Environmental Education has the potential to change environmental values and behaviours within the community. Numerous studies (Barnett et al., 2006; Caro, Pelkey, & Grigione, 1994; Dettmann-Easler & Pease, 1999; Jaus, 1984; Kruse & Card, 2004; McMillan, 2003; Theimer & Ernst, 2012) have indicated that it can be effective in changing the values, beliefs, or attitudes of participants. However, a change in attitude is not enough because the goals of conservation can only be achieved through action, which requires a behavioural change (Baldwin, 1995; Day, 2002). Whilst some studies have indicated that Environmental Education can increase environmentally responsible behaviour (Ramsey, 1993; Zelezny, 1999), some authors have noted that there is a lack of empirical evidence of resulting behavioural change (Gralton, Sinclair, & Purnell, 2004; Vaughan, Gack, Solorazano, & Ray, 2003). In particular, long term studies investigating changes in environmental behaviour are scarce (Gralton et al., 2004).

Wildlife gardening programs are a form of community environmental education. The effectiveness of programs targeted at the community has been called into question; as such programs will often only attract members of the community who already have an interest in the program's objectives (Davies & Webber, 2004). In such cases, those who would be considered the target audience do not receive the education and there is little hope of the program making any progress towards broader objectives. This is a concern with wildlife gardening programs. If programs are only attracting individuals who are interested in biodiversity issues and are already keen to create wildlife gardens, there should be concerns over the program's ability to add any net benefit to local biodiversity. This is an issue if individuals have already undertaken wildlife gardening before joining the program, or were planning to create a wildlife garden regardless of if they joined a program. If this situation is widespread in wildlife gardening programs, then the ability of programs to contribute to urban wildlife renewal will be weakened. This does not mean to say the wildlife gardening in itself is not contributing positively to urban biodiversity, as research suggests that it does, it merely means that there is a question mark over whether **programs** have the ability to contribute on a large-scale. However, if programs are making members more effective in creating wildlife gardens and are influencing non-members to change gardening practices through social diffusion; then even without recruiting previously unengaged members, programs can still be contributing to wildlife renewal.

1.2 RESEARCH NEEDS AND AIMS

Research suggests that improving biodiversity in urban environments is beneficial for wildlife and can positively benefit human well-being, however limited scientific attention has been paid to conserving nature close to where people live and work, and sustainability strategies tend to focus on the built components of the urban environment (Chiesura, 2004). If we are interested in conserving urban biodiversity and strengthening the human connection with nature, there seems to be a need to design our urban areas as habitats and environments that embrace biodiversity. To do this we need to understand current community attitudes toward native urban biodiversity and their underlying needs and wants. This study attempts to do this.

Attitudes toward, and motivations for gardening in general are well documented and studies show that gardens are significant places for interacting with nature (Bhatti & Church, 2004; Clayton, 2007; Gross & Lane, 2007; Power, 2005). However attitudes toward native plant use in gardens are limited and have not been widely studied (for exceptions see Goddard et al., 2013; Kiesling & Manning, 2010; New South Wales National Parks and Wildlife Service, 2002; Zagorski et al., 2004). Understanding attitudes towards native vegetation is important if we are to encourage wildlife gardening, as wildlife gardening will generally involve the use of native or indigenous plants.

By developing and disseminating frameworks featuring case studies and examples on successful learning-based strategies and community engagement processes, researchers can help community educators to engage people in sustainability issues (Tilbury & Wortman, 2008). There are numerous formal wildlife gardening community education initiatives and programs in existence across the globe. Considering wildlife gardening programs as a community engagement process, there is a need for research to assess how effectively such programs actually engage the community, and whether or not they only attract the interested or proactive members of the community.

The aims of this study are:

- To investigate attitudes toward nature in the backyard and willingness to plant native vegetation and share the urban area with native wildlife
- To assess the viability of encouraging wildlife gardening within the community
- To identify barriers and benefits that can be used to promote wildlife gardening
- To understand how programs are currently faring in regards to recruiting previously unengaged participants, and if they are potentially resulting in larger scale biodiversity benefits

This study has theoretical and practical significance. It further develops theory explaining community member attitudes toward native urban biodiversity. In particular, the study expands the knowledge of the community's underlying needs and wants, as well providing insights into what drives individuals to embrace nature, for example how important are personal experiences, education, and external incentives? This study will have practical significance as it will provide insights into the viability of encouraging wildlife gardening in urban areas. In conjunction with this, strategies (e.g., educational, incentive driven) for increasing the willingness of the community members to plant wildlife gardens and native vegetation in public open spaces are developed.



CHAPTER 2 RESEARCH DESIGN

2.1 SCOPING PHASE

The scope of this study was modified over time, and examining the potential for using wildlife gardening as a tool to engage the public with improving urban biodiversity was not initially planned. The original intention for this research was to address the questions: What are the current attitudes of members of the Victorian community toward native suburban gardens and native suburban wildlife and why are these attitudes held?

It was initially decided that people's attitudes toward, and use of Public Open Space (this term is used in Australian urban planning however it is commonly termed 'urban green space' in international literature (Grose, 2009)) should also be investigated. It was thought that this would place the study in a broader context and also ensure the results had greater scope to influence future urban planning initiatives. The broad aim at this stage was defined as 'investigating community attitudes toward native urban biodiversity and their willingness to adopt native suburban gardens and embrace native suburban wildlife'; and two main research questions were identified:

- What are the attitudes of community members toward suburban gardens and public open spaces?
- Are members of the community interested in planting native vegetation and embracing native suburban wildlife?

A questionnaire targeting the general public was designed for this phase of the project (see section 2.4.1). Analysis of this survey, revealed some interesting (although limited) findings in relation to the public's views on urbanisation and the provision of public open space, and these are discussed in Chapter 3. However, the data also showed that there was strong support for the use of native vegetation and that people were interested in having gardens that attracted native wildlife. During the data analysis phase for these surveys, I presented at an international conference titled *Healthy Parks, Healthy People.* At this conference the theme of wildlife gardening was addressed. Coupling my results, which pointed to support for native vegetation and wildlife in suburban areas, with discussions arising at the conference I decided to begin a new, and more targeted phase of the study.

The theme of public open space was dropped and the broad aim of the study was re-defined as examining community attitudes and behaviours toward native urban biodiversity in their yards and community willingness to participate in wildlife gardening. Research questions developed for Phase 2 of the study included:

 Is there potential to attract unengaged members of the public to become involved in wildlife gardening programs?

- Do wildlife gardening programs succeed in educating participants, and recruiting unengaged members of the community? What program features influence this success?
- What are the barriers and benefits for members of the community in having native suburban gardens and encouraging native suburban wildlife in their yards?
- What has influenced those participating in wildlife gardening programs to do so?
- Do participants in wildlife gardening programs believe that their gardening efforts have resulted in attracting native wildlife, and what factors influence and contribute to this perceived success?

The remainder of this chapter will discuss the identification of samples, method selection, questionnaire content, and data analysis for both Phase 1 and Phase 2 of the study.

2.2 IDENTIFYING SAMPLES

2.2.1 PHASE 1 - SCOPING

This *Phase 1* research questions were:

• What are the attitudes of community members toward suburban gardens and public open spaces how do these influence their gardening practices?

 What do members of the community see as the barriers and benefits to having native suburban gardens and public open spaces and encouraging native suburban wildlife?

In order to assess community member's views on yards and open spaces it was deemed necessary to consult the public. In social research one must choose a sample to represent the population that is of interest. In this case the population of interest was people living in urban/suburban areas of developed countries. The decision was made to use a sample of people living in the metropolitan region of the city of Melbourne in Australia. The Melbourne metropolitan region has a population of approximately 4.1 million and covers an area of 7694 square kilometres (City of Melbourne, 2014). It encompasses the City of Melbourne itself, as well as 31 other local government councils (State Government of Victoria, 2013).

Melbourne was chosen for a number of reasons. Like many industrialised countries (for example, New Zealand, The United States of America, and The United Kingdom) Australia is a highly urbanised country, with 89.2% of its 22,785,500 residents (Australian Bureau of Statistics, 2013) currently residing in urban areas (United Nations, 2012), therefore the topic of urban biodiversity conservation is important in this context. The future form the Australian urban environment will take is currently very controversial, with many residents unhappy with urban consolidation practices that are reducing yard space and vegetation in urban areas (Ruming, Houston, & Amati, 2012). Therefore, understanding how members of the community feel about biodiversity in urban areas can help to shape future planning decisions. In addition, introduced plant species in Australia (generally referred to as non-native plants throughout this thesis) are a major problem, with 2700 introduced plants having established populations, and sixty-eight per cent of these considered to be causing problems for natural ecosystems (Department of Foreign Affairs and Trade, 2013).

Whilst this research was undertaken in Australia, wildlife gardening is an initiative that is being encouraged by a variety of organisations across the globe. For example from the USA: Certified Wildlife Habitat (National Wildlife Federation, 2013) and from the UK: Wild about Gardens (The Royal Horticultural Society & The Wildlife Trusts, 2011). Importantly, many of the reasons for planting native gardens can also be applied in other countries, for example selecting native plants in the USA will also help to reduce water use (United States Environmental Protection Agency, 2013b). Given this, the results will be largely applicable to practitioners no matter their location, however cultural differences should be considered if applicable (Manfredo & Dayer 2004).

The metropolitan region of Melbourne, in the state of Victoria, was chosen as the state of Victoria is the most densely populated, and most cleared state in Australia, with half of the land area already cleared (Commissioner for Environmental Sustainability, 2008). Given that Victoria is continuing to lose native vegetation at a rate of about 4,000 hectares every year (Commissioner for Environmental Sustainability, 2008) and the high level of urbanisation in the state, urban nature conservation in Victoria is of great importance. In Victoria, 157 species of native animals and 778 native plant species are either rare or threatened with extinction. Extinctions have already taken place, with 24 native animal and 51 native plant species having become extinct

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since European settlement (Commissioner for Environmental Sustainability, 2008). A great threat to biodiversity in Victoria is the prevalence of weed species. Weeds have invaded most of the native bush land remaining in the capital city Melbourne, and the main source of these weeds is introduced species from private gardens (Commissioner for Environmental Sustainability, 2008; Smith & Smith, 2010). For these reasons, the metropolitan area of Melbourne was chosen as the sample site for the general public. This sample will be termed the *Public Scoping* sample for the remainder of this thesis.

2.2.2 PHASE 2 - NATURE IN THE BACKYARD

The research questions for *Phase 2* of the study were:

- Is there potential to attract unengaged members of the public to become involved in wildlife gardening programs?
- 2. Do wildlife gardening programs succeed in educating participants, and recruiting unengaged members of the community? What program features influence this success?
- 3. What are the barriers and benefits for community members in having native suburban gardens and encouraging native suburban wildlife in their yards?
- 4. What has influenced those participating in wildlife gardening programs to do so?
- 5. Do participants in wildlife gardening programs believe that their gardening efforts have resulted in attracting native wildlife, and what factors influence and contribute to this perceived success?

Based on these research questions, two samples were required. A sample of the general public to contribute to research questions 1 and 3, and a sample of wildlife gardeners to contribute to questions 1, 2, 4 and 5.

Wildlife gardening programs are being used as a tool to combat declining biodiversity in urban areas across the developed world. However, for the purposes of this study, a selection of wildlife gardening programs was required. Programs based in Australia were chosen for the same reasons identified for the *Scoping Phase* (Section 2.2.1). However, unlike in the *Scoping Phase*, the sample of wildlife gardeners was not confined to metropolitan Melbourne. This was due to the lack of wildlife gardening programs running in Melbourne, so programs across the whole of Australia were included in order to obtain a large sample size. This sample is termed the *Wildlife Gardener* sample for the remainder of this thesis.

For the general public, individuals residing in the metropolitan region of the city of Melbourne, in the state of Victoria were chosen. Again, this location was chosen for the same reasons identified in Section 2.2.1, and to allow data from identical questions to be combined. This sample is referred to as the *General Public* sample for the remainder of this thesis.

2.3 METHOD SELECTION

In choosing the most appropriate methods for any study, one must first consider the advantages and disadvantages of each method, within the context of the study's research questions. This study's research questions all center around human attitudes, which fall under the banner of social research. Survey research is commonly used in social research, with either questionnaires or interviews utilised for this purpose (Trochim, 2006).

It was determined that the research would take a mixed methods approach for acquiring data to adequately meet the aims of the project. Based on the analysis of the advantages and disadvantages of the main data collection methods used in social research, a combination of self-administered postal and internet questionnaires, along with face-to-face interviews were chosen to answer the research questions. The following sections discuss the reasons behind these choices.

2.3.1 SELF-ADMINISTERED POSTAL QUESTIONNAIRES

Self-administered postal questionnaires were selected as a data collecting mechanism for the *Public Scoping* sample and *General Public* sample. Such questionnaires are a widely used survey method and involve asking people questions in a written questionnaire which is mailed to them (Neuman, 2000). This method was chosen as it allows the researcher to ask many people a lot of questions in a short timeframe, and gives the researcher a snapshot of how people think, feel, or act in relation to a particular topic (Neuman, 2000). The technique usually involves selecting a smaller group from the population of interest and then extrapolating the results to reflect the population at large (Neuman, 2000). There are a number of advantages to using self-administered postal questionnaires, including:

- The method is less expensive than conducting interviews (Trochim, 2006).
- They can be widely distributed, therefore reaching a larger sample size (Trochim, 2006).
- Anonymity can be assured, which is useful as participants are more likely to provide honest answers (Czaja & Blair, 1996).

There are also a number of disadvantages to using self-administered postal questionnaires, including:

- They lack the personal interaction of an interview (Neuman, 2000).
- There is no control over the order that questions are completed, who completes the questionnaire, and questions cannot be modified or added to (Robson, 2002; Czaja & Blair, 1996).
- Questions can be skipped, or respondents can misunderstand particular questions. For this reason, the questionnaire should utilise simple language and clear instructions and the length should be kept to a minimum (less than 12 pages) (Robson, 2002; Czaja & Blair, 1996).
- They can be affected by bias. For example, certain groups of people may be less willing to respond than others. For example, non-English speaking people may be reluctant or unable to respond. Another source of bias may be that people who have more spare time (e.g., retirees) or have a particular interest in the topic may be more willing to respond (Dillman, 2007). These situations can result in a sample that is not representative of the population from which it was drawn.

• Non-respondent bias can be an issue due to low response rates.

To answer the research questions for the *Public Scoping* sample and *General Public* sample, a research method that allowed for the selected sample to be generalised to the population from which it was drawn was required. The postal questionnaire method was chosen, as, due to its low cost and ability to reach a wide distribution it can reach a large number of people. Sample size was the main consideration in choosing this technique, as the more people that provide their opinions and experiences, the greater the accuracy when generalising from the sample to the population. In addition, questionnaires were chosen over face-to-face or telephone interviews as the *Public Scoping* and *General Public* samples aimed to explore the personal attitudes toward gardens held by people in metropolitan Melbourne, including attitudes that may be considered by some to be less acceptable than others. The more anonymous a respondent could be, the more likely they would provide honest answers.

2.3.2 SELF-ADMINISTERED ONLINE QUESTIONNAIRES

Self-administered online questionnaires were selected as a means of data collection for the *Wildlife Gardener* sample and as an additional collection method for the *General Public* sample. Questionnaire research has traditionally relied on paper based surveying methods as a means of obtaining data, however internet based questionnaires are being increasingly used. Online surveys can either utilise an online invitation (e.g., a link in an email or on a website), or a paper invitation (e.g., a letter in the post directing the receiver to an internet address to complete the survey). Whilst self-administered online questionnaires afford the researcher similar advantages and disadvantages as their postal counterparts, there are a few differences.

An advantage of internet questionnaires over postal is that the overall costs associated with administering internet based questionnaires are generally lower than those for paper (Sax, Gilmartin, & Bryant, 2003). For example, in comparison to paper questionnaires, costs have been found to be: 24% of the cost (McDonald & Adam 2003), 45% of the cost (Jones & Pitt 1999), one-third the cost (Akl, Maroun, Klocke, Montori, & Schunemann, 2005), and 73% of the cost (Raziano, Jayadevappa, Valenzula, Weiner, & Lavizzo-Mourey, 2001).

A disadvantage of internet questionnaires over postal is that they have traditionally been subject to lower response rates compared to paper surveys (Bech & Kristensen, 2009). Bech and Kristensen, examined postal and internet survey response rates among older respondents in Denmark and found that the postal questionnaires resulted in a higher response rate (42%) than internet-based questionnaires (17%). The authors suggest that the lower response rate may have been influenced by the mode of invitation, which was via a letter. They suggest that the act of switching modes from paper to the internet was an extra step that resulted in decreased participation (Bech & Kristensen, 2009).

Research questions for the *Wildlife Gardening* sample required that the samples selected could be used to generalise to the populations from which they were drawn.

To allow for generalisations to be made, the online questionnaire (with an online invitation) method was selected. This method was chosen over postal questionnaires for a number of reasons:

- For privacy reasons it was preferable that the researcher did not have access to wildlife gardening program member's personal details. By having program organisers send out a link this avoided any potential privacy issues commonly raised by ethics committees.
- The programs primary contact with their members is via email, and so reaching potential participants this way was preferred as members are used to receiving this type of communication from their programs.

Both postal and online questionnaires were chosen for the *General Public* sample in an attempt to maximise the response rate and also investigate how differing the distribution method would affect the response rate. The steadily declining response rates for survey research around the globe (Neuman, 2000), as well as declining response rates achieved in previous personal experiences with postal survey research led to the use of a number of techniques with the aim of seeing which would yield the highest response rate.

2.3.3 FACE-TO-FACE INTERVIEWS

In a face-to-face interview, the interviewer and the interviewee are together at the same location (Trochim, 2006). Face-to-face interviews can add a personal touch

which is missing from postal questionnaires, and through the use of visual cues and conversation, can often bring about a range of responses that may have been missed by a questionnaire (Bryman, 2008).

Face-to-face interviews can either be fully-structured, semi-structured, or unstructured (Robson, 2002). In a fully structured interview, the interviewer follows a set of questions and records the interviewee's responses to each question. In a semistructured interview the interviewer uses a set of questions, but still allows for flexibility throughout the interview (for example, to expand on particular questions or change the order of the questions). In an unstructured interview the interviewer develops a conversation within the general area of interest (Robson, 2002). The advantages of face-to-face interviews include (Czaja & Blair, 1996):

- The flexibility afforded by both semi-structured and unstructured interviews allows for the possibility of probing for additional information to fully explore the thoughts of the interviewee.
- The technique generally achieves high response rates.
- The rate of completion is generally the same for all types of respondents, therefore response bias is low.
- Visual aids can be used by the interviewer to explain questions to the interviewee.

The disadvantages of face-to-face interviews include:

• Whilst the flexibility afforded by both semi-structured and unstructured interviews can be viewed as a positive, the same flexibility can also be classed

as a negative. This is because biases can be difficult to rule out and there is the potential for lack of standardisation (Robson, 2002).

- The technique is more expensive than questionnaires or telephone interviews.
 This is due to travel costs and the relatively large amount of time required for data collection (Robson, 2002; Czaja & Blair, 1996).
- Interviewees may respond in what they believe to be the socially desirable manner (Czaja & Blair, 1996).

Whilst research for the *Wildlife Gardening* sample required samples that could be generalised to the populations from which they were drawn, the research method needed to be flexible and conducive to exploratory work. Therefore semi-structured face-to-face interviews were also used. Such interviews would allow for the influences that drove people to participate in wildlife gardening programs to be explored and deeper insights gained. This is because semi-structured face-to-face interviews yield more detailed responses due to the ability of the researcher to modify the line of enquiry, change the order of questions, and seek elaboration on interesting responses. It was determined that the interviews should be face-to-face as opposed to telephone interviews, as it was decided that the interviews should occur on site at wildlife gardeners' homes, so that the garden itself could be referred to and used in the interview if appropriate.

2.4 QUESTIONNAIRE DEVELOPMENT AND CONTENT

2.4.1 PUBLIC SCOPING SAMPLE QUESTIONNAIRE CONTENT

The *Public Scoping* sample questionnaire (Appendix 1) was developed in late 2009 and was approved by the Deakin University Ethics Committee (Ref. No. 2010-155) on 27.10.09. The questionnaire consisted of the following sections:

SECTION A – Your front and backyards

This section sought information about the human-made and vegetative composition of the respondent's yards, the use of the respondent's yard and the respondent's preferred type of yard. This type of information was desired as it can be used to test whether there is a relationship between these factors and attitude toward urban biodiversity in yards and open spaces. For example, is there a relationship between having a backyard consisting of mostly non native plants and a dislike of wildlife in the suburbs? Examples of questions that were designed for this are:

- Please tick the response that best matches your **front yard**. (Multiple choice)
- Do you have any of the following in your **front and/or backyard**? Tick all that apply. (*List of both man-made and natural objects*)
- Please tick the response that best matches the types of plants you have in your
 backyard.
- Please tick the responses that best matches **why** you have the types of plants you have in your **front and/or backyards**. Tick all that apply.

- How often do you use either your front and/or backyard for entertaining friends and family?
- Please rank the following garden descriptions from 1 5 in order of your preference. 1 being the garden you would most prefer for **your** backyard space

SECTION B – Local open spaces

This section sought information about the respondent's relationship with their local open spaces (for the purposes of this thesis, defined as land that is used for public recreation and/or nature conservation; for example, parks, bicycle paths, sporting fields and nature reserves). It was deemed important to uncover what factors affected a person's use of open space and whether or not their relationship with open spaces had any association with their attitude toward urban biodiversity in yards and open spaces. Factors covered in this survey included proximity to local open spaces, with what frequency they use them, how and why they use them, and what benefit they feel they get from using them. Examples of questions that were designed for this are:

- How close to your house would you estimate your nearest local open space is?
- How often do you visit your local open spaces?
- Please tick **any** of the following activities you undertake at your local open spaces. Tick all that apply.
- Please indicate the extent to which you believe that your use of local open spaces results in you gaining benefits in the following areas?

SECTION C – Opinions and Attitudes

This section asked for respondent's opinions and attitudes about their yard space and local open spaces using a series of 34 statements on a 5 point Likert scale (where 1 = strongly disagree and 5 = strongly agree). The statements were grouped into themes indentified through the literature, with some questions used by the New South Wales National Parks and Wildlife Service (2002). The statements and the associated themes are presented in Table 2.1.

SECTION D – General Information

This final section sought general information about the respondent. Demographic factors have been shown to influence a range of attitudes, including environmental attitudes (Mangiafico, Obropta, & Rossi-Griffin, 2012). Therefore, collecting this information was deemed important as it can be used to test whether there is a relationship between demographic factors and attitudes toward urban biodiversity in yards and open spaces. Examples of questions that were designed for this are:

- Please indicate your age group
- What is your highest level of education?
- What is the annual gross (i.e. before tax) income that your household usually receives from all sources?

Table 2.1 Statements, grouped into themes, regarding opinions and attitudes about yard space andlocal open spaces, for use with a 5 point Likert scale

Aes	thetics			
I think local open spaces should be well maintained	I like local open spaces where the vegetation is well maintained and neat			
Having a garden that is neat and tidy is important to me	I think Australian native gardens look messy			
Biod	iversity			
I would like to have a garden that provides	I would like a garden that would encourage native			
opportunities for me to feed native wildlife	wildlife to my yard			
I think some local open spaces should provide habitat for native wildlife				
	l – sustainability			
I think there should be more local open spaces and				
smaller backyards	I think backyards are a waste of space and contribute to urban sprawl			
Having a garden that is water wise is important to me				
Family / Community /Social				
Having a backyard with space for children to play is important to me	Having a backyard with space for entertaining friends and family (e.g., decking, B.B.Q) is important to me			
I think an open space with a natural bush setting is a nice place to hold get-togethers with family and friends	I think the best parks are those with plenty of room for picnicking and playing outdoor games			
	ifety			
I think native gardens increase the risk of fire	A garden that minimises fire risk is important to me			
I think gum trees are dangerous in suburban backyards	A home where there is no chance of falling trees is important to me			
A home that is safe from the threat of dangerous wildlife (e.g., snakes) is important to me	I think native gardens encourage dangerous wildlife (e.g., snakes)			
	ce / Practical			
I think Australian native gardens require a lot of maintenance and watering	Having a garden that requires minimal maintenance is important to me			
I think it is important for local open spaces to provide facilities such as toilets and drinking taps	Having a garden that can provide me with fruit and vegetables is important to me			
Having a local open space within walking distance from my home is important to me				
Spiritual /Health				
I think visiting my local open space helps me to relax	I think visiting an open space with a natural bush setting has a positive impact on my health and mental well-being			
Spending time in my backyard and/or garden makes me feel relaxed	-			
Social Norms				
I think Australian native gardens are fashionable these days	Having a garden whose appearance is in keeping with my neighbours is important to me			
I think formal European gardens look out of place in Australia	Being someone who is recognised as caring for the environment is important to me			
Having a garden that will be admired by other people is important to me				

2.4.2 GENERAL PUBLIC SAMPLE QUESTIONNAIRE CONTENT

To assess community members' views on nature in the backyard a questionnaire was designed to be distributed to a sample of the general public residing in metropolitan Melbourne, the *General Public* sample. It was designed to answer research questions 1 and 3:

- Is there potential to attract unengaged members of the public to become involved in wildlife gardening programs?
- What are the barriers and benefits for community members in having native suburban gardens and encouraging native suburban wildlife in their yards?

The questionnaire (see Appendix 2) was developed in 2010 and was approved by the Deakin University Ethics Committee (Ref. No. 2010-216) on 13.10.10. Questions included in the questionnaire were built upon the results of the *Scoping Phase* sample. An informal pretest, involving friends and colleagues, was carried out to gauge how long the questionnaire would take to complete, identify any difficulties in the wording, and assess the questionnaire validity (i.e. if the questionnaire was measuring what it was designed to) (Trochim, 2006). Friends and colleagues were selected for the pretest because I knew them well and could therefore determine whether or not the questionnaire was measuring what it was intended to measure. For example, if someone who I know is not interested in being close to nature scored low on the Connectedness to Nature scale (a scale included in the survey, developed by Mayer & Franz, 2004)), this would indicate that the questions had construct validity. The questionnaire consisted of the following sections:

SECTION A – Your front and backyards

This section sought information about the man-made and vegetative composition of the respondent's yards, the use of the respondent's yard and the respondent's preferred type of yard. This type of information was desired as it can be used to test whether there is a relationship between these factors and attitude toward urban biodiversity in yards. For example, is there a relationship between the type of garden style one prefers and a dislike of wildlife in the garden? Examples of questions that were designed for this are:

- Do you have any of the following in your **front and/or backyard**? Tick all that apply. (*List of both man-made and natural objects*)
- Please tick the response that best matches the types of plants you have in your backyard.
- Please tick the responses that best matches **why** you have the types of plants you have in your **front and/or backyards**. Tick all that apply.
- How often do you use either your front and/or backyard for entertaining friends and family?
- Please rank the following garden descriptions from 1 5 in order of your preference. 1 being the garden you would most prefer for your backyard space.

This section also included three questions about the likelihood of the respondent joining a wildlife gardening program. These questions were included so the level of public support for such programs could be gauged, thus giving guidance into the feasibility of establishing more programs:

- If your council ran a wildlife gardening program would you consider joining? Such a program may provide advice about what species of plant is best suited for attracting the type of wildlife you would like, and a sticker or plaque to display on your letterbox. (This is generally speaking – you will NOT be contacted to participate).
- If you selected 'No' in Question13, please indicate why by ticking the one MAIN reason you would not be interested in joining a wildlife gardening program.
 Only answer if you selected 'No' in Question 13.
- Please identify what your preferred ways of finding out about a council wildlife gardening program would be by placing the numbers 1-2 in the boxes corresponding to your order of preference (This is generally speaking you will NOT be contacted to participate).

SECTION B – Opinions and Attitudes

This section was similar to the *Opinion and Attitudes* section in the *Public Scoping Sample* questionnaire; however it contained a revised selection of statements based on this sample's focus on yards as opposed to yards and open spaces. The section consisted on 17 statements about yard space, gardens, and nature in the yard. The statements targeted 4 main areas of interest based on themes presented in relevant literature and are provided in Table 2.2. In addition this section included the Connectedness to Nature scale, a series of 14 statements developed by Mayer and Franz (2004). This scale is discussed and the reasons behind the choice of this scale are

outlined in Section 2.4.5.3.

Table 2.2 Statements, grouped into themes, regarding opinions and attitudes about yard space, gardens and nature in the yard, for use with a 5 point Likert scale (where 1 = strongly disagree and 5 = strongly agree).

Aesthetics				
I think Australian native gardens look messy	Having a garden that is neat and tidy is important to me			
Safety				
A home where there is no chance of falling trees is important to me	I think gum trees are dangerous in suburban backyards			
A garden that minimises fire risk is important to me	I think native gardens increase the risk of fire			
A home that is safe from the threat of dangerous wildlife (e.g., snakes) is important to me	I think native gardens encourage dangerous wildlife (e.g., snakes)			
Social Norms				
I think Australian native gardens are fashionable these days	I think formal European gardens look out of place in Australia			
Being someone who is recognised as caring for the environment is important to me	Having a garden that will be admired by other people is important to me			
Convenience / Practical				
Having a garden that requires minimal maintenance is important to me	Having a garden that is water wise is important to me			
Other				
I would like a garden that would attract native wildlife	Having a backyard with space for entertaining (e.g., decking, B.B.Q) is important to me			
I think you can really feel at one with nature in an Australian native garden				

SECTION C – General Information

This section was included for the same reasons identified in General Information section of the Public Scoping sample questionnaire, and questions related to demographic factors.

2.4.3 WILDLIFE GARDENER SAMPLE QUESTIONNAIRE CONTENT

To explore the motivations and experiences of wildlife gardeners a questionnaire was designed to be distributed to a sample of wildlife gardeners participating in programs based in Australia. It was designed to answer research questions 1, 2, 4 and 5:

- Is there potential to attract unengaged members of the public to become involved in wildlife gardening programs?
- Do wildlife gardening programs succeed in educating participants, and recruiting unengaged members of the community? What program features influence this success?
- What has influenced those participating in wildlife gardening programs to do so?
- Do participants in wildlife gardening programs believe that their gardening efforts have resulted in attracting native wildlife, and what factors influence and contribute to this perceived success?

The wildlife gardening questionnaire (Appendix 3) was developed in mid 2010 and was approved by the Deakin University Ethics Committee (Ref. No. 2010-216) on 13.10.10. The questionnaire was developed with input from staff working on a Melbourne-based wildlife gardening program and consisted of the following sections:

SECTION A – Your wildlife gardening program experience

The aim of this section was to uncover information that would provide insights into the motivations for joining wildlife gardening programs, so that this information can guide future promotion of such programs. Questions designed for this were:

- How did you find out about this wildlife gardening program?
- Please identify your **top three** reasons for joining this wildlife gardening program by placing the numbers 1-3 in the boxes corresponding to your reasons in order of your preference.
- Before joining the program were you aware that **native** gardens could take many forms, such as a cottage garden, formal garden, or contemporary garden?

This section also sought to investigate the reasons underpinning the motivation to join the program, i.e. the respondent's feeling of connectedness to nature and where they feel this has come from. The idea that if we wish to have a public that will actively work toward the goal of achieving environmental sustainability, we must attempt to understand the kinds of experiences which produce such people, was put forward by Tanner (1980). His survey of 45 leaders of conservation groups began this line of research (Chawla, 1998). Questions designed to assess the types of significant life experiences common to wildlife gardeners included:

- When did you first become interested in nature?
- Do you believe you have an interest in connecting with nature in your daily life?

• Please identify your **top three** reasons why you believe you have an interest in connecting with nature in your daily life by placing the numbers 1-3 in the boxes corresponding to your reasons in order of your preference.

Another purpose of this section was to examine the effectiveness of wildlife gardening programs in recruiting participants that were not previously 'engaged' with urban biodiversity or wildlife gardening. Questions designed for this were:

- Had you already taken steps to create a wildlife garden before joining or hearing about this wildlife gardening program?
- Were you planning to create a wildlife garden before joining or hearing about this wildlife gardening program?
- Did you have an understanding of biodiversity issues before joining this wildlife gardening program?
- Has this wildlife gardening program increased your understanding of biodiversity issues?
- Has this wildlife gardening program increased your interest in biodiversity?

Finally, although not a main aim of this study, this section was designed to explore if participants felt that their efforts were attracting wildlife to their yards. Questions designed for this were:

• Has your participation in the program led to attracting **desired** native or nonnative wildlife to your yard? • Has your participation in the program led to attracting **unwanted** native or nonnative wildlife to your yard?

SECTION B – Nature in your yard

This section sought information about the human-made and vegetative composition of the respondent's yards, the reasons they chose either native or non-native plants, their respondent's preferred type of yard, and their experience with desired and non-desired wildlife in their yard. It consisted of the same questions as the *General Public* sample questionnaire.

SECTION C – Opinions and attitudes

This section was identical to the *Opinions and Attitudes* section of the *General Public* sample questionnaire.

SECTION D – General information

This section was included for the same reasons identified in *General Information* section of the *Public Scoping* sample questionnaire, and questions related to demographic factors.

2.4.4 CHOOSING AN ATTITUDE SCALE

Attitude measurement techniques can generally be categorised as either explicit measurements (e.g., direct self-report such as interviews and questionnaires)

or implicit measurement methods (e.g., observation) (Krosnick, Judd, & Wittenbrink, 2005). The majority of studies measuring environmental attitudes have utilised explicit methods, with implicit techniques receiving less attention (Milfont & Duckitt, 2010). A multitude of environmental attitude measurements exist (Dunlap & Jones, 2002), a situation which Stern (1992, p. 279) described as an "anarchy of measurement".

After reviewing various environmental attitude scales, three were short-listed for consideration. These were the Connectedness to Nature Scale (CNS: Mayer and Frantz, 2004), the Nature Relatedness scale (NR: Nisbet, Zelenski, & Murphy, 2009), and the New Ecological Paradigm scale (NEP: Dunlap, Van Liere, Mertig, & Jones, 2000). Ultimately the CNS was chosen as the attitude measurement tool for this research. The reasons for this are outlined in the following reviews of each of the three scales.

2.4.4.1 NATURE RELATEDNESS SCALE

The Nature Relatedness scale (NR) aims to assess the emotional, cognitive, and experiential aspects of an individual's connection to nature (Nisbet et al., 2009). Although the items in this scale would have been able to measure the constructs of interest in this research, it was not selected due to its length. Including a 21 statement scale would have resulted in a questionnaire length of greater than 12 pages, which Czaja and Blair (1996) caution is too long if one wishes to maximize responses.

2.4.4.2 NEW ECOLOGICAL PARADIGM SCALE

The NEP scale was originally called the New Environmental Paradigm scale and was developed in 1978 by Dunlap and Van Liere. The NEP Scale measures general beliefs about the relationship of humans to the environment and is the most commonly used measure of environmental attitudes (Hawcroft & Milfont, 2010). The currently used version of the scale consists of 8 positive items and 7 negative items which are designed to expose one's beliefs regarding the ability of humans to upset the balance of nature, the existence of limits to growth, the rights of humans to rule over nature, the idea that humans are exempt from nature's constraints, and the likelihood of an environmental crisis (Dunlap et al., 2000). Higher scores on the scale represent a more ecocentric orientation (indicating support for the preservation of natural resources) and lower scores represent a more anthropocentric orientation (indicating support for the exploitation of natural resources) (Hawcroft & Milfont, 2010). This scale was not selected due to its broad nature and the fact that it does not explore how people feel about being in nature and fails to tap into an emotional or personal facet (Nisbet et al., 2009). This criticism has also been leveled at other attitude scales including the New Ecological Consciousness scale (NEC; Ellis & Thompson, 1997) and the Environmental Identity scale (EIS; Clayton, 2003) (Nisbet et al., 2009).

2.4.4.3 CONNECTEDNESS TO NATURE SCALE

The CNS is a series of 14 statements developed by Mayer and Frantz (2004) that address a person's sense of connection with nature. The CNS attempts to measure a sense of inclusion or closeness with nature on both an emotional and cognitive level 40 (Mayer & Frantz, 2004). One drawback of the CNS is that, unlike the NR, it fails to address the experiential (physical) aspect of the human nature relationship (Nisbet et al., 2009), which is important in an individual's sense of connectedness (Chawla, 2002; Kahn, 2002). Although the NR included the additional aspect of experiential connection, the two scales are very closely related in what they are measuring. The length of this scale was considered the most appropriate for keeping the questionnaire length within desired limits. In addition, the statements used in the scale fit well with the research aims of this study (see questionnaire in Appendix 2 for items in the CNS). The scale has been demonstrated to predict eco-friendly behavior and also found to correlate significantly with biospheric values (r=0.49) and the New Environmental Paradigm (r=0.35). It has been shown that the scale has only one factor, possess high internal consistency (α =0.84) and has a significantly high test-retest reliability (r=0.79) (Frantz, Mayer, Norton, & Rock, 2005).

2.5 SAMPLE SELECTION AND QUESTIONNAIRE DISTRIBUTION

2.5.1 PUBLIC SCOPING SAMPLE SELECTION AND DISTRIBUTION

The data obtained through the *Public Scoping* sample needed to be used to make generalisations about the population from which it was drawn. Therefore, random sampling was used to generate the sample that would receive the *Public Scoping Sample* questionnaire. The sampling frame used was the 2009 Residential White Pages telephone directory (which lists non-private land line phone numbers),

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and two thousand Melbourne metropolitan residents were selected using systematic random sampling, which involved selecting the 10th name listed on every second page

Consent forms (see Appendix 1) were required for ethics approval and drawing of gift voucher prizes, however, it was made clear that such details would be removed upon receipt of completed questionnaires, assuring respondents of anonymity. A plain language statement introduced the questionnaire (See Appendix 1). Questionnaires were distributed on April 12th 2010 and participants asked to please return the completed questionnaire by May 10th. Reminder postcards were sent out approximately one week after the return by date had passed.

2.5.2 GENERAL PUBLIC SAMPLE SELECTION AND DISTRIBUTION

The data obtained through the *General Public* sample needed to be used to make generalisations about the population from which it was drawn. Therefore, systematic random sampling (2nd name listed on every page) was used to generate the sample that would receive the *General Public* sample questionnaire. The sampling frame used was the 2009 Residential White Pages telephone directory (which lists non-private land line phone numbers). Four thousand Melbourne metropolitan residents were selected using systematic random sampling.

As outlined in section 2.2.5, both postal and online surveys were chosen for this aspect of the study. This occurred in the following manner:

- 1000 members of the public received a letter addressed to The Resident in the post. Inside was a plain language statement, paper copy of the survey and a reply paid envelope (see Appendix 2).
- 1000 members of the public received a letter addressed to them (e.g., B. Smith) in the post. Inside was a plain language statement, paper copy of the survey and a reply paid envelope (see Appendix 2).
- 1000 members of the public received a postcard addressed to The Resident (see Appendix 2) inviting them to complete an online survey. The plain language statement and consent were available online.
- 1000 members of the public received a postcard addressed to them (e.g., B.
 Smith) (see Appendix 2) inviting them to complete an online survey. The plain language statement and consent were available online.

Regardless of whether a questionnaire was completed online or on paper, the instrument was self-administered and anonymous, as respondents were not asked to identify themselves on the surveys. Consent forms were required for ethics approval and drawing of the gift voucher prizes, however, it was made clear that such details would be removed upon receipt of survey, assuring respondents of anonymity. A plain language statement introduced the questionnaire.

Questionnaires (paper copies and postcards) were sent out on October 12th 2010, and participants were asked to please return (or complete online for postcards) the questionnaire by November 5th. Reminder postcards (Appendix 2) were sent out approximately one week after the return by date had passed.

2.5.3 WILDLIFE GARDENING SAMPLE SELECTION AND DISTRIBUTION

An online search was undertaken in May 2010 to locate wildlife gardening programs operating in Australia. Nine wildlife gardening programs from across Australia (two from New South Wales: all states and territories represented except Western Australia and the Australian Capital Territory) were found and approached. All but one agreed to be involved in the recruitment of participants by emailing their members some information about the study and a link to complete the study online (Appendix 3). The eight programs sent out the customised link to all their participants in October 2010. Each program was allocated a different survey link so comparisons of respondent attitude and success in attracting wildlife could be made between programs. Table 2.3 shows which program features (investigated in this study) are provided by each of the programs.

Four of the programs were based in suburban localities with significant remaining remnant vegetation. Whilst not classed as rural, the natural capital present in these localities limits the transferability of the study's findings to highly urbanised areas with little or no remaining remnant vegetation. The remaining four programs involved in this study are not based in any locality and are open to any member of the public to join; therefore some members may not reside in suburban areas, but rural ones. The programs are independent of one another, and the area from which they each operate is briefly described in the sections below.

Program features						
Program name	Site assessments	Provision of native plants / vouchers	Welcome pack	Program sign for displaying	Newsletters	Fee for joining
GARDENS FOR WILDLIFE (VICTORIA)	Yes	Yes	Yes	Yes	Yes	No
GARDENS FOR WILDLIFE (TASMANIA)	No	No	Yes	Yes	No	No
BACKYARD HABITAT (NEW SOUTH WALES)	Yes	Yes	Yes	Yes	No	No
BACKYARDS FOR WILDLIFE (QUEENSLAND)	No	Yes	Yes	Yes	No	No
GARDEN FOR WILDLIFE (NORTHERN TERRITIORY)	Yes	No	Yes	Yes	Yes	Yes, \$10 admin fee
BACKYARDS FOR WILDLIFE (SOUTH AUSTRALIA)	No	No	No	No	No	No
HABITAT NETWORK (NEW SOUTH WALES)	Yes	No	No	No	No	No
BACKYARD WILDLIFERS (AUSTRALIA WIDE)	No	No	No	No	No	No

Table 2.3 Program features provided by the different programs involved in the study.

2.5.3.1 GARDENS FOR WILDLIFE (VICTORIA)

The Gardens for Wildlife program is open to all residents in the municipality of Knox in metropolitan Melbourne, located in the state of Victoria. It is an interactive program, offering members such things as newsletters and site visits. The program had 220 members at the time this research was conducted. The municipality is located approximately 25 kilometres east of the Melbourne CBD and is almost completely surrounded by a "Green Belt" (defined by Amati and Yokohari (2006) as "a zone of land around the city where building development is severely restricted"). However, there is now only approximately 4% native vegetation or areas with indigenous vegetation left in Knox. Tall eucalypt forests and scrub bushland dominate the native vegetation and local forest areas are characterised by an open canopy with dense understorey. Fauna is comprised of mainly urban species found in many Melbourne municipalities, however, due to its close proximity to the Dandenong Ranges the faunal diversity is somewhat enhanced (Knox City Council, 2013).

2.5.3.2 GARDENS FOR WILDLIFE (TASMANIA)

The Gardens for Wildlife program run by the Department of Primary Industries, Parks, Water and Environment in Tasmania, and is open to all residents of the State of Tasmania and is a self-guided program. However, the program produces a newsletter which points participants to relevant news and events (Department of Primary Industries, Parks, Water and Environment, 2013). The program has 233 members at the time of this research. Although Tasmania is the least populated state of Australia, approximately 23% of the total area of Tasmania has been cleared of native vegetation since European settlement, largely for agricultural purposes. Due to this decline in native vegetation, along with the introduction of pest species and diseases, there has been a decline in many populations of Tasmania's native fauna (Tasmanian Planning Commission, 2009). The Backyard Habitat program is run by the Lane Cove Council, Sydney, New South Wales, and is open to all residents in the municipality of Lane Cove. At the time of this research the program had 139 members. It is an interactive program, offering members such things as newsletters and site visits. The municipality has approximately 90 hectares of bushland. Approximately 625 species of indigenous plants occur in the municipality, among them a number of vegetation types including wet and dry sclerophyll forest, heath land, mangroves and tidal flats. Although Lane Cove has 90 hectares of bushland, urbanisation means that it is fragmented into small pockets (Lane Cove Council, 2013).

2.5.3.4 BACKYARDS FOR WILDLIFE (QUEENSLAND)

The Backyards for Wildlife program is run by the Moreton Bay Regional Council, Queensland and is open to all residents in the municipality of Moreton Bay. Moreton Bay is 40 minutes drive north of the city of Brisbane. It is an interactive program, offering members such things as advice and free plants. The area comprises a number of habitats: grasslands, woodlands, forests, sandy ocean beaches, mangroves, tidal creeks and rivers, marshlands, brackish and freshwater swamps and lagoons. As a result of the varied landscape, a large range of native plants and animals can be found in the region. However, urbanisation has affected many of these ecosystems and they have been reduced and fragmented (Moreton Bay Regional Council, 2013).

2.5.3.5 GARDEN FOR WILDLIFE (NORTHERN TERRITIORY)

The Garden for Wildlife program run in the Alice Springs region, in the Northern Territory, is delivered by environmental consultants, Low Ecological Services. The scheme had 147 members at the time of this research, and is an interactive program, offering members such things as newsletters and site assessments (Low Ecological Services, 2013). Alice Springs in located in Central Australia and has a continental desert environment with an arid climate. The region has abundant plant and animal life; however it has been influenced by feral plant and animal species. The introduction of weeds, predatory species (cats and foxes), and competitive herbivores (rabbits, cattle, horses and camels) have changed the natural landscape and ecology of the area and contributed to the loss of biodiversity in Central Australia. There have been 14 mammal extinctions since the European settlement and currently a large number of animals in the region are threatened or endangered (Alice Springs Town Council, 2013).

2.5.3.6 BACKYARDS FOR WILDLIFE (SOUTH AUSTRALIA)

The Backyards for Wildlife program is run by the Department of Environment, Water & Natural Resources in South Australia, and is open to all residents in the metropolitan Adelaide area. It is an internet based program where participants sign up as a pledge to plant native species for wildlife. There were 1100 members at the time of this research. Habitat destruction and fragmentation since European settlement in the Adelaide area has resulted in only approximately 3% of the original native vegetation remaining. For this reason many local native species are currently under threat, and much of the present flora and fauna are introduced species. Apart from birds, native animals are rare in the Adelaide suburbs (Department of Environment, Water and Natural Resources, 2012).

2.5.3.7 HABITAT NETWORK (NEW SOUTH WALES)

The Habitat Network is co-ordinated by International Environmental Weed Foundation in partnership with City of Ryde, Hunter's Hill Council, RNC Alliance, Field of Mars Environmental Education Centre, and Ryde - Hunter's Hill Flora and Fauna Preservation Society. It is open to anyone to join, however is based in the municipalities of Ryde and Hunter's Hill in New South Wales, and most members reside in these areas. The Network had 490 members at the time of this research and the program is interactive, offering members such things as newsletters and site visits (Habitat Network, 2013). The area has recorded over 200 plant species, however due to urban development many of these plants are now locally and regionally scarce. The area is home to wide variety of native wildlife including possums, reptiles, and over 80 recorded species of birds which are also under pressure due to urban development and the related threats of domestic cats and dogs, the introduction of exotic plant and animal species, and the pollution of water ways (Hunter's Hill Council, 2013). Backyard Wildlifers is a forum based program in which participants sign up and join the online community (Backyard Widlifers, 2013). It is a self-guided program, however participants can seek advice from one another on the forum. The program is open to anyone Australia wide and at the time of this research had 79 members.

2.6 WILDLIFE GARDENER INTERVIEWS

The wildlife gardening questionnaire included an invitation to provide contact details if the participant was interested in being involved in a 30 minute face-to-face interview about their thoughts on biodiversity in the urban area.

Ten interviews were conducted in November 2010 on site at interviewee's places of residence. Interviews ranged in time from 12 to 35 minutes and followed a semi structured format. This was necessary as an answer to one question may lead the interviewee to inadvertently answer other questions on the list, or to raise a new line of questioning that may not have been originally planned. For a list of the questions used as a guide for all interviews see Appendix 4.

The intent of the interviews was to build upon the information collected with the survey, by allowing interviewees to expand upon their answers to provide deeper insights into the catalysts and motivations for joining wildlife gardening programs, so that this information can guide future promotion of such programs. Questions designed for this were:

- How did you hear about gardens for wildlife?
- Why did you decide to join gardens for wildlife?

Also of interest were the reasons **behind** the motivation to joining the program, i.e. the respondents feeling of connectedness to nature and where they feel this has come from. Questions designed to assess the types of significant life experiences common to wildlife gardeners included:

- Do you prefer native vegetation or exotic in your garden? Why?
- What experiences, if any, do you think have contributed to your preference for native or exotic vegetation in your garden?
- How do you feel about native wildlife in the suburbs?
- Why do you think you feel that way about native wildlife in the suburbs?
- What experiences, if any, do you think have contributed to your attitude about native wildlife in the suburbs?

An additional area of interest was the perceived effectiveness of wildlife gardening programs in attracting desired native species to people's yard. Questions designed for this were:

- How long have you been involved in the program?
- What type of plants have you selected? What species have they attracted?

Prior to the commencement of the interview, participants were provided with a plain language statement (Appendix 4), which outlined the purpose of the interview, time required, and issues of confidentiality. Before beginning the interview, participants were asked to sign a consent form (Appendix 4). The interviews were approved by the Deakin University Ethics Committee (Ref. No. 2010-216) on 13.10.10.

2.7 DATA SETS

2.7.1 QUALITY OF DATA

The quality of any data is influenced mainly by two factors: data validity (i.e. are you measuring what you think you are?), and data reliability (i.e. how repeatable are your results) (Trochim, 2006). This section will examine: the methodological limitations of this study that can potentially compromise the validity and reliability of the data, along with the steps taken to minimise them, quality of the final data sets, and sample representativeness. The limitations of postal and internet questionnaires were discussed in section 2.2.1 and 2.2.2, and are summarised in Table 2.4 along with the steps taken to minimise the methodological in Table 2.4 along with the steps taken to minimise the methodological in Table 2.4 along with the steps taken to minimise the methodological limitations of the postal and internet questionnaires the methodological limitations of the postal and internet questionnaires for both the general public and wildlife gardener samples.

Table 2.4 Limitations of postal and internet questionnaires and steps taken to minimise th	е
limitations (adapted from Miller, 2000)	

Limitations (adapted from Miller, 2000) Steps Taken			
Postal and Internet Questionnaires for the General Public			
Answer categories may not reflect what the respondent really thinks	 As many options as possible were included to cover most obvious possible answers Multiple choice questions included 'other,' and 'unsure' boxes where appropriate Scaled responses included an 'neutral' category 		
The respondent may have a idea of what the researcher is looking for and modify their response	 In Section B of the questionnaire, the opinions and attitudes section, it was stated that 'there are no right or wrong answers.' Anonymity was assured in the covering letter Issues of confidentiality were given in the covering letter and consent form 		
The respondent may misunderstand or misinterpret the question	 Questions and instructions were written in a clear, simple and unambiguous manner The opinions and attitudes section of the questionnaire contained multiple questions for each aspect of relationship with urban nature being looked at, so that a more accurate picture of the respondent's thoughts could be obtained. 		
Response rates can be low	 Completion of the questionnaire offered participants the chance to win one of three \$100 vouchers (respondents choice of a movie, book, or garden centre voucher) Reminder letters were used to target non-respondents. 		
Samples obtained may not represent the populations from which they were drawn	 The voucher draw was also used to encourage those members of the population who are not interested in the topic to participate. The covering letter was worded as neutrally as possible (i.e. it did not indicate any particular agenda that may have influenced people to respond or not respond). Potential participants were randomly selected. Reminder letters were used to target non-respondents. 		
Internet Questionnaires for wildlife gardeners Same as for postal questionnaires with the exception of:			
Response rates can be low	• Completion of the questionnaire offered participants the chance to win a \$100 voucher (respondents choice of a movie, book, or garden centre voucher)		
Samples obtained may not represent the populations from which they were drawn	• The voucher draw was also used to encourage all members of the wildlife gardening groups to respond, not just those that are very active in their gardening.		

2.7.2 PUBLIC SCOPING SAMPLE DATA SET

A total of 288 questionnaires were received, and a response rate of 15.75% was achieved (171 returned to sender). As discussed in Section 2.2.1, self-administered postal or internet questionnaires can result in a sample that is not representative of the population from which it was drawn. An issue in survey research is non-response bias as there is a tendency for respondents to be either interested in the topic or in a situation with time on their hands (e.g., retired) and this can bias the data collected (Sax et al. 2003). The percentage breakdown of the demographic categories of age, gender, level of education and income in the returned *Public Scoping* sample was compared to the data collected in the 2009 Australian Census. The sample was found to be comparable to the Census data in terms of gender and income, however, the sample consisted of a greater number of people with higher qualifications (48.1% had university qualifications in the sample compared to 36% in the Census data), and more older people (56.3% were over 50 years old in the sample compared to 38% in the Census data). These factors should be kept in mind when considering the results.

It is acknowledged that this is a low response rate and based on the efforts taken to minimise non-response, infer that this a function of declining response rates in urban areas (Neuman, 2000). Key findings relating to desire to have a garden that attracts wildlife were comparable to previous studies on wildlife in yards (Department for Environment, Food and Rural Affairs, 2002; New South Wales National Parks and Wildlife Service, 2002). Therefore, we consider that the results presented are useful as a preliminary study into the determinants of wildlife gardening behaviour and that these results will be useful to inform the direction of future research efforts.

2.7.3 GENERAL PUBLIC SAMPLE DATA SET

From the *General Public* sample 417 responses were received and 293 returned to sender resulting in a response rate of 11.2%. As outlined for the *Public Scoping* sample data set, non-response bias is an issue in survey research. The percentage breakdown of the demographic categories of age, gender, level of education and income in the returned *General Public* sample was compared to the data collected in the 2009 Australian Census. The sample was found to be comparable to the Census data in terms of income; however, the sample varies on other demographic factors. The sample consists of a greater number of people with higher qualifications (54% have university qualifications in the sample compared to 36% in the census data). The sample is also slightly skewed toward an older age group (65% were over 50 years old in the sample compared to 38% in the Census data), and unlike in the public scoping sample, also toward females (60% were female in the sample compared to 50% in the Census data). These factors should be kept in mind when considering the results.

It is acknowledged that this is a low response rate and given the efforts taken to minimise non-response and the similarity of this response rate to the *Public Scoping* sample, once again infer that this a function of declining response rates in urban areas (Neuman, 2000).

2.7.4 WILDLIFE GARDENER SAMPLE DATA SET

A total of 263 useable responses were received, providing a response rate of 12%. Although this is a low response rate, given the targeted nature of the sample and the efforts to minimise non response, it again assumed the low response is due to declining response rates in social research conducted in urban areas (Neuman, 2000). Another consideration may be that members of wildlife gardening groups that had not been overly involved in active wildlife gardening in their yards were less likely to respond as they did not want to be seen to look 'bad'. However, a low response rate does not always correspond to a non response error (Krosnick, 1999) and therefore the results presented are useful as a preliminary study into the motivations and experiences of wildlife gardeners.

2.8 ANALYSIS

2.8.1 QUESTIONNAIRE ANALYSIS

Data from both the *General Public* and *Wildlife Gardeners'* questionnaires were coded and entered into PASW Statistics Version 18.0 (Statistical Package, formally known as SPSS, now known as IBM SPSS Statistics) and then checked for accuracy. Assumptions for each test were checked prior to conducting the test. The 95% confidence interval was chosen for all statistical tests used ($p \le 0.05$), meaning that the observed difference was deemed to be significant if the probability of it occurring by chance is less than or equal to 0.05. Descriptive statistics were used in addressing all research questions to sort and display the data, and identify possible relationships. In addition, a number of different statistical procedures were then used to analyse the data.

To explore differences in responses between groups, depending on whether the data were parametric or not, tests included the chi-squared test for independence, independent samples *t*-test, one-way ANOVA, and Tukey's Honestly Significant Difference Test.

In assessing the reliability and validity of the Connectedness to Nature Scale, Cronbach's Alpha Coefficient was calculated and found to be 0.87. The suitability of the data for factor analysis was assessed through the inspection of the correlation matrix, which revealed the presence of many coefficients of 0.3 and above. The Kaiser-Meyer-Oklin value was found to 0.92, exceeding the recommended value of 0.6 (Kaiser, 1970, 1974) and the Bartlett's Test of Sphericity (Bartlett, 1954) was statistically significant. These results all supported the factorability of the correlation matrix. A principal components analysis (PCA) was then performed for the 14 items of the CNS. This revealed the presence of three components with eigenvalues exceeding 1, explaining 41.1%, 9.2% and 9.1% of the variance respectively. An inspection of the screeplot revealed a clear break after the first component, therefore it was determined that a one factor solution was best.

The 17 Likert scale statements used to gather the opinions and attitudes about nature in the yard of the *General Public* and *Wildlife Gardener* samples were assessed for their suitability for developing individual scales representing various aspects of

nature in the yard. These aspects, which were identified through review of the literature, were: concern about safety, aesthetic preference, social norms, and practicality/maintenance). Factor analysis failed to detect these predicted components or any other components that made theoretical sense. Furthermore the Cronbach's alpha's calculated for each of the proposed scales (using the statements theoretically thought to be related) were all below the recommended 0.65 (Vaske, 2008). Although statistical analysis of likert scales is problematic and any parametric analysis should be considered preliminary, for this study it was assumed that these Likert items were measuring different constructs and as such should be analysed separately in examining their relationship to other variables of interest.

2.8.2 INTERVIEW ANALYSIS

With the permission of the interviewee, interviews were recorded on a Dictaphone. Following the interviews, a total of 2 hours, 55 minutes, and 23 seconds of audio was transcribed verbatim using an external transcription service. Data analysis involved compiling responses to individual questions and identifying key themes. Direct quotes have been used throughout the results chapters to illustrate the concepts uncovered. To ensure anonymity interviewees are not identified.

2.9 CONCLUSION

This chapter has outlined the research questions and the methods used to answer them. Self-administered postal and internet questionnaires were used to answer the research questions concerned with the *Public Scoping and General Public* samples, and self-administered internet questionnaires and semi-structured face-toface interviews were used to answer the research questions concerned with the *Wildlife Gardener* sample. The questionnaires were pilot tested and the subsequent analysis demonstrated their validity and reliability. The following chapters present and discuss the results obtained in relation to relevant theory and literature.



CHAPTER 3 ATTITUDES TOWARD URBANISATION

3.1 BACKGROUND

In assessing whether there is potential for wildlife gardening programs to be successful in improving urban biodiversity, one must first consider the attitudes of the community members toward urbanisation and wildlife in the suburbs. Given the current trend in Australian housing development is for larger house sizes on smaller blocks, which results in smaller yards (Grose, 2009; Randolph, 2004), there is a need to gain an understanding of residents attitudes toward this trend as it has implications for the management of wildlife gardening programs.

Urbanisation has occurred on every continent except Antarctica, across a wide range of biomes (Smith et al., 2005) and is classified as one of the biggest threats to global biodiversity (Ricketts & Imhoff, 2003). It can be characterised by an increased human population density and the development of commercial or industrial infrastructure (Smith et al., 2005) and is one of the most obvious examples of human activities affecting ecosystems (Rees, 1997). Urbanisation fragments or destroys natural habitats; however it also creates new ones. It affects the quality and flow of water, and can alter regional climates (Sukopp & Starfinger, 1999; Kinzig & Grove 2001). Two components of the urban landscape that have biodiversity conservation potential are private open space and public open space.

Private open space is the term used by urban planners to describe the private land which surrounds a person's dwelling, in lay terms this is referring to the front and backyard (Grose, 2009). The terms front yard, backyard, and yard space are used throughout this thesis, as these are terms that are familiar to the public and were used in the questionnaires.

There is considerable variation in the way public open space (POS) is defined, with different organisations and governing bodies employing differing definitions of POS (Kellett & Rofe, 2009). Grose (2009, p. 53) states that:

"POS in Australia includes playing fields for specific sports such as Australian Rules football and cricket, and grassed areas as open parks. POS does not include setbacks and buffers required by legislation around environmentally sensitive areas such as the coast and wetlands, nor does it include large areas set aside regionally for preservation of bushland."

However, this definition does not go far enough in explaining exactly what types of spaces should be classed as POS. Grose (2009, p. 53) reference Jim and Chen (2003) to show that POS in Australia is considered different to urban green spaces;

"urban green spaces are considered to have significant amounts of vegetation and exist mainly as semi-natural areas (Jim & Chen, 2003)."

However, Jim and Chen, (2003, p. 95) actually state that

"Greenspaces in cities exist mainly as semi-natural areas, managed parks and gardens, supplemented by scattered vegetated pockets associated with roads and incidental locations."

As there is no clear definition of public open space, for the purposes of this thesis, it is defined as land that is used for public recreation and/or nature conservation; for example, parks, bicycle paths, sporting fields and nature reserves. However, for this thesis the term used will be *local open space*. The term *local* was chosen over *public* as when communicating with the public I wanted to emphasise that the study was interested in how people used and felt about open spaces that were near to their place of residence. The term *open space* was chosen over *green space* as the former is a more encompassing term.

The value of local open spaces to the health and wellbeing of people is well established (Van Herzele & Wiedemann, 2003). Fuller, Irvine, Devine-Wright, Warren, and Gaston (2007) have shown that a positive relationship exists between the biodiversity present in parks and the psychological benefits reported by visitors.

3.1.1 URBAN CONSOLIDATION / SMART GROWTH

The concept of sustainable development has made higher density, mixed-use urban development a popular policy choice in many parts of the world as legislators and urban planners argue that there are economic, social and environmental benefits to urban compaction (Dovey, Woodcock, & Wood, 2009; Eaton, Hammond, & Laurie, 2007; Fan & Khattak, 2009). Indeed, many efforts to achieve urban sustainability used compactness as a way of maintaining environmental, social, and economic resources (Banister, Watson, & Wood, 1997; Duany, Plater-Zyberk, & Speck, 2000).

This type of development forms the basis of the dominant urban planning framework used in Australia. In England, there is also a push towards urban compaction. For example, in the year 2000 the Government set a target of 60% of new houses to be built on either abandoned or underused industrial and commercial sites or in place of existing buildings (Department of Transport and the Regions, 2000). Urban consolidation, as it is generally referred to in Australia, is the process of increasing urban densities and was first considered in Australia in the late 1980's (Ruming et al., 2012). In the United States, this type of urban planning is referred to as Smart Growth (the term Compact City is also commonly used). There are five components to Smart Growth, which Burchell, Listokin, and Galley (2000, p. 821) name as: (1) control of outward growth movement, (2) inner-area revitalization, (3) design innovation, (4) land preservation, and (5) transportation reorientation. As urban consolidation is the term commonly used in Australia, this is the term that will be used throughout the thesis.

The premise of urban consolidation is that by coupling controlled outward residential development with a redirection of a portion of growth to already established areas, the result will be an urban environment which has encroached less on natural ecosystems. In addition, this style of land use planning is also thought to reduce carbon emissions and private automobile use, and improve social cohesion, equity, and accessibility (Burchell et al., 2000; Duany et al., 2000; Jenks, Burton, & Williams, 1996; Ruming et al., 2012). Furthermore, the resulting urban form is considered economically viable because infrastructure, such as roads and street lighting, can be provided cost-effectively per capita. Based on these assertions, in theory, designing urban areas to be more compact can contribute to a more sustainable way of life (Eaton et al., 2007). However, despite these advantages, if given the choice a large number of people choose to live in suburban areas rather than the more populated urban centers (Neuman, 2005).

There is an ongoing debate among urban planners, academics, and the public about urban consolidation and its benefits to sustainability (Burchell et al., 2000; Randolph, 2004; Ruming et al., 2012) and there is often resistance to the implementation of urban consolidation policies due to efforts to preserve neighbourhood character. This situation is evident in Melbourne, Australia as the state government planning system promotes both densification and the protection of existing urban character (Dovey et al., 2009). In addition, Australian urbanites seem to be generally opposed to the idea of urban consolidation, as can been seen in the Ruming et al (2012) study, which found residents from the Ku-ring-gai local

government area in Sydney, New South Wales, were largely against this style of land use planning.

Despite the possibilities, the creation of sustainable urban developments through urban consolidation has been difficult (Van den Berg, Hartig, & Staats, 2007). A recent review of the empirical evidence into whether urban consolidation results in a form of sustainable development revealed that some studies have shown a positive relationship between compactness and sustainability while others have shown a negative relationship, suggesting that the data are inconclusive (Neuman, 2005; Randolph, 2004). Van den Berg et al. (2007) theorise that to some extent, methodological differences may be leading to different studies uncovering contradictory relationships. To date, different compactness and sustainability indicators have been used by different researchers (Van den Berg et al., 2007).

Local open spaces have been shown to be greatly valued and important to residential satisfaction (Bonaiuto, Aiello, Perugini, Bonnes, & Ercolani, 1999). Therefore if urban consolidation results in a shortage of such space, residents may seek out greener living options, resulting in outward migration to the urban periphery. Such urban fringe developments have a high automobile dependence (Kaplan & Austin, 2004), which often leads to planning and transportation practices that result in unsustainable developments (Van den Berg et al., 2007). Moreover, with ongoing urban sprawl, individual residents may come to suffer from progressively limited access to nature and decreased quality of the nature experiences they had originally sought (Van den Berg et al., 2007). However in an attempt to combat urban sprawl, density

may have been overemphasised in new housing developments and as a result, local open space has the potential to be seen as an optional extra instead of an essential part of an urban ecosystem (Fan & Khattak, 2009). Therefore, urban planners are concerned with how inhabitants of recently built suburbs perceive and use local open space. Also of concern is how local open space fits within the current goals of sustainability, and the role that it plays in the ecological function of local ecosystems (Grose, 2009).

Despite urban consolidation being the predominant urban planning framework in Australia (Ruming et al., 2012), as mentioned earlier, there is a current trend in Australian housing development toward larger house sizes on smaller blocks, resulting in a reduction in yard space (Grose, 2009; Randolph, 2004). This type of development does not appear to be aligned with the objectives of urban consolidation, as the increase in house size is not being met with an increase in house occupants, therefore population densities are not being increased as a result of such developments, so the need for further outward growth will continue. Houses in such developments are often termed 'McMansions' (McGrew, 2008). This trend has implications not only for biodiversity but also quality of suburban life, as due to this decrease in the size of yard space, the use of the suburban backyards as a place for outdoor recreation is currently under threat (Grose, 2009).

Backyard size has been shown to be negatively correlated with garden composition (Smith et al., 2005), which is consistent with the fact that the amount of vegetation present in backyards has decreased over the decades in line with the

decrease in backyard size. Grose (2009) used a series of aerial comparisons of suburbs in Perth, Australia to show there has been a reduction in vegetation in yard space and the street between 1955 and 2005. With reduced backyard sizes, there may be limited opportunity for residents to develop gardens capable of supporting wildlife. In addition, Grose (2009) also observed that many new Perth suburbs are not planted with street trees and suggests that recently built suburbs are unlikely to become much greener in the future as there is no room for additional vegetation. With the decline in yard space in newer suburbs and older suburbs experiencing increased subdivisions, local open space may very well become the only significant contributor to urban forests (Grose, 2009), which are defined as comprising all the vegetation present in urban woodlands, along streets, in vacant blocks, as well as in public and private parks and gardens (Konijnendijk & Randrup, 2002).

Cordell (1976) put forward that changing the size of yards would ultimately affect the demand for local open space. Therefore, it may be that within new housing developments and existing communities that are experiencing increasing subdivisions, more local open space will be required to compensate the reduced yard space. However, more recent work (Grahn & Stigsdotter, 2003; Maat & De Vries, 2006; Schipperijn, Stigsdotter, Randrup, & Troelsen, 2010) has found that people without private yards do not compensate by visiting local open spaces more often and that those with private gardens are actually more likely to visit local open spaces (Schipperijn et al., 2010). If this is correct it has implications for local open space planning. Despite the contradictory information about the inherent sustainability benefits of urban consolidation (Neuman, 2005; Randolph, 2004), urban consolidation has the benefit of resulting in less encroachment on remnant vegetation at the urban fringe, untouched ecosystems and rural landscapes, all of which provide habitat for wildlife and are important for maintaining biodiversity (Burchell et al., 2000; Daniels & Lapping, 2005). However, this should not mean that biodiversity should not be valued in urban and suburban areas and that we cannot have more compact residential areas that also function as biodiverse ecosystems.

Urban consolidation is changing the amount of backyard and local open space that is available to people and wildlife. This has both ecological and social implications, as, for example, backyard size is negatively correlated with garden composition (Smith et al., 2005), and local open spaces are important to residential satisfaction (Bonaiuto, Aiello, Perugini, Bonnes, & Ercolani, 1999). Importantly for this study, urban consolidation presents implications for the practice of wildlife gardening, for example, with smaller yards there may be a reduction in the amount of vegetation that can be added. Therefore there is a need to understand how the community feel about urbanisation. The aim of this chapter is to gain an insight into how members of the general community feel about the impacts of urbanisation on backyards, their feelings about wildlife in the yard, and their attitudes and use of local open spaces.

3.2 RESULTS

The data for this chapter are mainly from the *Public Scoping* questionnaire; however two questions of interest to this chapter were also included in identical form in the *General Public* questionnaire, so the data from these questions have been combined. Asterisks are used to highlight where this occurs.

In response to the question "How close to your house would you estimate your nearest local open space is?" (*n*=269), 69.5% of respondents selected *within 500 metres*; 26.4% selected *500 metres - 1 kilometre*; 3.7% selected *over 1 kilometre - 3 kilometres*; and 0.4% selected *over 3 kilometres*. The majority of respondents, 89.6% (*n*=242) indicated that they visited local open spaces. Respondents most commonly reported that they visited local open spaces on a weekly basis with 42.6%, followed by daily 24.8%, monthly 19.6%, and yearly 1.5%. It was not possible to run statistical tests to examine the relationship between distance from open space and frequency of visits. This was because all of the chi-squared test for independence outputs had more than 20% of the expected counts less than 5 (Yates, Moore & McCabe, 1999, p. 734). This is due to the very low numbers of those indicating they lived either *1km - 3 kilometres* or *over 3 kilometres* from their nearest local open spaces, and the low numbers indicating they only visited yearly.

Respondents were asked to indicate the extent to which they believed their use of local open spaces resulted in them gaining various benefits. These benefits and the breakdown of responses are displayed in Table 3.1.

	%					
Proposed benefits of local open spaces	n	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
An opportunity for physical activity	237	1.1	0.7	3.3	31.9	50.7
An opportunity for relaxation/recreation	236	1.3	0.4	5.1	44.5	48.7
An opportunity to learn about the local environment	228	3.1	12.7	37.3	31.6	15.4
An opportunity to help improve the environment	225	4.9	14.2	41.8	25.3	13.8
A sense of community or belonging	230	1.7	10.0	20.0	45.7	22.6
A sense of personal satisfaction	235	1.3	5.1	17.0	45.1	31.5
Improved physical health	239	1.3	1.3	3.8	41.4	52.3
Improved mental health	236	0.8	1.3	9.3	36.9	51.7
An expansion of my social network	228	5.7	21.1	37.7	24.1	11.4

Table 3.1 Public Scoping sample responses to Likert scale items relating to proposed benefits

 of visiting local open spaces, presented as percentages

Of the 10.4% who indicated they did not visit local open spaces (*n*=27), the main reason for not visiting was being *too busy* with 40.7%, followed by *I have no interest in visiting local open spaces* 33.3%, *I have limited mobility* 18.5%, *Local open spaces are too far away* 11.1%, and *Lack of facilities (e.g., toilets)* 3.7%. Due to the low numbers of those indicating they do not visit local open spaces, it was not possible to run statistical tests to examine relationships as all of the chi-squared test for independence outputs had more than 20% of the expected counts less than 5 (Yates, et al., 1999, p. 734).

Responses to the selected Likert scale items on opinions about the use of local opens spaces and private yard space that are particularly relevant to this chapter are summarised in Table 3.2.

Likert Scale Item		%					
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
I think visiting my local open space helps me to relax	269	0.7	3.0	14.5	43.9	37.9	
Having a backyard with space for children to play is important to me	269	5.6	10.0	19.0	31.2	34.2	
* I would like a garden that would encourage native wildlife to my yard	665	3.0	6.9	20.2	34.6	35.3	
I think there should be more local open spaces and smaller backyards	266	16.9	34.2	30.1	13.9	4.9	
Spending time in my backyard and/or garden makes me feel relaxed	267	0.0	1.5	5.2	50.9	42.3	
I think some local open spaces should provide habitat for native wildlife	268	0.4	1.9	9.7	45.1	42.9	
Having a garden that requires minimal maintenance is important to me	268	2.6	10.8	23.1	43.7	19.8	
Having a local open space within walking distance from my home is important to me	236	0.4	1.9	11.6	44.4	41.8	
*Having a backyard with space for entertaining friends and family (e.g., decking, B.B.Q) is important to me	664	1.3	6.0	17.6	52.0	27.5	

Table 3.2 Public Scoping sample responses to Likert scale items relating to opinions about theuse of local opens spaces and private yard space, presented as percentages

* Data combined from the *Public scoping* and *General Public* questionnaires due to the question being identical.

3.3 DISCUSSION

The results suggest that there are reasonable amounts of local open space in metropolitan Melbourne, as the majority (69.5%) of survey respondents indicated their

nearest local open space was within 500 metres. The results also show that this close proximity of open space is important to the respondents, with 86.2% agreeing that having a local open space within walking distance from home is important. The use of public open space appears to be high among metropolitan Melbourne residents, with 89.6% of respondents reporting that they visit local open spaces. However, the frequency of use of such spaces is not high for the majority of respondents, with 42.6% only visiting weekly, and almost 20% only monthly, leaving only a quarter of respondents visiting daily. It has been shown that the closer one lives to a local open space, the more frequently they will use it than those who live further away (Grahn, 1994; Van Herzele & Wiedemann, 2003). Unfortunately the current data set did not allow for this relationship to be tested.

The literature surrounding the use of local open spaces and urban consolidation has put forward that local open spaces are sites which bring the community together and promote a sense of community and social cohesion (Burchell et al., 2000; Duany et al., 2000; Jenks et al., 1996; Ruming et al., 2012). However, this study found that this assumption may not be entirely accurate, as just over a quarter of respondents indicated they did not believe their use of local open spaces resulted in an expansion of their social network. Although a greater proportion (35.5%) did agree that local open spaces were of social benefit to them (37.7% remaining neutral), when contrasted to the percentages of people agreeing that local open spaces provide the other benefits listed (See Table 3.1), it can been seen that the benefit of *An expansion of my social network* is the least agreed with, followed by *An opportunity to learn about the local environment*. If urban planners are hoping that increasing public open spaces and 72 decreasing yard space will automatically create more community interaction, they may find the resulting urban form does not meet their expectations. The high percentage of those indicating a neutral opinion to the social opportunities provided by local open spaces indicates that whilst there is potential for local open spaces to provide for this social interaction, at present there may be barriers preventing people from using spaces for this purpose.

There is a willingness among community members to share the urban environment with wildlife, with approximately 70% of respondents from both the *Public Scoping* and *General Public* questionnaires agreeing that they would like a garden that would encourage native wildlife to their yard. Couple this with the finding that 88% of the *Public Scoping* sample believe that some local open spaces should provide habitat for native wildlife, and these findings are in line with other sources that indicate the public may be willing to share the urban environment with wildlife (Department for Environment, Food and Rural Affairs, 2002; New South Wales National Parks and Wildlife Service, 2002).

The results indicate that Melbournians still have a fondness for backyards, and that backyards provide residents with many benefits. Over 90% of respondents agree that spending time in their backyard (and/or garden) makes them feel relaxed. In terms of using yard space for entertaining, just over 80% of respondents agreed that having a backyard with space for entertaining friends and family was important to them. This result is in line with Head and Muir's (2006) research which showed that in a sample of houses from Sydney (New South Wales), Wollongong (New South Wales) and Alice

Springs (Northern Territory) 65% of backyards had outdoor dining settings and 87% had designated recreational or entertaining areas in their backyard space.

The results suggest that many Melbournians do not agree with urban consolidation policies, as just over 50% of respondents are against more local open spaces to compensate for smaller backyards, and approximately 30% indicated a neutral view on this. The *Public Scoping* sample questionnaire provided space for respondents to add comments about their views on yards and open spaces. Remarks provided by many respondents echoed the sentiment:

"Get people to stop building a second house in their backyard, it's going to be very squashy. I hate it!" - Public Scoping sample, Female aged between 50-59 years old.

"Disappointed to see governments and councils building on the city's open spaces." - Public Scoping sample, Male aged between 60-69 years old.

"Many homes are losing their backyards to dual occupancies e.g., units. I think in time people will again want large backyards to bring families up in." - Public Scoping Sample, Female aged between 40-49 years old.

"I am totally opposed to the breaking up of housing blocks into high density living areas – e.g., town house / dual occupancy. Save our backyards!!" - Public Scoping sample, Female aged between 60-69 years old.

Comments made on the questionnaires also point to a dislike of 'McMansion' style housing that seems to be prevalent despite urban consolidation being the dominant planning framework:

"I am very shocked that new homes in this area are being built without any yard at all." - Public Scoping sample, Female aged between 60-69 years old.

"I believe that houses are getting too big and backyards seem to be getting smaller, not a good thing." - Public Scoping sample, Male aged between 60-69 years old.

"I believe that future housing developments need to provide larger blocks of land to allow for a 'proper' backyard." - Public Scoping sample, Male aged between 30-39 years old.

"I am very concerned with the councils allowing house blocks that have no back yards. I feel for the children and families. Need room to be together." - Public Scoping sample, Female aged between 60-69 years old.

Another theme to emerge from respondent comments was that today's children are missing out on the benefits that having a backyard can offer, for example:

"Size of backyards need to be sufficient for children to play safely and be creative." - Public Scoping sample, Female aged between 50-59 years old.

"Our backyard is very important to us. It is a secure place for our children to play in and it gives us pleasure to be out in it. Space for the children to *run around in is very important."* - Public Scoping sample, Female aged between 40-49 years old.

"Generally I feel backyards are shrinking and kids spend too much time indoors and not climbing trees (i.e. being kids)." - Public Scoping sample, Male aged between 40-49 years old.

Researchers have noted that children today are missing out on the exposure to the natural world that influences environmental values (Kahn, 2002; Kellert, 2002; Louv, 2005, Orr, 2002). This is due to declining access to nature in urban areas, but also, unlike previous generations, today's children are often not afforded the opportunity to roam freely outdoors (Clements, 2004; Pergams & Zaradic, 2006). Additionally there has been a significant decline in visits to natural areas for recreation in western countries (Pergams & Zaradic, 2008). Research suggests that it is important to develop meaningful bonds with the natural environment during childhood to instill positive values of nature (Bunting & Cousins 1985; Chawla, 2002; Horwitz, 1996; Kellert, 2002). In addition, it has been shown that having emotional connections with places helps develop pro-environmental attitudes and behaviours (Vaske & Kobrin, 2001) and therefore strengthening these connections may lead to improved environmental attitudes (Budruk, Thomas, & Tyrrell, 2009). This is an area where wildlife gardening may be useful as a tool reconnect children with nature. Although a backyard is not the only access to nature that children have, with urban consolidation, certainly access to natural areas is becoming more limited and this is an issue that may have significant ramifications for future generations' relationships with nature.

Ultimately, questions about the future of urban planning are beyond the scope of this research. This research does not aim to predict how future urban environments will be shaped by planning decisions. As mentioned in section 3.2.1, there is merit to urban consolidation in that it results in less encroachment on areas that provide habitat for wildlife; however, this should not mean that biodiversity should not be valued in urban and suburban areas. In fact, many governments and councils value biodiversity within their boundaries and are developing strategies to try to ensure that vegetation is not lost during the process of consolidation. For example, in the city of Melbourne, Australia, there is a push for urban greening within the urban core through what is called the Urban Forest Strategy (City of Melbourne, 2012). As it currently stands, private yards with domestic gardens comprise a geographically widespread proportion of urbanised areas (Loram et al., 2007), so there is no reason to ignore the conservation potential of said gardens at the present time.

3.4 CONCLUSION

The results indicate that many residents in metropolitan Melbourne are unhappy with the loss of backyards through subdivisions in established suburbs and planning decisions in new developments. Based on respondents in this study, residents also appear to be generally in favour of having wildlife in their suburbs and in their backyards. Given that residents are still largely interested in maintaining their own yard space, and have an interest in wildlife in the suburbs, there is a place for the use of wildlife gardening programs in helping to improve the biodiversity of local areas. The next questions that need to be answered are:

- What are the current vegetative compositions of resident's yards?
- What is their preferred vegetative composition for their gardens? And
- How do people feel about different species of wildlife in their yards?

These questions are addressed in the next chapter titled: *Do people want nature in the backyard?*



CHAPTER 4 DO PEOPLE WANT NATURE IN THE BACKYARD?

4.1 BACKGROUND

If wildlife gardening is to be used as a tool to improve biodiversity in local areas, it has to be something the community is interested in, and willing to participate in. Therefore, before wildlife gardening can be deemed viable, there is a need to understand the characteristics of domestic gardens and what motivates gardeners to create the gardens they do (Zagorski et al., 2004). In particular, there is a need to understand if the community is interested in using native plants and if they welcome the idea of wildlife in the suburbs.

There are numerous studies on attitudes toward gardening and gardens (Head & Muir, 2004, 2005; Head, Muir, & Hampel, 2004; Lohr & Pearson-Mims, 2005; Zagorski et al., 2004) and studies show that gardens are important as a place for interacting with nature (Bhatti & Church, 2004; Clayton, 2007; Gross & Lane, 2007; Power, 2005). There are fewer studies focussing on attitudes toward the use of native plants in gardens (for exceptions see Goddard et al., 2013; Kiesling & Manning, 2010;

New South Wales National Parks and Wildlife Service, 2002; Zagorski et al., 2004). The Zagorski et al. (2004) study found a strong relationship between gardener's values and the species composition of their gardens, with those holding conservationist views more likely to have native gardens. The authors state that to their knowledge theirs' is the only study investigating the effect attitudes have on garden composition, and indicate that continuing work on the causes of variation in garden vegetation is required (Zagorski et al., 2004). A study by Kiesling and Manning (2010) examined how Clayton's (2003) Environmental Identity Scale could explain differences in the gardening behavior of home gardeners in a Midwestern U.S.A. metropolitan area and found that the scale correlated with ecological gardening practices. Other researchers have failed to find a link between environmental values and environmentally sensitive gardening practices (Goddard et al., 2013; Larson et al., 2009; Larson et al., 2010; Yabiku et al., 2008).

The literature typically depicts gardens as sites of human activity where nature is shaped by people according to their culture, ideas and actions (Power, 2005). Gardens have been understood to reflect changing social patterns (Caldicott, 1997), marketing influences, and environmental knowledge (Head & Muir, 2005). Schipperijn et al. (2010) discovered that having a garden is strongly positively related to a person's age and education level.

Studies focusing on preferences of urban natural areas in comparison to builtup areas are common, yet studies looking at preferences for different forms of nature are limited (Özgüner & Kendle, 2006). A review of the literature shows that studies often find contradictory information about how people view nature and their preferences for it in urban areas. Some people find natural landscapes untidy and sometimes frightening (Head & Muir, 2004; Parsons, 1995) and there is some evidence to suggest that the public prefer manicured landscapes (New South Wales National Parks and Wildlife Service, 2002), possibly because urban residents have been exposed to a style of garden consisting of lawn and flower beds for a long period (Forbes, Cooper, & Kendle, 1997, Özgüner & Kendle, 2006). In contrast, neighbourhood satisfaction has been found to be positively correlated with large connected tree patches that differ in shape and size (Lee, Ellis, Kweon, & Hong, 2008), a study in France by Caula, Hvenegaard, and Marty (2009) found 72% of respondents preferred natural green spaces over ornamental and wanted them increased in the city, and research has found that many people have a preference for natural landscapes and diverse ecosystems (Lindemann-Matthies, Junge, & Matthies, 2010; Nielsen., Olsen, & Lundhede, 2007; Junge, Lindemann-Matthies, Hunziker, & Schüpbach, 2011; Schroeder, 1991)

According to some researchers (Kaplan & Kaplan, 1989; Orians & Heerwagen, 1992) people's desire to have contact with nature may reflect an evolutionary heritage (known as biophilia), i.e. that our desire to connect with nature linked to the conditions under which early humans evolved. According to the theory, modern humans are still born with a predisposition to prefer certain features common in natural but not built environments.

Attitudes towards trees can also be seen as somewhat contradictory, with individuals expressing both a fondness for, and fear of trees (Head & Muir, 2005). Reasons for people wanting trees in their backyard are numerous, including strong spiritual/aesthetic attachment; shading; a desire to create habitat for wildlife; their role in ensuring privacy; their role in moderating microclimate; and, their usefulness for production of food and fuel (Bhatti & Church, 2004; Head & Muir, 2004, 2005; Lohr, Pearson-Mims, Tarnai & Dillman, 2004; Zagorski et al., 2004). On the other hand, reasons for people not wanting trees in their backyards have also been found to be numerous, including perceived danger of trees falling, aesthetics and shading (Head & Muir, 2005; Parkin, Shackleton, & Schudel, 2006). It has been established that individuals with a low socioeconomic status and education level tend to have more negative attitudes towards trees in urban areas (Lohr et al., 2004). Other studies have shown that this extends to what is planted in backyards, with lower socio-economic areas tending to have less vegetated gardens (Daniels & Kirkpatrick, 2006a; Kinzig et al., 2005; Kirkpatrick, Daniels, & Zagorski, 2007). Garden size has also been shown to have an influence on garden composition, with smaller gardens displaying reduced vegetation cover (Smith et al., 2005). In light of the current trend toward reduced yard spaces, this is a potential issue for wildlife gardening.

Aesthetics is one of the most important factors in neighborhood satisfaction (Kaplan, 2001; Kearney, 2006; Langdon, 1988; Sirgy & Cornwell, 2002), and research has shown that vegetation is a factor influencing neighborhood attachment (Bonaiuto, Fornara, & Bonnes, 2003), use of space, sense of safety, and social contact among neighbours (Kuo & Sullivan, 1998). In addition, Nasar (1988) has shown that openness 82 (level of open views and lack of spatial enclosure, which can be reflected in housing density) is an important factor associated with neighborhood satisfaction.

In looking at desired garden types among the community, examining how wildlife is perceived as either welcome or unwelcome in people's yards is important. Studies focussing on community attitudes toward wildlife consistently find that many people have negative attitudes toward urban wildlife. In Australia, negative attitudes toward possums in urban areas have been uncovered in numerous studies (Matthews, Lunney, Waples, & Hardy, 2004; Miller, Brown, & Temby, 1999). International examples of negative attitudes toward urban wildlife include a study by West and Parkhurst (2002) who found that negative attitudes toward deer existed in Virginia, USA; and a study by DeStefano and Desblinger (2005) who discuss negative attitudes toward beavers in Massachusetts and mountain lions throughout western U.S.A.

In Australia, many people consider brushtail possums to be a nuisance as they sometimes utilise house roof cavities as den sites and create aesthetic concerns such as garden damage and odour (Temby, 2005). A study on attitudes toward urban possums in Melbourne, Australia, found that many people had negative attitudes toward possums despite having had no experiences with possums (Whiting, Miller, & Temby, 2010). When individuals are unsure or uninformed about an issue, their opinions can be greatly influenced by the opinions of others (Decker, Brown, & Siemer, 2001). Furthermore it has been shown that in general, people are inclined to express attitudes in line with what they perceive to be the public consensus (Sparks, 2006). This has been theorised to extend to behaviours carried out, the theory being that attitudes of others

influence people's actual behaviour. Fishbein and Ajzen (1975) developed a theoretical model which suggests that attitudinal and normative social influences can be viewed as determinants of behaviour, meaning that behaviour is influenced not only by one's own attitudes about the behaviour (Decker et al., 2001), but also their beliefs about other people's attitudes (McKnight & Sutton, 1994).

Numerous other factors have been shown to influence attitudes about wildlife, including demographic factors like gender (Kellert & Berry, 1987) and education (Manfredo, Teel, & Bright, 2003). However, circumstantial factors can also influence attitudes. For example, the abundance of the species in question has been shown to influence attitudes (West & Parkhurst, 2002) and as DeStefano and Desblinger (2005) point out, almost any species, once it reaches high population numbers can be regarded as a pest.

Whilst studies have found that many people have negative attitudes toward their local wildlife; other sources indicate the public may be willing to share the urban environment with wildlife. In the UK, the Department for Environment, Food and Rural Affairs (2002) reported that 78% of households with gardens have taken some action to encourage wildlife in the garden. A study in Australia found that 64% of respondents believe that wildlife should be encouraged (to varying degrees) in suburban backyards (New South Wales National Parks and Wildlife Service, 2002). The Australian study also sheds some light on what types of wildlife are considered desirable in urban areas (e.g., animals with a cute appearance and good reputation) and discusses some of the reasons why native plants are not considered desirable (e.g., fear of snakes, spiders

and falling trees). The study also highlighted that many people have a 'partitioned view of the world' (also discussed by Head & Muir, 2005), which refers to the view that some areas are right for nature and other areas are right for humans.

This chapter will examine questionnaire results from the *General Public* and *Wildlife Gardener* samples that relate to current garden composition, garden composition preference, and the types of welcome and unwelcome wildlife in yards in an attempt to determine whether members of the community would be accepting of a more wildlife friendly, biodiverse, urban environment.

4.2 RESULTS

Table 4.1 displays the frequency and percentages of the presence of a number of front and backyard features reported from a range of pre-determined features by both the *General Public* and *Wildlife Gardener* samples. The features for which a chisquared test for independence showed there to be a significantly higher incidence among wildlife gardens compared to the public were: chicken coop (χ 2=46.25, df=1, p<0.01); bird bath (χ 2=26.16, df=1, p<0.01); nest box (χ 2=30.69, df=1, p<0.01); frog pond (χ 2=77.97, df=1, p<0.01); vegetable patch (χ 2=20.33, df=1, p<0.01); fruit trees (χ 2=4.92, df=1, p=0.03); compost heap (χ 2=34.74, df=1, p<0.01); water tank (χ 2=6.85, df=1, p=0.01). The features for which a chi-squared test for independence showed there to be a significantly higher incidence among the public compared to wildlife gardeners were: BBQ (χ 2=4.62, df=1, p=0.03) and lawn (χ 2=19.79, df=1, p<0.01).

	General Public		Wildlife	Gardeners	
Garden Features	n	%	n	%	
Shed	231	57.9	154	58.8	
Swimming pool	38	9.5	32	12.2	
Spa	25	6.3	12	4.6	
Play Equipment	64	16.0	52	19.8	
Chicken coop	15	3.8	54	20.6	
Bird bath	186	46.6	176	67.2	
Bird feeder	87	21.8	74	28.2	
Nest box	27	6.8	57	21.8	
Frog pond	31	7.8	93	35.5	
Fishpond	65	16.3	44	16.8	
Lawn	323	81.0	171	65.3	
Vegetable patch	199	49.9	178	67.9	
Fruit trees	231	57.9	175	66.8	
Compost heap	225	56.4	207	79.0	
Water tank	169	42.4	139	53.1	
Water feature	75	18.8	58	22.1	
BBQ	251	62.9	142	54.2	

Table 4.1 Frequencies and percentages of the presence of a range

 of garden features by both the *General Public* and *Wildlife Gardeners*

The question, *Please tick the one response that best matches* **overall** the types of plants (including trees) you have in your front and/or backyard, yielded information about what types of plants respondents **mostly** have in their yards. This information is displayed in Table 4.2. A chi-squared test for independence showed a significant difference in the types of plants reported to be mostly present in the front and backyards of the *General Public* and *Wildlife Gardener* samples: χ 2=129.25, df=6, p<0.01.

Bold text indicates the feature differed significantly between the General Public and Wildlife Gardeners.

	General Public		Wildlife G	ardeners
Types of plants mostly in respondents yard	n	%	n	%
I have no plants	2	0.5	0	0.0
Unsure of what types of plants I have	15	3.7	0	0.0
Mostly non-native plants	83	20.2	4	1.6
Mostly Australian native plants	43	10.5	53	56.6
Mostly locally indigenous plants	5	1.2	48	18.9
Mostly fruit and/or Vegetable plants	15	3.7	6	2.4
A mix of non-native, native and/or indigenous plants	247	60.2	140	55.1

Table 4.2 Frequencies and percentages of the types of plants mostly present in both the

 General Public and *Wildlife Gardeners* yards

The questionnaire also asked whether respondents have **any** Australian native plants in their front or backyards. In response to the question *Do you have any* **Australian native** plants in your front or backyards (including indigenous species)? All respondents in the *Wildlife Gardener* sample indicated that they did have native plants. In contrast, 79.9% (*n*=326) of the *General Public* sample indicated they had native plants, 8.8% (*n*=36) reported having no native plants, and 11.3% (*n*=46) were unsure if they had any native plants. A chi-squared test for independence showed that there was a significant difference between the *General Public* and *Wildlife Gardener* samples: χ 2=58.01, df=2, p<0.01. Both samples were asked if they would consider planting any (or more) Australian native plants; 98.4% (*n*=249) of the *Wildlife Gardener* sample indicated *yes*, compared to 87.9% (*n*=350) of the *General Public* sample. A chi-squared test for independence found this difference to be significant: χ 2=23.11, df=1, p<0.01.

The mean CNS score for those indicating they would consider planting natives in the future was 3.61 (maximum score = 5), compared to 3.32 for those who would not consider planting natives. An independent samples t-test was conducted to compare these CNS scores and a significant difference was found with those considering planting 87 natives (*SD*=0.57) having higher scores than those not considering planting natives [*SD*=0.71; t(365)=3.07 p<0.01].

Respondents were asked to rank a list of pre determined garden types from 1 – 6, with 1 being the garden type they would **most prefer**. Table 4.3 shows the frequencies and percentages of the garden types ranked as 1, by both the *General Public* and *Wildlife Gardeners*. A chi-squared test for independence showed a significant difference in most preferred choice of garden type between the *General Public* and *Wildlife Gardener* samples: χ 2=125.23, df=5, p<0.01.

Table 4.3 Frequencies and percentages of garden types ranked as 1st (most preferred), by both the *General Public* and *Wildlife Gardeners*.

	General Public		Wildlife Gardene	
Preferred garden types	n	%	n	%
Lawn with non-native plants	53	13.3	3	1.2
Lawn with native plants	138	34.6	45	17.8
No lawn, non-native plants in a cottage setting	29	7.3	16	6.3
No lawn, native plants in a bush setting	82	20.6	155	61.5
Mainly fruit or vegetables	86	21.6	34	13.4
No garden, prefer manmade structures	11	2.8	0	0

Demographic factors for the *General Public* sample were examined in relation to the most preferred type of garden and whether a respondent would consider planting native species in the future. There was no significant difference in most preferred garden type based on sex (χ 2=8.9, df=5, p=0.11), income (χ 2=4.8, df=5, p=0.45), or place of birth (χ 2=2.61, df=5, p=0.76). However age (χ 2=28.0, df=5, p<0.01) and education level (χ 2=18.8, df=5, p=0.01) were found to be significantly different and the percentage break down of these can be seen in Table 4.4. No demographic factors (sex, income, place of birth, age, or education level) were found to influence the likelihood

of one considering planting native species in the future.

	% E	Education	% Age		
Preferred garden types	No University n=176	University <i>n</i> =213	Up to 39 <i>n=</i> 83	40-59 n=166	Over 60 <i>n</i> =139
Lawn with non-native plants	15.9	11.3	6	16.3	13.7
Lawn with native plants	39.2	31.5	39.8	34.3	33.1
No lawn, non-native plants in a cottage setting	7.4	7.0	4.8	7.8	7.9
No lawn, native plants in a bush setting	15.9	23.5	8.4	21.7	25.2
Mainly fruit or vegetables	16.5	25.8	38.6	17.5	16.5
No garden, prefer manmade structures	5.1	0.9	2.4	2.4	3.6

Table 4.4 Percentages of *General Public* respondents indicating preferences for garden typebased on both level of education and age

Scores on the CNS (Mayer & Franz, 2004) were analysed against most preferred garden type using a one-way ANOVA and a significant difference was found between CNS scores based on garden preference [F(5, 362)=6.63, p<0.01)]. Details relating to CNS scores and preferred garden types can be found in Table 4.5. Post-hoc comparisons using the Tukey HSD test indicated that the mean CNS score for those whose preferred garden type was a bush setting did differ significantly from those who had a preference for; lawn with non-native plants (p<0.01); lawn with native plants (p<0.01); cottage setting (p=0.02); and no garden (p<0.01). However, there was no significant difference between those who would prefer a bush setting and those who

would prefer a fruit and vegetable dominated garden (p=0.49). A significant difference in CNS score was also found between those who would prefer a fruit and vegetable based garden, and those who would prefer no garden (p=0.02). There were no other significant differences between preferences for garden types.

Preferred garden types	n	Mean CNS	SD
Lawn with non-native plants	50	3.40	.49
Lawn with native plants	130	3.51	.52
No lawn, non-native plants in a cottage setting	24	3.39	.68
No lawn, native plants in a bush setting	73	3.82	.56
Mainly fruit or vegetables	80	3.66	.60
No garden, prefer manmade structures	11	3.08	.78

Table 4.5 Mean CNS scores of the General Public Sample based on preferred type of garden

To analyse the responses to the statement, *I would like a garden that would encourage native wildlife to my yard,* data was combined from the *Public scoping* and *General Public* questionnaires due to the question being identical (*n*=665). The breakdown of responses was: 35.3% strongly agreed, 34.6% agreed, 20.2% remained neutral, 6.9% disagreed, and 3.0% strongly disagreed.

Tables 4.6 shows the wildlife types that were provided by the *General Public* Sample in response to a question asking them to list any wildlife that they are pleased to see (or hear) in their yard, any wildlife they were unhappy to see (or hear) in their yard, and any wildlife they don't see or hear but would like to. A total of 90.6% (n=378) respondents listed wildlife they were pleased to see or hear, 74.6% (n=311) listed wildlife they were unhappy to see or hear, and 45.8% (n=191) listed wildlife they don't see or hear but would like to. Based on the lists provided, categories of wildlife were 90 created and each listed animal was allocated to a grouping. Unfortunately, due to discrepancies in the level of species identification provided by respondents, some of the categories are not mutually exclusive. For example, some respondents just reported 'Native birds' had been attracted, whilst others reported 'Noisy Miner' (an Australian native honey eating bird), therefore a category of **Native birds** was required, but this obviously overlaps with many other categories.

Table 4.6 List of the types of wildlife reported as either *pleased to see, unhappy to see,* or *don't have but want to see* in the yard, including number and percentage of individuals that mentioned the wildlife type

	Respondent pleased to s		Respondents reporting unhappy to see <i>n=311</i>		Respondents reporting wanting to see <i>n=191</i>	
Wildlife species	n	%	n	%	n	%
Just mentioned Birds	94	24.1	6	1.9	43	22.5
Honeyeaters	137	48.9	19	6.1	16	8.4
Parrots	201	53.2	22	7.1	45	23.6
Small birds	67	17.7	10	3.2	23	12
Large birds	182	48.1	41	13.2	37	19.4
Medium birds	76	20.1	98	31.5	2	1.0
Water or Shore birds	20	5.3	4	1.3	1	0.5
Raptors	25	6.6	0	0.0	5	2.6
Possums	184	48.7	106	31.4	5	2.6
Mammals (exc. Possums)	40	10.6	57	18.3	20	10.5
Lizards	68	18.0	1	0.3	29	15.2
Snakes	2	0.5	16	5.1	1	0.5
Other reptiles	1	0.3	0	0.0	2	1.0
Frogs	36	9.5	1	0.3	43	22.5
Other Amphibians	2	0.5	0	0.0	1	0.5
Insects	93	24.6	134	43.1	12	6.3
Spiders	23	6.1	42	13.5	0	0.0

Tables 4.7 through 4.20 provide details of all the species that were listed by respondents (sorted into the categories used in Table 4.6), and the number of unique times they were mentioned by respondents. In reading the tables, each entry represents exactly what respondents wrote, for example, when Cockatoo is listed in Table 4.9 with a frequency of 56 pleased to see, this means 56 respondents wrote 'cockatoo' at this question. Underneath Cockatoo, Black Cockatoo and Sulphur Crested **Cockatoo** are also listed and the frequencies for *pleased to see* are 9 and 5 respectively. This means that this many respondents wrote 'Black Cockatoo' and 'Sulphur Crested Cockatoo'. They are grouped together so it is easier to see response patterns for the same type of animal. Due to discrepancies in the level of species identification, in some instances reported species do not correspond to the correct name for an actual species, and some of the categories are not mutually exclusive (Appendix 5 chronologically lists the scientific names for the species listed in results tables throughout the thesis, for all the types of animals that respondents identified to species level). Six respondents listed 'any wildlife' in the category of don't see or hear but would like to, however this is not included in the tables as it did not fit with any of the wildlife categories developed.

	п			
Types of Birds (Generic)	Pleased to see	Unhappy to see	Don't have but want	
Bird	80	3	23	
Native bird	14	1	20	
Non-native bird	0	3	0	

Table 4.7 Birds (Generic) listed as either pleased or unhappy to see or hear, or wanted, by the General Public

	п			
Types of Honeyeaters	Pleased to see	Unhappy to see	Don't have but want	
Bell Miner	0	1	3	
Eastern Spinebill	9	0	1	
Yellow Wattlebird	1	0	0	
Honeyeater	45	0	8	
New Holland Honeyeater	5	0	2	
Noisy miner	18	7	0	
^Miner/minor	6	9	0	
Wattlebird	87	2	4	
Red Wattlebird	4	0	0	
White-plumed Honeyeater	1	0	0	

Table 4.8 Honeyeaters listed as either *pleased* or *unhappy to see or hear*,or wanted, by the General Public

^ There were 6 different spellings for Miners. As the Noisy Miner is spelt with an i, and the Indian Myna is spelt with a y, the use of an i or y in the spelling determined which category it was classified to (honeyeater or medium bird). However as it cannot be assumed that the public are aware of the spelling difference, the results for these birds should be interpreted with caution.

Table 4.9 Large sized Birds (defined for this study as having an average length above 40cm) listed as either *pleased* or *unhappy to see or hear*, or *wanted*, by the *General Public*

	n			
Types of Large Birds (40cm+)	Pleased to see	Unhappy to see	Don't have but want	
Cuckoo-shrike	0	0	1	
Currawong	26	1	0	
Crow	28	26	0	
Kookaburra	43	0	35	
Lyre bird	2	0	0	
Magpie	148	13	1	
Raven	9	7	0	
Tawny frogmouth	22	0	1	

		п	
Types of Parrots	Pleased to	Unhappy	Don't have
	see	to see	but want
Cockatoo	56	19	4
Black Cockatoo	9	0	0
Sulphur crested cockatoo	5	1	10
Cockatiel	3	0	0
Corella	6	0	1
Galah	33	2	7
Gang Gang	1	0	0
Grass Parakeet	0	0	1
*Green parrot	3	0	0
King Parrot	7	0	6
Lorikeet	60	0	11
Rainbow Lorikeets	20	0	2
Parrot	56	0	14
Rosella	85	0	13
Crimson Rosella	3	0	2
Eastern Rosella	2	0	4

Table 4.10 Parrots listed as either *pleased* or *unhappy to see or hear*, or*wanted*, by the *General Public*

* Not a correct or common name for a species

Table 4.11 Raptors listed as either *pleased* or *unhappy to see or hear*, or*wanted*, by the *General Public*

		n		
Types of Raptors	Pleased to see	Unhappy to see	Don't have but want	
*Small hawk	1	0	0	
Night Jar	2	0	0	
Owl	17	0	5	
Powerful Owl	2	0	0	
Wedge tail eagle	1	0	0	

* Not a correct or common name for a species

Table 4.12 Small sized Birds (defined for this study as having an average)	
length up to 19cm) listed as either pleased or unhappy to see or hear,	
or wanted, by the General Public	

	п			
Types of Small Birds (up to 19cm)	Pleased to see	Unhappy to see	Don't have but want	
Fantails	1	0	0	
Rufous Fantail	0	0	1	
Finch	8	0	3	
Firetail	1	0	0	
Kingfisher	0	0	1	
Pardalote	2	0	3	
Robin	0	0	1	
Robin Red Breast	0	0	1	
Silvereye	11	0	2	
Small native bird	0	0	5	
Sparrow	20	10	0	
Swallow	2	0	0	
Thornbill	1	0	1	
Tit	1	0	0	
Treecreeper	1	0	0	
Willie wagtail	11	0	2	
Wren	5	0	4	
*Blue Robin	1	0	0	
Blue Wren	7	0	5	
Scrub wren	1	0	0	
Weebill	0	0	1	

* Blue Robin is not a correct name for an Australian species, and it is likely the respondent meant Blue Wren.

		n	
Types of Medium Birds (20-39cm)	Pleased to see	Unhappy to see	Don't have but want
Blackbird	30	19	0
Butcherbird	16	2	0
Dove	32	13	0
Native Dove	1	1	0
Turtle dove	0	1	0
Magpie-lark	7	0	0
^Myna	5	14	0
Indian Myna	8	43	0
Pigeon	30	25	0
Crested pigeon	2	0	0
Top-Knot pigeons	2	0	0
Starling	6	9	0
Thrush	5	1	2
Whip bird	1	0	0

Table 4.13 Medium sized Birds (defined for this study as having an average length of between 20 and 39cm) listed as either *pleased* or *unhappy to see or hear,* or *wanted,* by the *General Public*

^ See note at Table 4.8

Table 4.14 Water or Shore birds listed as either *pleased* or *unhappy to*see or hear, or wanted, by the General Public

- (n		
Types of Water / Shore birds	Pleased to see	Unhappy to see	Don't have but want	
Duck	14	2	1	
Black duck	1	0	0	
Wood duck	2	0	0	
Heron	1	1	0	
Ibis	1	0	0	
Plover	1	0	0	
Silver Gull	0	1	0	
Stork	1	0	0	
Water hens	1	0	0	

		n		
Types of Amphibians	Pleased to	Unhappy	Don't have	
	see	to see	but want	
Common / Eastern Froglet	1	0	0	
Frog	34	1	42	
Green tree frog	0	0	1	
Spotted marsh frog	1	0	0	
Striped Marsh Frog	1	0	0	
Amphibian	1	0	1	
Salamander	1	0	0	

Table 4.15 Amphibians listed as either *pleased* or *unhappy to see orhear*, or *wanted*, by the *General Public*

Table 4.16 Spiders listed as either *pleased* or *unhappy to see or hear*, or*wanted*, by the *General Public*

- (0.1)	n			
Types of Spiders	Pleased to see	Unhappy to see	Don't have but want	
Crab spider	0	1	0	
Garden spider	1	0	0	
Huntsman	0	2	0	
Mouse spider	1	0	0	
Orb spider	1	0	0	
Golden Orb spider	1	0	0	
Redback spider	2	13	0	
Spider	19	26	0	
White-tail spider	0	8	0	

Table 4.17 Possums listed as either *pleased* or *unhappy to see or hear*,or wanted, by the General Public

- (-	n			
Types of Possums	Pleased to see	Unhappy to see	Don't have but want	
Brushtail Possum	73	39	0	
Possum	63	57	2	
Ringtail Possum	81	16	2	
Sugar Glider	0	0	1	

	n			
Types of Mammals	Pleased to see	Unhappy to see	Don't have but want	
Bandicoot	0	0	1	
Bat	15	7	0	
Flying fox	5	0	0	
Fruit bat	9	4	1	
Deer	2	1	0	
Echidna	5	0	1	
*Anteater	0	0	1	
Fat tailed dunnart	1	0	0	
Fox	3	16	1	
Kangaroo	4	0	3	
Eastern Grey Kangaroo	1	0	0	
Grey Kangaroo	1	0	0	
Koala	0	0	8	
Platypus	0	0	1	
Rabbit	3	10	0	
Rat	2	28	0	
Mice	2	18	0	
Mole	1	0	0	
Wallaby	5	0	2	
Swamp wallaby	1	0	0	
Wombat	4	0	2	

Table 4.18 Mammals (exc. Possums) listed as either *pleased* or *unhappy to*see or hear, or wanted, by the General Public

* Anteater is likely referring to an Echidna, as these are sometimes called Spiny Anteaters

	n			
Types of Reptiles	Pleased to see	Unhappy to see	Don't have but want	
Blue tongue lizard	22	0	4	
Drop tail Lizard	4	0	0	
Gecko	6	0	1	
Goanna	1	0	1	
Lizard	19	0	23	
*Penny lizard	1	0	0	
Skink	26	1	2	
Snake	2	10	1	
Brown snakes	0	1	0	
Tiger snake	0	3	0	
Reptile	1	0	1	
Turtle	0	0	1	

Table 4.19 Reptiles listed as either *pleased* or *unhappy to see or hear*,or *wanted*, by the *General Public*

* Penny lizard is not a correct name for a species; it is most likely a skink

Table 4.20 Insects listed as either pwanted, by the General Public	pleased or unhappy to see or hear, or
	n

	n			
Types of Insects	Pleased to see	Unhappy to see	Don't have but want	
Ant	3	19	0	
Bull ant	0	5	0	
Native ant	0	0	1	
Aphid	0	6	0	
Вее	30	3	1	
Native bee / wasp	4	0	0	
Beetle	2	2	0	
Ladybug	18	0	4	
Bugs	13	11	1	
Butterfly	19	1	4	
Altona Skipper Butterfly	0	0	1	
Cicada	3	1	0	
Cockroach	1	17	0	
Cricket	5	0	0	

Types of Insects cont.	Pleased to see	Unhappy to see	Don't have but want	
Dragonfly	5	0	1	
Earwig	1	8	0	
Fly	2	17	0	
Harlequin bug	0	1	0	
Grasshopper	1	0	0	
Insect	3	1	0	
Leech	0	1	0	
Locusts	0	1	0	
Millipede	0	6	0	
Moth	2	1	0	
Cabbage moth	1	6	0	
Case moth	1	0	0	
White moth	0	1	0	
Mosquito	4	36	0	
Passionvine hopper	0	1	0	
Praying mantis	2	0	0	
Silverfish	0	1	0	
Slater	1	3	0	
Slug	1	17	0	
Snail	4	52	0	
Stick insect	3	0	0	
Stink bug	0	1	0	
Termite	0	1	0	
Wasp	1	32	0	
Witchetty grub	1	0	0	
Worm	14	0	0	
Earth Worm	3	0	0	
Scrub worm	1	0	0	

4.3 DISCUSSION

The results suggest that individuals involved in wildlife gardening programs are more likely to have garden features that could be described as promoting sustainability, both from a biodiversity perspective **and** self-sufficiency perspective. For example, bird baths, nest boxes, and frog ponds are all features that are designed to provide resources for wildlife and can subsequently be seen as beneficial for biodiversity. In a similar way, the finding that wildlife gardeners were less likely to have a lawn, may indicate that in these cases the area that was once lawn has been planted out, which would provide habitat and resources for local wildlife. This planting out of lawns was seen at 3 of the 10 wildlife gardener interview sites, see figure 4.1 for an example. Other features reported more commonly by wildlife gardeners (chicken coop, vegetable patch, fruit trees, compost heap and water tank) are of environmental benefit due to their ability to help residents be less reliant on commercial enterprises. For example, by using a water tank residents can take pressure off mains water supply. These findings suggest that those involved in wildlife gardening are more open to environmental initiatives in general, and not just wildlife gardening. This fits with the results of Zagorski et al. (2004), that those holding conservationist views are were more likely to have native gardens.

Bird feeding is a popular activity among urban residents in the western world (Jones & Reynolds, 2008). For example, in the UK it is estimated that 12.6 million (48%) households engage in bird feeding (Davies et al., 2009). In the current study there was no significant difference in the presence of bird feeders between the yards of the *General Public* and *Wildlife Gardeners,* with approximately one quarter of both samples reporting the presence of one. This does not suggest that all those with bird feeders utilise them, or that those without formal feeders do not engage in this activity. The result is interesting however, as it may indicate that both wildlife gardeners and the broader community are equally interested in attracting birds to their yard, so provides 101 evidence that there is scope to engage the public with the premise of wildlife gardening. It should be pointed out, however, that this result could potentially be a result of non-response bias in the *General Public* sample, thereby giving an inflated view of the number of bird feeders present in the gardens of the general public. This study does not examine bird feeding directly, or make any claims to the practice's benefits or problems. However it is worth noting that whilst research suggests supplementary feeding can benefit bird populations (Daniels & Kirkpatrick, 2006b; Fuller et al., 2008), it also indicates that there are negative impacts, which include disease transmission and increased predation pressure (Robb, McDonald, Chamberlain, & Bearhop, 2008).



Figure 4.1 A planted area where traditionally there would be a lawn, at a wildlife gardener's house in suburban Melbourne

Although just over three quarters of the *General Public* sample indicated they have at least some Australian native plants in their yards, if we look at the compositions of their yards overall, it becomes apparent that the use of native species is not overly common. The most common garden composition was a mix of non-native, native and/or indigenous plants, followed by mostly non-native plants, and then mostly Australian native plants. In contrast, the use of native (and indigenous) species is much more prevalent among the Wildlife Gardening sample and they were also shown to be significantly more likely to consider planting native species in the future. However, it must be pointed out that the percentage of the General Public sample that indicated they would consider native plants in the future was very high in its own right (almost 90%). In addition, the *General Public* sample's most preferred garden type selected from the six choices (see Table 4.3) was a lawn with native plants. Based on these findings, although their current use does not appear to be extensive, the use of native plants in domestic gardens **does** have the potential to grow at this moment in time. A study by Doody et al. (2010) in New Zealand found that 54% of their sample would be prepared to plant a native species found in a local urban forest remnant in their garden. This figure is much lower than found in the current study. Perhaps this difference reflects the desire of residents to have control the type of species they plant, i.e. if they feel they are forced to plant a specific native species, as in the Doody et al. (2010) study, they may be less inclined to do so than if they are free to choose their own native plants. Another reason for the high number of respondents indicating they would choose native plants in the future could be non-response bias, i.e. people with

less interest in nature and biodiversity did not complete the survey, and if they had the percentage of those willing to plant natives in the future would be lower.

The examination of the relationship between demographic factors and a willingness to plant native species in the future is promising, as no demographic factors were found to be related. This means that in promoting the use of native plants to the general public, there are no specific target groups that need to be considered.

The study found that with an increase in sense of connection with nature, respondents were more likely to consider planting native vegetation in the future. In addition, those with a preference for a garden with a bush setting had a stronger sense of connection with nature than those preferring all other garden types except fruit and vegetable gardens. These findings are similar to that of Zagorski et al. (2004), which showed that those holding conservationist views were more likely to have native gardens.

A relationship exists in regards to respondents' preferred type of garden and their age and education level. The figures suggest that those with a university degree are more likely to want a predominantly fruit and vegetable garden or a garden with a bush setting than those without a university degree. In terms of age, it appears that younger individuals are more interested in predominantly fruit and vegetable gardens, and less interested in a garden with a bush setting. If younger, and more educated generations continue to lean towards more fruit and vegetable dense gardens, this would need to be considered by those working in the field of urban conservation (or wildlife gardening programs) and integrated in to any attempts to engage the public on issues around providing habitat for wildlife. In addition, human-wildlife conflicts may become more widespread if urban wildlife is seen to be eating one's produce. However, as the *General Public* sample is skewed towards older individuals and individuals with higher qualifications, there is a need to consider these results and the hypothesised implications as preliminary.

Figure 4.2 shows a vegetable garden within a wildlife gardener's garden, and as discussed above, Wildlife Gardeners actually had a significantly higher proportion of respondents indicating they have a vegetable patch and fruit trees, compared to the general public. Therefore wildlife gardening and fruit and vegetable gardening are not mutually exclusive. There are many benefits to having fruit and vegetables grown at home, for example it teaches children about where their food comes from and can promote healthy eating (Blair, 2009; Ratcliffe, Merrigan, Rogers, and Goldberg, 2011). This research does not discount the benefits of fruit and vegetable gardens, and due to their popularity, in particular with younger generations, the results suggest that incorporating such gardens into the promotion of wildlife gardening may be useful in encouraging the broader public to become involved.

On the surface, the results suggest that majority of the population is willing to plant native vegetation and a significant number would like a garden that attracts native wildlife to their yard. However, given the low response rate for this study there is a need to interpret the results with caution. Despite this, if we compare our results to studies in the UK and other Australian studies that asked urban residents about wildlife gardening, our finding that approximately 70% of respondents (*Public Scoping* and *General Public*) would like a garden that would encourage native wildlife does not seem to be overly (if at all) inflated. In a study of community knowledge, beliefs, attitudes and behaviour with respect to urban wildlife, the New South Wales National Parks and Wildlife Service (2002) found that 64% of respondents believed that wildlife should be encouraged in suburban backyards. A UK report indicated a similar finding, with 78% of households with gardens surveyed taking some action to encourage wildlife in the garden (Department for Environment, Food and Rural Affairs, 2002). Given the similarities between these findings, the results presented here appear to be valid.



Figure 4.2 A vegetable garden integrated into the garden of a wildlife gardening program participant in suburban Melbourne

The types of wildlife species listed by the *General Public* sample as either *pleased to see, unhappy to see,* or *want to see* in the yard are broad ranging. A number of *General Public* respondents failed to list any species at these questions, instead

leaving it blank: for example approximately 10% did not list any *pleased to see* wildlife. It may not be that these non respondents do not have any wildlife they are pleased to see in their yard, as a similar proportion of *Wildlife Gardeners* also left this question blank. It could be presumed that all wildlife gardeners would have some wildlife in their yards they were pleased to see; therefore non response on these questions in most cases is likely due to the open ended nature of the questions. As discussed in Chapter 2, these questions were designed this way due to the fact that people tend to have poor species identification skills (Bebbington, 2005; Pilgrim, Cullen, Smith, & Pretty, 2008). Therefore, providing a list of species may have resulted in respondents either not selecting species that were present in their yard because they did not know the name of the species, or selecting species they didn't have in their yard because they thought that was what the species is called. However, in hindsight, a question listing a generic range of species (i.e. native birds, lizards) and asking if these were welcome or unwelcome would have been useful for interpreting how welcome different types of wildlife is in yards.

The results from this set of questions cannot be taken to mean that there are not other types of wildlife that respondents are pleased to have, unhappy to have, or want to have. As discussed, many people left this question blank, making it difficult to interpret the results. In addition, the open ended style means that the species listed may be the ones that are in the forefront of people's minds. For example, people may have butterflies in their yard, but did not think to include this on the survey (however the question did include a note indicating that wildlife could include mammals, birds, reptiles, amphibians and 'bugs'). Similarly, in regards to what wildlife people would like 107 to see, had people been asked, for example, if they would be happy to see small birds, there may have been a greater number of people indicating this preference. Using this example, a NSW Parks and Wildlife Service (2002) study found 80% of respondents would like small birds in their yard, whereas in this study only 12% indicated they didn't have these species and would like them. Nevertheless, some trends can be garnered from the results that were obtained, but these should be viewed with these limitations in mind.

The level of species identification provided by respondents varied considerably, with many respondents simply indicating 'birds', whereas others were more specific, for example 'Eastern Spinebill'. The data obtained for this question showed that, as research has established (Bebbington, 2005; Pilgrim et al., 2008), the public generally does not have well developed species identification skills.

Looking at the types of wildlife species that were listed by the *General Public* as welcome in the backyard, it can be seen that the most popular species are all native to Australia. For example, a little over half of those that answered the question listed at least one type of parrot (native to Australia). A slight exception to this may be the Cockatoo. Although a large number (56) reported they welcomed this bird, a fair number (19) reported they were unwelcome. This is likely due to their reputation for damaging timber decking and panelling on houses (Birdlife Australia, 2014). Other native species listed as welcome included large native birds, (such as the Magpie), which were mentioned by almost half of those that answered the question, as were possums.

Looking at the types of wildlife species that were listed by the *General Public* as unwelcome in the backyard, the highest subgroup of animals is insects. This is possibly due to their tendency to eat garden produce (e.g., cabbage moth) or elicit fear (e.g., wasp). This is concerning as insects are a vital part of global biodiversity and have a very important role in ecosystem function. If the public has a negative attitude toward them, and are taking steps to reduce their numbers, this may have flow-on effects for the rest of the ecosystem, and species further up the food chain. This study did not assess this, however further research into how the public interact with and value insects would be useful. Despite the large numbers listing insects as unwelcome, almost a quarter of respondents did list insects as a welcome type of wildlife, so perhaps there is a more balanced view of insects than the unwelcome list would suggest.

Possums also featured prominently on the list of unwelcome species, and were listed by 31.4% of people who answered the question, presumably due to their habit of sometimes utilising house roof cavities as den sites and damaging gardens (Temby, 2005). Compare this to the 48.7% who indicated they are pleased to see possums, and it can be seen that the community has very differing attitudes towards possums in urban areas (Whiting et al., 2010). Although mammals other than possums were not listed as unwelcome in great numbers (18.3%), the species under this category that were listed can be seen as introduced pests (e.g., rats, rabbits and foxes). This may indicate that at least a portion of the public is aware of the detrimental effect such species can have on our ecosystem. Another subgroup that had a relatively large proportion (31.5%) of species listed as unwelcome is medium sized birds. Looking at the species that come under this subgroup, it can be seen that the majority are introduced birds, and certainly the ones listed as *unhappy to see* are almost exclusively non-native birds. Introduced birds are often seen as pests, such is the case with the Indian Myna which was the most unwelcome of all medium sized birds listed by respondents. The Indian Myna defends its territory aggressively, and a relationship between the presence of Indian Mynas and the long-term abundance of some cavity-nesting and small bird species has been demonstrated (Grarock, Tidemann, Wood, & Lindenmayer, 2012). In the category of small birds, the only species listed as unwelcome were Sparrows, an introduced bird. These results, taken with the predominance of native species listed as welcome, indicate that the public is very much in favour of native wildlife in the suburbs as opposed to non-native wildlife.

Parrots were the most listed species that the *General Public* do not currently have, but would like in their yards. Again, there appears to be a preference for wanting native wildlife, and this preference can be seen across all wildlife categories. Apart from bird species, the types of wildlife that respondents have the greatest interest in seeing in their yards are frogs (22.5%) and lizards (15.2%).

4.4 CONCLUSION

A large proportion of the metropolitan Melbourne population is interested in planting more native vegetation in their yards and there is support for wildlife in yards. Based on these results there may be scope for wildlife gardening programs to engage with the public in an effort to help increase the biodiversity of their local area. The next chapter, *Wildlife gardening and connectedness to nature: engaging the unengaged*, will look at whether there is any potential to attract unengaged members of the public to become involved in wildlife gardening, and in doing so further examines whether there is a case for the use of wildlife gardening programs as a tool to engage the general community with nature and help improve biodiversity in the program's local area.



CHAPTER 5 WILDLIFE GARDENING AND CONNECTEDNESS TO NATURE: ENGAGING THE UNENGAGED

5.1 BACKGROUND

The following chapter is due to be published in the August edition of *Environmental Values* – an international peer-reviewed journal focusing on society and environment. As a result, it has a slightly different format to the other chapters in this thesis and there is a small amount of repetitious text. However, the numbering of subject headings and reference style remains consistent with the rest of the thesis.

5.2 ABSTRACT

An often overlooked impact of urbanisation is a reduction in our ability to connect with nature in our daily lives. If people lose the ability to connect with nature we run the risk of creating a nature-disconnect, which is hypothesised to have an impact on our empathy for other species and our desire to help conservation efforts. Understanding how a sense of connection with nature can impact upon people's decisions to seek out nature in their daily lives is important if we wish to encourage the practice of wildlife gardening as a tool to enhance both urban biodiversity and connectedness to nature. This study targeted members of wildlife gardening programs (n=261) and members of the general public (n=417) and provides empirical evidence that connectedness to nature is a primitive belief, but also shows that a strong sense of connection with nature is not a prerequisite for engaging in wildlife gardening.

KEYWORDS

Connectedness to nature, wildlife gardening, urban conservation, urban wildlife, biodiversity conservation

5.3 INTRODUCTION

The reduction in our ability to connect with nature in our daily lives is an underestimated and often neglected negative effect of urbanisation. Urbanisation affects biodiversity by fragmenting and reducing native vegetation, typically resulting in dramatic losses of indigenous species (Collinge, 1996). Contact with nature is acknowledged as beneficial to human health and well being (Rohde & Kendle, 1997), relaxation (Chiesura, 2004; Ulrich & Addoms, 1981), stress recovery and relief (Leather, Pyrgas, Beale, & Lawrence, 1998; Parsons, Tassinary, Ulrich, Hebl, & Grossman-Alexander, 1998), increased mental energy (Hartig, Mang, & Evans, 1991) and increased social interaction (Sullivan, Kuo, & DePooter, 2004).

Research has demonstrated that without regular contact with nature we are at risk of developing a nature-disconnect, which has been hypothesised to have a significant impact on our empathy for other species and hence our desire to support conservation efforts elsewhere (Luck, 2008; Rohde & Kendle, 1997). Evidence suggests that it is especially important to develop meaningful bonds with the natural environment during childhood to ensure positive values towards the natural environment (Bunting & Cousins, 1985; Chawla, 2002; Horwitz, 1996; Kellert, 2002) and it has often been reported that today's children lack the exposure to the natural world that is important in shaping environmental values (Kahn, 2002; Kellert, 2002; Orr, 2002). Given that we live in a rapidly urbanising world (United Nations, 2012), naturedisconnect is a potentially significant threat as it could lead to less support for wildlife conservation in the future, putting more and more species at risk. However, empirical research has only just begun to examine what ecologists and ecopsychologists have been theorising about the importance of feeling connected to nature. Therefore research into people's affective sense of connection with nature is needed to add empirical evidence to the field; Mayer and Frantz (2004) developed the Connectedness to Nature Scale (CNS) for this purpose. The scale consists of 14 statements that were designed to address a person's sense of emotional connection with nature. A criticism of the scale is that it does not focus on an emotional connection, instead measuring people's beliefs about their connection to the natural world (Perrin & Benassi, 2009). However, this is still a valid construct to measure and is appropriate for the purposes of this study.

The sense of connection that one feels with the natural world has been theorised to be a primitive belief (Schultz & Tabanico, 2007). Such beliefs are thought to form the inner core of a person's belief system and 'represent his "basic truths" about physical reality, social reality and the nature of the self.' (Rokeach, 1968, p. 6). These primitive beliefs are thought to be unconscious, as Bem (1970, p. 5–6) writes, 'Our most fundamental primitive beliefs are so taken for granted that we are apt not to notice that we hold them at all; we remain unaware of them until they are called to our attention or are brought into question by some bizarre circumstance in which they appear to be violated... They are the non-conscious axioms upon which our other beliefs are built.' Social psychologists theorise that primitive beliefs influence a wide range of beliefs and attitudes concerning more specific environmental issues (Schultz, 2002). Therefore, although unconscious, the beliefs people hold about their connectedness to nature guides the formation of other beliefs about nature, concerns about environmental problems and environmental programs and policies (Schultz & Tabanico, 2007).

A related concept is that of environmental identity, which relates to how people see themselves in relation to the natural world (Clayton & Opotow, 2003). Schultz and Tabanico (2007, p. 1219) state that 'One of the most fundamental beliefs that a person holds is about his or her relationship to the natural environment; that is, "Am I part of nature, or am I separate from nature?". In western, industrialised society, people often view themselves as being separate from the natural world around them (Frantz et al., 2005) and a cultural value of superiority of humans over other life forms exists (Mayer & Frantz, 2004; White, 1967). It has been hypothesised that values such as this make it 115 easier for people to damage the environment without feeling guilt as there is no association between self and nature. If a nature-self association existed, behaviours damaging the earth would be experienced as self-destruction (Roszak, 1995). Therefore, finding ways to increase our feeling of connectedness with nature is important if we wish to strive to protect the environment.

Despite the modern tendency to view ourselves as separate from nature, it has been put forward that there may be a biological predisposition for humans to have a positive association with nature. This theory is known as the biophilia hypothesis and its basis is that there is genetic tendency to affiliate with life (Wilson, 1993; 1984), whereas connectedness to nature is subjective, and refers to an individual affective sense of connection with the natural world. Hinds and Sparks (2008) summarise the biophilia argument by saying that the technological advances made by humans have occurred so rapidly that our evolutionary adaptation to our modern environments has yet to substantially develop, and therefore there is still a need to be with nature. Not all evidence completely supports biophilia (see Kahn, 1999 for a review), for example a study by Schultz and Tabanico (2007) using the Implicit Association Test (IAT – a tool that assesses the degree to which people associate themselves with nature, without requiring conscious awareness of the association), found that 25% of their samples showed a stronger association between self and built environment and they were able to show that IAT scores can change as a result of experience. Schultz and Tabanico (2007) point out that if the IAT effect resulted from a biological disposition it should not be so easy to change. Importantly, some authors (Kahn, 1997; Kellert, 2002) have suggested that the biological disposition for biophilic tendencies may be weak, and 116

require the addition of learning, culture and experience of nature to fully develop. Although different to connectedness to nature, biophilia is a similar concept and therefore it may be expected that connectedness to nature can be strengthened through contact with nature so that individuals with greater experiences in nature would express a greater connection than with those with less experience (Hinds & Sparks, 2008).

5.3.1 WILDLIFE GARDENING

Wildlife gardening has been broadly described as any actions undertaken in private or domestic gardens to increase their suitability for wildlife (Davies et al., 2009). Given that wildlife gardening increases people's access to natural environments, it has the potential to address the issue of 'nature-disconnect' whilst also contributing to much needed urban nature conservation (Chamberlain et al., 2004; French, et al., 2005; Thompson et al., 1993; Rudd et al., 2002). Globally there are numerous wildlife gardening programs aiming to do this, some examples include, from Australia: Gardens for Wildlife (Knox City Council, 2013) and Backyards for Wildlife (Department for Environment and Heritage, 2012), from the USA: Certified Wildlife Habitat (National Wildlife Federation, 2013) and from the UK: Wild about Gardens (The Royal Horticultural Society & The Wildlife Trusts, 2011).

Wildlife gardening programs fall under the broad banner of community environmental education. The success of such programs has been seen as limited as they tend to only attract the informed and enthusiastic members of the community 117 rather than reaching those most in need of the environmental education (Davies & Webber, 2004). This is illustrated by a study examining attitudes toward possums in a Melbourne municipality (Miller et al., 1999) which found that respondents with positive attitudes toward possums had a significantly greater interest in learning about possums, than respondents with negative attitudes (Miller et al., 1999). In this situation, individuals with negative attitudes toward possums may be the target audience, however it may prove difficult to change their attitudes through education as such individuals have low levels of interest in learning more. Therefore if wildlife gardening programs are only attracting interested members of the community (i.e. those with positive attitudes toward wildlife in urban areas), who may well already be practising a form of wildlife gardening, what net benefit is this contributing to either biodiversity conservation or people's connection with nature?

Given the potential benefits of wildlife gardening, research into the degree with which wildlife gardening activities are practised is growing (see Buczacki, 2007; Cowie & Hinsley, 1988; Davies et al., 2009; Gaston, Warren, Thompson, & Smith, 2005; Gaston, Fuller, Loram, MacDonald, Power, & Dempsey, 2007; Lepczyk, Mertig, & Liu, 2004). However, research into the success of formal wildlife gardening programs at attracting unengaged individuals is lacking. This study aims to fill this gap by investigating the relationship between feeling a sense of connection with nature and involvement in wildlife gardening programs to determine whether or not wildlife gardening programs are only attracting the engaged members of the community.

5.4 METHODS

5.4.1 WILDLIFE GARDENERS' SURVEY AND INTERVIEWS

Eight wildlife gardening programs (in which participants join up and receive information about gardening for wildlife with the expectation that those participants are undertaking planting for wildlife) from across Australia (all states represented except Western Australia and the Australian Capital Territory) were approached and agreed to be involved in the study, constituting a member base and therefore a sample size of 2199. In an effort to increase the response rate, program participants were contacted and invited to participate by their respective programs emailing their members a description of the study and a link to complete the survey online. Participants were also offered the chance to go into a draw to win a \$100 gift voucher of their choosing. The wildlife gardening programs sent out a customised link to all their participants in October 2010. Each program was allocated a different survey link so comparisons of respondent attitudes and values could be made between programs. The survey began with a covering letter and consisted of the following sections:

1. Your wildlife gardening program experience. This section sought information about motivations for joining a wildlife gardening program and the reasons *behind* the motivation to joining the program. It also asked about the impacts of the program on individual knowledge and interest in biodiversity and the perceived success of the program in attracting wildlife. 2. Nature in your yard. This section sought information about the human-made and vegetative composition of the respondent's yard, the reasons they chose either native or non-native plants, their preferred type of yard, and their experiences with desired and non-desired wildlife in their yard.

3. Opinions and attitudes. This section asked for the respondent's opinions and attitudes about nature in their yard via a 5 point likert scale: first through a series of 17 statements generated for this study, followed by the Connectedness to Nature Scale (CNS).

4. General information. This section sought general demographic information about the respondent.

The survey included an invitation to provide contact details if the participant was interested in being involved in a 30 minute interview about their thoughts on biodiversity in urban areas. The intent of the interviews was to build upon the information gathered through the survey, by allowing interviewees to expand upon their answers to provide deeper insights. Ten interviews were conducted in November 2010 at interviewees' places of residence. Interviews ranged in time from 12 to 35 minutes and followed a semi-structured format. This was necessary as an answer to one question may lead the interviewee to inadvertently answer other questions on the list, or to raise a new line of questioning that may not have been originally planned. With the permission of the interviewee, interviews were recorded via dictaphone. Following the interviews, the recording was transcribed verbatim using an external transcription service.

5.4.2 PUBLIC SURVEY

Surveying the public on their attitudes toward and values of nature was undertaken as part of a broader study on community attitudes to nature in the backyard. The results from the larger study are not the focus of this paper, however some comparisons are highly relevant to this study and as such this sample is included here. The survey consisted of 30 questions, which were identical to the Wildlife Gardeners Survey with the exception of questions relating to participation in wildlife gardening programs, and the inclusion of questions regarding interest in joining a wildlife gardening program.

The survey was sent to 4000 randomly selected residents of metropolitan Melbourne. Residents were selected using systematic random sampling of the 2009 Residential White Pages telephone directory. A range of recruitment methods were used: 2000 people received a hard copy of the survey along with an accompanying covering letter, consent form and reply-paid envelope – 1000 of these were addressed to 'The Resident' and 1000 were personally addressed: 2000 people received a colour postcard (with an image of a rainbow lorikeet) inviting them to complete the survey online – 1000 of these were addressed to 'The Resident' and 1000 were personally addressed. In an effort in increase response rates participants were offered the chance to go into the draw to win one of four \$100 gift vouchers of their choosing, and reminder postcards were sent out approximately one week after the stated return-by date.

5.4.3 DATA ANALYSIS

Quantitative questionnaire data from both the wildlife gardening and public samples were coded and entered into PASW (Predictive Analytics SoftWare) version 18.0. Qualitative data obtained from open-ended survey questions were analysed for key themes and then coded and entered into PASW for statistical analysis. Qualitative data obtained from interviews were analysed for key themes and quotes selected to illustrate quantitative results.

The degree to which wildlife gardeners feel a sense of connection to nature was measured using the Connectedness to Nature Scale (CNS), a series of statistical tests (discussed in section 2.8.1) were undertaken to confirm the internal reliability of the scale and the presence of one factor. Independent samples t-tests and ANOVAs were used for testing relationships between groups when a continuous variable was present and the chi-squared test for independence was used when dealing with categorical data. Comparative data were considered statistically significant at $P \le 0.05$.

5.5 RESULTS

5.5.1 WILDLIFE GARDENERS

The *Wildlife Gardening* sample yielded 261 useable responses (response rate of 11.9%). We acknowledge that this represents a low response rate, and given our efforts to minimise non response (see methods section) and the targeted nature of this sample

it is likely that this is due to declining response rates in social research conducted in urban areas (Neuman, 2000). However, in reviewing the literature in survey research Krosnick (1999) concluded that having a low response rate does not always correspond to a large amount of nonresponse error. Given this, we feel the results presented are useful as a preliminary study into the relationship between connection with nature and wildlife gardening and that these results will be useful as a platform for future research efforts.

The CNS scores of wildlife gardeners ranged from 2.36 to 5.00 with the mean score being 3.91 (higher scores indicate a stronger sense of connectedness to nature). An independent samples t-test was conducted to compare the CNS scores for the public and members of wildlife gardening programs. A significant difference was found with the public (M=3.57, SD=0.59) having lower scores than those in wildlife gardening programs [M=3.91 SD=0.52; t(606)=7.22 p<0.01]. However, 23.4% of wildlife gardeners had a CNS score below the mean score for the public. Eta squared was a moderate 0.08, which indicates that 8% of the variance in CNS scores is explained by the participation in wildlife gardening programs.

The survey provided data on the wildlife gardening intentions and actions of respondents prior to joining their programs. 8.6% of people in wildlife gardening programs had no intentions to create a wildlife garden (defined as *either* not having taken steps to create a wildlife garden, or not planning to create one) and 26.1% had not taken action to create a wildlife garden before joining or hearing about their gardening program. An independent samples t-test was used to compare the CNS

scores of people who had intentions to create a wildlife garden prior to joining their wildlife gardening program (M=3.93, SD=0.51) and those who hadn't (M=3.67, SD=0.57) and the difference was found to be significant (t(228)=2.27 p=0.02).

A one-way ANOVA was conducted to explore the impact of length of time in a wildlife gardening program on sense of connectedness with nature, as measured by the CNS scale. Subjects were categorised into 4 groups as shown in Table 5.1. No significant difference was found between the groups [F(3, 211)=2.49, p=0.06)].

The survey asked respondents what age they felt they had developed an interest in nature. 'As a child' was the most commonly selected age (n=119, 46.5%), followed by 'always been interested' (n=67, 26.2%), 'as a teenager' (n=28, 10.9%), 'as a young adult' (n=23, 9%), and lastly 'in adulthood' (n=19, 7.4%), Figure 5.1 displays what age respondents developed an interest and the corresponding mean CNS values.

A one-way ANOVA was conducted to explore the relationship between the age when an interest in nature developed and CNS score. Subjects were categorised into groups as shown in Figure 5.1. There was a statistically significant difference found between the groups [F(4, 223)=4.09, p=0.003)]. The effect size, calculated using eta squared, was 0.07 which is considered a moderate effect. Post-hoc comparisons using the Tukey HSD test indicated that the mean CNS score for those who developed an interest in adulthood (M=3.53 SD=0.57) differed significantly from those who had always been interested in nature (M=3.96 SD=0.49) and also those who developed an interest as a child (M=4.00 SD=0.49). No other groups were found to have statistically significant differences.

Time in group (years, months)	n	Mean CNS	SD
Less than 1 year	40	3.92	.60
1–2.11 years	113	3.85	.51
3–4.11 years	40	4.11	.47
5+ years	21	3.99	.49

Table 5.1 Length of time in wildlife gardening group and CNS mean scores

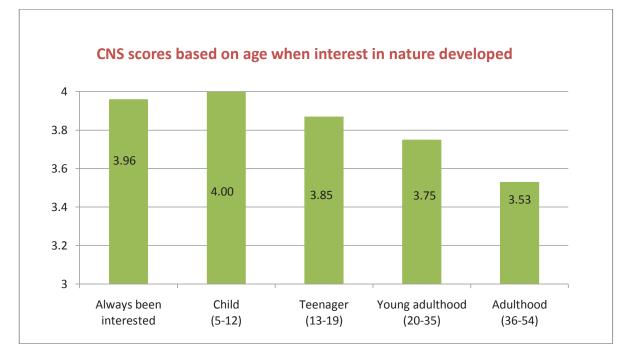


Figure 5.1 Mean CNS scores (higher scores indicating a higher connection with nature) based on when a respondent indicated an interest in nature developed

Respondents were also asked to identify the top three reasons (from a list) why they have an interest in connecting with nature in their daily lives. An independent samples t-test found significant difference between the CNS scores of people who indicated an affinity with nature as one of their top 3 reasons for wanting to connect with nature in their daily lives (M=3.98, SD=0.52) and those who did not indicate an affinity [M=3.82, SD=0.50; t(229)=2.52 p=0.03. A significant difference in CNS was also found between people who included growing up with nature in their top 3 (M=4.00, SD=0.53) and those who did not [M=3.84, SD=0.50; t(230)=2.13 p=0.03. No other reasons were found to differ significantly in CNS score. Table 5.2 summarises the reasons given for their interest and the corresponding mean CNS score.

Table 5.2 Self-reported influences on desire to connect with nature (as selected in respondents top three)

Influence	n	%	Mean CNS
I have always felt an affinity with nature, I don't know why	159	61.4	3.98
I grew up in a nature rich environment, so I like to be sur- rounded by nature	125	48.3	4.00
My parents were interested in nature and this influenced me to be interested in nature	95	36.7	3.97
An influential person (not a teacher) in my life inspired me to be interested in nature	54	20.8	3.91
I had some educational experiences as an adult (20+) that got me interested in nature	54	20.8	3.93
As a child (5–12) I would visit wilderness areas for holidays and this got me interested in nature	51	19.7	3.93
As a teenager (13–19) I would visit wilderness areas for holidays and this got me interested in nature	40	15.4	3.76
I had some educational experiences as a child (5–12) that got me interested in nature	38	14.7	3.86
I grew up without much nature, so this has influenced me to seek out nature	32	12.4	4.02
I had some educational experiences as a teenager (13–19) that got me interested in nature	29	11.2	3.94
An influential teacher in my life inspired me to be interested in nature	19	7.3	3.89

5.5.2 GENERAL PUBLIC

From the public sample 417 responses were received and 293 returned to sender resulting in a response rate of 11.2%. We acknowledge the low response rate achieved for this sample and based on our efforts to minimise non-response (see methods section), deduce that this is a result of declining response rates in urban areas (Neuman, 2000). However, based on the reasons provided the wildlife gardener's results section, we believe the results are still valuable as a preliminary study into the public's connection with nature and its relationship to wildlife gardening. The percentage breakdown of the demographic categories of age, gender, level of education and income were compared to the data collected in the 2006 Australian Census (Australian Bureau of Statistics, 2007). The sample's percentage breakdown of income was similar to that of the Census data. However, the sample consisted of a greater number of females than found in the population (60.2% were female in the sample compared to 51% in the Census data), more older people than found in the population (65% were over 50 years old in the sample compared to 38% in the Census data) and also a greater number of people with a higher educational attainment (54% had university qualifications in the sample compared to 36% in the Census data). Therefore results should be interpreted with these biases in mind, and this is discussed further in the discussion section.

The CNS score for the public ranged from 1.29 to 5.00 with the mean being 3.57. When asked if they would consider joining a wildlife gardening program 40.4% (n=163) of respondents answered yes, 32.5% (n=131) answered no, and 27.0% (n=109)

were unsure. The mean CNS score of those who would consider joining was 3.78 (ranging from 2.29–5.00), compared to 3.35 for those who would not consider joining, (ranging from 1.29–5.00 – however, those with CNS scores above 4.57 provided the reason for not considering joining as 'would do it myself') and 3.53 for those who were unsure (ranging from 2.00–4.71). A one-way ANOVA was conducted to explore these differences and found a statistically significant difference in the CNS scores [*F*(2, 372)=20.95, *p*>0.01)]. The effect size, calculated using eta squared, was 0.10 which is considered large according to Cohen (1988). Post-hoc comparisons using the Tukey HSD test indicated that each of the three groups (yes, no and unsure about joining a wildlife gardening program) were significantly different from one another.

The reasons given for not wanting to join a program were examined in terms of the mean CNS (Table 3). A one-way ANOVA was conducted to explore the differences in CNS mean found across the reasons given and a statistically significant difference was found [F(8, 124)=2.57, p=0.01)]. The effect size, calculated using eta squared, was 0.14 which is considered large according to Cohen (1988). Post-hoc comparisons using the Tukey HSD test indicated that the mean CNS score for those who gave the reason that they would engage in wildlife gardening by themselves (M=3.85 SD=0.58) differed significantly from those gave the reason that they had no interest in wildlife gardening (M=3.15 SD=0.66) and also those who said they had no interest in gardening in general (M=3.05 SD=0.80). No other groups were found to have statistically significant differences.

Reason for having no interest in jo	n	%	Mean CNS	
I have no interest in wildlife garde	ning	38	30.9	3.15
I have no interest in gardening in g	general	9	6.5	3.05
I prefer a more formal style of gard	9	6.5	3.67	
I prefer non-native plants	3	2.2	3.43	
I am too busy to be involved		36	25.9	3.39
I do not have the finances to chang	ge my garden	12	8.6	3.25
Other: (not listed in the survey but	Too old	8	6.5	3.53
received numerous comments, % would possibly be higher if had been an option to tick)	Do myself	13	9.4	3.85
	No room	5	3.6	3.44

Table 5.3 Reasons for not considering joining a wildlife gardening program

5.6 DISCUSSION

5.6.1 WILDLIFE GARDENERS' SENSE OF CONNECTION WITH NATURE

If we are to prevent urban dwellers from developing a nature-disconnect and we wish to encourage pro-environmental behaviours in the future it is important to find ways to increase our feeling of connectedness with nature (Luck, 2008; Rohde & Kendle, 1997). To do this we need to understand how a connection to nature develops. The results of this study support the notion that connectedness to nature is a primitive belief (Schultz & Tabanico, 2007), given that over half of all wildlife gardeners in the sample felt that they have always had an affinity with nature and believed this is why they have an interest in connecting with nature in their daily life. It is worth noting that these results are based on people's self-reflection on their connection to nature and when it developed and such reflections do not always provide reliable estimates 129 (Kihlstrom, Eich, Sandbrand, & Tobias, 2000). However, the higher sense of connection with nature felt by those who indicated they had always felt an affinity with nature, and those who developed an interest as a child, compared to those who developed an interest in nature as an adult also supports this hypothesis.

This notion of always having an affinity with nature is articulated in the following quotes from wildlife gardening program interviewees in response to questioning about the reasons they want wildlife in their gardens:

"I can't answer that one... I have just always had an affinity with animals and the environment. It is just something that I have; it is just a part of me. I have just grown up feeling that way and very strongly about it. So, yeah, I can't explain why I feel that way, I just do."

"I respect it. I don't go 'I'm a human, I'm worth more than that mouse'.... I think it's actually something that's innate with me.... and that certainly doesn't come from my parents I don't think. It's not anything I've ever heard them say."

It is interesting to note that the two most commonly reported reasons given for having an interest in connecting with nature after 'always had an affinity' are related to early life experiences with nature (growing up in a nature rich environment and parental influence). These findings reaffirm the hypothesis that contact with nature in our formative years is essential to developing a connection with nature (Bunting & Cousins, 1985; Chawla, 2002; Horwitz, 1996; Kellert, 2002). Whilst it was only ranked ninth out of eleven possible reasons, it is worth noting the high mean CNS score for those who selected growing up without nature as one of their 3 reasons for having an interest in connecting with nature. This result may be purely due to chance as a function of the relatively small number of respondents selecting this reason and the low survey response rate. However there may also be other explanations that warrant future investigation such as the role of the biophilia hypothesis and the inherent need to connect with nature even when opportunities are limited. Early childhood experiences and parental influence were also mentioned by wildlife gardening program interviewees in response to the question about the reasons they want wildlife in their yards:

"I'm from the bush originally, and used to having kangaroos and koalas and heaps of birds and that sort of stuff, and I think it's just nostalgic..."

"...my parents and my grandparents both have acre properties in Upper Ferntree Gully and they were big gardeners. So, I suppose I have probably got it from them..."

If connectedness to nature is a primitive belief, does this mean that a sense of connection to nature cannot be enhanced (or even added in later life)? Although a stronger sense of connectedness to nature was present in those who either felt they always had an affinity with nature, or developed an interest in nature early in life than those who discovered an interest later in life, some wildlife gardeners did indicate that they felt this interest developed later in life. This suggests two things; firstly, although a primitive belief, connectedness to nature does require the addition of learning, culture and experience of nature to develop fully (as suggested by Kahn, 1997 and Kellert, 2002): and secondly, provides further support for the idea that the timing of this learning, culture and experience of nature is very important, as people who developed an interest early have had a longer period of time with the interest, thereby resulting in a greater sense of connection to nature.

Considering that connectedness to nature can be enhanced through learning, culture and experience of nature (Kahn, 1997; Kellert, 2002), it may be expected that those who have been involved in wildlife gardening programs for longer would have a stronger sense of connection with nature. This study did not find this to be the case, and further research to address why this is would be useful. In addition, this study did not look at connectedness to nature before participation in wildlife gardening programs and further research comparing connectedness to nature before and after participation is needed.

5.6.2 ENGAGING THE UNENGAGED

When we consider that the vast majority of wildlife gardeners in this study had *intentions* to create wildlife gardens prior to joining their respective programs, it seems that wildlife gardening programs are not succeeding in attracting unengaged members of the community i.e. 'converting the non-converted'. This finding should be concerning to those seeking to promote wildlife gardening as it indicates that there are limitations in the extent to which such programs can contribute to enhancing urban biodiversity, strengthen the community's connectedness to nature, or improve neighbourhood health and wellbeing. However, this is not to say that there is not 132

potential for wildlife gardening programs to reach unengaged members of the community and make the contribution mentioned above and this is discussed below.

As mentioned above, only a small percentage (approximately 8%) of people in wildlife gardening programs had no intentions to create a wildlife garden before joining. Given that those with no prior intentions to create wildlife gardens had significantly lower CNS scores than those who had intentions to create a wildlife garden; these programs appear to be at least reaching some unengaged members of the community. If just 8% of the greater population could be encouraged to engage in wildlife gardening it could be a significant boost to urban vegetation with potential flow on benefits i.e. support for conservation projects due to an increased sense of connection with nature (Luck, 2008; Rohde & Kendle, 1997). Motivations for gardening in general are well documented (see Clayton, 2007; Kiesling & Manning, 2010), however motivations for engaging in sustainable gardening, and in particular wildlife gardening have not been widely studied (for exceptions see Kiesling & Manning, 2010; New South Wales National Parks and Wildlife Service, 2002; Zagorski et al., 2004). The task for future research is to determine what motivations, messages or incentives attracted these previously unengaged people to begin wildlife gardening so such messages can be used more broadly to encourage the community to embrace wildlife gardening.

When we consider that over a third of the public sample indicated they would consider joining a wildlife gardening program, it seems hopeful that there is indeed space to influence others. However, the large proportion of the public sample

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expressing interest in wildlife gardening should not be considered to be representative of the community as a whole. Non response bias is an issue in survey research and there is a tendency for respondents to be either interested in the topic or in a situation with time on their hands (e.g., retired) and this can bias the data collected (Sax et al., 2003). In this case the demographic profile of the public sample did include a higher proportion of older individuals than would be expected, and was also biased towards females and those with higher educational attainment.

In terms of the sample being biased as a result of only interested parties responding; the significant difference in the CNS scores between the public and wildlife gardeners sample somewhat alleviates the concern that the public sample is highly biased in this regard. However, the high proportion of people willing to consider joining a program is still likely to be misleading. To estimate a more conservative percentage of people who would consider wildlife gardening, if we assume that *all* of the non-respondents (n=1290) would *not* be interested in wildlife gardening (as if they were interested they may have been more likely to complete the survey), that still means 9.5% of the community would be interested. In all likelihood one would assume the real figure to be higher, as some nonrespondents may be interested but for one reason or another did not participate in the study.

Understanding how a sense of connection with nature can impact upon people's decisions to seek out nature in their daily lives is important if we wish to encourage the practice of wildlife gardening as a tool to enhance both urban biodiversity and connectedness to nature. This study showed that members of wildlife gardening programs on average have a stronger sense of connection to nature than the general public. Zagorski et al. (2004) found a strong relationship between gardener's values and the species composition of their gardens, with those holding conservationist views more likely to have native gardens, which is consistent with our finding. In addition this result is similar to Kiesling and Manning's (2010) finding that environmental identity, as measured by Clayton's (2003) Environmental Identity Scale can significantly predict ecological gardening behaviour. This adds weight to the assertion that affective connection (i.e. connectedness to nature) and environmental identity are important explanatory concepts within environmental psychology research (Hinds & Sparks, 2008).

Looking at the CNS scores obtained in the public sample, we see that a stronger feeling of connection with nature is strongly related to the hypothetical scenario of joining a wildlife gardening program. These results, however, do not suggest that those who do not display a strong connection with nature are not going to participate in wildlife gardening programs. This is evident when you consider the large range of CNS scores displayed by both wildlife gardeners and members of the public who would consider joining a wildlife gardening program, and finding that almost a quarter of wildlife gardeners have a CNS score below the mean CNS score for the public. Therefore feeling a sense of connectedness with nature is not a prerequisite for getting involved with wildlife gardening. Given the numerous benefits to human health and well being (Chiesura, 2004; Hartig et al., 1991; Leather et al., 1998; Parsons et al., 1998; Rohde & Kendle, 1994; Sullivan et al., 2004; Ulrich & Addoms, 1981) that contact with nature is accepted to provide us, it is promising that the practice of wildlife gardening 135 has the potential to reach those who are currently unengaged. As wildlife gardening involves creating more natural urban landscapes, if more and more people can be encouraged to participate, the result may have flow on effects for neighbourhood health and wellbeing.

Developing a model of the determinants of wildlife gardening behaviour would be very useful for those working to increase native vegetation in urban areas, either through wildlife gardening programs or other initiatives. As already addressed, although a strong sense of connectedness to nature is not essential to becoming involved in wildlife gardening, a strong relationship between the two does exist. In developing a model of the determinants of wildlife gardening behaviour, it would be useful to be able to define CNS cut-off points, below which an individual would not be interested in joining a wildlife gardening program, and above which an individual would be interested in joining. In reality things are not that simple, for example a number of individuals with very high CNS scores indicated that they would not consider joining a wildlife gardening program. However, the reasons given by these individuals for not being interested were related to the desire to undertake wildlife gardening activities alone. Nevertheless, there was still a large amount of variation in the CNS scores of those who were interested in joining a program and those who weren't interested indicating that, as expected, other factors will influence one's decision to engage in wildlife gardening. Further research should focus on determining these other factors so that a more complete picture of determinants of wildlife gardening behaviour can be developed.

5.7 CONCLUSION

This study has both theoretical and practical significance. The study adds to the theoretical understanding of connectedness to nature by adding empirical evidence to support the hypothesis that connectedness to nature is a primitive belief that requires the addition of experience, in particular in childhood, to develop fully and promote the strongest connection to nature. Importantly this study shows that, although a positive relationship does exist, feeling a sense of connectedness with nature is not a prerequisite for getting involved with wildlife gardening. Whilst the results suggest wildlife gardening programs are currently not succeeding in attracting unengaged members of the community, this study shows that wildlife gardening programs have the potential to encourage those who do not have a strong sense of connection with nature to become involved. Future research into how wildlife gardening programs can achieve this is needed if these programs are going to succeed in enhancing urban biodiversity, connectedness to nature and neighbourhood health and wellbeing.



CHAPTER 6

PREACHING TO THE CONVERTED? DO THE FEATURES OF WILDLIFE GARDENING PROGRAMS HELP TO RECRUIT PREVIOUSLY UNENGAGED INDIVIDUALS?

6.1 BACKGROUND

Wildlife gardening programs can be seen as a form of Environmental Education. Environmental Education has the potential to change the environmental values and behaviour of the community. Numerous studies (Barnett et al., 2006; Caro et al., 1994; Dettmann-Easler & Pease, 1999; Jaus, 1984; Kruse & Card, 2004; McMillan, 2003; Theimer & Ernst, 2012) have indicated that Environmental Education can be effective in changing the values, beliefs, or attitudes of participants. However, a change in attitude is not enough because the goals of conservation can only be achieved through action, which requires a behavioural change (Baldwin, 1995; Day, 2002). Whilst some studies have indicated that Environmental Education can increase environmentally responsible behaviour (Ramsey, 1993; Zelezny, 1999), some authors have noted that there is a lack of empirical evidence of behavioural change resulting from Environmental Education (Gralton et al., 2004; Vaughn et al., 2003).

As was discussed in Chapters 3 and 5, research has suggested that it is important to develop meaningful bonds with nature during childhood to develop positive environmental values (Bunting & Cousins 1985; Chawla, 2002; Horwitz, 1996; Kellert, 2002), and that today's children are missing out on the exposure to the natural world that would help develop those bonds (Kahn, 2002; Kellert, 2002; Louv, 2005; Orr, 2002). School based Environmental Education may be an important tool as children are a captive audience. School based learning can take place either in the classroom or through excursions. Excursions to natural areas, such as nature parks, are often used by school teachers to support their environmental education units. Studies by Ballantyne, Fien, and Packer (2001a, 2001b) have demonstrated that engaging students in experiences in the environment which allow them to observe environmental problems and the impacts these have on wildlife, is one of the most effective ways of delivering an environmental message. However, Haluza-Delay (2001) found that Environmental Education centred on wilderness experiences may actually reinforce the separation of pristine nature and the students' home environments and not lead to more environmentally responsible behaviours at home.

It has been put forward that teaching children in their local environment may increase their sense of stewardship to the place they live (Fisman, 2005) and research has suggested that incorporating interactions with local nature, especially wildlife, into programs is important if the aim is to foster a connection to nature in participants (Theimer & Ernst, 2012). In addition, a study of metropolitan adults' attitudes toward trees and gardening found that active gardening in childhood was the most important predictor of whether trees had personal value in adulthood (Lohr & Pearson-Mims, 139 2005). This is promising as it shows that experiences with nature during childhood can shape one's environmental attitudes as an adult.

Currently, there is a growing movement concerned with reconnecting children with nature (Ernst & Theimer, 2011). Numerous programs and initiatives are being run in the U.S. with the aim of engaging children with the natural world (Ernst & Theimer, 2011). In Australia, there has recently been a push towards making school grounds more biodiverse through involving students in wildlife gardening, and subsequently integrating urban biodiversity into the school curriculum. Examples of programs include the Students Futurescaping Schools project (Gould League, 2013) and KinderGardens for Wildlife (Knox City Council, 2013). Given the decline in nature in urban areas, and that children are at risk of missing out on experiences that help develop bonds with nature (Kahn, 2002; Kellert, 2002; Louv, 2005; Orr, 2002), utilising often large expanses of space in school grounds for biodiversity conservation seems a logical move. Children spend a significant amount of time at school, and if we can create meaningful experiences with nature during those times perhaps environmental values can be better fostered.

Similarly, if wildlife gardening programs can increase children's exposure to nature in their everyday lives, within their immediate backyard environment, such programs may have an influence of the environmental attitudes of future generations. This line of research was beyond the scope of this project, however given the potential benefits, it is an area that deserves future research efforts.

Wildlife gardening programs would be classed as a form of community based education. Such programs are often seen as limited in their success because they tend to only attract the informed and enthusiastic members of the community; therefore the message does not reach those most in need of the education (Davies & Webber, 2004). This is illustrated by a study examining attitudes toward possums in a Melbourne municipality (Miller et al., 1999) which found that respondents with positive attitudes toward possums had a significantly greater interest in learning about possums, than respondents with negative attitudes. In this situation, individuals with negative attitudes toward possums are the target audience, however it may prove difficult to change their attitudes through education as such individuals have low levels of interest in learning more (Miller et al., 1999). Therefore community attitudes toward biodiversity in urban areas will influence any education attempts. Despite this potential drawback, a number of biodiversity centred community education programs, such as "What can you find in your backyard?", and "Our Environment: It's a Living thing" have recently been developed in NSW based on human dimensions research undertaken by the New South Wales National Parks and Wildlife Service (Davies & Webber, 2004).

If wildlife gardening programs are only attracting individuals who currently undertake wildlife gardening, or were planning to do so of their own accord, then their ability to affect an increase in native vegetation or wildlife in their area will be lessened. In Chapter 5 it is reported that that only a small minority (8.6%) of wildlife gardening program members had no intention to create a wildlife garden prior to joining, and it is warned that wildlife gardening programs were currently not succeeding in recruiting unengaged individuals in large enough numbers to be making a 141 difference to local biodiversity. However, it is indicated that there is potential for wildlife gardening programs to attract unengaged members of the community based on the analysis of scores on the Connectedness to Nature Scale (Mayer & Franz, 2004), a scale designed to assess a person's sense of emotional connection with nature. Connectedness to Nature Scale scores were broad ranging, across both wildlife gardening program participants and members of the public who indicated they would consider joining a wildlife gardening program. In addition it is shown that almost a quarter of current wildlife gardeners have a Connectedness to Nature Scale score below the mean score for the public. Therefore, in Chapter 5 it is concluded that feeling a sense of connection to nature is not a prerequisite for becoming involved in wildlife gardening programs and the potential to recruit such participants exists.

Despite the potential of wildlife gardening programs, which has been established in the preceding chapters, if such programs are to maximise their success in contributing to the biodiversity of their local area, then they must be recruiting unengaged members of the community. The previous chapters have established that there is the potential to engage the broader public in wildlife gardening activities, as there is support for the use of native plant species and a willingness to have wildlife in the yard. However, this potential is not currently translating to the recruitment of previously unengaged individuals. In addition to attracting unengaged members of the community, it would be assumed that programs that also educate their members on biodiversity and native gardening practices would have a greater chance of participants creating gardens that are of most benefit to local biodiversity. If members are not equipped with the knowledge required to establish gardens that are ecologically 142 appropriate and designed to maximise benefit to local wildlife, then it may be unlikely that positive biodiversity outcomes are achieved. This chapter will further address the issue of recruiting unengaged members of the public to the cause of wildlife gardening, by looking at how program features can influence recruitment and self-reported increases in biodiversity understanding.

As previously stated, there are numerous wildlife gardening programs in operation across the globe. Organisations running such programs range from local councils (e.g., Australia: Knox City Council, Gardens for Wildlife) to national federations (e.g., USA: National Wildlife Federation, Garden for Wildlife). The method of delivery and features provided by such programs also differs significantly. Some programs (e.g., Knox City Council, Gardens for Wildlife) are highly interactive, whilst others are solely online programs that participant's sign up to but make no commitment (e.g., South Australian Department of Environment and Natural Resources, Backyards for Wildlife). The method of delivery and features included in wildlife gardening programs will undoubtedly impact upon the running budget of the program, and the inclusion of interactive features such as site assessments for members may not be considered feasible by implementing organisations due to budget and human resources restraints.

Although there are many potential benefits to wildlife gardening, and numerous wildlife gardening programs are running globally, there does not appear to be any published research into how successful such programs are at recruiting unengaged individuals. This Chapter aims to fill this gap by investigating which program features impact upon the success of these programs in attracting unengaged individuals to join.

6.2 RESULTS

To determine whether program features play a role in attracting previously unengaged members of the community, the chi-squared test for independence was used to examine the relationship between program features and whether or not a respondent indicated they had prior intentions to create a wildlife garden. It was found that more members from programs offering site assessments and native plants/vouchers indicated that they had no intention of creating a wildlife garden prior to joining than those from programs not offering these features. That is, the offer of site assessments and native plants/vouchers appeared to help in recruiting participants. The results of these tests, along with the percentage breakdown of those planning to create a wildlife garden are reported in Table 6.1.

Program features	ł	% of respondents planning to create a garden before joining	χ2	df	р
Site assessment	Offered Not offered	85.2 96.5	9.11	1	<0.01
Provision of native plants/ vouchers	Offered Not offered	84.3 95.3	7.77	1	<0.01
Welcome pack	Offered Not offered	90.2 94.7	0.85	1	0.36
Program sign for displaying	Offered Not offered	90.2 94.7	0.85	1	0.36
Newsletters	No Offered Not offered	87.8 93.0	1.19	1	0.27

Table 6.1 Program features and intentions to create a wildlife garden prior to joining

In terms of self-reported understanding of biodiversity issues before joining a program, 87.9% of respondents indicated that they did have a prior understanding, compared to 12.1% who indicated no prior understanding. The chi-squared test for independence was used to examine whether there was a relationship between program features and self-reported knowledge of biodiversity before joining, the results of which can be seen in Table 6.2.

Program features		% reported prior biodiversity understanding	χ2	df	р
Site assessment	Offered Not offered	83.5 91.5	3.18	1	0.08
Provision of native plants/ vouchers	Offered Not offered	77.5 93.5	12.45	1	<0.01
Welcome pack	Offered Not offered	86.4 91.8	0.96	1	0.33
Newsletters	Offered Not offered	81.0 90.7	3.74	1	0.05

Table 6.2 Program features and knowledge of biodiversity before joining

Further, to determine whether wildlife gardening programs are successful in increasing self-reported biodiversity understanding among participants, the percentage of respondents indicating an increased understanding of biodiversity was calculated and found to be 74.6% (*n*=176). To delve further and determine if there is a relationship between prior self-perceived understanding of biodiversity and perceived biodiversity knowledge after joining, a chi-squared test for independence was used and no significant relationship was uncovered χ 2=2.24, df=1, p=0.14. Table 6.3 shows the

percentage breakdown of perceived biodiversity understanding before and after joining a program.

Perceived understanding of biodiversity before joining the program	Perceived increased understanding o biodiversity after joining the progran Yes No				
Yes (<i>n</i> =205)	72.7%	27.3%			
No (<i>n</i> =31)	87.1%	12.9%			

 Table 6.3 Self-reported knowledge of biodiversity before and after joining a program

To determine whether program features effect biodiversity learning outcomes the chi-squared test for independence was used to examine the relationship between program features and whether or not a respondent indicated they increased their biodiversity knowledge since joining the program. The results of these tests, along with the percentage breakdown of respondents indicating increased knowledge are displayed in Table 6.4.

Program features		% reporting increased biodiversity understanding	χ2	df	р
Site assessment	Offered Not offered	84.5% 70.3%	4.57	1	0.03
Provision of native plants/ vouchers	Offered Not offered	87.2% 67.3%	10.37	1	0.00
Welcome pack	Offered Not offered	77.1% 68.2%	1.54	1	0.22
Newsletters	Offered Not offered	84.5% 70.3%	4.56	1	0.03

 Table 6.4 Program features and self-reported knowledge of biodiversity after joining

6.3.1 RECRUITING PREVIOUSLY UNENGAGED MEMBERS

Providing members with signs that can be displayed to alert people that pass by is a feature offered by many wildlife gardening programs. The idea is that providing these signs will result in recruitment of individuals who saw a sign and became interested. In this sample, five out of the eight programs provided members with such signs. Figure 6.1 displays one such sign affixed to a prominent tree stump at the front of a program participant's yard. The results did not show that the provision of these signs increased the likelihood that the program would recruit individuals that had no prior intentions to create a wildlife garden. However, respondents were not asked if they had displayed their sign, or where it had been displayed, so based on the current data it cannot be determined whether the signs are not successful in recruiting previously unengaged individuals as a function of the signs themselves, or as a result of poor utilisation by members. This is a point that would be very useful to clarify, and future research focussing on this issue would be of benefit in understanding how signage can create social diffusion and promote wildlife gardening to the community.

The provision of site assessments and native/indigenous plants or vouchers were features found to increase the chances of those who had no previous intentions to create a wildlife garden having joined a program. It was also found that individuals indicating they did not have a prior understanding of biodiversity issues were more likely to belong to programs offering native/indigenous plants or vouchers. In addition, although not found to be significant, there seemed to be a similar relationship with site assessments, with 83.5% of respondents in programs with site assessments indicating prior biodiversity knowledge, compared to 91.5% of respondents in programs without site assessments.



Figure 6.1 Sign from Knox City Council's Gardens for Wildlife program

The two program features identified as significant in this research could be seen as alleviating some perceived barriers to wildlife gardening (to be discussed in Chapter 7). For example, offering native/indigenous plant nursery vouchers to participants upon joining will represent a money saving incentive to potential members. Having a site assessment provided, which outlines what plants should be removed and provides participants with lists of plants suited to their yard, will represent a significant reduction in the time spent preparing for a wildlife garden. Without site assessments participants would need to spend a significant amount of time researching their local 148 indigenous plant species and wildlife to determine what is possible in their yard. Therefore we suggest that these features succeed in attracting unengaged participants due to the time and cost saving benefit they represent to potential members.

Despite these features being shown to increase the recruitment of previously unengaged individuals, it should be noted that these previously unengaged individuals still represent a very small proportion of total program members (8.6%, reported in Chapter 5). Therefore, in their current form, such programs are not reaching their full potential as tools to significantly enhance local biodiversity. Discovering ways of increasing the recruitment of individuals who are not engaged with the cause is essential if such programs are to maximise their success in improving their local biodiversity. If including the features identified here was the only answer, then the number of previously unengaged members in programs offering those features should be much higher than they currently are.

One way of engaging unengaged members of the community could be utilising already motivated members of wildlife gardening programs to run 'streetscaping' projects in their neighbourhood. This approach was learnt of in an interview with a wildlife gardener. The project was undertaken in a Melbourne based wildlife gardening program where an existing member identified a bird species that was under threat in her local area, and indentified habitat plants that could potentially help provide a corridor for this species from the bush reserve nearby (personal communication, 2011). She devised an initiative she called 'streetscaping' (referring to the process by which the features of a street are enhanced) to enlist the help of her neighbours to create more habitat for this bird. With the help and support of her wildlife gardening program she began door knocking in her street and asking neighbours if they would be willing to plant some of these habitat plants in their yard. Residents were told that these plants would be provided to them free of charge at a morning tea to be hosted by one of their neighbours. Of the 14 houses visited originally, only one refused. Due to time restraints it was decided to letterbox drop the remaining houses. An invitation (see Figure 6.2) was produced from the point of view of the bird, asking residents to help (and including information about the project being implemented by a neighbour). This was then letterbox dropped to the remaining 76 houses in the street. Seventeen of those who received the letterboxed invitation participated in the project, an uptake rate of about 22%.

In all, 31 residents took part in the project and received three habitat plants, a \$10 nursery voucher to buy subsequent plants, information on how to carry out the planting and a fact sheet on the bird. Unfortunately there was no follow up as to how many of the residents who received plants actually planted these, and of those who did, how many plants survived. Despite this, anecdotal reports following the streetscaping project are that the plantings were successful in attracting the target bird to the street (personal communication, 2011). Following on from this initiative, three other streetscaping projects have been undertaken through the Melbourne based wildlife gardening program.



Dear Rickards Avenue Residents....



Hi, I'm an **Eastern Spinebill**. I'm a beautiful little bird with lovely grey and gold markings, about the same size as a budgerigar. I dart from flower to flower retrieving pollen and I can even catch insects mid air. The problem is that I'm in a spot of bother. I can't seem to find anything to eat or anywhere to hide. I'd love to visit your garden. Can you help me? All I need is a little support from my fellow Australians.

Knox City Council and the *Gardens for Wildlife* program need your help! Their aim is to provide food and habitat for me by creating a wildlife corridor along Rickards Avenue. To kick off this initiative, the Knox Environment Society (KES) is going to help by donating to each household three local plants. So come along, meet your neighbours, enjoy a cup of tea or coffee and help the environment at the same time.

When:	2.00pm Saturday, 30 th August 2008
Where:	For a garden tour of vegetation that attracts eastern spinebills then on to for refreshments, free plants & information about the Gardens for Wildlife program
RSVP:	by Thursday 28th August 2008 to Please contact if you can't attend but would like information regarding the <i>Gardens</i> for <i>Wildlife</i> program.

Figure 6.2 Front and back of invitation to participate in a community initiated streetscaping project in suburban Melbourne

Given the success of the community streetscaping project undertaken in Melbourne, this approach has great potential to recruit unengaged members of the community. The initiative already encompasses many of McKenzie-Mohr's (2011) community based social marketing strategies, so is well grounded in accepted behavior change theory. For example, the initiative helps build social norms, promotes social diffusion, provides incentives to act (free plants), and makes the behavior more convenient (through the provision of plants and advice on planting). Programs should be encouraged to implement similar initiatives by empowering current members to take on a leadership role in their communities, as research shows that messages communicated through personal contact with a community resident who is already involved in a behavior are more likely to be successful in obtaining commitment from others (McKenzie-Mohr, 2011). Such initiatives should also be developed in a way that provides ample opportunities for further engagement with residents and possible requirement to the broader wildlife gardening program. This aim is achievable as the likelihood of securing a larger commitment, in this case joining the wildlife gardening program, is made greater once someone has already agreed to a smaller action (McKenzie-Mohr, 2011), in this case planting a few habitat plants. When implementing, it will be important for programs to carefully evaluate the success of the initiative by including follow up monitoring of participants to determine initially whether the plants have been planted, if they survive, and importantly if the plant is successful in attracting desired fauna.

There is a need for research into the potential benefits of using social media by wildlife gardening programs to convey information and increase member engagement and interaction. As mentioned, this study did not explore the impact of presence on the social media site *Facebook*, as only one program in the sample utilised this method of communication. However, a growing number of programs outside of this sample (not Australian based) have begun using social media. Research into the word of mouth recruitment ability of social media sites has shown that it is more effective than traditional marketing techniques (Trusov, Bucklin, & Pauwels, 2009). Therefore, investigating how this can be used to advantage in a wildlife garden context would be a very useful research endeavour.

6.3.2 BIODIVERSITY EDUCATION

The findings relating to increases in self-reported biodiversity knowledge after joining should be encouraging for those working on wildlife gardening programs. Whilst more than 80% of wildlife gardeners indicated they had an understanding of biodiversity before joining their wildlife gardening program, 72.7% of these still indicated that their knowledge of biodiversity increased through their participation in their program. Although there was no statistically significant difference in the selfreported biodiversity learning among those who indicated prior knowledge about biodiversity (72.7% indicating increased knowledge) and those who didn't (87.1% indicating increased knowledge), there appears to be a relationship whereby those with no prior biodiversity understanding are more likely to gain knowledge through involvement in the program. This is promising given those with little knowledge about biodiversity are the ones most in need of education. In terms of which program attributes were more likely to lead to increased biodiversity knowledge among members, it was found that individuals in programs that provide site assessments and native/indigenous plants or vouchers, and utilise newsletters to communicate with members, were more likely to report an increase in biodiversity knowledge through participation in the program. A rationale for site assessments and newsletters resulting in a higher chance of self-reported increased biodiversity knowledge is most likely straight forward. Home visits that assess participant's current gardens and provide them with personalised information on how to create the most appropriate wildlife garden (based on factors specific to their garden and location) would presumably provide insights into biodiversity issues in participant's local area. In terms of newsletters, it stands to reason that if provided with regular newsletters containing information about wildlife gardening topics and local biodiversity issues, that participants will have a greater chance of improving their biodiversity knowledge than if they did not have access to such materials.

This study did not examine the robustness of site assessments or the content of newsletters, and it was not ascertained whether members read the newsletters they were provided with. Future research looking into how the quality of information provided in site assessments and newsletters, and also the readership of newsletters, can influence perceived increases biodiversity knowledge (and actual, if a testing system can be devised) would be very beneficial to build upon these preliminary findings. Nevertheless, the results presented indicate that these features do increase the perceived biodiversity knowledge of members, and so their inclusion in programs appears warranted. However, does this increase in perceived biodiversity knowledge 154 equate to greater success in creating gardens that attract wildlife? Chapter 8 investigates self-reported success in attracting wildlife, and picks up on this line of enquiry.

6.4 CONCLUSION

If wildlife gardening programs wish to maximise their contribution to the biodiversity of their area, they must be able to recruit individuals who would not have undertaken wildlife activities of their own accord.

This chapter points to how programs can increase the likelihood of this recruitment of unengaged individuals occurring. Program features that may help in this regard are providing site assessments to members, and providing members with native/indigenous plants or vouchers, however these are not currently recruiting unengaged participants on a large scale. If membership in wildlife gardening programs is to be used as tool to improve biodiversity going forward, then other strategies for attracting unengaged individuals need to be developed; there is potential in the 'streetscaping' initiative, however further research would be beneficial.

This chapter has identified some program features that may be beneficial in attracting unengaged participants to join, the next chapter (*Using barriers and benefits to encourage wildlife gardening*) looks at how barriers and benefits could be used to encourage people to become involved in wildlife gardening.



CHAPTER 7 USING BARRIERS AND BENEFITS TO ENCOURAGE WILDLIFE GARDENING

7.1 BACKGROUND

For any behaviour, there exists a set of barriers and benefits. Barriers are obstacles that are either real or perceived, or physical or psychological, that prevent individuals from carrying out a behavior (McKenzie-Mohr, 2011). Benefits are rewards that are also either real or perceived, or physical or psychological, that will motivate individuals to carry out a behavior (McKenzie-Mohr, 2011). Barriers and benefits can be applied to all manner of behaviours, including sustainable behaviours. For example, in regards to recycling, a real physical barrier could be that the local council does not provide big enough recycling bins, and a real psychological benefit could be a feeling of 'doing your bit' for the environment.

When working to encourage the public to adopt a sustainable behaviour, often one has hunches about what would either motivate or discourage people from engaging in that behaviour (McKenzie-Mohr, 2011). However, when developing social marketing strategies to encourage that sustainable behaviour, such hunches should never be relied upon and it is essential to undertake barriers and benefits research (McKenzie-Mohr, 2011). This chapter looks at the barriers and benefits to wildlife gardening that may be useful in helping those working on wildlife gardening initiatives (or any other urban vegetation renewal schemes) encourage involvement.

In Chapter 4 it was shown that 87.9% of the *General Public* sample would consider planting Australian native plants (or planting more) and that 69.9% of the combined *Public Scoping* and *General Public* samples agree that they would like a garden that would encourage native wildlife to their yard. In Chapter 5 it was shown that 40.4% of *General Public* respondents would consider joining a wildlife gardening program. These results indicate that, as the research into the relationship between attitudes and behaviours confirms (Kollmuss & Agyeman, 2002), having a desire for wildlife in the yard and taking action through wildlife gardening programs is not a straight-forward relationship. There must be variables which impact upon one's attitude toward wildlife in yards that effect one's inclination to actually engage with wildlife gardening programs. Determining what these variables are is valuable as if we can understand the barriers and benefits to any behaviour, we can then create a social marketing campaign to encourage the behaviour.

Community attitudes towards different types of vegetation and vegetative structure will have an influence on any attempts to engage the public in wildlife gardening. However, gardens and gardeners should not be seen as static and resistant

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to change and there may be scope to use the current environmental climate to create a new social gardening pattern. To be successful in persuading people to adopt native gardens, efforts would have to address the cultural conventions that structure residential landscapes (Nassauer, Wang, & Dayrell, 2009). Parsons (1995) suggests that there is considerable potential for conflict between ecological sustainability and aesthetics in landscape design. For example, native gardens may prove difficult to promote as they do not fit the public's view of having 'aesthetic appeal' (Beck, Heimlich, & Quigley, 2002). Beck et al. (2002) found that perceptions of a garden's manageability were linked to how people rated them overall, and therefore concluded that information about the manageability of different garden alternatives should be incorporated into education initiatives.

Evidence suggests that neighbours mimic the gardening style present in their street (Hunter & Brown, 2012; Jim, 1993; Warren, Lerman, & Charney, 2008; Zmyslony & Gagnon, 1998). However, Kirkpatrick, Daniels, and Davison (2009) found no such evidence of mimicry in a study in Hobart, Australia. They propose that differences in social and cultural attitudes towards front gardens, or variation in the type, incidence and enforcement of regulations may be responsible for the lack of mimicry. The authors suggest that in Hobart, and probably elsewhere in Australia, the process of neighbourhood mimicry cannot be used to encourage particular characteristics of front gardens. Community attitudes towards wildlife in urban areas will also influence any attempts to encourage wildlife gardening. Whilst studies have found that many people have negative attitudes toward their local wildlife (DeStefano & Desblinger, 2005; West & Parkhurst, 2002), other sources indicate the public may be willing to share the urban environment with wildlife. In the UK, the Department for Environment, Food and Rural Affairs (2002) reports that 78% of households with gardens take some action to encourage wildlife in the garden. In Australia, a project by the New South Wales National Parks and Wildlife Service (2002) found that 64% of respondents believe that wildlife should be encouraged (to varying degrees) in suburban backyards. The Australian study also discusses some of the reasons why native plants are not considered desirable (e.g., fear of snakes, spiders and falling trees). Chapter 4 showed that community members are generally in favour of having wildlife in the suburbs and that they had a particular interest in native wildlife being present in the suburbs as opposed to non-native wildlife.

Chapter 5 looked primarily at how a sense of connection to nature influences wildlife gardening activities, the current chapter is concerned with investigating other factors that influence one's desire to have a garden that attracts wildlife. It is the aim of this chapter to develop a framework of determinants of this desire and highlight how this can be used to develop marketing messages to encourage people to undertake wildlife gardening and hence enhance biodiversity conservation in people's local area. This will involve investigating the perceived barriers and benefits to wildlife gardening.

7.2.1 GENERAL PUBLIC SAMPLE

As reported in Chapter 5, the CNS score for the public ranged from 1.29 to 5.00 with the mean being 3.57. An independent samples t-test found a significant difference between the CNS scores of those who indicated they would like wildlife in their yard (M=3.66, SD=0.54) and those who would not like it (M=3.26, SD=0.63), t(374)=-5.76, p<0.01). Reasons given for having no interest in joining a hypothetical wildlife gardening program are summarised in Table 7.1.

Reasons	n	%	
I have no interest in wildlife ga	rdening	38	30.9
I have no interest in gardening	in general	9	6.5
I prefer a more formal style of g	garden	9	6.5
I prefer non-native plants	3	2.2	
I am too busy to be involved	36	25.9	
I do not have the finances to ch	ange my garden	12	8.6
Other: not listed in the survey Too old		8	6.5
but received numerous comments, % possibly higher	Undertake independently	13	9.4
if had been an option to tick	No room	5	3.6

Table 7.1 Reasons provided as to why a respondent would not be interested in joining a wildlife gardening program

The relationship between demographic variables and whether or not one would consider joining a wildlife gardening program was examined. Table 7.2 displays the chi-

squared results for the demographic variables along with the percentages showing demographic factors vary in relation to if one would consider joining a wildlife gardening program.

		nsider join hetical pro	•	Chi-squared Results			
Variable	Yes	Unsure	No	n	X ²	df	р
Income				341	0.56	2	0.76
\$80,000 per annum or lower	40.6	27.6	31.8				
\$80,001 + per annum	38.9	25.5	35.6				
Age				398	12.70	4	0.01
18-39 years old	48.8	25.0	26.2				
40-59 years old	41.1	31.5	27.4				
60+ years old	34.2	22.6	43.2				
Gender				399	2.47	2	0.29
Male	36.5	26.4	37.1				
Female	42.9	27.1	30.0				
Education				398	3.58	6	0.73
High school or below	32.6	31.5	36.0				
TAFE / Technical College	41.5	26.6	31.9				
Undergraduate University	44.0	23.0	33.0				
Postgraduate University	42.6	27.0	30.4				
Country of birth				397	0.02	2	0.99
Australia	40.2	26.8	33.0				
Overseas	39.6	27.5	33.0				

Table 7.2 Comparison (via percentages) of demographic factors and their relationship to if one would consider joining a wildlife gardening program, including Chi-squared results

The relationships between attitudes toward various statements relating to nature in the backyard and if one would consider joining a wildlife gardening program were examined. Table 7.3 displays the chi-squared results for all variables, along with the percentages showing how different attitudes vary in relation to if one would consider joining a wildlife gardening program. In conducting the chi squared tests using the variables in their raw state, outputs that had more than 20% of the expected counts being less than 5 (Yates et al., 1999, p. 734) were frequently produced. Therefore, variables generated for statements relating to nature in the yard were recoded. The categories of *Strongly agree* and *Agree* were condensed into *Agree, Neutral* remained the same, and *Strongly disagree* and *Disagree* were condensed into *Disagree*.

their relationship to if one would consider joining a wildlife gardening program, including Chi- squared results						
Variable	% Consider joining a hypothetical program	Chi-squared Results				

Table 7.3 Comparison (via percentages) of the various attitudes toward nature in the yard and

Variable	% Consider joining a hypothetical program				Chi-squared Results			
	n	Yes	Unsure	No	n	X ²	df	р
I think Australian native gardens look messy					393	10.05	4	0.04
Agree	70	28.6	25.7	45.7				
Neutral	97	36.1	32.0	32.0				
Disagree	226	45.6	25.2	29.2				
l think formal European gardens look out of place in Australia					397	3.66	4	0.45
Agree	92	43.5	26.1	30.4				
Neutral	159	41.5	29.6	28.9				
Disagree	146	37.0	24.7	38.4				
Having a garden that is neat and tidy is important to me					397	12.21	4	0.02
Agree	208	34.6	26.9	38.5				
Neutral	95	30.9	32.6	27.4				
Disagree	94	52.3	21.3	25.2				

Variable cont.			er joining cal progr		Ch	ii-squareo	d Res	ults
	n	Yes	Unsure	No	n	X ²	df	р
l think gum trees are dangerous in suburban backyards					394	20.61	4	<0.01
Agree	152	29.6	25.7	44.7				
Neutral	86	41.9	34.9	23.3				
Disagree	159	49.1	23.9	27.0				
A home where there is no chance of falling trees is important to me					398	9.50	4	0.05
Agree	257	37.4	25.3	37.4				
Neutral	83	41.0	34.9	24.1				
Disagree	58	51.7	22.4	25.9				
I think native gardens increase the risk of fire					396	10.60	4	0.03
Agree	61	44.3	14.8	41.0				
Neutral	131	32.8	29.8	37.4				
Disagree	204	44.1	28.4	27.5				
A garden that minimizes fire risk is important to me					395	5.60	4	0.23
Agree	238	43.7	23.1	33.2				
Neutral	108	36.1	33.1	30.6				
Disagree	49	32.7	32.7	34.7				
I think native gardens encourage dangerous wildlife (e.g., snakes)					396	18.51	4	<0.01
Agree	35	25.7	17.1	57.1				
Neutral	107	31.8	36.4	31.8				
Disagree	254	46.1	24.4	29.5				
A home that is safe from dangerous wildlife is important to me					397	5.54	4	0.24
Agree	205	37.1	26.8	36.1				
Neutral	103	42.7	32.0	25.2				
Disagree	89	43.8	21.3	34.8				

Variable cont.	% Consider joining a hypothetical program		Chi-squared R		d Res	Results		
	n	Yes	Unsure	No	n	X ²	df	р
Having a garden that requires minimal maintenance is important to me					397	4.94	4	0.29
Agree	295	37.6	28.5	33.9				
Neutral	52	42.3	25.5	32.7				
Disagree	50	54.0	20.5	26.0				
Having a garden that is water wise is important to me					used	uared statis as more tha ed counts l	n 20%	6 of the
Agree	370	40.3	28.1	31.6		s is due to t w numbers		
Neutral	18	44.4	11.1	44.4		eing with t		
Disagree	9	33.3	11.1	55.6				
Having a garden that will be admired by other people is important to me					394	5.26	4	0.26
Agree	174	39.1	29.9	31.0				
Neutral	131	42.0	29.0	29.0				
Disagree	89	40.4	19.1	40.4				
Having a backyard with space for entertaining is important to me					395	2.49	4	0.65
Agree	287	41.5	27.2	31.4]			
Neutral	75	37.3	29.3	33.3	1			
Disagree	33	39.4	18.2	42.4	1			
I think Australian native gardens are fashionable these days					397	4.44	4	0.35
Agree	264	43.2	25.4	31.4	1			
Neutral	103	33.0	32.0	35.0	1			
Disagree	30	40.0	20.0	40.0	1			
Being someone who is recognized as caring for the environment is important to me					396	22.33	4	<0.01
Agree	215	50.7	24.2	25.1				
Neutral	123	26.8	33.1	39.8				
Disagree	58	32.8	24.1	43.1				

7.2.2 WILDLIFE GARDENER SAMPLE

Respondents from the *Wildlife Gardening* sample were asked if they were aware that a native garden could take many forms (e.g., bush, cottage, contemporary) prior to joining their program and 74% indicated that they were aware of this. Respondents were asked to indicate how they found out about their wildlife gardening program and the methods reported are summarised in Table 7.4 along with mean CNS scores and the percentage of those planning to create a garden before joining a program. Classifying the methods of hearing about the program as either self-directed (i.e. searching on the internet) or presented with the information (i.e. all other methods), the chi-squared test for independence showed a significant difference between the method of learning about the program and intention to create a wildlife garden $X^2(1, N=257)=4.61$, p=0.32. An independent samples t-test showed there to be no significant difference in CNS score between those who found out about the program by self-direction (M=3.93, SD=0.54) and those who were provided with the information (M=3.86, SD=0.44), t(225)=0.73, p=0.47.

In order to assess respondents' reasons for joining their respective programs, they were asked to identify their top three reasons from a list of options (or specify other reasons). The breakdown of reasons selected is shown in Table 7.5.

How did participants find out about this program?		% of sample	Mean CNS	% planning to create
Word of mouth		28.2	3.79	87.5
Search for wildlife gardening on the internet		5.5	3.86	100
Brochure/Pamphlet		24.7	4.01	88.9
Other : not listed in the survey	Community Event	12.9	3.85	93.9
but received numerous comments, % possibly higher if	Sign on participant fence	3.1	3.96	87.5
had been an option to tick as Newspaper		2.7	3.88	85.7
people may have categorised these as word of mouth)	Other	12.2	4.11	93.5

 Table 7.4 Mean CNS score based on different ways of learning about a wildlife gardening program

Table 7.5 Mean CNS score based on different reasons for joining a program

Reason for joining program	n	%	Mean CNS
I wanted to attract native wildlife to my yard	207	80.9	3.92
I wanted to help increase biodiversity in the urban area	144	56.3	4.02
I wanted a water wise / drought tolerant garden	128	50.0	3.87
I believe a native garden is 'right' for Australia	124	48.4	3.90
I like the look native plants create for my yard	76	29.7	3.82
I wanted to create a place for my children to explore nature	29	11.3	3.79
I wanted to create a place to relax	21	8.2	3.98
I wanted to be recognised for my wildlife gardening efforts	13	5.1	3.93
Inspire others (not listed as an option but added by people)	7	2.7	4.01

7.3 DISCUSSION

7.3.1 BENEFITS

In looking at the reasons why current wildlife gardeners joined their programs this study is able to identify benefits that may have the ability to influence the community to engage in wildlife gardening. It can be seen that the three most common reasons provided by the *Wildlife Gardening* sample were:

- 1. I wanted to attract native wildlife to my yard
- 2. I wanted to help increase biodiversity in the urban area
- 3. I wanted a water wise / drought tolerant garden

These reasons for joining should be utilised in marketing messages encouraging wildlife gardening, as logic dictates that other individuals with an interest in nature will most likely be attracted by these messages. However, what about the wider community who may not have the same interest in nature? As wildlife gardening involves planting native or indigenous plant species, this study looked at the public's reasons for wanting to have these species in their gardens, with the *General Public* sample's top three being:

- 1. They are water wise
- 2. They provide homes for native wildlife
- 3. They are easy to maintain

Examination of how the importance one places on having a water wise garden effects whether an individual would consider joining a program was not possible due to the extremely low numbers of respondents that indicated water wise gardens were not important to them. This finding is in line with 'they are water wise' being the top reason for the general public wanting native plants in their yards. These findings are not unexpected, as throughout Australia water scarcity is a major concern and water saving messages are common (Randolph & Troy, 2008) and it has been shown that the public generally share a commitment to water saving (Head & Muir, 2007). However, this is not just an issue for Australia, as there is a growing emphasis on water saving messages in the UK (Gilg & Barr, 2006), USA, (United States Environmental Protection Agency, 2011a), Greece (Kolokytha, Mylopoulos, & Mentes, 2002) and many other countries. The generally low maintenance qualities of native plants, along with their water saving and habitat providing benefits, should be added to marketing messages. Marketing campaigns also need to take into consideration the barriers that may prevent people from taking action and actually engaging in wildlife gardening.

7.3.2 BARRIERS

The main reasons that *General Public* respondents would not consider joining a wildlife gardening program provide insights into how recruitment can be maximised. The results show that having no interest in wildlife gardening was the main reason people would not consider joining a wildlife gardening program. Being 'too old' was offered as a reason by a small number of respondents, and interestingly this was the only demographic variable found to be related to the likelihood that one would not consider joining a program. Whilst being able to encourage wildlife gardening in the elderly, as well as people who indicated no interest, is likely to be unrealistic, other reasons for not considering joining may be useful to incorporate into both programs and marketing strategies. For example being too busy or not having the finances were commonly mentioned as reasons. To combat these barriers, programs or initiatives can

implement strategies to minimise the time and money needed to participate. For example, by offering indigenous or native plant nursery vouchers and home visits to help participants identify what species would suit their gardens, and informing people of how much less time needs to be spent maintaining a native garden. Such features were actually found to increase the likelihood of previously unengaged individuals having joined a program (see Chapter 6), providing further evidence that they should be promoted to the public in any marketing materials.

In line with the literature that suggests native plants are not considered desirable because of a fear of snakes and spiders (New South Wales National Parks and Wildlife Service, 2002), the belief that native gardens encourage dangerous wildlife was found to be related to not considering joining a program, and conversely not believing that native gardens encourage dangerous wildlife was found to be related to considering joining a program. Interestingly, whilst belief that native gardens encourage dangerous wildlife was related, the importance one placed on having a home that is safe from dangerous wildlife was not. Perhaps this is because residents are from a metropolitan area, and they do not perceive there to be any threat of dangerous wildlife (for example snakes) in their communities.

The belief that eucalypts (gum trees) are dangerous in suburban backyards has been noted by other researchers (Head & Muir, 2005; New South Wales National Parks and Wildlife Service, 2002) and this belief was also found to be related to respondents not considering joining a program. Although the importance placed on having a home with no chance of falling trees was found to be related to considering joining a program, the percentages show that approximately equal proportions of those who *agreed* a home with no chance of falling trees was important to them would or would not consider joining a program. The difference appears to be in that approximately 50% of those who *disagreed* a home with no chance of falling trees was important to them **would** consider joining a program, and only approximately 25% would not. These results indicate that the importance placed on having a home with no chance of falling trees would not show any difference in whether they would consider joining a program, as people agreeing did not show any difference in whether they would consider joining a program or not. Only disagreeing that it was important appears to have an influence, indicating that those who are not concerned about falling trees may be more likely to join programs, but it *does not* mean that those to whom a home with no chance of falling trees is important would not consider joining a program.

Previous researchers have found that fire risk is a concern for urban/suburban residents (Özgüner & Kendle, 2006), however this concern about fire risk of native gardens was not found to be related to whether a respondent would consider joining a program. Although concern about the risk of fire was not related, a belief that native gardens increased the risk of fire was found to be related. This may be due to the fact that although participants were from Victoria, Australia, one of the highest bushfire risk areas in the world (Commissioner for Environmental Sustainability, 2008), they reside in a metropolitan area and this is not a major concern for them. A rural sample may show fire risk to be a stronger predicting factor, and wildlife gardening initiatives in such areas would benefit from assessing this assumption. Factors relating to aesthetic garden preference were found to be related to the likelihood of a member of the public considering joining a wildlife gardening program. Specifically, a belief that Australian native gardens look messy, and the importance one places on having a neat and tidy garden were related to whether or not a respondent would indicate they would consider joining a program. It can be seen that more people who *agreed* that native gardens were messy **would not** consider joining a program, and more people who *disagreed* that native gardens were messy selected they **would** consider joining a program. In regards to the importance placed on having a neat and tidy garden was important to them would or would not consider joining a program. Although, approximately 50% of those who *disagreed* that a neat and tidy garden was important to them would consider joining a program, and only approximately 25% would not.

These results indicate a preference for a neat and tidy garden would not be a barrier to joining a program, as people agreeing they would like a neat and tidy garden did not show any difference in whether they would consider joining a program or not. However, those that disagree that a neat and tidy garden is important to them, i.e. those who don't care about having a neat garden, may be more likely to join programs.

In terms of opinion about the aesthetics of native gardens, these results indicate that those who have a negative opinion about the aesthetics of native gardens are less likely to join wildlife gardening programs, and those that have a positive view are more likely to. In this regard, having a negative view of the aesthetics of native gardens can be viewed as a barrier that will prevent this subset of individuals from engaging in wildlife gardening. This result supports Parsons (1995) assertion that there is potential for conflict between ecological sustainability and aesthetics in landscape design.

However, wildlife gardens can take many forms and be designed to suit individual style (Knox City Council, 2013) and a quarter of all of those in programs had not realised this prior to joining. Similarly, 17.8% the *General Public* sample believe a native garden is messy. A study in Switzerland showed that both ecological and aesthetic quality can be achieved in the same garden (Lindemann-Matthies & Marty, 2013). Perhaps there is scope to change how the public view the aesthetic appeal of native gardens and it may be useful to include information about the different styles of wildlife garden that can be created in any wildlife gardening marketing.

The only other attitudinal variable that was found to be related to one considering joining a wildlife gardening program was whether a respondent thought that being someone who is recognised as caring for the environment is important to them. Those who *agreed* had a higher percentage of those that *would* consider joining a program, and those that *disagreed* had a higher percentage of those that *would* not consider joining a program.

Perceived behavioural control may also influence one's motivation to engage in wildlife gardening. Perceived behavioural control is included in many models of behaviour determinants and it is well established that this variable has some influence on one's intention to carry out a certain environmental behaviour (Ajzen, 1991). In the 172 wildlife gardening example, it may be that if an individual feels that their urban environment is too degraded for them to be able to make a difference, they will be less likely to engage in wildlife gardening. This line of research would be useful to help complete the picture of what determines one's potential for engaging in wildlife gardening.

After developing a marketing message, wildlife gardening programs or initiatives need to ensure they reach the unengaged members of the community. The findings suggest that the most effective way of recruiting participants for programs is through word of mouth and brochures and it is encouraging to note that people who are recruited in this way are less likely to have been planning to create a wildlife garden. As would be expected, all of those who discovered the program through their own actions (i.e. looking for it on the internet) had prior intentions to create wildlife gardens. This study provides empirical evidence that it is important for wildlife gardening programs or initiatives to undertake marketing campaigns if they wish to attract unengaged members of the community, and therefore have an impact on improving urban biodiversity.

7.3.3 SOCIAL NORMS AND CREATING A PARADIGM SHIFT

Social norms, which can be thought of as internalised beliefs about what other people think, feel or prefer (Nassauer et al., 2009), did not appear to be overly important in people's consideration of joining a wildlife gardening program. The statements *I think Australian native gardens are fashionable these days* and *Having a* 173 garden that will be admired by other people is important to me were not found to be related. Wanting to be someone who is recognised as caring for the environment, which was found to be related to considering joining a program, may be considered a type of norm as it deals with what other people think about you, and 'wanting to keep up appearances'. The results from this study are not robust enough to add to theory about social norms having the ability to encourage wildlife gardening. However, the topic will be explored due to its importance.

The pressure to conform to mainstream perceptions of having a conventional looking garden can be strong (Beck et al., 2002; Goddard et al., 2013; Robbins, Polderman, & Birkenholtz, 2001) and Nassauer et al. (2009) point out that in metropolitan America, ecologically minded landscapes are not yet typical and suggest that widespread adoption of such yards faces the barrier of perceived norms favouring conventional landscape designs. Goddard et al. (2013) found that friends and neighbours had the most influence on people's gardening practices in Leeds, UK and hypothesised that this was due to social norms. They concluded that the community preference for tidy gardens acts as a considerable barrier to the uptake of wildlife gardening practices in the UK (Goddard et al., 2013). As previously noted, this study found that the belief that native gardens are messy is negatively related to considering joining a wildlife gardening program. Perhaps this relationship is due to the social norm of a 'lawn and flower beds' style of gardening (Forbes et al., 1997) and the results on aesthetics may be in fact tapping into an element of social norms. This, taken with Goddard et al.'s (2013) finding, suggests such norms do play an important role in inclination to want a yard that attracts wildlife.

Norm theory suggests that if we can change the paradigm of what is fashionable in terms of gardens then this can be used to create a shift in gardening practices. Therefore there is a need for any wildlife gardening program or initiative to think about how to spread the message beyond interested people to expose others in the community to wildlife gardening in their everyday experience, thereby changing the predominant view of what a garden should look like. Local councils could have a big role in bringing about this shift. For example, local councils typically try to encourage the use of native vegetation through their websites. However, only residents with an interest in such things are likely to access that information, therefore it is doubtful that this strategy is effective in changing the majority of their residents gardening practices. Local councils could take the lead in promoting native plant use, by 'walking the talk' and using indigenous native vegetation in their local open space landscaping. Another way councils could help encourage indigenous plant use could involve sending out information regarding local indigenous plants to all new residents when they move in, and possibly including vouchers to local native nurseries. This may influence new residents to choose native species as they may feel it is the norm in the area. Similarly, existing residents could receive such information and vouchers in their yearly rates notice, and this may expose many to the idea of using indigenous plants who would have otherwise not considered it.

Wildlife gardening programs may be able to help in bringing about a paradigm shift in gardening practices, as potential exists to utilise already engaged members of the community (such as those in wildlife gardening programs). Ryan and Grese (2005) found that over 50% of volunteers on ecological restoration projects in Michigan, U.S.A. 175 had discouraged friends and neighbours from using exotic plant species. In the present study a small number of wildlife gardeners indicated one of their reasons for joining the program was to inspire others. This had not been included as a reason for joining, but had been added by respondents under 'other'. Had this been included as a possible selection this may have been a much more prevalent reported motivation for wildlife gardeners. Other potential ways that programs could help include facilitating streetscaping projects like the one discussed in Chapter 6, providing signs/plaques for participants to display on their properties at street level (i.e. letter box, fence) to alert passersby to the significance of the garden, and providing bumper stickers for participants to place on cars to increase community awareness that a different style of gardening exists. Although the results presented in Chapter 6 seemed to indicate that providing wildlife gardening signage to members did not equate to greater success in recruiting more unengaged individuals, further research into the reasons for this would be beneficial.

Some evidence suggests that neighbours mimic the gardening style present in their street (Hunter & Brown, 2012; Jim, 1993; Warren et al., 2008; Zmyslony & Gagnon, 1998). Importantly, Nassauer et al. (2009) found that individual homeowners place great value on having a front yard that matches the neighbourhood appearance, but that this neighbourhood appearance does not need to match the broader social norm. Nassauer et al. (2009) suggest that the development of a consistent neighbourhood appearance can spring from the government level through incentives, urban developers, or through local neighbourhood action involving residents taking action to improve the biodiversity of their area. All of these avenues of action taken 176 together are likely to be needed if there is to be a shift in gardening practices, and all of these avenues would benefit from utilising the preliminary picture this study has built up concerning the barriers and benefits to wildlife gardening. Further research into exactly how social norms can influence the type of garden one creates would be valuable as such knowledge could assess the viability of creating a cultural change towards native/wildlife gardens becoming the norm.

7.4 CONCLUSION

The preceding chapters have built a picture that shows that whilst wildlife gardening has the potential to engage with the broader community, programs are currently not achieving this. This chapter has shown that a range of strategies are likely to be needed if programs are to succeed in encouraging wildlife gardening in the broader community. It seems that there is currently not a great deal of interest in joining formal wildlife gardening programs, but support does exist for planting more native vegetation and having wildlife in yards. Changing the current social norm of manicured yards will be essential if we wish to bring about significant change in garden landscapes and improve urban biodiversity. Therefore wildlife gardening programs or initiatives must think about how to spread the message beyond interested people to expose others in the community to wildlife gardening in their everyday experience. Any initiative or program aimed at encouraging wildlife gardening would benefit from utilising the barriers and benefits identified in this chapter. Barriers were found to be: concern about the safety of native vegetation (trees and dangerous animals), aesthetic preference, age, time availability, and lack of finances. The main reasons (benefits) that current wildlife gardeners joined their programs were based around wanting to attract native wildlife, wanting to help increase biodiversity and wanting a water wise garden. It is suggested that both the barriers and benefits be developed into marketing messages and program features to either emphasise benefits or dispel fears.

The next chapter, *Plant it and they will come*? is the final results chapter, and examines if program members perceive their efforts through participation in their programs have resulted in the attraction of wildlife.



CHAPTER 8 PLANT IT AND THEY WILL COME? A LOOK AT THE PERCEIVED SUCCESS OF WILDLIFE

A LOOK AT THE PERCEIVED SUCCESS OF WILDLIFE PROGRAM MEMBERS IN ATTRACTING WILDLIFE

8.1 BACKGROUND

As mentioned in Chapter 1, urbanisation typically reduces native vegetation cover and fragments remaining cover into isolated patches, which limits the viability of indigenous species (Collinge, 1996). Despite this, revegetation of degraded landscapes takes place on a relatively large scale across rural areas in many countries and limited scientific attention has been focussed on conserving nature in urban areas (Chiesura, 2004).

Studies assessing the success of revegetation initiatives in rural and agricultural areas suggest that revegetation does provide habitat for many species of bird and some arboreal marsupials (Munro, Lindenmayer, & Fischer, 2007). A review of the literature (Munro et al., 2007) on the response of fauna to revegetation in Australian agricultural areas found that species richness of birds was positively influenced by

revegetated areas that were large, wide, structurally complex, old, and near remnant vegetation. However, the authors found that in the short term, bats, small terrestrial mammals, reptiles, and amphibians did not benefit significantly from revegetation and suggest that for many species revegetation is not a good replacement of remnant vegetation.

Revegetation in urban or suburban areas is often limited to tree plantings and friends groups' efforts at their local site of interest. However, for wildlife populations to thrive there needs to be connectivity between vegetation patches (Hobbs et al., 1990). Whilst large urban green spaces such as public parks can support high levels of biodiversity and provide important habitat for many species (Rudd et al., 2002), preserving such spaces in isolation may be of limited biodiversity benefit. Without connections between urban green spaces there is little opportunity for dispersal and therefore gene flow is restricted (Hobbs et al., 1990).

Domestic gardens are a major contributor to urban biodiversity in many developed countries (Cannon, 1999) and research has suggested that domestic gardens can indeed help support wildlife populations (Ansell, Baker, & Harris, 2001; Baker et al., 2003; Bland et al., 2004; Cannon, 1999; Daniels & Kirkpatrick, 2006b; Davies et al., 2009; Dickman & Doncaster, 1987; Goddard et al., 2013; Good, 2000; Saville, 1997; Vickery, 1995). Therefore they are thought to be important in developing wildlife corridor connectivity in urban areas (Rudd et al., 2002). However, in Australia and other industrialised nations, this assumption may not hold true if the trend towards urban consolidation, which results in reduced yard space in new residential developments (Hall, 2007) continues.

Despite the potential contribution wildlife gardening can make to urban biodiversity, there appear to be no published papers investigating the success of **programs** in attracting native wildlife. Palmer and Dann (2004) looked at how program features used in a United States based wildlife gardening program influenced how often members undertook wildlife management or resource conservation activities. However, undertaking wildlife gardening does not necessarily equate to attracting wildlife and there is a clear need to start to identify if wildlife gardening programs can result in positive biodiversity outcomes. At present it is uncertain whether the wildlife conservation value of urban gardens can be significantly improved by wildlife gardening (Chamberlain et al., 2004). If wildlife gardening programs are not succeeding in their goal of attracting native wildlife, they will not be contributing to faunal diversity.

In addition, few studies have examined how a modification to domestic garden composition, in an attempt to increase their conservation value, can be successful in attracting wildlife (for exceptions see Burghardt et al., 2009; Sperling & Lortie, 2010). Other research has examined the occurrence of wildlife in urban and suburban areas and the influence of various landscape features on their distribution. These studies have shown that the value of an urban or suburban habitat patch can be influenced by the density and diversity of the vegetation, the density and age of trees, nearby water bodies and the level of human disturbance (Jokima¨ki, 1999; Thompson et al., 1993; White et al., 2005). It has also been shown that garden size influences species occurrence, with larger gardens in general attracting a greater range of species (Chamberlain et al., 2004; Thompson et al. 1993).

Investigating the success of wildlife gardening programs in terms of members attracting wildlife to their yards was not a main aim of this research. Nevertheless, a programs ability to have members that are successful in attracting wildlife needs to be considered when assessing the viability of programs contributing in a meaningful way to biodiversity. As this study is a social research project, monitoring of wildlife gardening sites was not undertaken, and results relating to the attraction of wildlife were obtained through self-reports form respondents.

This chapter aims to investigate which program features and other factors impact upon the success of wildlife gardening programs in terms of the reported success in attracting native wildlife.

8.2 RESULTS

When asked *Has your participation in the program led to attracting desired native or non-native wildlife to your yard?*, 70.5% (*n*=179) of respondents indicated yes. However, upon inspection of the list of animals supposedly attracted provided by respondents, it was clear that some respondents were basing their answer on wildlife that was already present in their yards before joining their program. For example, one respondent wrote: My involvement in the program hasn't changed what I get coming to my yard, as I would have had these anyway do to my own efforts. But I get possums, micro bats, various owls, parrots, rosellas, lorikeets, and an increase in skinks and overall increase in biodiversity through what I have been doing

If all respondents whose comments in their list of attracted species indicated the wildlife may have been present before joining the program are excluded, then 65.0% (*n*=165) of respondents reported that wildlife had been attracted to their garden through their program participation. Of respondents that selected that they had not taken steps to create a wildlife garden prior to joining their program were assessed, 43.3% perceived that wildlife had been attracted through efforts brought about by their participation in the program.

Using only the data that **excluded** responses that indicated wildlife was pre existing (65% of respondents), categories of wildlife were created and each listed animal was allocated to their grouping. This information is provided in Table 8.1, along with information regarding the number of unique respondents reporting that species and the percentage of respondents who reported attracting wildlife (i.e. not a percentage of the whole *Wildlife Gardener* sample). Unfortunately, due to discrepancies in the level of species identification provided by respondents, some of the categories are not mutually exclusive. For example, some respondents just reported 'Native birds' had been attracted, whilst others reported 'Noisy Miner', therefore a category of *Native birds* was required, but this obviously overlaps with many other categories. Tables 8.2 through 8.13 provide details of all the species that were listed by respondents (sorted into the categories used in Table 8.1), and the number of unique times they were mentioned by respondents Species details are listed as they were reported by respondents, they have not been edited, therefore in some instances reported species do not correspond to the correct, or common name for an actual species. (Appendix 5 chronologically lists the scientific names for the species listed in results tables throughout the thesis, for all the types of animals that respondents identified to species level). The categories of *Just mentioned 'Birds'* and *Just mentioned 'Native birds'* are not included in these tables, as there are no species to list under these categories.

Wildlife species reportedly attracted	Number of individual respondents reporting the species was attracted	% of those reporting wildlife attracted
Lizards	72	43.9%
Honeyeaters	65	39.6%
Parrots	53	32.3%
Small native birds	53	32.3%
Frogs	40	24.4%
Insects and Arachnids	40	24.4%
Mammals (exc. possums)	39	23.8%
Just mentioned 'Birds'	38	23.2%
Large birds	35	21.3%
Possums	34	20.7%
Medium birds	24	14.6
Snakes	13	7.9%
Raptors	12	7.3%
Water/shorebirds	10	6.1%
Just mentioned 'Native birds'	9	5.5%

Table 8.1 List of the types of wildlife reportedly attracted by respondents as a result of their participation in their program and the number and percentage of individuals that mentioned the species

Table 8.2 Honeyeaters listed as attracted toyards as a result of participation in wildlifegardening program

HONEYEATERS	n
Honeyeater	22
Black headed Honeyeater	1
Brown Honeyeater	1
Budgerigar	1
Crescent Honeyeater	3
Eastern Spinebill	10
New Holland Honeyeater	10
Noisy miner	6
Red wattlebird	3
Yellow-faced Honeyeater	1
Yellow-throated Honeyeater	3
Yellow wattlebird	1
White naped Honeyeater	1
Wattlebird	20
White plumed Honeyeater	4
Strong-billed Honeyeater	1
Spinebill	3

Table 8.3 Large sized birds listed asattracted to yards as a result ofparticipation in wildlife gardening program

LARGE BIRDS (40+cm)	n
Brush Turkey	2
Channel Billed Cuckoo	2
Crane	1
Crow	4
Cuckoo-shrike	1
Currawong	3
Kookaburra	12
Magpie	11
Pheasant Coucal	1
Raven	1
Forest Raven	1
Little Raven	1
Tawny frogmouth	9

Table 8.4 Shore or Water birds listed asattracted to yards as a result ofparticipation in wildlife gardening program

SHORE / WATER BIRDS	n
Duck	2
Australian maned duck	1
Pacific Black Duck	1
Heron	1
Lapwing	1
Native Hens	4
Plover	3

Table 8.5 Raptors listed as attracted toyards as a result of participation in wildlifegardening program

RAPTORS	n
Barn owl	1
Boobook owl	1
Brown Goshawk	3
Hawk	2
Owl	1
Pacific Baza	1
Powerful Owl	1
Eagle	1
Harrier	1

Table 8.6 Medium sized birds listed as	
attracted to yards as a result of	

participation in wildlife gardening program		
MEDIUM BIRDS	n	
Blackbird	1	
Black-faced Cuckoo Shrike	2	
Bowerbird	3	
Western bowerbird	1	
Butcherbird	6	
Dove	1	
Fig bird	1	
Grey -crowned Babbler	2	
*Grey Cuckoo	1	
Grey shrike-thrush	1	
Magpie-lark / Peewee	7	
Native pigeon	1	
Pallid Cuckoo	1	
Pigeon	1	
Bronzewing pigeon	1	
Crested Pigeon	5	
Fruit pigeon	1	
Wonga Pigeon	2	
*Shrike Thrush	3	
*Shrike	1	
Spangled Drongo	1	
Whip bird	2	
*Not recognized nemos for Australi		

Table 8.7 Parrots listed as attracted toyards as a result of participation in wildlifegardening program

pardening program	
PARROIS	n
Black Cockatoo	1
Corella	2
Galah	5
Green parrot	1
King George Parrot	1
King Parrot	6
Lorikeet	14
Musk lorikeet	4
Rainbow Lorikeets	8
Major Mitchell	1
Mulga Parrot	1
Parrot	11
Red Rump parrot	1
Ring neck parrot	3
Rosella	8
Crimson Rosella	10
Eastern Rosella	8
Pale-headed rosella	1
Sulphur crested cockatoo	10
Yellow-Tailed Black-	2
Cockatoo	

*Not recognised names for Australian species

Table 8.8 Small sized birds listed as attracted to yards as a result of participation in wildlife gardening program

participation in wildlife gardening program					
SMALL BIRDS	n				
Bronze Cuckoo	1				
Fairy Martin	1				
Finch	6				
Gold finch	1				
Red-browed Finch	2				
Grey Fantail	6				
Kingfisher	2				
*Fairy kingfisher	1				
Sacred kingfisher	1				
Pardalote	4				
Spotted pardalote	1				
Robin	2				
Flame Robin	1				
Scarlet robin	3				
Flycatcher	1				
Satin Flycatcher	1				
Quail	1				
Silvereye	8				
Swallow	2				
Welcome Swallow	1				
Thornbill	10				
Brown Thornbill	3				
Tasmanian Thornbill	1				
Whistler	1				
Golden Whistler	2				
Willie wagtail	5				
Wren	9				
Blue Wren	6				
Superb Blue Wren	3				
Superb Fairy Wren	3				
*Not recognised names for Australian species					

Table 8.9 Mammals listed as attracted toyards as a result of participation in wildlifegardening program

MAMMALS	n
Bandicoot	9
Brown bandicoot	1
Eastern-barred bandicoot	5
White-barred bandicoot	1
Bat	5
Fruit bat	2
Bettong	2
Echidna	13
Kangaroo	1
Long nosed Potoroo	1
Pademelon	3
Platypus	1
Possum	13
Brushtail Possum	11
Sugar Gliders	1
Ringtail Possum	12
Quoll	1
Tasmanian devil	1
Wallaby	7
Bennett's wallaby	1
Wombat	2

*Not recognised names for Australian species

Table 8.10Snakes listed as attracted toyards as a result of participation in wildlifegardening program

SNAKES	n
Snake	4
Carpet snake	2
Copper head snake	1
Red bellied black snake	1
Tiger snake	1
Tree snake	2
White lipped snake	1

Table 8.11 Frogs listed as attracted to yardsas a result of participation in wildlifegardening program

FROGS	n
Frog	37
Striped Marsh Frog	1
Suddell painted frog	1
Tasmanian Tree frog	1

Table 8.12 Lizards listed as attracted toyards as a result of participation in wildlifegardening program

LIZARDS	n
Bearded Dragon	2
Blue tongue lizard	23
Gecko	2
Marbled gecko	1
Monitor lizard	1
Lace monitor	1
Lizard	35
Long-nosed dragon	1
Skink	17
Fire-tail skink	1
Water dragon	2
Eastern Water Dragon	1

Table 8.13 Insects and Arachnids listed asattracted to yards as a result ofparticipation in wildlife gardening program

INSECTS AND ARACHNIDS	n
Blue banded bee	4
Butterfly	19
Painted Lady Butterfly	1
Saltbush Blue Butterfly	1
Dragonfly	3
Grasshopper	1
Insect	18
Ladybug	1
Native bee	6
Spider	3
Teddy bear bee	1

The chi-squared test for independence was used to examine the relationship between program features and self-reported success in attracting desired wildlife. The results of these tests, along with the percentage breakdown of those reporting attraction of desired wildlife are displayed in Table 8.14.

Program features		% of members reporting wildlife attracted	χ2	df	р
Site assessment	Offered Not offered	64.5% 70.6%	0.67	1	0.41
Provision of native plants/ vouchers	Offered Not offered	65.8% 68.8%	0.07	1	0.79
Welcome pack	Offered Not offered	71.7% 58.2%	3.23	1	0.07
Newsletters	Offered Not offered	74.3% 64.4%	1.68	1	0.19

Table 8.14 The influence of program features on the attraction of wildlife

A number of other variables were assessed in relation to their impact on reported success in attracting wildlife. Size of the block of land was one variable analysed, and the breakdown of block size and the attraction of wildlife attracted can be seen in Table 8.15. The chi-squared test for independence showed no significant difference in whether a respondent indicated native wildlife had been attracted and the size of their block of land; χ 2=0.90, df=3, p=0.83.

Wildlife attracted to the yard?		Size of Block					
		Small suburban (< 500sqm)	Av. suburban (500-1000sqm)	Large suburban (>1000sqm)	Property (Rural)		
Yes	п	16	66	54	27		
	%	66.7%	66%	71.1%	73%		
No	п	8	34	22	10		
	%	33.3%	34.0%	28.9%	27%		

Table 8.15 Reported attraction of wildlife across different block sizes

In relation to the length of time participants had been involved in their wildlife gardening groups, a pattern was evident, with those being involved for longer periods of time being more likely to report that wildlife had been attracted (Table 3). This pattern was confirmed by the chi-squared test for independence; χ 2=32.38 df=5, p<0.01.

Wildlife attracted to the yard?		Time in wildlife gardening group						
		< 1 year	1y – 1y,11m	2y – 2y,11m	3y – 3y,11m	4y – 4y,11m	5years +	
Yes	n	18	35	44	26	10	20	
	%	40.0%	59.3%	65.7%	89.7%	90.9%	87.0%	
No	п	27	24	23	3	1	3	
	%	60.0%	40.7%	34.3%	10.3%	9.1%	13%	

Table 8.16 Reported attraction of wildlife across time in group

In relation to the types of plants utilised by participants and wildlife attracted, a pattern was evident, with those using native or indigenous species having the highest percentage of respondents indicating wildlife had been attracted (Table 8.17). A chi-squared test could not be conducted to test this relationship as the output produced

that had more than 20% of the expected counts of less than 5 (Yates et al., 1999, p. 734).

Wildl attrac	ife cted to	Type of plants in yard					
the yard?		Mostly non- native	Mostly Aust. native	Mostly locally indigenous	Mostly fruit or vegetable	Mix non-native, native/indig.	
Yes	n	0	39	37	2	82	
	%	0%	72.2%	78.7%	40%	59.9%	
No	n	4	15	10	3	55	
	%	100%	27.8%	21.3%	60%	40.1%	

 Table 8.17 Reported attraction of wildlife across type of vegetation

The relationship between self-perceived increases in understanding of biodiversity after joining a program and perceived success in attracting desired wildlife was examined. It was found that 70.9% (n=107) of those who indicated an increased understanding of biodiversity reported success in attracting wildlife, compared to 60% (n=30) of those who did not indicate an increase in knowledge. To determine if an increase in self-reported biodiversity knowledge is related to greater success in attracting wildlife to one's yard the chi-squared test for independence was used. The results of this test were non-significant; χ 2=1.57, df=1, p=0.21.

8.3 DISCUSSION

It is important to note that the results regarding wildlife attraction are based on a self-report measure and may be potentially distorted for a number of reasons.

- Non-response bias may be an issue in that members who had not undertaken much wildlife gardening may have been less likely to complete the survey.
- It is possible that wildlife reportedly attracted through wildlife gardening had always been present in respondent's yards, and their involvement in the program merely enhanced their observation skills.
- Finally, whilst all species attracted have been included in analysis this should not be taken to mean that the attraction of that species is necessarily good for the biodiversity of the local area. For example, an area may have an over abundance of parrot species, and the attraction of such species is actually to the detriment of other species (for example smaller insectivorous birds); meaning biodiversity has not been contributed to in a positive way.

It may seem promising to wildlife gardening programs that approximately 70% of wildlife gardeners reported that their participation in their program had led to attracting wildlife to their yard. However, further examination of the lists of attracted wildlife provided by respondents, showed that many respondents were actually reporting wildlife that was already present prior to joining a program. The revised figure was 65% of respondents reporting wildlife had been attracted as a result of actions undertaken through participation in their program. This inaccurate representation of attracted species then casts doubt over the validity of information provided by other respondents. In an attempt to gain a more accurate representation of how programs are seen to be helping in attracting wildlife, the wildlife attraction statistics of the respondents who had selected that they had **not** taken steps to create

a wildlife garden prior to joining their program were assessed, and 43.3% perceived that wildlife had been attracted through efforts brought about by their participation in the program. This figure is obviously less promising than the initial 70% provided by responders. However, it must be stressed that these results are based on a self-report measure and need to be followed up with before and after monitoring of wildlife gardening sites.

Is it actually important to be able to pinpoint if a wildlife gardener has attracted (reportedly attracted in this case) wildlife based on efforts brought about by participation in a program as opposed to efforts brought about of their own accord? It depends on the question one is hoping to address. If one wants to understand if wildlife gardening (undertaken privately **or** in a program) can attract wildlife, then the distinction between the two is not important. However, if one is interested in how wildlife gardening programs can achieve a net benefit to a local area's biodiversity, then the distinction between the two matters. It matters because if program members have already undertaken wildlife gardening *and* seen wildlife attracted as a result, then the program has not helped that member increase the biodiversity of their yard, nor improved the local biodiversity. This links back to Chapters 5 and 6 and the need to recruit participants that have not yet created, or are not intending to create a wildlife garden. This is not to say that those who have already began wildlife gardening cannot benefit from involvement in such a program, either on a personal level, or in resultant wildlife attraction. This also highlights the need for on the ground surveying of wildlife gardening sites to ascertain just how beneficial for biodiversity the actions undertaken are.

Despite the uncertainty arising from the self-reported lists of attracted wildlife provided on questionnaires, qualitative data from the interviews indicated that program participants *were* having success in attracting wildlife based on their gardening efforts, as demonstrated by the following accounts given by interviewees:

"I was just down checking out some of the plants and noticed some black caterpillars on them. I took a photograph of the caterpillars and jumped on the net and found out it was a Magpie Moth caterpillar. They actually feed almost solely on the fireweed, so that's been terrific. Since then I've discovered a moth"

"...since I've put in some of the plants – we put in about 60 or 70 plants out the front. I mean some of them are just little, and we put in three Kangaroo Paw, and I notice there's butterflies flitting around the Kangaroo Paw already."

Although there is uncertainty surrounding the data, some of the findings will now be compared to other studies on revegetation, but this should be viewed as exploratory. The most common type of wildlife reported to have been attracted by wildlife gardeners was birds. This result is consistent with the recolonisation of agricultural revegetation sites (Munro et al., 2007). Lizards were also commonly reported to have been attracted, which is at odds with the conclusion of Munro et al. (2007) that reptiles do not benefit significantly from revegetation in agricultural areas in the short term. Munro et al. (2007) also concluded that amphibians and bats did not benefit significantly from revegetation, however this study found that frogs were quite commonly reported to have been attracted, however very low numbers of bats were reportedly attracted. These discrepancies may be due to the Munro et al. study being in an agricultural setting, or they may point to the fact that wildlife gardeners were reporting species as attracted, when in fact they were already present.

In line with previous findings that planting indigenous plant species is of greater benefit to local native fauna (Barrett, 2000; Burghardt et al., 2009; French et al., 2005), this study showed that the number of people reporting attraction of wildlife was highest for native or indigenous gardens (74.1% and 83% attracted wildlife respectively). However, the data did not lend itself to statistical testing, so the significance of the relationship was not established. However, considering the literature surrounding the benefits of native plants to wildlife, and the raw figures presented in this chapter, programs should ensure that the use of such plants is encouraged. Whilst it is acknowledged that wildlife gardening programs do promote the use of indigenous or native plants, as the majority of respondents had a garden consisting of a mix of species, this suggests that programs could be doing more to encourage the use of indigenous plants.

The longer a person had been involved in a wildlife gardening group, the greater the probability that they reported having attracted wildlife. It is assumed that those with a longer involvement in the group have developed their wildlife garden to a greater extent than those involved for less time, however this assumption was not tested in this study, as based on time restraints (i.e. slow recruitment of participants would have resulted in a very low sample size which would not have provided data that could be used to form statistical conclusions) it was not feasible to conduct before and

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after monitoring of respondents' gardens. However, it seems a plausible explanation as revegetation studies in agricultural areas have found that the age of the revegetation is an important factor in the area being utilised by fauna (Munro et al., 2007). Based on this finding relating to length of time in the group, programs should be investing in ensuring that members remain engaged and involved in the program for the long term, as our results suggest this will facilitate that greatest impact on the local biodiversity.

In contrast to other research (Chamberlain et al., 2004; Thompson et al., 1993), this study did not find a significant difference in whether or not a respondent indicated wildlife had been attracted based on the size of one's property. This would appear to be promising considering the current trend towards smaller blocks in new residential areas (Hall, 2007). Specific information about individual respondent's distance to remnant vegetation was not collected, however, as discussed in Section 2.5.3, four of the wildlife gardening programs were based in suburban localities with significant remaining remnant vegetation. Whilst not classed as rural, the natural capital present in these localities limits the transferability of the study's findings to highly urbanised areas with little or no remaining remnant vegetation. The remaining four programs involved in this study are not based in any locality and are open to any member of the public to join (not just those in urban areas). Further research into the ability of small yards in more urbanised locations to be of benefit to biodiversity is necessary. Interpreting the role of yard size is difficult, as pointed out by Chamberlain et al. (2004) who discuss that due to a function of size, larger yards may be more likely to report more species if animals settled randomly across the area. The authors also conclude that variation in local habitat rather than variation in garden habitat has the biggest 196

influence on bird occurrence. In contrast, Clergeau, Jokimaki and Savard (2001), who studied urban bird data from France, Finland and Canada, concluded that site features are more important than surrounding landscapes in determining bird species richness, a conclusion also reached by (Evans, Newson, & Gaston, 2009). Clergeau et al. (2001) suggest that site-specific actions to improve the suitability of the environment for birds can significantly influence bird diversity in the suburbs. However, Goddard et al. (2010) point out that most studies into avian assemblages in urban areas have been conducted within large habitat patches (for example parks), which are generally larger than a typical garden. Cleary this is an area that requires further research.

If the conclusion that variation in local habitat rather than variation in garden habitat has the biggest influence on bird occurrence (Chamberlain et al., 2004) is correct, it brings into question how successful wildlife gardening programs would be in attracting wildlife in highly urbanised localities with little remaining remnant vegetation. Certainly one would not expect the same types of wildlife to be present towards the inner urban core of a city as are present towards the urban fringe. For example it is not feasible to attract wallabies to an inner city suburb. Conducting research to assess the feasibility of attracting wildlife, and what types of species can be reasonably expected, in such areas may be hampered by the lack of wildlife gardening initiatives present in such localities. Nevertheless, undertaking such research will be important if we wish to conserve nature where people live, as in the face of increasing urbanisation, residential areas with remaining remnant vegetation will become less and less. Although there will be a reduced ability to attract certain types of species to more urbanised locations, there is still merit to encouraging wildlife gardening in such areas. As discussed in Chapter 5 people living in urban environments are in danger of developing a nature-disconnect which may reduce empathy for animals and their willingness to support conservation efforts (Luck, 2008; Rohde & Kendle, 1997). Wildlife gardening is one way that people can connect to nature in their immediate environment, so may be beneficial in reducing the incidence of nature disconnect. In addition, native vegetation is uniquely adapted to local conditions and therefore requires less water than non-native varieties, a feature that is very useful in the Australian climate. In addition, as discussed in Chapter 4, interest in growing fruit and vegetables gardens is mounting among the younger more educated generations. Integrating edible gardens into any attempts to engage the public on issues around wildlife gardening may be an angle that can be taken to help those in such highly urbanised areas contribute on at least some level to local biodiversity.

The results provide preliminary evidence that wildlife gardening programs can achieve at least some success in attracting wildlife through their members actions (as reported by gardeners themselves), at least in areas with some remaining natural capital. Municipalities or organisations in such areas should not become complacent in the area of biodiversity improvement based on their existing natural assets. Empowering residents through wildlife gardening in such areas, based on this study's findings, has the potential to bring about an improvement in the local biodiversity. This is demonstrated by the quantitative analysis undertaken and can be illustrated by this 198 qualitative quote from an interview participant living amongst remnant vegetation, when asked if wildlife had been attracted to the yard as a result of participating in a wildlife gardening program:

"Yes, within the first few months actually, certainly within one year. My next door neighbour at the time, they're lovely people, they said to me, "[NAME], I'm really glad that you've moved in here because we've been here for 20 or 30 years", they said. And for the last X many years they hadn't seen, they listed a whole range of bird species that they liked seeing, and they hadn't seen these birds; and they said, "Within months of you moving in, we're starting to see these birds." ..."So that was my first milestone, my first realisation, that what I'm doing here actually does have a direct, immediate impact on the local environment. I live next to 16 acres of bush, but what I'm doing on my acre has a visible impact to other people around me as well as myself."

From a program development point of view, it is concerning that no program features were found to influence the degree to which participants reported an increase in native wildlife. However, the attraction of wildlife was based on respondents self reports, which involves people's perceptions, which can be flawed (Kihlstrom et al., 2000), for example it is possible that the level of wildlife in one's yard has not changed, and that their participation in the program has merely enhanced their observation of their garden, resulting in an inaccurate assessment of what has been attracted. As a result, this finding should be viewed as preliminary and future research needs to implement accurate before and after faunal surveys to accurately determine the extent of wildlife attraction. It may have been expected that the provision of a site assessment would increase the amount of native wildlife attracted through participation. Such an assessment should presumably provide members with the knowledge required to create an ecologically sound habitat suitable for a range of native species. The finding that assessments did not increase the reported attraction of native wildlife could be taken to mean one of two things:

- It may be that individuals becoming involved in wildlife gardening programs undertake their own research into ecologically sound habitat development; therefore site assessments are not required.
- It may be due to the nature of self-reporting.

Similarly, it may have been expected that the use of regular newsletters to convey practical information to members would also influence the wildlife attracted, however this was not found to be the case. The reasons for this may be the same as hypothesised for site assessments; however only the presence or absence of a newsletter was studied, not newsletter content. It may be that the quality and quantity of the information presented in each program's newsletter differs, which may then influence the learning of members, and subsequently their gardening efforts and success in attracting native wildlife. Further research into the quality of information provided to program members and resultant outcomes in terms of knowledge and wildlife attraction would be beneficial.

Although the informational content of newsletters was not assessed, respondents were asked if their program had increased their knowledge of biodiversity. When the 200 relationship between increases in self-reported biodiversity knowledge and success in attracting wildlife was examined, no significant relationship was apparent i.e. those who reported increased biodiversity knowledge were no more successful in attracting wildlife to their yards than those who did not report an increase in biodiversity knowledge. This brings the discussion back to a line of enquiry that was discussed in Chapter 6. In Chapter 6 it was established that 74.6% of respondents felt that their understanding of biodiversity issues had increased since joining a program. In addition, it was shown that the provision of site assessments and newsletters increase the perceived biodiversity understanding of members, and that this suggested their inclusion in programs may be warranted. It was then posited whether or not the increase in perceived biodiversity knowledge equates to greater success in attracting wildlife to gardens. This line of enquiry will be picked up now.

It may be expected that an increase in biodiversity knowledge would translate to greater success in attracting wildlife to one's yard, and that the program features responsible would also equate to greater success in attracting wildlife. However, the preliminary results presented in this chapter indicate that providing site assessments, native/indigenous plants or vouchers, or newsletters may not increase the likelihood of perceived success in attracting native wildlife. These initial findings seem to suggest that programs may not need to be educating participants about biodiversity to ensure that biodiversity is contributed to positively. However, a relationship does appear to be forming, with those indicating increased biodiversity knowledge more likely to report being successful in attracting wildlife. It is possible that the small number of those indicating no increase in biodiversity knowledge impaired the ability of the chi-squared 201

test to pick up a significant relationship. Alternatively, the lack of significant relationship found may be due to the initial interest and/or knowledge possessed by wildlife gardening program members. In the preceding chapters it has been shown that whilst there is potential to recruit unengaged members of the community, at present the majority of members became involved as they were interested in wildlife gardening and nature. This member bias towards interested individuals may equate to a motivation among members to undertake research themselves. Alternatively, it may be that the member base already has a high level of prior biodiversity knowledge, which is supported by the study's finding of high levels of self-reported biodiversity knowledge. Further research into how the actual (not self-reported) biodiversity knowledge of participant impacts upon the success of wildlife gardening in attracting wildlife is required.

Despite the uncertainty surrounding the importance of biodiversity education in attracting wildlife that this study has uncovered, it is clear from interviews with wildlife gardening program participants and survey comments that members perceive that the knowledge and advice provided by wildlife gardening programs to be of great benefit to them:

"I had somebody visit, and told me all this stuff which I never knew, and gave me all this advice which I listened to and acted on... I actually got a bit disheartened because the beautiful forest that I thought I'd bought turned out to be sweet pittosporums [noxious weed in the area]...I've got rid of all the pittosporums" – Interviewee from a program with a site assessment

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"the wildlife people when they came, they told us that we had ivy, I'd always kept it under control, but nonetheless, it would be best to get rid of that, so we did, and a couple of other things." – Interviewee from a program with a site assessment

"I really feel that the program together with associated workshops etc have really made it possible to regenerate our block of land in a logical and successful way. I feel I have so many avenues to turn to for advice. I don't think it would be possible to achieve this alone." – Survey comment

Returning to the impact of program features on reported wildlife attraction, the provision of native/indigenous plants or vouchers was not shown to have an influence. This may be due to the majority of people joining a wildlife gardening program taking the initiative to purchase native or indigenous plants. As this is generally the main feature of wildlife gardening, presumably it would not make sense to join a program and not plant native species. Therefore provision of such plants may not be necessary for the attraction of native wildlife, as members may acquire these plants on their own. However, this feature has been shown to aid in the recruitment of previously unengaged members, so may indirectly be contributing to improving wildlife attraction. Specific species of plants that participant's chose (either obtained through programs or independently) were not investigated, hence it is not possible to determine whether species selection differed significantly amongst members who obtained plants directly through programs compared to those who obtained them independently. Therefore, as has been advised numerous times throughout this chapter, future research should monitor wildlife gardens at a site level with an emphasis on plant species and resultant

wildlife outcomes. Such research should also investigate the types of habitat creating practices (e.g., leaving logs/branches on the grounds for lizard habitat) that are being carried out.

It is acknowledged that such undertakings may not be feasible for implementing organisations due to budget and human resources constraints. Therefore this research gap may need to be filled by researchers. However, one avenue that wildlife gardening programs could utilise in this endeavour is citizen science. Citizen science involves members of the public assisting in research using methodologies developed by or in collaboration with professional researchers (Cooper, Dickinson, Phillips, & Bonney, 2007; Koss et al., 2009). Citizen science projects are well established within the field of ecology, and they are especially prevalent in the field of ornithology, with over 600 projects registered with the Cornell Lab of Ornithology (Dickinson, Zuckerberg, & Bonter, 2010). In a wildlife gardening context, programs could enlist members to undertake wildlife surveys of their properties before they begin making improvements, and again at regular intervals to monitor wildlife. It is acknowledged that this approach would still involve members of the public self-reporting the wildlife attracted to their yard, but as the data collection would be undertaken in a systematic way based on scientific method, the margin for error would be reduced. Dickinson et al. (2010) discuss that as of yet, it is not well understood whether personalised training or selfguided training (e.g., internet based) is more effective in reducing participant errors. What is known is that while participants in citizen science projects may initially make errors in data collection, they generally improve their skills over time (Dickinson et al., 2010). Dickinson et al. (2010) suggest that this is likely because participants have 204

developed a familiarity with the protocols, have strengthened their identification skills, and have also developed an awareness of which areas and times species are present.

With today's technology citizen science programs can utilise the internet and smart phone technology to provide participants with a streamlined way of submitting their recorded data into centralised databases, which can then be analysed by trained researchers (Dickinson et al., 2010). Such programs would undoubtedly take significant resources to set up; however the ongoing benefits to participant engagement and tracking of biodiversity improvements may be immense. Perhaps there is scope for wildlife gardening programs to collaborate and develop a citizen science model that can be rolled out across all programs. This would be beneficial as it would avoid programs 're-inventing the wheel' and result in a centralised program which would have cost saving benefits. For this reason the quality of the program may be better than it would have been if individual programs designed and implemented their own citizen science initiatives. As mentioned, citizen science programs take significant resources to set up, resources which are often lacking in wildlife gardening programs, which often have little funding (personal communication). With pooled resources, programs could include features such as data collection training and Smartphone application development that would have just not been possible for an individual program to implement. In addition to simply pooling resources, if wildlife gardening programs collaborated and produced a joint funding application, this may increase the likelihood of securing government grants to produce the joint project. A joint citizen science program would also yield larger data sets across a range of urban environments, providing researchers with a wealth of data.

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8.4 CONCLUSION

These preliminary results indicate that large numbers of members of wildlife gardening programs *perceive* that their efforts are succeeding in attracting wildlife. These results should be followed up with before and after field monitoring of wildlife gardening sites to substantiate these self-report findings. Such research should investigate exactly what types of plants are being selected, what habitat creating practices (e.g., leaving logs/branches on the grounds for lizard habitat) are being carried out, and the role that distance to remnant vegetation plays in wildlife attraction.

This chapter suggests that even small yards can be successful in attracting native wildlife and that this attraction will increase over time and may be enhanced through the use of native and indigenous plants. From a program development point of view, no program features were found to increase the level of reported wildlife attraction, and this brings into question whether including such features in programs is warranted given funds and human resources required for such features. However, as features such as site assessments and the provision of plants are related to the recruitment of previously unengaged individuals (Chapter 6), their inclusion in programs is warranted. This is because the recruitment of such individuals if of great importance if programs wish to be able to add net benefit to local biodiversity.



CHAPTER 9 CONCLUSION

9.1 REVIEW OF MAIN FINDINGS

The greatest threat to global biodiversity is the actions of humans, and one of the biggest contributors to biodiversity loss is urbanisation. This thesis has been concerned with the role that wildlife gardening, defined as any actions undertaken in gardens to encourage and provide habitat for wildlife (Davies et al., 2009), may be able to play in mitigating two of the main impacts of urbanisation. These impacts are:

- The reduction in native vegetation cover resulting in the fragmentation of remaining cover into isolated patches, which leads to losses of indigenous fauna (Collinge, 1996).
- The reduction in our ability to connect with nature in our daily lives, which puts us at risk of developing a nature-disconnect. This has been hypothesised to have a great impact on our empathy for other species and our motivation to become involved in conservation efforts (Luck, 2008; Rohde & Kendle, 1997).

Domestic gardens make up a significant proportion of the urban landscape (Loram et al., 2007) and they are seen as essential to developing wildlife corridor connectivity in urban areas (Doody et al., 2010; Parker et al., 2008; Rudd et al., 2002). The practice of wildlife gardening in private gardens has been put forward as a tool for enhancing the connectivity and viability of wildlife corridors (Rudd et al., 2002). Programs designed to encourage the public to become involved in wildlife gardening are operating around the world, however it is unclear whether the broader community has any interest in undertaking wildlife gardening, or if it is just individuals with an interest in biodiversity who would embrace more biodiverse residential areas. This study attempted to answer this question, as well as investigate how well current wildlife gardening programs are engaging with the community to bring about potential net increases to biodiversity in their local area.

The results presented in this thesis suggest that members of the community support planting more native vegetation and having wildlife in yards, however there is currently not a great deal of interest in joining **formal** wildlife gardening programs.

Wildlife gardening programs can be viewed as community environmental education. Such programs tend to only attract those in the community with an interest in the topic, and miss those individuals whose participation would most benefit the cause, i.e. unengaged individuals (Davies & Webber, 2004). For this reason it is imperative that programs have the capacity to recruit unengaged members of the community. Results of this thesis show that wildlife gardening programs are currently not succeeding in recruiting unengaged individuals in large numbers, as only a small

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minority (8.6%) of members had no intention to create a wildlife garden prior to joining. Despite this, through analysis of scores on Mayer and Franz's (2004) Connectedness to Nature Scale (designed to assess one's sense of emotional connection with nature), it was shown that there is **potential** for wildlife gardening programs to attract unengaged members of the community. It was found that across both wildlife gardening program participants, and members of the public who indicated they would consider joining a program, there was a broad range of Connectedness to Nature Scale scores. Interestingly almost a quarter of current wildlife gardeners have a Connectedness to Nature Scale score **below** the mean score for the public. Taken together, these results showed that feeling a sense of connection to nature is not a prerequisite for becoming involved in a wildlife gardening program. Therefore there is **potential** to recruit unengaged participants to wildlife gardening programs.

This study examined the features of wildlife gardening programs in terms of their ability to result in the recruitment of previously unengaged individuals. Features offered by programs that were shown to increase the chance of previously unengaged participants joining are the provision of site assessments and native/indigenous plants or vouchers for participants. Streetscaping initiatives, where existing members organise localised native plantings at the street level involving neighbours, are a potentially effective tool for exposing the broader community to wildlife gardening and bolstering recruitment of previously unengaged individuals.

The results uncovered barriers and benefits to joining wildlife gardening programs. Barriers included: a belief that native gardens encourage dangerous animals, belief that eucalypts (gum trees) are dangerous, a belief that native gardens are messy, lack of finances, lack of time, and age. This study suggests marketing strategies aimed at encouraging wildlife gardening (which may or may not include participation in a program) should incorporate information about these barriers that will dispel fears or beliefs. In addition, some of these barriers can be developed into program features that will lessen the burden associated with some of the barriers. In fact, the two program features found to be related to unengaged members joining can be seen as alleviating some of these perceived barriers to wildlife gardening. For example, offering native/indigenous plant nursery vouchers to participants upon joining will represent a money saving incentive to potential members. Having a site assessment provided, which outlines what plants should be removed and provides participants with lists of plants suited to their yard, will represent a significant reduction in the time spent preparing for a wildlife garden. Without site assessments participants would need to spend a significant amount of time researching their local indigenous plant species and wildlife to determine what is possible in their yard.

Benefits of wildlife gardening were found to be: the attraction of native wildlife, being able to help increase biodiversity, having a water wise garden, and having a low maintenance garden. Marketing strategies aimed at encouraging wildlife gardening should incorporate messages to emphasise these benefits.

The potential role that social norms may be able to play in bringing about a paradigm shift in gardening practices was discussed. Strategies put forward that could be utilised to change the current social norms surrounding gardening included: Local

councils taking a lead role and utilising indigenous vegetation in their landscaping, sending out native nursery vouchers and/or information regarding local indigenous plants to all new residents when they move in, and yearly in rates notices to existing residents. These strategies may expose many to the idea of using indigenous plants who would have otherwise not considered it and also create a sense that native gardening is the done thing in the area. It was also suggested that wildlife gardening programs may be able to help in bringing about this paradigm shift though the facilitation of streetscaping projects, providing signs/plaques for participants to display on their properties at street level to alert passersby to the significance of the garden, and providing bumper stickers for participants to place on cars to increase community awareness that a different style of gardening exists.

This thesis also examined the perceived success of wildlife gardening programs in terms of members attracting wildlife to their yards. It was found that many respondents did not accurately report what wildlife had been attracted as a result of participation in the program. This limited the analysis that could be done and the strength of any conclusions regarding the attraction of wildlife. It was pointed out that it is important to be able to pinpoint if a wildlife gardener has attracted wildlife based on efforts brought about by participation in a program as opposed to efforts brought about of their own accord. This is important, as if program members have already undertaken wildlife gardening and seen wildlife attracted as a result, then the program has not helped that member increase the biodiversity of their yard, nor improved the local biodiversity. This links back to the need for wildlife gardening programs to be recruiting participants that have not yet created, or are not intending to create a wildlife garden; which, at the present time, programs are not succeeding in doing.

Despite the uncertainty about the data on perceived wildlife attraction, the results suggest that that even small yards can be successful in attracting native wildlife and that this attraction will increase over time and may be enhanced through the use of native and indigenous plants. Importantly, it was pointed out that as this is a social research study and was based on self-reporting of respondents, it cannot be said with certainty that wildlife gardening programs are responsible for this reported attraction, and therefore that they are improving biodiversity. The suggestion was made that the results should be followed up with before and after field monitoring of wildlife gardening sites to substantiate these self-report findings. Another caution to the findings was that the wildlife gardening programs involved in this study were from areas with moderate amounts of natural capital still in existence, and therefore research into how successful wildlife gardening programs would be in attracting wildlife in highly urbanised localities with little remaining remnant vegetation would be beneficial.

It was suggested that there may be benefit to wildlife gardening programs collaborating to develop a citizen science model that can be rolled out across all programs. This would reduce the costs of developing a citizen science initiative as costs are shared across programs and there is no 're-inventing the wheel'. This is likely to result in a higher quality citizen science program than could have been produced if individual programs designed and implemented their own initiatives. A collaborative

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citizen science program would also yield larger data sets across a range of urban environments, providing researchers with a wealth of data.

9.2 CONCLUDING REMARKS

This research has provided evidence that there is enough community support for planting native vegetation and welcoming wildlife in yards to warrant the encouragement of wildlife gardening as a tool to help improve biodiversity in urban areas. However, there appears to be less support for joining formal wildlife gardening programs. Despite this, the evidence presented in this thesis does suggest that there is scope for these programs to provide a platform to engage the public in wildlife gardening. Unfortunately though, programs are not currently succeeding in recruiting unengaged members of the community in large numbers. Therefore, in their current form, programs are not reaching their full potential as tools to enhance local biodiversity. This study identified barriers and benefits that can be used by wildlife gardening programs (or others working with the public on urban revegetation) to encourage currently unengaged members of the community to become involved. Only once the broader community embraces the practice of wildlife gardening, will a significant contribution to the improvement of urban biodiversity be made.

REFERENCES

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50,* 179–211.

Akl, E. A., Maroun, N., Klocke, R. A., Montori, V., & Schunemann, H. J. (2005). Electronic mail was not better than postal mail for surveying residents and faculty. *Journal of Clinical Epidemiology*, *58*, 425–429.

Alice Springs Town Council. (2013). Alice Springs Region. Retrieved May 22, 2013 from http://www.alicesprings.nt.gov.au/alice-springs/region

Alvey, A. A. (2006). Promoting and preserving biodiversity in the urban forest. *Urban Forestry & Urban Greening*, *5*(4), 195–201.

Amati, M., & Yokohari, M. (2006). Temporal changes and local variations in the functions of London's green belt. *Landscape and Urban Planning*, 75, 125–142.

Ansell, R., Baker, P., & Harris, S. (2001). The value of gardens for wildlife - lessons from mammals and herpetofauna. *British Wildlife*, *13*, 77–84.

Australian Bureau of Statistics. (2013). 3101.0 Australian Demographic Statistics. Canberra: Author. Retrieved from http://www.ausstats.abs.gov.au/ausstats/subscriber. nsf/0/2092704486 8802B5CA257B50001A9D5E/\$File/31010_sep%202012.pdf

Australian Bureau of Statistics. (2007). 2006 Census QuickStats : Melbourne (Statistical Division). Canberra: Author. Retrieved March 23, 2011 from www.abs.gov.au

Backyard Widlifers. (2013). Backyard Widlifers. Retrieved May 22, 2013 from http://backyardwildlifers.com

Baker, P.J., Ansell, R. J., Dodds, P. A. A., Webber, C. E., and Harris, S. (2003). Factors affecting the distribution of small mammals in an urban area. *Mammal Review*, 33(1), 95–100.

Baldwin, R. F. (1995). Changes in attitude not enough. *Conservation Biology, 9*, 240–241.

Ballantyne, R., Fien, J., & Packer, J. (2001a). Program effectiveness in facilitating intergenerational influence in environmental education: Lessons from the field. *Journal of Environmental Education*, *32*(4), 8–15.

Ballantyne, R., Fien, J., & Packer, J. (2001b). School environmental education programme impacts upon student and family Learning: a case study analysis. *Environmental Education Research*, *7*(1), 23–37.

Banister, D., Watson, S., & Wood, C. (1997). Sustainable cities: Transport, energy, and urban form. *Environment and Planning B: Planning and Design, 24*(1), 125–143.

Barnett, M., Lord, C., Strauss, E., Rosca, C., Langford, H., Chavez, D., & Deni, L. (2006). Using the urban environment to engage youths in urban ecology field studies. *The Journal of Environmental Education*, *37*(2), 3–11.

Barrett, G. J. (2000). Birds on farms: Ecological management for agricultural sustainability. *Wingspan, 10*(Suppl.), 1–16.

Bartlett, M. S. (1954). A note on the multiplying factors for various chi square approximations. *Journal of the Royal Statistical Society, 16*(Series B), 296–298.

Bebbington, A. (2005). The ability of A-level students to name plants. *Journal of Biological Education*, *39*(2), 63–6

Bech, M., & Kristensen, M. B. (2009). Differential response rates in postal and Webbased surveys among older respondents. *Survey Research Methods*, 3(1), 1–6.

Beck, T.B., Heimlich, J.E., & Quigley, M. F. (2002). Gardeners' Perceptions of the Aesthetics, Manageability, and Sustainability of Residential Landscapes. *Applied Environmental Education and Communication*, 1(3), 163–172.

Bem, D. J. (1970). Beliefs, attitudes, and human affairs. Belmont, CA: Brooks-Cole.

Bernays, E. M., & Graham, M. (1988). On the evolution of host specificity in phytophagous arthropods. *Ecology*, *69*, 886–892.

Bhatti, M., & Church, A. (2004). Home, the culture of nature and meanings of gardens in late modernity. *Housing Studies*, *19*(1), 37–51.

Bhullar, S., & Majer, J. (2000). Arthropods on street trees: a food resource for wildlife. *Pacific Conservation Biology*, *6*, 171–173.

Birdlife Australia. (2014). Sulphur-crested Cockatoo. Retrieved January 8, 2014 from http://www.birdsinbackyards.net/species/Cacatua-galerita

Blair, D. (2009). The child in the garden: An evaluative review of the benefits of school gardening. *Journal of Environmental Education*, 40(2), 15–39.

Bland, R. L., Tully, J., & Greenwood, J. J. D. (2004). Birds breeding in British gardens: an underestimated population? *Bird Study*, *51*, 96–106.

Bonaiuto, M., Aiello, A., Perugini, M., Bonnes, M., & Ercolani, A. P. (1999). Multidimensional perception of residential environment quality and neighbourhood attachment in the urban environment. *Journal of Environmental Psychology, 19*(4), 331–352.

Bonaiuto, M., Fornara, F., & Bonnes, M. (2003). Indexes of perceived residential environment quality and neighborhood attachment in urban environments: a confirmation study on the city of Rome. *Landscape and Urban Planning, 65*, 41–52.

Braithwaite, R. W., Lonsdale, W. M., & Estbergs, J. A. (1989). Alien Vegetation and Native Biota in Tropical Australia: the Impact of *Mimosa pigra*. *Biological Conservation*, *48*, 189–210.

Bryman, A. (2008). Social Research Methods. New York: Oxford University Press.

Buczacki, S. (2007). Garden Natural History. London: Harper Collins Publishers.

Budruk, M., Thomas, H., & Tyrrell, T. (2009). Urban Green Spaces: A Study of Place Attachment and Environmental Attitudes in India. *Society & Natural Resources: An International Journal*, *22*(9), 824–839.

Bunting, T. E, & Cousins, L. R. (1985). Environmental dispositions among school-age children: A preliminary investigation. *Environment and Behavior*, *17*, 725–768.

Burchell, R. W., Listokin, D., & Galley, C. C. (2000). Smart growth: More than a ghost of urban policy past, less than a bold new horizon. *Housing Policy Debate*, *11*(4), 821–879.

Burghardt, K. T., Tallamy, D. W., & Shriver, W. G. (2009). Impact of native plants on bird and butterfly biodiversity in suburban landscapes. *Conservation Biology*, *23*(1), 219–224.

Caldicott, E. (1997). Gardening Australian style: the Adelaide example. *South Australian Geographical Journal*, *96*, 42–53.

Cannon, A. (1999). The significance of private gardens for bird conservation. *Bird Conservation International, 9,* 287–297.

Caro, T. M., Pelkey, N., & Grigione, M. (1994). Effects of conservation biology education on attitudes towards nature. *Conservation Biology*, *8*, 846–852.

Caula, S., Hvenegaard, G. T., & Marty, P. (2009). The influence of bird information, attitudes, and demographics on public preferences toward urban green spaces: The case of Montpellier, France. *Urban Forestry & Urban Greening*, 8(2), 117–128.

Chamberlain, D. E., Cannon, A. R., & Toms, M. P. (2004). Associations of garden birds with gradients in garden habitat and local habitat. *Ecography*, *27*, 589–600.

Chawla, L. (1998). Significant life experiences revisited: A review of research on sources of environmental sensitivity. *Journal of Environmental Education*, *29*(3), 11–21.

Chawla, L. (2002). Spots of time: Manifold ways of being in nature in childhood. In P. H. J Kahn & S. R. Kellert (Eds.), *Children and nature: Psychological, sociocultural and evolutionary investigations* (pp. 199-225). Cambridge, MA: The MIT Press.

Chiesura, A. (2004). The role of urban parks for the sustainable city. *Landscape and Urban Planning*, *68*(1), 129–138.

City of Melbourne. (2012). Urban Forest Strategy: Making a great city greener 2012 – 2032. Melbourne: Author. Retrieved May 2, 2013 from http://www.melbourne.vic.gov .au/Sustainability/UrbanForest/Documents/Urban_Forest_Strategy.pdf

City of Melbourne. (2014). City of Melbourne profile. Retrieved January 8, 2014 from <u>https://www.melbourne.vic.gov.au/ABOUTMELBOURNE/MELBOURNEPROFILE/Pages/C</u><u>ityofMelbourneprofile.aspx</u>

Clayton, S. (2003). The environmental identity scale. In S. Clayton, & S. Opotow (Eds.), *Identity and the natural environment: The psychological significance of nature* (pp. 45–66). Cambridge: MIT Press.

Clayton, S. (2007). Domesticated nature; Motivations for gardening and perceptions of environmental impact. *Journal of Environmental Psychology*, *27*, 215–224.

Clayton, S., & Opotow, S. (2003). *Identity and the Natural Environment: The Psychological Significance of Nature*. Cambridge: MIT Press.

Clements, R. (2004). An investigation of the state of outdoor play. *Contemporary Issues in Early Childhood*, *5*(1), 68–80.

Clergeau, P., Jokima¨ki, J., & Savard, J. P. L. (2001). Are urban bird communities influenced by the bird diversity of adjacent landscapes? *Journal of Applied Ecology, 38*, 1122–1134.

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences*. Hillsdale, NJ: Erlbaum.

Colding, J., Lundberg, J., & Folke, C. (2006). Incorporating green-area user groups in urban ecosystem management. *Ambio*, *35*, 237–244.

Collinge, S. K. (1996). Ecological consequences of habitat fragmentation: implications for landscape architecture and planning. *Landscape and Urban Planning*, *36*(1), 59–77.

Commissioner for Environmental Sustainability. (2008). Victoria 2008, State of the Environment, Summary. Brunswick, Victoria: Author. Retrieved from http://www.ces.vic.gov.au/__data/assets/pdf_file/0019/124723/Summarybooklet.pdf

Cooper, C. B., Dickinson, J., Phillips, T., & Bonney, R. (2007). Citizen science as a tool for conservation in residential ecosystems. *Ecology and Society*, *12*(2), 11. Retrieved from http://www.ecologyandsociety.org/vol12/iss2/art11/

Cordell, H. K. (1976). Substitution between privately and publicly supplied urban recreational open space. *Journal of Leisure Research, 8,* 160–174.

Cowie, R. J., & Hinsley, S. A. (1988). The provision of food and the use of bird feeders in suburban gardens. *Bird Study, 35,* 163–168.

Crisp, P. N., Dickinson, K. J. M., & Gibbs, G. W. (1998) .Does native invertebrate diversity reflect native plant diversity? A case study from New Zealand and implications for conservation. *Biological Conservation*, *83*, 209–220.

Czaja, R., & Blair, J. (1996). *Designing surveys: A guide to decisions and procedures.* Thousand Oaks, CA: Pine Forge Press.

Daniels, G. D., & Kirkpatrick, J. B. (2006a). Comparing the characteristics of front and back domestic gardens in Hobart, Tasmania, Australia. *Landscape and Urban Planning*, *78*(4): 344–352.

Daniels, G. D., & Kirkpatrick, J. B. (2006b). Does variation in garden characteristics influence the conservation of birds in suburbia? *Biological Conservation*, *133*(3), 326–335.

Daniels, T., & Lapping, M. (2005). Land preservation: an essential ingredient in smart growth. *Journal of Planning Literature*, *19*(3), 316–329.

Davies, Z. G., Fuller, R. A., Loram, A., Irvine, K. N., Sims, V., & Gaston, K. J. (2009). A national scale inventory of resource provision for biodiversity within domestic gardens. *Biological Conservation*, *142*(4), 761–771.

Davies, R., & Webber, L. (2004). Enjoying our backyard buddies - social research informing the practice of mainstream community education for the conservation of urban wildlife. *Australian Journal of Environmental Education, 20*(1), 77–87.

Day, B. (2002). Time to focus on behavior change. *Applied Environmental Education & Communication*, 1(4), 211–212.

Decker, D. J., Brown, T. L., Siemer, W. F. (2001). *Human Dimensions of Wildlife Management in North America*. Bethesda, Maryland: The Wildlife Society.

Department for Environment, Food and Rural Affairs. (2002). *Working with the grain of nature: A biodiversity strategy for England*. London: Author.

Department for Environment and Heritage. (2012). Backyards for Wildlife. Retrieved May 22, 2013 from http://www.backyards4wildlife.com.au/index.php?page=backyards -4-wildlife

Department of Primary Industries, Parks, Water and Environment. (2013). Gardens for Wildlife. Retrieved May 22, 2013 from http://www.gardensforwildlife.dpipwe.tas.gov .au/gfw.nsf

Department of Transport and the Regions. (2000). Our Towns and Cities: The Future – Full Report. London

Department of Environment, Water and Natural Resources. (2012). Backyards for Wildlife. Retrieved May 10, 2013 from http://www.backyards4wildlife.com.au

Department of Foreign Affairs and Trade. (2013). Australia's environment at a glance. Retrieved May 10, 2013 from http://www.dfat.gov.au/facts/env_glance.html

DeStefano, S., & Desblinger, R. D. (2005). Wildlife as valuable natural resources vs. intolerable pests: a suburban wildlife management model. *Urban Ecosystems, 8*, 179–190.

Dettmann-Easler, D., & Pease, J. L. (1999). Evaluating the effectiveness of residential environmental education programs in fostering positive attitudes toward wildlife. *The Journal of Environmental Education*, *31*(1), 33–39.

Dickinson, J. L, Zuckerberg, B. J, & Bonter, D. N. (2010). Citizen science as an ecological research tool: challenges and benefits. *Annual Review* of *Ecology*, *Evolution*, and Systematics, *41*, 149–72.

Dickman, C.R. & Doncaster, C. P. (1987). The Ecology of Small Mammals in Urban Habitats. I. Populations in a patchy environment. *Journal of Animal Ecology*, 56(2), 629– 640.

Dillman, D. A. (2007). *Mail and Internet Surveys: The Tailored Design Method, second ed.* New Jersey: Hoboken, John Wiley Co.

Doody, B. J., Sullivan, J. J., Meurk, C. C., Stewart, G. H., & Perkins, H. C. (2010). Urban realities: the contribution of residential gardens to the conservation of urban forest remnants. *Biodiversity and Conservation*, *19*, 1385–1400.

Dovey, K., Woodcock, I., & Wood, S. (2009). A Test of Character: Regulating Placeidentity in Inner-city Melbourne. *Urban Studies*, *46*(12), 2595–2615. Duany, A., Plater-Zyberk, E., & Speck, J. (2000). *Suburban Nation*. New York: North Point Press.

Dunlap, R. E., & Jones, R. E. (2002). Environmental concern: conceptual and measurement issues. In R. E. Dunlap, & W. Michelson (Eds.), *Handbook of environmental sociology* (pp. 482–524). Westport, CT: Greenwood Press.

Dunlap, R. E., Van Liere, K. D., Mertig, A. G., & Jones, R. E. (2000). Measuring endorsement of the new ecological paradigm: a revised NEP scale. *Journal of Social Issues, 56,* 425–442.

Dunn, R. R., Gavin, M. C., Sanchez, M. C., & Solomon, J. N. (2006). The pigeon paradox: dependence of global conservation on urban nature. *Conservation Biology, 20*, 1814–1816.

Eaton, R. L., Hammond, G. P., & Laurie, J. (2007). Footprints on the landscape: An environmental appraisal of urban and rural living in the developed world. *Landscape and Urban Planning*, *83*(1), 13–28.

Ellis, R. J., & Thompson, F. (1997). Culture and the environment in the Pacific Northwest. *American Political Science Review, 91,* 885–987.

Ernst, J., & Theimer, S. (2011). Evaluating the effects of environmental education programming on connectedness to nature, *Environmental Education Research*, *17*(5), 577–598.

Evans, K. L., Newson, S. E., & Gaston, K. J. (2009). Habitat influences on urban avian assemblages. *Ibis*, *151*, 19–39.

Fan, Y., & Khattak, A. J. (2009). Does urban form matter in solo and joint activity engagement? *Landscape and Urban Planning*, *92*(3-4), 199–209.

Fishbein, M., & Ajzen, I., (1975). *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley Publishing Company.

Fisman, L. (2005). The Effects of Local Learning on Environmental Awareness in Children: An Empirical Investigation. *The Journal of Environmental Education, 36*(3), 39–50.

Forbes, S., Cooper, D., & Kendle, A. D. (1997). The history and development of ecological landscape styles. In T. Kendle & S. Forbes (Eds.), *Urban nature conservation: landscape management in the urban countryside* (pp. 69-113). London: E & FN Spon.

Frantz, C., Mayer, F. S., Norton, C., & Rock, M. (2005). There is no "I" in nature: The influence of self-awareness on connectedness to nature. *Journal of Environmental Psychology*, *25*(4), 427–436.

French, K., Major, R., & Hely, K. (2005). Use of native and exotic garden plants by suburban nectarivorous birds. *Biological Conservation*, *121*, 545–559.

Fuller, R. A., Irvine, K. N., Devine-Wright, P., Warren, P. H., & Gaston, K. J. (2007).
Psychological benefits of greenspace increase with biodiversity. *Biology Letters*, *3*, 390–394.

Fuller, R. A., Warren, P. H., Armsworth, P. R., Barbosa, O., & Gaston, K. J., 2008. Garden bird feeding predicts the structure of urban avian assemblages. *Diversity and Distributions*, *14*, 131–137.

Gaston, K. J., Warren, P. H., Thompson, K., & Smith, R. M. (2005). Urban domestic gardens (IV): the extent of the resource and its associated features. *Biodiversity and Conservation*, *14*, 2249–3327.

Gaston, K. J., Fuller, R. A., Loram, A., MacDonald, C., Power, S., & Dempsey, N. (2007). Urban domestic gardens (XI): variation in urban wildlife gardening in the UK. *Biodiversity and Conservation, 16*, 3227–3238.

Gilg, A., & Barr, S. (2006). Behavioural attitudes towards water saving? Evidence from a study of environmental actions. *Ecological Economics*, *57*, 400–414.

Goddard, M. A., Dougill, A. J., & Benton, T. G. (2013). Why garden for wildlife? Social and ecological drivers, motivations and barriers for biodiversity management in residential landscapes. *Ecological Economics, 86,* 258–273.

Goddard, M. A., Dougill, A. J., & Benton, T. G. (2010). Scaling up from gardens: biodiversity conservation in urban environments. *Trends in Ecology & Evolution, 25*, 90–98.

Good, R. (2000). The value of gardening for wildlife - what contribution does it make to conservation? *British Wildlife*, *12*, 77–84.

Gould League. (2013). Futurescaping Schools project. . Retrieved June 26, 2013 from http://www.gould.org.au/html/StudentsFuturescapingSchools.asp

Gralton, A., Sinclair, M., & Purnell, K. (2004). Changes in attitudes, beliefs and behaviour: A critical review of research into the impacts of environmental education initiatives. *Australian Journal of Environmental Education*, 20(2), 41–52.

Grahn, P., 1994. Green structures: the importance for health of nature areas and parks. *European Regional Planning*, *56*, 89–112.

Grahn, P., & Stigsdotter, U. A. (2003). Landscape planning and stress. *Urban Forestry & Urban Greening*, 2(1), 1–18.

Grarock, K., Tidemann, C. R., Wood, J., & Lindenmayer, D. B. (2012). Is It Benign or Is It a Pariah? Empirical Evidence for the Impact of the Common Myna (*Acridotheres tristis*) on Australian Birds. *PLoS ONE*, *7*(7). Retrieved from http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0040622#po ne.0040622-ABC1

Grose, M. (2009). Changing relationships in public open space and private open space in suburbs in south-western Australia. *Landscape and Urban Planning, 92*, 53–63.

Gross, H., & Lane, N. (2007). Landscapes of the lifespan: exploring accounts of own gardens and gardening. *Journal of Environmental Psychology, 27*, 225–241.

Habitat Network. (2013). Habitat Network. Retrieved May 10, 2013 from http://www.habitatnetwork.org/HabitatNetwork_main.htm

Hall, T. (2007). Where have all the gardens gone? An investigation into the disappearance of back yards in the newer Australian suburb. Urban Research Program, Research Paper 13 Brisbane: Griffith University.

Haluza-Delay, R. (2001). Nothing here to care about: Participant constructions of nature following a 12 day wilderness program. *The Journal of Environmental Education, 32*(4), 43–48.

Hartig, T., Mang, M., & Evans, G. W. (1991). Restorative effects of natural environment experiences. *Environment and Behaviour, 23*, 3–26.

Hawcroft, L. J., & Milfont, T. L. (2010). The use (and abuse) of the new environmental paradigm scale over the last 30 years: a meta-analysis. *Journal of Environmental Psychology*, *30*, 143–158.

Head, L., & Muir, P. (2004). Nativeness, invasiveness and nation in Australian plants. *The Geographical Review*, *94*(2), 199–217.

Head, L., & Muir, P. (2005). Living with trees - perspectives from the suburbs. In M. Calver, H. Bigler-Cole, G. Bolton, Dargavel, A. Gaynor, P. Horwitz, J. Mills, G. Wardell-Johnson (Eds.), *6th National Conference of the Australian Forest History Society* (pp. 84-95). Rotterdam: Millpress.

Head, L., & Muir, P. (2006). Suburban life and the boundaries of nature: resilience and rupture in Australian backyard gardens. *Transactions of the Institute of British Geographers*, *31* (4), 505–524.

Head, L., & Muir, P. (2007). Changing cultures of water in eastern Australian backyard gardens. *Social and Cultural Geography*, *8*, 889–906.

Head, L., Muir, P., & Hampel, E. (2003). Nature and culture in the backyard. In *Proceedings from the State of Australian Cities*. Sydney: University of Western Sydney.

Head, L., Muir, P., & Hampel, E. (2004). Australian backyard gardens and the journey of migration. *The Geographical Review*, 94(3), 326–347.

Hinds, J., & Sparks, P. (2008). Engaging with the natural environment: The role of affective connection and identity. *Journal of Environmental Psychology*, *28*(2), 109–120.

Hobbs, R. J., Saunders, D. A., & Hussey, B. M. T. (1990). Nature Conservation: The Role of Corridors. *Ambio*, *19*(2), 94–95.

Horwitz, W. A. (1996). Development origins of environmental ethics: The life experience of activists. *Ethics and Behavior, 6,* 29–54.

Hunter, M. C. R., & Brown, D. G. (2012). Spatial contagion: gardening along the street in residential neighborhoods. *Landscape and Urban Planning*, *105*(4), 407–416.

Hunter's Hill Council. (2013). Bushland and Biodiversity. Retrieved May 10, 2013 from http://www.huntershill.nsw.gov.au/Page/Page.aspx?Page_Id=99

Jaus, H. H. (1984). The development and retention of environmental attitudes in elementary school children. *Journal of Environmental Education, 15*(3), 33–36.

Jenks, M., Burton, E., & Williams, K. (1996). *The compact city: A sustainable urban form?* London: E., & F. N. Spon.

Jim, C. Y.(1993). Trees and landscape of a suburban residential neighbourhood in Hong Kong. *Landscape and Urban Planning, 23*, 119–143.

Jim, C. Y., & Chen, S. S. (2003). Comprehensive greenspace planning based on landscape ecology principles in compact Nanjing city, China. *Landscape and Urban Planning*, *65*, 95–116.

Jokima[•]ki, J. (1999). Occurrence of breeding bird species in urban parks: effects of park structure and broad-scale variables. *Urban Ecosystems*, *3*, 21–34.

Jones, R., & Pitt, N. (1999). Health surveys in the workplace: comparison of postal, email and World Wide Web methods. *Occupational Medicine-Oxford, 49,* 556–558.

Jones, D. N., & Reynolds, S. J. (2008). Feeding birds in our towns and cities: a global research opportunity. *Journal of Avian Biology, 39*, 265–271.

Junge, X., Lindemann-Matthies, P., Hunziker, M., & Schüpbach, B. (2011). Aesthetic preferences of non-farmers and farmers for different land-use types and proportions of ecological compensation areas in the Swiss lowlands. *Biological Conservation*. *144*(5), 1430–1440.

Kahn, P. H. (1997). Developmental Psychology and the Biophilia Hypothesis: Children's Affiliation with Nature. *Developmental Review*, *17*(1), 1–61.

Kahn, P. (1999). *The human relationship with nature: Development and culture*. Cambridge, MA: MIT Press.

Kahn, P. H, J. (2002). Children's affiliations with nature: Structure, development and the problem of environmental generational amnesia. In P. H. J Kahn & S. R. Kellert (Eds.), *Children and nature: Psychological, sociocultural and evolutionary investigations* (pp. 94-116). Cambridge, MA: The MIT Press.

Kaiser, H. 1970. A second generation Little Jiffy. Psychometrika, 35, 401–415.

Kaiser, H. 1974. An index of factorial simplicity. Psychometrika, 39, 31–36.

Kaplan, R. (2001). The Nature of the View from Home: Psychological Benefits. *Environment and Behavior, 33*(4), 507–542.

Kaplan, R., & Austin, M. E. (2004). Out in the country: Sprawl and the quest for nature nearby.*Landscape and Urban Planning*, *69*, 235–243.

Kaplan, S., & Kaplan, R. (1989). *The experience of nature: A psychological perspective*. New York: Cambridge University Press.

Kearney, A. R. (2006). Residential Development Patterns and Neighborhood Satisfaction: Impacts of Density and Nearby Nature. *Environment and Behavior*, *38*(1), 112–139.

Kellert, S. R. (2002). Experiencing nature: Affective, cognitive, and evaluative development in children. In P. H. J Kahn & S. R. Kellert (Eds.), *Children and nature: Psychological, sociocultural and evolutionary investigations* (pp. 117-151). Cambridge, MA: MIT Press.

Kellert, S. R., & Berry, J. K. (1987). Attitudes, knowledge, and behaviours toward wildlife as affected by gender. *Wildlife Society Bulletin*, *15*, 363–371.

Kellett, J., & Rofe, M. W. (2009). Creating Active Communities: How Can Open and Public Spaces in Urban and Suburban Environments Support Active Living? (Research Report). Retrieved from http://saactivelivingcoalition.com.au/wpcontent/uploads/2012/05/Creating-Active-Communities-FULL-REPORT.pdf

Kiesling, F. M., & Manning, C. M., 2010. How green is your thumb? Environmental gardening identity and ecological gardening practices. *Journal of Environmental Psychology*, *30*, 315–327.

Kihlstrom, J. F., Eich, E., Sandbrand, D., & Tobias, B. A. (2000). Emotion and Memory: Implications for Self-Report. In A. Stone, J. S. Turkkan, C. A. Bachrach, J. B. Jobe, H. S.

Kurtzman & V. S. Cain (Eds.), *The science of self-report: implications for research and practice* (pp. 81-99). Mahwah, NJ: Erlbaum.

Kinzig, A. P., & Grove, J. M. (2001). Urban-suburban ecology. In, S. A. Levin (Ed.), *Encyclopaedia of Biodiversity Vol. 5* (pp. 733–745). San Diego: Academic Press.

Kinzig, A. P., Warren, P., Martin, C., Hope, D., & Katti, M. (2005). The effects of human socioeconomic status and cultural characteristics on urban patterns of biodiversity. *Ecology and Society, 10*(1). Retrieved from http://www.ecologyandsociety.org/vol10/iss1/art23/

Kirkpatrick, J., Daniels, G., & Davison, A. (2009). An antipodean test of spatial contagion in front garden character. *Landscape and Urban Planning*, *93*(2), 103–110.

Kirkpatrick, J. B., Daniels, G. D., & Zagorski, T. (2007). Explaining variation in front gardens between suburbs of Hobart, Tasmania, Australia. *Landscape and Urban Planning*, *79*(3-4), 314–322.

Knox City Council. (2013). Gardens for Wildlife. Retrieved May 22, 2013 from http://www.knox.vic.gov.au/Page/page.asp?Page_Id=880&h=1

Knox City Council. (2013). KinderGardens for Wildlife. Retrieved June 26, 2013 from http://www.knox.vic.gov.au/Page/Page.asp?Page_Id=2133&h=0

Kollmuss, A., & Agyeman, J. (2002). Mind the Gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, *8*(3), 239–260.

Kolokytha, E.G., Mylopoulos, Y. A., & Mentes, A. K. (2002). Evaluating demand management aspects of urban water policy—A field survey in the city of Thessaloniki, Greece. *Urban Water*, *4*, 391–400

Konijnendijk, C. C., & Randrup, T. B. (2002). Editorial. *Urban Forestry & Urban Greening,* 1(1), 1–4.

Koss, R. S., Miller, K., Wescott, G., Bellgrove, A., Boxshall, A., McBurnie, J., Bunce, A., Gilmour, P., & Ierodiaconou, D. (2009). An evaluation of Sea Search as a citizen science programme in Marine Protected Areas. *Pacific conservation biology*, *15*, 116–127.

Krosnick, J. A. (1999). Survey Research. Annual Review of Psychology, 50, 537–567.

Krosnick, J. A., Judd, C. M., & Wittenbrink, B. (2005). The measurement of attitudes. In D. Albarracı'n, B. T. Johnson, & M. P. Zanna (Eds.), *The handbook of attitudes* (pp. 21–76). Mahwah, NJ: Lawrence Erlbaum.

Kruse, C. K., & Card, J. A. (2004). Effects of a conservation education camp program on camper's self-reported knowledge, attitude and behaviour. *The Journal of Environmental Education*, *35*(4), 33–45.

Kuo, F. E., & Sullivan, W. C. (1998). Fertile ground for community: inner-city neighborhood common spaces. *American Journal of Community Psychology, 26*(6), 823–851.

Lane Cove Council. (2013). Backyard Habitat Program. Retrieved May 22, 2013 from http://www.lanecove.nsw.gov.au/Our%20Environment/natural%20environment/infor mation%20for%20residents/backyardhabitat.htm

Langdon, P. (1988). A Good Place to Live. The Atlantic, 261(3), 39.

Larson, K., Casagrande, D., Harlan, S., & Yabiku, S. (2009). Residents' yard choices and rationales in a desert city: social priorities, ecological impacts, and decision tradeoffs. *Environmental Management*, *44*, 921–937.

Larson, K., Cook, E., Strawhacker, C., & Hall, S. (2010). The influence of diverse values, ecological structure, and geographic context on residents' multifaceted landscaping decisions. *Human Ecology*, *38*, 747–761.

Leather, P., Pyrgas, M., Beale, D., & Lawrence, C. (1998). Windows in the workplace. *Environment and Behaviour*, *30*, 739–763.

Lee, S. W., Ellis, C. D., Kweon, B. S., & Hong, S. K. (2008). Relationship between landscape structure and neighborhood satisfaction in urbanized areas. *Landscape and Urban Planning*, 85(1), 60-70.

Lepczyk, C.A., Mertig, A.G., & Liu, J. (2004). Assessing landowner activities related to birds across rural-to-urban landscapes. *Environmental Management, 33,* 110–125.

Lindemann-Matthies, P., Junge, X., & Matthies, D. (2010). Experimental evidence for human preference of biodiversity in grassland ecosystems. *Biological Conservation*, *143*, 195–202.

Lindemann-Matthies, P., & Marty, T. (2013). Does ecological gardening increase species richness and aesthetic quality of a garden? *Biological Conservation*, *159*, 37–44.

Lohr, V., & Pearson-Mims, C. H. (2005). Children's active and passive interactions with plants influence their attitudes and actions as adults. *HortTechnology*, *15*, 472–476.

Lohr, I. V., Pearson-Mims, C. H., Tarnai, J., & Dillman, D. A. (2004). How urban residents rate and rank the benefits and problems associated with trees in cities. *Journal of Arboriculture*, *30*(1), 28–34.

Loram, A. Thompson, K., Warren, P. H., & Gaston, K. J. (2008). Urban domestic gardens (XII): The richness and composition of the flora in five UK cities. *Journal of Vegetation Science*, *19*(3), 321–330.

Loram, A., Tratalos, J., Warren, P. H., & Gaston, K. J. (2007). Urban domestic gardens (X): the extent and structure of the resource in five major cities. *Landscape Ecology, 22*, 601–615.

Louv, R. (2005). Last child in the woods: Saving our children from nature-deficit disorder. Chapel Hill, NC: Algonquin Books of Chapel Hill.

Low Ecological Services. (2013). Garden for Willdife. Retrieved May 22, 2013 from http://wildlife.lowecol.com.au/about/garden-for-wildlife/

Luck, G. (2008). Conserving backyard biodiversity. *Science Alert*. Retrieved May 22, 2013 from http://www.sciencealert.com.au/opinions/20081504-17185-2.html

Maiteny, P. (2002). Mind in the gap: summary of research exploring 'inner' influences on pro sustainability learning and behaviour. *Environmental Education Research, 8*, 299–306.

Manfredo, M. J., & Dayer, A. A. (2004). Concepts for Exploring the Social Aspects of Human Wildlife Conflict in a Global Context. *Human Dimensions of Wildlife*, *9*(4), 1–20.

Manfredo, M. J., Teel, T. L., & Bright, A. D. (2003). Why are public values toward wildlife changing? *Human Dimensions of Wildlife*, *8*, 287–306.

Mangiafico, S. S., Obropta, C. C., & Rossi-Griffin, E. (2012). Demographic Factors Influence Environmental Values: A Lawn-Care Survey of Homeowners in New Jersey. *Journal of Extension, 50*(1). Retrieved from http://www.joe.org/joe/2012february /rb6p.shtml Maat, K., & De Vries, P. (2006). The influence of the residential environment on greenspace travel: testing the compensation hypothesis. *Environment and Planning A, 38,* 2111–2127.

Mathieu, R., Freeman, C., & Jagannath A. (2007). Mapping private gardens in urban areas using object-oriented techniques and very high-resolution satellite imagery. *Landscape and Urban Planning*, *81*(3), 179–192.

Matteson, K. C., & Langellotto, G. A. (2011). Small scale additions of native plants fail to increase beneficial insect richness in urban gardens. *Insect Conservation and Diversity*, *4*, 89–98.

Matthews, A., Lunney, D., Waples, K., & Hardy, J. (2004). Brushtail Possums: "Champion of the suburbs" or "Our tormentors"? In D. Lunney & S. Burgin (Eds.), *Urban Wildlife: more than meets the eye* (pp. 159-168). Sydney: Royal Zoological Society of New South Wales.

Mayer, F. S., & Frantz, C. M. (2004). The connectedness to nature scale: A measure of individuals' feeling in community with nature. *Journal of Environmental Psychology,* 24(4), 503–515.

McDonald, H., & Adam, S. (2003). A comparison of online and postal data collection methods in marketing research. *Marketing Intelligence & Planning, 21,* 85–95.

McGrew, A. (2008). *Repurposing the suburban McMansion: A congregate living proposal for seniors, families, and young professionals.* (Master's thesis, Florida State University, Tallahassee, FL). Retrieved from http://etd.lib.fsu.edu/theses_1/available/etd-11102008-193411/unrestricted/McGrewAThesis.pdf

McKenzie-Mohr, D. (2011). Fostering Sustainable Behavior: An Introduction to Community-Based Social Marketing. BC, Canada: New Society Publishers.

McKnight, J., & Sutton, J. (1994). Social Psychology. Sydney: Prentice Hall.

McMillan, E. E. (2003). A method for evaluating the impact of an introductory environmental studies class on the values of students. *Applied Environmental Education & Communication*, *2*(2), 91–98.

Milfont , T. L., & Duckitt, J. (2010). The environmental attitudes inventory: A valid and reliable measure to assess the structure of environmental attitudes. *Journal of Environmental Psychology*, *30*, 80–94.

Miller, K. K. (2000). Public and stakeholder values and knowledge of wildlife in Victoria, Australia. (Ph.D. thesis, Deakin University, Australia). Retrieved from http://dro.deakin. edu.au/view/DU:30023532

Miller, K. K., Brown, P. R., & Temby, I. (1999). Attitudes Towards Possums: a Need for Education? *The Victorian Naturalist, 116*(4), 120–127.

Moreton Bay Regional Council. (2013). Backyards for Wildlife. Retrieved May 22, 2013 from http://www.moretonbay.qld.gov.au/backyardsforwildlife/

Munro, N. T., Lindenmayer, D.B., & Fischer, J. (2007). Faunal response to revegetation in agricultural areas of Australia: a review. *Ecological Management and Restoration, 8,* 200–208.

Munyenyembe, F., Harris, J., Hone, J., & Nix, H. (1989). Determinants of bird populations in an urban area. *Australian Journal of Ecology*, *14*(4), 549–557.

Myers, N. (1996). The biodiversity crisis and the future of evolution. *Environmentalist, 16,* 37–47.

Nasar, J. L. (1988). Perception and evaluation of residential street scenes. In J. L. Nasar (Ed.), *Environmental aesthetics: Theory, research, and applications* (pp. 275 – 289). New York: Cambridge University Press.

Nassauer, J.I., Wang, Z., & Dayrell, E. (2009). What will the neighbors think? Cultural norms and ecological design. *Landscape and Urban Planning*, *92*, 282–292.

National Wildlife Federation. (2013). Garden for Wildlife. Retrieved May 22, 2013 from http://www.nwf.org/Get-Outside/Outdoor-Activities/Garden-for-Wildlife.aspx.

Neuman, M. (2005). The Compact City Fallacy. *Journal of Planning Education and Research*, 25(1), 11–26.

Neuman, W. L. (2000). *Social Research Methods: Qualitative and Quantitative Approaches.* Boston, MA: Allyn and Bacon.

New South Wales National Parks and Wildlife Service. (2002). *Urban wildlife renewal* -*Growing conservation in urban communities.* Research commission. Australia: Woolcott Research Pty Ltd.

Nielsen, A. B., Olsen, S. B., & Lundhede, T. (2007). An economic valuation of the recreational benefits associated with nature-based forest management practices. *Landscape and Urban Planning*, *80*(1-2), 63–71.

Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2009). The Nature Relatedness Scale: Linking individuals' connection with nature to environmental concern and behavior. *Environment and Behavior, 41*, 715–740.

Orians, G. H., & Heerwagen, J. H. (1992). Evolved responses to landscapes. In J. H. Barkow, L. Cosmides & J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 555-579). Oxford, UK: Oxford University Press.

Orr, D. W. (2002). Political economy and the ecology of childhood. In P. H. J Kahn & S. R. Kellert (Eds.), *Children and nature: Psychological, sociocultural and evolutionary investigations* (pp. 279-303). Cambridge, MA: MIT Press.

Özgüner, H., & Kendle, A. D. (2006). Public attitudes towards naturalistic versus designed landscapes in the city of Sheffield (UK). *Landscape and Urban Planning,* 74(2), 139–157.

Palmer, D., & Dann, S. L. (2004). Using Implementation and Program Theory to Examine Communication Strategies in National Wildlife Federation's Backyard Wildlife Habitat Program. *Applied Environmental Education & Communication*, *3*(4), 219–238.

Parker, K., Head, L., Chisholm, L. A., & Feneley, N. (2008). A conceptual model of ecological connectivity in the Shellharbour Local Government Area, New South Wales, Australia. *Landscape and Urban Planning, 86*(1), 47–59.

Parkin, F., Shackleton, C., & Schudel, I. (2006). The effectiveness of schools-based National Arbor Week activities in greening of urban homesteads: A case study of Grahamstown, South Africa. *Urban Forestry & Urban Greening*, *5*, 177–187.

Parsons, R. (1995). Conflict between ecological sustainability and environmental aesthetics: Conundrum, canard or curiosity. *Landscape and Urban Planning, 32*(3), 227–244.

Parsons, R., Tassinary, L. G., Ulrich, R. S., Hebl, M. R., & Grossman-Alexander, M. (1998). The view from the road: implications for stress recovery and immunization. *Journal of Environmental Psychology*, *18*(2), 113–140.

Pergams, O. R. W., & Zaradic, P. A. (2006). Is love of nature in the U.S. becoming love of electronic media? A 16-year downtrend in national park visits explained by watching movies, playing video games, internet use, and oil prices. *Journal of Environmental Management*, *80*(4), 387–393.

Pergams, O. R. W., & Zaradic, P. A. (2008). Evidence for a fundamental and pervasive shift away from nature-based recreation. *PNAS*, *105*(7), 2295–2300.

Perrin, J. L., & Benassi, V. A. (2009). The connectedness to nature scale: A measure of emotional connection to nature? *Journal of Environmental Psychology*, *29*, 434–440.

Power, E. R. (2005). Human-nature relations in suburban gardens. *Australian Geographer*, 36(1), 39–53.

Pilgrim, S., Cullen, L., Smith, D. J., & Pretty, J. (2008). Ecological knowledge is lost in wealthier communities and countries. *Environmental Science and Technology*, *42*(4), 1004–1009

Ramsey, J. M. (1993). The effects of issue investigation and action training on eighthgrade students' environmental behaviour. *The Journal of Environmental Education*, 24(3), 31–36.

Randolph, B. (2004). The Changing Australian City: New Patterns, New Policies and New Research Needs. *Urban Policy and Research*, *22*(4), 481–493.

Randolph, B., & Troy, P. (2008). Attitudes to conservation and water consumption. *Environmental Science and Policy, 2*, 441–455

Ratcliffe, M. M., Merrigan, K. A., Rogers, B. L., & Goldberg, J. P. (2011). The Effects of School Garden Experiences on Middle School–Aged Students' Knowledge, Attitudes, and Behaviors Associated With Vegetable Consumption. *Health Promotion Practice*, *12*(1), 36–43

Raziano, D. B., Jayadevappa, R., Valenzula, D., Weiner, M., & Lavizzo-Mourey, R. (2001). E-mail versus conventional postal mail survey of geriatric chiefs. *Gerontologist, 41,* 799–804. Rees, W. E. (1997). Urban ecosystems: the human dimension. *Urban Ecosystems, 1,* 63–75.

Ricketts, T., & Imhoff, M. (2003). Biodiversity, urban areas, and agriculture: locating priority ecoregions for conservation. *Conservation Ecology*, *8*(2), 1. Retrieved from http://www.consecol.org/vol8/iss2/art1/

Robb, G. N., McDonald, R. A., Chamberlain, D. E., & Bearhop, S. (2008). Food for thought: supplementary feeding as a driver of ecological change in avian populations. *Frontiers in Ecology and the Environment, 6*, 476–484.

Robbins, P., Polderman, A., & Birkenholtz, T. (2001). Lawns and Toxins: An Ecology of the City. *Cities*, *18*(6), 369–380.

Robson, C. (2002). *Real world research: A resource for social scientists and practitionerresearchers*. Oxford: Blackwell.

Rohde, C. L. E., & Kendle, A. D. (1997). Nature for people. In T. Kendle & S. Forbes (Eds.), *Urban nature conservation: landscape management in the urban countryside* (pp. 319–335). London: E & FN Spon.

Rokeach, M. (1968). Beliefs, attitudes, and values. San Francisco, CA: Jossey-Bass.

Roszak, T. (1995). Where psyche meet Gaia. In T. Roszak, M. E. Gomes & A. D. Kanner (Eds.), *Ecopsychology: Restoring the earth, healing the mind.* San Francisco: Sierra Club Books.

Rudd, H., Vala, J., and Schaefer. V. (2002). Importance of Backyard Habitat in a Comprehensive Biodiversity Conservation Strategy: A Connectivity Analysis of Urban Green Spaces. *Restoration Ecology*, *10*(2), 368–375.

Ruming, K., Houston, D., & Amati, M. (2012). Multiple Suburban Publics: Rethinking Community Opposition to Consolidation in Sydney. *Geographical Research*, *50*(4), 421– 435.

Ryan, R. L., & Grese, R. E. (2005). Urban volunteers and the environment: forest and prairie restoration. In P. F. Barlett (Ed.), *Urban place: Reconnecting with the natural world* (pp. 173–188. Cambridge, MA: MIT Press.

Saville, B. (1997). *The Secret Garden: report of the Lothian Secret Garden Survey*. Edinburgh: Lothian Wildlife Information Centre.

Sax, D. F., & Gaines, S. D. (2003). Species diversity: from global decreases to local increases. *Trends in Ecology and Evolution 18*, 561–566.

Sax, L.J., Gilmartin, S. K., & Bryant, A. N. (2003). Assessing response rates and nonresponse bias in web and paper surveys. *Research in Higher Education, 44*(4), 409–432.

Sears, A. R., & Anderson, S. H. (1991). Correlation between birds and vegetation in Cheyenne, Wyoming. In L. W. Adam & K. L Leedy (Eds.), *Wildlife Conservation in Metropolitan Environments.* (pp. 75–80). Columbia (MD): National Institute for Urban Wildlife.

Schipperijn, J., Stigsdotter, U. K., Randrup, T. B., & Troelsen, J. (2010). Influences on the use of urban green space - A case study in Odense, Denmark. *Urban Forestry & Urban Greening*, *9*(1), 25–32.

Schroeder, H. W. (1991). Preference and meaning of arboretum landscapes: Combining quantitative and qualitative data. *Journal of Environmental Psychology*, *11*(3), 231–248.

Schultz, P.W. (2002). Inclusion with nature: Understanding human nature interactions. In P. Schmuck & P. W. Schultz (Eds.), *The psychology of sustainable development* (pp. 61–78). New York: Kluwer.

Schultz, P. W., & Tabanico, J. (2007). Self, identity, and the natural environment: Exploring implicit connections with nature. *Journal of Applied Social Psychology, 37*(6), 1219–1247.

Sirgy, M. J., & Cornwell, T. (2002). How neighborhood features affect quality of life. *Social Indicators Research*, *59*(1), 79–114.

Smith, R. M., Gaston, K. J., Warren, P. H., & Thompson, K. (2005). Urban domestic gardens (V): relationships between landcover composition, housing and landscape. *Landscape Ecology, 20,* 235–253.

Smith, P., & Smith, J. (2010). Urban edge effects in the Blue Mountains, New South Wales: implications for design of buffers to protect significant habitats. *Pacific Conservation Biology*, *16*, 92–200.

Sparks, G. G. (2006). *Media effects research: a basic overview*. Belmont, CA: Thomson Wadsworth.

Sperling, C. D., & Lortie, C. J. (2010). The importance of urban backgardens on plant and invertebrate recruitment: a field microcosm experiment. Urban *Ecosystems*, *13*(2), 223–235.

State Government of Victoria. (2013). Metropolitan Melbourne. Retrieved January 8, 2014 from http://www.liveinvictoria.vic.gov.au/living-in-victoria/melbourne-and-regional-victoria/Melbourne

Stern, P. C. (1992). Psychological dimensions of global environmental change. *Annual Review of Psychology*, *43*, 269–302.

Sukopp, H., & Starfinger, U. (1999). Disturbance in urban ecosystems. In L. R. Walker (Ed.), *Ecosystems of Disturbed Ground*: *ecosystems of the world 16* (pp.397–412). Amsterdam: Elsevier.

Sullivan, W. C., Kuo, F. E., & DePooter, S. F. (2004). The fruit of urban nature: vital neighbourhood spaces. *Environment and Behaviour*, *36*, 678–700.

Tallamy, D. W. (2004). Do alien plants reduce insect biomass? *Conservation Biology*, *18*(6), 1689–1692.

Tanner, T. (1980). Significant life experiences: A new research area in environmental education. *Journal of Environmental Education*, *11*(4), 20–24.

Tasmanian Planning Commission. (2009). *State of the Environment Tasmania 2009*. Hobart: Author. Retrieved May 22, 2013 from http://soer.justice.tas.gov.au/2009/

Temby, I. (2005). *Wild Neighbours: The Human Approach to Living with Wildlife*. Broadway, NSW: Citrus Press

Theimer, S., & Ernst, J. (2012). Fostering connectedness to nature through U. S. Fish and Wildlife Service education and outreach programming: A qualitative evaluation. *Applied Environmental Education and Communication*, *11*(2), 79–87.

The Royal Horticultural Society & The Wildlife Trusts. (2011). Wild about Gardens. Retrieved May 22, 2013 from http://www.wildaboutgardens.org.uk Thompson, P. S., Greenwood, J. J. D., & Greenaway, K. (1993). Birds in European gardens in the winter and spring of 1988–89. *Bird Study, 40,* 120–134.

Tilbury, D., & Wortman, D. (2008). How is community education contributing to sustainability in practice? *Applied Environmental Education & Communication*, 7(3), 83–93.

Trochim, W. M. (2006). The Research Methods Knowledge Base, 2nd Edition. Retrieved March 20, 2010 from http://www.socialresearchmethods.net/kb/

Trusov, M., Bucklin, R. E., & Pauwels, K. (2009). Effects of Word-of-Mouth Versus Traditional Marketing: Findings from an Internet Social Networking Site. *Journal of Marketing*, 73, 90–102.

Ulrich, R. S., & Addoms, D. (1981). Psychological and recreational functions of a residential park. *Journal of Leisure Research*, *13*, 43–65.

United Nations. (2012). *World Urbanization Prospects, the 2011 Revision*. New York: Author. Retrieved from http://esa.un.org/unup/Wallcharts/urban-rural-areas.pdf

United States Environmental Protection Agency. (2013a). WaterSense. Retrieved June 25, 2013 from http://www.epa.gov/watersense/our_water/water_use_today.html

United States Environmental Protection Agency. (2013b). What to Plant. Retrieved June 25, 2013 from http://www.epa.gov/watersense/outdoor/what_to_plant.html

Van den Berg, A. E., Hartig, T., & Staats, H. (2007). Preference for Nature in Urbanized Societies: Stress, Restoration, and the Pursuit of Sustainability. *Journal of Social Issues,* 63(1), 79–96.

Van Herzele, A., & Wiedemann, T. (2003). A monitoring tool for the provision of accessible and attractive urban green spaces. *Landscape and Urban Planning, 63*, 109–126.

Vaske, J. J. (2008). *Survey research and analysis: Applications in parks, recreation and human dimensions.* State College, PA: Venture Publishing Inc.

Vaske, J.J., & Kobrin, K. C. (2001). Place attachment and environmentally responsible behavior. *Journal of Environmental Education*, *32*(4), 16–21.

Vaughan, C., Gack, J., Solorazano, H., & Ray, R. (2003). The effect of environmental education on schoolchildren, their parents, and community members: A study of intergenerational and intercommunity learning. *The Journal of Environmental Education*, *34*(3), 12–21.

Vickery, M. L. (1995). Gardens the neglected habitat. In A. S. Pullin (Ed.), *Ecology and Conservation of Butterflies* (pp. 123–134). London: Chapman and Hall.

Warren, P.S., Lerman, S.B., & Charney, N.D. (2008). Plants of a feather: spatial autocorrelation of gardening practices in suburban neighborhoods. *Biological Conservation*, 141, 3–4.

West, B. C., & Parkhurst, J. A. (2002). Interactions between deer damage, deer density, and stakeholder attitudes in Virginia. *Wildlife Society Bulletin*, *30*, 139–147.

White, J.G., Antos, M. J., Fitzsimons, J. A., & Palmer, G. C. (2005). Non-uniform bird assemblages in urban environments: the influence of streetscape vegetation. *Landscape and Urban Planning*, *71*, 123–135.

White, L., Jr. (1967). The historical roots of our ecologic crisis. Science, 155, 1203–1207.

Whiting, A. E., Miller, K. K., & Temby, I. (2010) Community Attitudes toward Possums in Metropolitan Melbourne. *The Victorian Naturalist*, *127*(1), 4–10.

Wilson, E. O. (1984). Biophilia. Cambridge: Harvard University Press.

Wilson, E. O. (1993). Biophilia and the conservation ethic. In S. R. Kellert & E. O. Wilson (Eds.), *The biophilia hypothesis* (pp. 31–41). Washington, D.C.: Island Press.

Yabiku, S. T., Casagrande, D. G., Farley-Metzger, E. (2008). Preferences for landscape choice in a Southwestern desert city. *Environment and Behavior, 40*, 382–400.

Yates, D., Moore, D., & McCabe, G. (1999). *The Practice of Statistics (1st Ed.).* New York: W.H. Freeman.

Zagorski, T., Kirkpatrick, J. B., & Stratford, E. (2004). Gardens and the bush: Gardeners' attitudes, garden types and invasives. *Australian Gepgraphic Studies*, *42*(2), 207–220.

Zelezny, L. C. (1999). Educational interventions that improve environmental behaviors: A meta-analysis. *The Journal of Environmental Education*, *31*(1), 5–14.

Zmyslony, J., & Gagnon, D. (1998). Residential management of urban front-yard landscape: A random process? *Landscape and Urban Planning, 40,* 295–307.

PUBIC SCOPING SAMPLE SURVEY DOCUMENTS

This appendix consists of all the materials delivered to the *Public Scoping* sample which are:

- Consent form
- Plain Language Statement
- Survey
- Reminder postcard

DEAKIN UNIVERSITY PLAIN LANGUAGE STATEMENT AND CONSENT FORM



TO: The Participant

Consent Form

Date:

Full Project Title: Community views on yards and open spaces

I have read and I understand the attached Plain Language Statement.

I freely agree to participate in this project according to the conditions in the Plain Language Statement.

I have been given a copy of the Plain Language Statement to keep.

The researcher has agreed not to reveal my identity and personal details, including where information about this project is published, or presented in any public form.

Participant's Name (printed)	
Signature	Date

I would like to be kept informed of the study's findings.
 My email address is

If you have misplaced the reply-paid envelope please send to:

Amy Whiting School of Life and Environmental Sciences Deakin University 221 Burwood Highway Burwood 3125 **DEAKIN UNIVERSITY**

PLAIN LANGUAGE STATEMENT AND CONSENT FORM



TO: The Participant

Revocation of Consent Form

(To be used for participants who wish to withdraw from the project)

Date:

Full Project Title: Community views on yards and open spaces

I hereby wish to WITHDRAW my consent to participate in the above research project and understand that such withdrawal WILL NOT jeopardise my relationship with Deakin University.

Participant's Name (printed)

Signature Date

Please mail or fax this form to:

Amy Whiting School of Life and Environmental Sciences Deakin University 221 Burwood Highway Burwood 3125 Fax: 9251 7626

Your invitation to contribute to the research project: Community views on yards and open spaces

April 12th, 2010

Dear Resident,

My name is Amy Whiting. I am completing my PhD research degree at Deakin University under the supervision of Dr Kelly Miller, Dr John White and Associate Professor Geoff Wescott.

The following is a Plain Language Statement and contains information about this research project. Its purpose is to explain to you as openly and clearly as possible all the procedures involved in this project so that you can make a fully informed decision whether you are going to participate. Please read this Plain Language Statement carefully and once you understand what the project is about and if you agree to take part in it, you will be asked to sign the Consent Form. By signing the Consent Form, you indicate that you understand the information and that you give your consent to participate. Please tear off this copy of the Plain Language Statement to keep as a record.

I am conducting a survey which aims to investigate how the community uses and values their yards and local open spaces, as well as their attitudes towards different garden compositions. This research will help inform future urban planning initiatives which will benefit human well-being and urban conservation. It is anticipated that the findings of the study will help in designing communities that meet peoples' expectations and inform education programs. You have been randomly selected from the *White Pages* residential directory to participate in this study.

The survey is 8 pages long and will take approximately 15 minutes to complete and your voluntary participation would be greatly appreciated. There is not expected to be any stress or risk involved in your participation. However, as participation is voluntary, you can choose not to participate or not to answer particular questions if you wish. If you wish to ask any questions before deciding to take part, feel free to contact me at the numbers below. If you decide to take part and later change your mind, you are free to withdraw from the project up until your identifying details have been removed (at this stage your data is not able to be linked to you). If you decide to withdraw please notify me or complete and return the Revocation of Consent Form attached. Your decision to take part or not take part, or to take part and then withdraw, will not affect your relationship with Deakin University.

To participate, after reading this Plain Language Statement sign the Consent Form and then complete the survey. Please place the completed Consent Form and survey in the reply-paid envelope provided and return it by **May 10th 2010**. Once returned, your Consent Form will be entered into a draw for the chance to win one of three \$100 vouchers (your choice of a movie, garden centre or book voucher).

Please note that your survey and consent form will be filed separately, therefore linking your survey with your name and address will not be possible. As such, you will remain completely anonymous.

The data will be stored in a locked filling cabinet at Deakin University and access to this data will be limited to the researchers involved in this study. After the completion of the study the data will be stored at Deakin University for a duration of six years after final publication using the data collected, after which it will be destroyed.

This project will be carried out according to the National Statement on Ethical Conduct in Human Research (2007). It has been approved by the Human Research Ethics Committee of Deakin University as is being funded by Deakin University. If you have any complaints about any aspect of the project, or any questions about your rights as a research participant, then you may contact: The Manager, Office of Research Integrity, Deakin University, 221 Burwood Highway, Burwood Victoria 3125, Telephone: 9251 7129, Facsimile: 9244 6581; research-ethics@deakin.edu.au. Please quote project number EC 2009-155.

Aggregated results will be used for research purposes and will contribute the development of Amy Whiting's PhD thesis and may be reported in scientific journals or presented at academic conferences. In any publication, information will be provided in such a way that you cannot be identified. Should you be interested in learning of the study's findings, please provide your contact details on the consent form.

Thank you very much for taking the time to participate in this research. If you have any questions or concerns regarding any aspect of this research, please feel free to contact me at the numbers below.

Amy Whiting PhD candidate Phone: 0423 155 899 Email: aewhi@deakin.edu.au

Survey - Community views on yards and open spaces

SECTION A – Your front and backyards

This section consists of questions related to your front and backyard spaces.

1. Please tick the response that best matches your home	2.
Separate house	Flat, unit or apartment in a small block
Separate unit or townhouse	Flat, unit or apartment in a high rise
Semi-detached unit or townhouse	□ Other, please specify
2. Please tick the response that best matches the size of	your front yard.
I don't have a front yard (go to Q5)	
Small (courtyard size)	
Medium (room for a small lawn and garden beds)	
Large (room for a large lawn and garden beds)	
3. Please tick the response that best matches your front	yard.
□ Mostly human made structures (e.g. paving / drivewa	ay)
Mostly lawn with some garden beds	
Highly vegetated with little or no lawn	
□ Other, please describe	
4. Please tick the response that best matches the types	of plants you have in your front yard.
Mostly Non-Australian plants (e.g. roses)	Mostly Australian native plants (e.g. wattle)
Mostly Vegetable and / or Fruit species	Unsure what types of plants are in front yard
A mix of Non-Australian and Australian plants	I have no plants in my front yard

- 5. Please tick the response that best matches the size of your **backyard**.
- □ I don't have a backyard (go to Q8)
- □ Small (courtyard size)
- □ Medium (typical suburban yard size)
- □ Large (greater than a quarter acre)

6. I	Please tick the response that best r	matches your back	yard.		
	Mostly human made structures (e	.g. paving / decking	g / pool)		
	Mostly lawn with some garden be	ds			
	Highly vegetated with little or no l	awn			
	Other, please describe				
•••••					
•••••					
7.	Please tick the response that best	matches the types	of plants you have	e in vour backvard .	
	Mostly Non-Australian plants (e.g.			lian native plants (e.g. wattle)	
	Mostly Vegetable and / or Fruit sp		-	ypes of plants are in backyard	
	A mix of Non-Australian and Austr		I have no plan		
		·	·		
8.	Please tick the responses that best	t matches why you	have the types of	plants you have in your front	
an	d/or backyards. Tick all that apply.				
	They look good		They produce	food	
	They are water wise		They were alread	eady there when I moved in	
	They provide homes for wildlife		I have no plan	ts in my front or backyard	
They are good for the environment			I have no front or backyard (go to Q13)		
	Other, please specify				
	Do you have any of the following ir	-	backyard ? Tick al		
	Paved area or decking	Nest box		Bird bath	
	Fish pond	🖵 Spa		Bird feeder	
	BBQ	Frog pond		Shed	
	Swimming pool	Children's play	• •	·	
	Other, please specify				
	Do you use your front and/or bac	kyard for any of th	-	Ill that apply.	
	Sporting games		Bird watching		
	Reading		Relaxing		
_	How often do you use either your	front and/or back	-	ing friends and family?	
	Daily Weekly		YearlyNever		
	Monthly				
12.	. On average, approximately how n	nuch time do you s		ich month?	
	1 hour or less		4 hours		
	2 hours		More than 4 h		
	3 hours		Other, please	specify	

13. Please rank the following garden descriptions from 1-5 in order of your preference. 1 being the garden you would most prefer for **your** backyard space.



A backyard with a lawn surrounded by garden beds with Non-Australian plants (such as roses). Such a backyard may also have space for entertaining people, such as decking.



A backyard with a lawn surrounded by garden beds with Australian native plants (such as wattle). Such a backyard may also have space for entertaining people, such as decking.



A backyard with little or no lawn, instead lots of Australian native plants organised in more of a bush setting. Such a backyard may also have space for entertaining people, such as decking.



A backyard with little or no lawn, instead lots of Non-Australian plants (such as roses) organised in a cottage garden setting. Such a backyard may also have space for entertaining people, such as decking.



A backyard that has little or no garden, but is mainly outdoor entertaining areas such as decking and/or a pool.

14. Is there anything else you would like to say about your **front and/or backyards** and how you use them?

SECTION B – Local open spaces

This section consists of questions related to your local open spaces. For this survey local open space is defined as land that is used for public recreation and/or nature conservation. For example, parks, bicycle paths, sporting fields and nature reserves etc.

15. How close to your house would you estimate your nearest local open space is?

□ Within 500 metres

Over 1km - 3 kilometres

500 metres - 1 kilometre

Over 3 kilometres

- 16. Do you visit any local open spaces?
- Yes
- No (go to Q22)
- 17. How often do you visit your local open spaces?
- Daily
- Weekly

- Monthly
- Yearly

18. What type of local open spaces do you visit?	
Children's Parks (with playgrounds)	Large parks with play equipment and BBQs
Nature reserves	Bicycle and walking paths
Local sports grounds	Public gardens
□ Other, please specify	
19. Please tick any of the following activities you undert	ake at your local open spaces. Tick all that apply.
Sporting games	Relaxing
Walking	Picnics
Reading	Taking children to park
Bird watching	Walking the dog
□ Other, please specify	
20. Please tick any of the following activities you use you all that apply.	ur local open spaces for and circle how often. Tick
 Catching up with friends and family informally	Daily Weekly Monthly Yearly

□ Hold get-togethers with family and friends.....Daily Weekly Monthly Yearly (e.g. picnics, BBQ's, Christmas and birthday parties)

21. Please indicate the extent to which you believe that your use of local open spaces results in you gaining benefits in the following areas? **Then proceed to section C.**

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a)	An opportunity for physical activity	1	2	3	4	5
b)	An opportunity for relaxation/recreation	1	2	3	4	5
c)	An opportunity to learn about the local environment	1	2	3	4	5
d)	An opportunity to help improve the environment	1	2	3	4	5
e)	A sense of community or belonging	1	2	3	4	5
f)	A sense of personal satisfaction	1	2	3	4	5
g)	Improved physical health	1	2	3	4	5
h)	Improved mental health	1	2	3	4	5
i)	An expansion of my social network	1	2	3	4	5

22. Please tick **any** of the following reasons for not visiting your local open spaces that apply to you. Tick all that apply.

- □ I am too busy
- Local open spaces are dirty
- □ Local open spaces are dangerous
- □ I have limited mobility

- □ Local open spaces are too far away
- □ Lack of facilities (e.g. toilets)
- I have no interest in visiting local open spaces
- □ Other, please specify.....

SECTION C - Opinions and attitudes

The following questions ask for your opinions and attitudes about your yard space and local open spaces. There are **no** right or wrong answers.

23. Please indicate the extent to which you agree or disagree with the following statements.

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a)	I think Australian native gardens are fashionable these days	1	2	3	4	5
b)	I think local open spaces should be well maintained	1	2	3	4	5
c)	Having a garden that is water wise is important to me	1	2	3	4	5
d)	I think native gardens increase the risk of fire	1	2	3	4	5
e)	Having a garden that is neat and tidy is important to me	1	2	3	4	5
f)	I think visiting my local open space helps me to relax	1	2	3	4	5
g)	I think formal European gardens look out of place in Australia	1	2	3	4	5
h)	I think gum trees are dangerous in suburban backyards	1	2	3	4	5
i)	I think Australian native gardens look messy	1	2	3	4	5
j)	A garden that minimises fire risk is important to me	1	2	3	4	5
k)	I think Australian native gardens require a lot of maintenance and watering	1	2	3	4	5
I)	Having a backyard with space for children to play is important to me	1	2	3	4	5
m)	I think backyards are a waste of space and contribute to urban sprawl	1	2	3	4	5
n)	I think an open space with a natural bush setting is a nice place to hold get-togethers with family and friends	1	2	3	4	5
o)	A home where there is no chance of falling trees is important to me	1	2	3	4	5
p)	Having a garden that will be admired by other people is important to me	1	2	3	4	5
q)	I think the best parks are those with plenty of room for picnicking and playing outdoor games	1	2	3	4	5
r)	A home that is safe from the threat of dangerous wildlife (e.g. snakes) is important to me	1	2	3	4	5
s)	I think there should be more local open spaces and smaller backyards	1	2	3	4	5
t)	I think visiting an open space with a natural bush setting has a positive impact on my health and mental well-being	1	2	3	4	5
u)	I think some local open spaces should provide habitat for native wildlife	1	2	3	4	5

v)	I would like to have a garden that provides opportunities for me to feed native wildlife	1	2	3	4	5
w)	Having a backyard with space for entertaining friends and family (e.g. decking, B.B.Q) is important to me	1	2	3	4	5
x)	I would like a garden that would encourage native wildlife to my yard	1	2	3	4	5
y)	Having a garden that can provide me with fruit and vegetables is important to me	1	2	3	4	5
z)	Spending time in my backyard and/or garden makes me feel relaxed	1	2	3	4	5
aa)	I think you can really feel at one with nature in an Australian bush garden (e.g. with native plants)	1	2	3	4	5
bb)	Having a garden whose appearance is in keeping with my neighbours is important to me	1	2	3	4	5
cc)	I think it is important for local open spaces to provide facilities such as toilets and drinking taps	1	2	3	4	5
dd)	I like local open spaces where the vegetation is well maintained and neat	1	2	3	4	5
ee)	Having a local open space within walking distance from my home is important to me	1	2	3	4	5
ff)	I think native gardens encourage dangerous wildlife (e.g. snakes)	1	2	3	4	5
gg)	Being someone who is recognised as caring for the environment is important to me	1	2	3	4	5
hh)	Having a garden that requires minimal maintenance is important to me	1	2	3	4	5

SECTION D - General information

This section deals with general information about you. Remember that all of the information that you give remains **strictly confidential**.

24. Ple	ease indi	cate your age gr	oup				
1 8	-29	3 0-39	40-49	50-59	60-69	D 70-79	□ 80+
25. Ar	e you?						
🛛 Ma	ale						
🖵 Fe	male						
26. W	hat is you	ur highest level o	of education?				
🛛 Hig	gh Schoo	l					
🛛 Та	fe / Tech	nical College					
🛛 Un	iversity ι	undergraduate c	legree				
🛛 Un	iversity p	oostgraduate de	gree				
🛛 Ot	her, plea	se specify		•••••			

27. Please indicate which country you were born in If not Australia, please indicate your year of arrival	
28. What is the main language spoken at home?	
 29. Do have any children under 18 years? Yes No (go to Q31) 	
 30. Please indicate how many children you have and the # 5 years old and under # 6 - 10 years old # 11 - 15 years old # 16 - 17 years old 	eir ages
31. Which of the following best describes your housing	situation?
Renting	Owned outright
Living in parent's house	Owned with a mortgage
Other, please specify	
32. What is your postcode?	
33. How long have you lived at your current address?	
Less than 1 year	11 - 20 years
1 - 5 years	Over 20 years
□ 6 - 10 years	
34. What is the annual gross (i.e. before tax) income tha sources?	at you r household usually receives from all
□ \$1 - \$6,000	□ \$80,001 - \$180,000
□ \$6,001 - \$34,000	□ over \$180,000
□ \$34,001 - \$80,000	
 35. Do you own any of the following? Dog, if yes, how many 	
Cat, if yes, how many	
Other pets (please specify what type and number)	
 36. Are you a member of any gardening, conservation, v Yes, please specify No 	

37. Finally, do you have any other comments you would like to make?

								••••••		
•••••	 									
•••••	 •••••	•••••	•••••	•••••	•••••	••••••	•••••		•••••	•••••

Please return this questionnaire and consent form using the reply-paid envelope provided by May $10^{th} 2010$.

(If you have misplaced the reply-paid envelope please send to: Amy Whiting, School of Life and Environmental Sciences, Deakin University, 221 Burwood Highway, Burwood 3125)

Thank you very much for your time

Community views on yards and open spaces... have YOUR say!

You were recently sent an invitation to complete a survey about how you use and value your yard and local open spaces. If you have completed and returned this, thank you and please disregard this postcard. Although the survey is voluntary, if you haven't filled it out, your participation would be greatly appreciated. The results will be used to help design better communities. Have YOUR say about how you want your urban environment to be in the future! Flip this card over for more details.



If you still have the survey, great... simply fill it out (and the consent form), and pop it in the reply paid envelope and post it! You will still be in the running to **WIN** one of three \$100 book/movie/or garden centre vouchers!

If you have misplaced it, no worries! You can email me at <u>aewhi@deakin.edu.au</u> or call 0423155899 and ask for another copy to be sent out to you!

Thank you for your time!

Amy Whiting PhD Student School of Life and Environmental Sciences Deakin University, Burwood 3125

APPENDIX 2

GENERAL PUBLIC SAMPLE SURVEY DOCUMENTS

This appendix consists of all the materials delivered to the *General Public* sample which are:

- Invitation Postcard for online sample
- Plain Language Statement (digitised copy was provided for online participants)
- Consent form (digitised copy was provided for online participants)
- Survey (digitised copy was provided for online participants)
- Reminder postcards

How do YOU feel about nature in the backyard? *We want to know!*

Simply go online and complete a voluntary 15 minute survey.

See the back of this card for details.



How do YOU feel about nature in the backyard? *We want to know!*

Simply go online and complete a voluntary 15 minute survey.

See the back of this card for details.



Here's what you do...

Log on to the internet and go to www.surveymonkey.com/naturebackyard where you will find an introductory letter that explains the study. Have a read and if you agree to take part, proceed to the survey before November 5th. Of course, if you would prefer to complete a paper copy of the survey you are welcome to! Simply phone or email me and ask for a copy to be sent out. By participating you could WIN your choice of a movie, book or garden centre voucher worth \$100!

Thank you for your time!

Amy Shaw - PhD Student aewhi@deakin.edu.au / 0423 155 899 School of Life and Environmental Sciences Deakin University, Burwood 3125

Here's what you do...

Log on to the internet and go to www.surveymonkey.com/backyardnature where you will find an introductory letter that explains the study. Have a read and if you agree to take part, proceed to the survey before November 5th. Of course, if you would prefer to complete a paper copy of the survey you are welcome to! Simply phone or email me and ask for a copy to be sent out. By participating you could WIN your choice of a movie, book or garden centre voucher worth \$100!

Thank you for your time!

Amy Shaw - PhD Student aewhi@deakin.edu.au / 0423 155 899 School of Life and Environmental Sciences Deakin University, Burwood 3125



PLAIN LANGUAGE STATEMENT AND CONSENT FORM

Your invitation to contribute to the research project: Community views on nature in the backyard

Plain Language Statement Date: October 12th 2010 Full Project Title: Community views on nature in the backyard Principal Researcher: Kelly Miller Student Researcher: Amy Shaw Associate Researcher(s): Dr John White and Associate Professor Geoff Wescott

Dear Resident

My name is Amy Shaw. I am completing my PhD research degree at Deakin University. This letter is to invite you to participate in a research project, which aims to investigate how the community feels about nature in backyards as well as their attitudes towards native vegetation and urban nature. This research is totally funded by Deakin University and is being undertaken as part of my PhD research degree.

4000 surveys are being distributed to individuals from the Melbourne metropolitan and you have been randomly selected from the *White Pages* residential directory to participate in this study. Whether you agree to take part in the project is completely up to you; your decision to take part or not take part will not affect your relationship with Deakin University. Please read the following information carefully and tear off this copy of the Plain Language Statement to keep as a record. If you agree to take part in the study, please complete the survey and place it, along with the signed consent form, in the reply-paid envelope provided and return it by **November 5th 2010**.

This research will help inform future urban planning initiatives which will benefit human well-being and urban conservation. It is anticipated that the findings of the study will help in designing communities that meet peoples' expectations and inform education programs.

The survey has 6 pages and should take no more than 15 minutes of your time to complete. The survey asks about your views on nature in backyards as well as your attitudes towards native vegetation and urban wildlife. There are also some general questions about you, to help interpret the information that you give. All participants consent forms will be removed from surveys as soon as received (therefore you remain anonymous) and entered into a draw for the chance to win one of three \$100 vouchers (your choice of a movie, book, or garden centre voucher). The winners of the survey will be randomly drawn and contacted by email or telephone.

There is not expected to be any stress or risk involved in your participation. However, as participation is voluntary, you can choose not to participate or not to answer particular questions if you wish. However, as the survey is anonymous, once you have completed the survey it will not be possible to withdraw from the study if you change your mind. All surveys will be kept for at least 6 years and then destroyed.

Aggregated results will be used for research purposes and will contribute the development of my PhD thesis and may be reported in scientific journals or presented at academic conferences. Participants are invited to contact the researchers should they wish to obtain a summary of the results.

Thank you very much for taking the time to participate in this research. If you have any questions or concerns regarding any aspect of this research, please feel free to contact me at the number or email address listed below.

Amy Shaw - PhD Student School of Life and Environmental Sciences Deakin University, Burwood 3125 Phone: 0423 155 899 Email: aewhi@deakin.edu.au

This project will be carried out according to the National Statement on Ethical Conduct in Human Research (2007). It has been approved by the Human Research Ethics Committee of Deakin University. If you have any complaints about any aspect of the project, or any questions about your rights as a research participant, then you may contact: The Manager, Office of Research Integrity, Deakin University, 221 Burwood Highway, Burwood Victoria 3125, Telephone: 9251 7129, Facsimile: 9244 6581; research-ethics@deakin.edu.au. Please quote project number 2010-216.



PLAIN LANGUAGE STATEMENT AND CONSENT FORM

TO: The Participant

Consent Form

Date:

Full Project Title: Community views on nature in the backyard

I have read and I understand the attached Plain Language Statement.

I freely agree to participate in this project according to the conditions in the Plain Language Statement.

I have been given a copy of the Plain Language Statement to keep.

The researcher has agreed not to reveal my identity and personal details, including where information about this project is published, or presented in any public form.

Participant's Name (printed)	
Signature	Date

To go in the draw to win one of three \$100 gift vouchers please provide:
Email and/or Telephone

If you have misplaced the reply-paid envelope please send to:

Amy Shaw School of Life and Environmental Sciences Deakin University 221 Burwood Highway Burwood 3125

Survey - Community views on nature in backyard

SECTION A – Nature in your yard

1. Please tick any of the following that you have in your front or backyard. Tick all that apply Paving or decking Play equipment □ Fish pond Water feature Chicken pen Drive way Lawn Clothes line Bird bath U Vegetable patch □ BBQ Bird feeder □ Fruit trees □ Other, please specify..... Swimming pool Nest box Compost **G** Frog pond U Water tanks

2. Approximately what percentage of your total block is taken up by vegetation (e.g. garden, trees, lawn)%

3. Please tick the one response that best matches **overall** the types of plants (including trees) you have in your front and/or backyard.

- □ I have no plants (please skip to Q6) □ Mostly Australian native plants
- □ Unsure what types of plants I have □ Mostly locally indigenous plants
- □ Mostly non-native plants
- □ Mostly fruit and/or vegetable plants

4. Do you have any Australian native plants in your front or backyards (including indigenous species)?

Unsure

Garage

□ Shed

□ Spa

 \Box Yes \rightarrow Please identify your top three reasons by placing the numbers 1-3 in the boxes corresponding to your reasons in order of your preference.

Example - #1 reason	1	They produce food	
They look good		They provide shade	
They are water wise/ drought tolerant		They provide privacy	
They do not require much maintenance		They were already there when I moved in	
They provide homes for native wildlife		Other, please specify	
They are good for the environment		-	

\Box No \rightarrow Please identify your top three reasons by placing the numbers 1-3 in the boxes corresponding to your reasons in order of your preference.

Example - #1 reason	1	They don't produce food	
They are not attractive		They don't provide shade	
They create a messy garden		They don't provide privacy	
They will attract wildlife (in general) to my garden		Other species already there when moved in	
They will attract dangerous wildlife to my garden		Other, please specify	
They increase the risk of fire			

A mix of non-native, native and/or indigenous plants

- 5. Do you have any **non-native** plants in your front or backyards?
- Unsure
- □ Yes → Please identify your **top three** reasons by placing the numbers 1-3 in the boxes corresponding to your reasons in order of your preference.

Example - #1 reason	1	They produce food
They look good		They provide shade
They are water wise/ drought tolerant		They were already there when I moved in
They provide homes for native wildlife		Other, please specify
They are good for the environment		
They provide privacy		

□ No → Please identify your **top three** reasons by placing the numbers 1-3 in the boxes corresponding to your reasons in order of your preference.

Example - #1 reason	1	They don't produce food	
They are not attractive		They don't provide shade	
They are not water wise/ drought tolerant		They don't provide privacy	
They require too much maintenance		Other species already there when moved in	
They do not provide homes for native wildlife		Other, please specify	
They are not good for the environment			

- 6. Would you ever consider planting any (or more) Australian native plants?
- □ Yes → Please identify your **top three** reasons by placing the numbers 1-3 in the boxes corresponding to your reasons in order of your preference.

Example - #1 reason	1	They produce food	
They look good		They provide shade	
They are water wise/ drought tolerant		They provide privacy	
They do not require much maintenance		Other, please specify	
They provide homes for native wildlife			
They are good for the environment			

□ No → Please identify your top three reasons by placing the numbers 1-3 in the boxes corresponding to your reasons in order of your preference.

Example - #1 reason	1	They don't produce food	
They are not attractive		They don't provide shade	
They create a messy garden		They don't provide privacy	
They will attract wildlife (in general) to my garden		I don't have the finances	
They will attract dangerous wildlife to my garden		I don't have the time	
They increase the risk of fire		Other, please specify	
I have no interest in gardening in general			

7. Are you a member of any gardening, conservation, wildlife or environmental groups?

□ Yes, please specify which groups.....

8. Do you have any pets?

Yes, please list species and how many (e.g. 1 dog, 2 cats).....
 No

9. Please rank the following garden descriptions by placing the numbers **1** - **6** in the boxes corresponding to your preferences.1 being the garden you **would most prefer** (from this list) for your backyard space.

Example – least preferred garden option	6
A backyard with a lawn surrounded by garden beds with non-native plants and/or trees. Such a backyard may also have space for entertaining people, such as decking.	
A backyard with a lawn surrounded by garden beds with Australian native plants and/or trees. Such a backyard may also have space for entertaining people, such as decking.	
A backyard with little or no lawn, instead lots of non-native plants and/or trees organised in a cottage garden setting. Such a backyard may also have space for entertaining people, such as decking.	
A backyard with little or no lawn, instead lots of Australian native plants and/or trees organised in more of a bush setting. Such a backyard may also have space for entertaining people, such as decking.	
A backyard with lots of fruit and vegetable species . Such a backyard may also have space for entertaining people, such as decking.	
A backyard that has little or no garden , but is mainly outdoor entertaining areas such as decking and/or a pool.	

10. Thinking about wildlife you currently see (or hear) in your yard, in the left column of the following table please list any wildlife (which can include mammals, birds, reptiles, amphibians, 'bugs') that you are **pleased** to see (or hear) in your yard (where possible list the species, for example you might write *Brushtail Possums* instead of *Possums*). Then for each of these types of wildlife, please indicate how often you see (or hear) them in your yard.

Type of wildlife	See occasionally	See often	See everyday
	1	2	3
	1	2	3
	1	2	3
	1	2	3
	1	2	3
	1	2	3
	1	2	3

11. Thinking about wildlife you currently see or hear in your yard, In the left column of the following table please list any wildlife (which can include mammals, birds, reptiles, amphibians, 'bugs') that you are **not happy** to see or hear in your yard (where possible list the species, for example you might write *Brushtail Possums* instead of *Possums*). Then for each of these types of wildlife, please indicate how often you see (or hear) them in your yard.

Type of wildlife	See occasionally	See often	See everyday
	1	2	3
	1	2	3
	1	2	3
	1	2	3
	1	2	3
	1	2	3
	1	2	3

12.	Are there any types	of wildlife that you do	not currently see	(or hear) in your y	ard that you would like to)?
	Yes, please list spe	cies				

 	 ••••••

🛛 No

13. If your council ran a wildlife gardening program would you consider joining? Such a program may provide advice about what species of plant is best suited for attracting the type of wildlife you would like, and a sticker or plaque to display on your letterbox. (This is generally speaking – you will NOT be contacted to participate).
Yes

- Unsure

14. If you selected 'No' in Question13, please indicate why by ticking the one **MAIN** reason you would not be interested in joining a wildlife gardening program. **Only answer if you selected 'No' in Question 13.**

- □ I have no interest in wildlife gardening
- □ I have no interest in gardening in general
- □ I prefer a more formal style of garden
- □ I prefer non-native plants

- □ I am too busy to be involved
- □ I do not have the finances to change my garden
- □ I already belong to a wildlife gardening program
- □ Other, please specify.....

15. Please identify what your preferred ways of finding out about a council wildlife gardening program would be by placing the numbers **1-2** in the boxes corresponding to your order of preference (This is generally speaking – you will NOT be contacted to participate).

Information displayed on council websites	Posters placed around the community	
Brochures/pamphlets sent by mail	Advertised in the local paper	
Information about the program included in council rates notice	Other, please specify	
I am not interested in such programs so I have no preference		

SECTION B - Opinions and attitudes

16. Please indicate the extent to which you agree or disagree with the following statements about nature in your yard. There are **no** right or wrong answers.

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a)	I think Australian native gardens are fashionable these days	1	2	3	4	5
b)	Having a garden that is water wise is important to me	1	2	3	4	5
c)	I think Australian native gardens look messy	1	2	3	4	5
d)	I think formal European gardens look out of place in Australia	1	2	3	4	5
e)	I think gum trees are dangerous in suburban backyards	1	2	3	4	5
f)	Having a garden that is neat and tidy is important to me	1	2	3	4	5
g)	A garden that minimises fire risk is important to me	1	2	3	4	5
h)	Having a garden that requires minimal maintenance is important to me	1	2	3	4	5
i)	A home where there is no chance of falling trees is important to me	1	2	3	4	5
j)	I would like a garden that would encourage native wildlife to my yard	1	2	3	4	5
k)	I think native gardens encourage dangerous wildlife (e.g. snakes)	1	2	3	4	5

I)	Having a garden that will be admired by other people is important to me	1	2	3	4	5
m)	Being someone who is recognised as caring for the environment is important to me	1	2	3	4	5
n)	Having a backyard with space for entertaining (e.g. decking) is important to me	1	2	3	4	5
o)	I think you can really feel at one with nature in an Australian native garden	1	2	3	4	5
p)	I think native gardens increase the risk of fire	1	2	3	4	5
q)	A home that is safe from dangerous wildlife (e.g. snakes) is important to me	1	2	3	4	5

17. Please answer each of these questions in terms of the way you generally feel. There are no right or wrong answers. Using the following scale, in the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

,	candidiy as you can what you are presently experiencing.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a)	I often feel a sense of oneness with the natural world around me	1	2	3	4	5
b)	I think of the natural world as a community to which I belong	1	2	3	4	5
c)	I recognize and appreciate the intelligence of other living organisms	1	2	3	4	5
d)	I often feel disconnected from nature	1	2	3	4	5
e)	When I think of my life, I imagine myself to be part of a larger cyclical process of living	1	2	3	4	5
f)	I often feel a kinship with plants and animals	1	2	3	4	5
g)	I feel as though I belong to the earth as equally as it belongs to me	1	2	3	4	5
h)	I have a deep understanding of how my actions affect the natural world	1	2	3	4	5
i)	I often feel part of the web of life	1	2	3	4	5
j)	I feel that all inhabitants of Earth, human, and nonhuman, share a common 'life force'	1	2	3	4	5
k)	Like a tree can be part of a forest, I feel embedded within the broader natural world	1	2	3	4	5
I)	When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature	1	2	3	4	5
m)	I often feel like I am only a small part of the natural world around me and that I am no more important than the grass on the ground on the birds in the trees	1	2	3	4	5
n)	My personal welfare is independent of the welfare of the natural world	1	2	3	4	5

SECTION C - General information

18. Please indicate your age group□18-29□30-39□	40-49 🖸 50-59	□ 60-69	D 70-79	□ 80+
19. Are you? ❑ Male ❑ Female				
20. What is your highest level of educ ☐ High School ☐ Tafe / Technical College	cation? University undergrad University postgradu	-	Other, please spe	

	Were you born in Australia? Yes No, please indicate which country y	ou were born in		and your year of	arrival
22.	What is the main language spoken	at home?			
	Do have any children under the age Yes No	e of 13?			
	Which of the following best describe Renting Owned (mortgage or outright)	es your housing si	Living	in parent's house please specify	
25.	What is your postcode?				
	How long have you lived at your cur Less than 1 year 1 - 5 years	rrent address?		Over 20 years	
	Please tick the response that best n Separate house Separate unit or townhouse Semi-detached unit or townhouse	natches your hom	Flat, unFlat, un	nit or apartment in a small bloc nit or apartment in a high rise please specify	
	Please tick the response that best n Smaller suburban block (less than 5 Average suburban block between (500sqm)	Large :	suburban block (more than 100)0sqm)
	What is the annual gross (i.e. befor \$1 - \$6,000 \$6,001 - \$34,000	re tax) income tha □ \$34,001 - \$80 □ \$80,001 - \$18),000	sehold usually receives from a over \$180,000	all sources?
30.	Finally, do you have any other com	ments you would	ike to make	e about nature in your backyar	d?
·····					
·····					
-	Chaple you yong much for your ti	ma Diagon rati	ura thia au	www.and.concent.form.ue	ing the really

Thank you very much for your time. Please return this survey and consent form using the reply paid envelope provided by **November 5th 2010**.

If you have misplaced the envelope send to: Amy Shaw, School of Life and Environmental Sciences, Deakin University, 221 Burwood Highway, Burwood 3125

How do YOU feel about nature in the backyard? Have YOUR say!

You were recently sent an invitation to complete a survey about how you feel about nature in the backyard. If you have completed this survey, thank you and please disregard this postcard.

Although the survey is voluntary, if you haven't filled it out, your participation would be greatly appreciated. The results will be used to help design better communities. Have YOUR say about how you want your urban environment to be in the future! Flip this card over for more details.



SENT TO THOSE THAT ORINALLY RECIEVED POSTCARDS

To complete the survey...

Log on to the internet and go to www.surveymonkey.com/backyardnature there you will find an introductory letter that explains the study. Have a read and if you are keen, proceed to the survey. Of course, if you would prefer to complete a paper copy of the survey you are welcome to! Simply phone or email me and ask for a copy to be sent out. You will still be in the running to **WIN** one of three \$100 book/movie/or garden centre vouchers!

Thank you for your time!

Amy Whiting - PhD Student <u>aewhi@deakin.edu.au</u> / 0423 155 899 School of Life and Environmental Sciences Deakin University, Burwood 3125

SENT TO THOSE THAT ORINALLY RECIEVED POSTAL SURVEYS

If you still have the survey, great... simply fill it out and pop it in the reply paid envelope along with the consent form and post it! You will still be in the running to **WIN** one of three \$100 book/movie/or garden centre vouchers!

If you have misplaced it, no worries! Simply phone or email me and ask for a copy to be sent out. Or you can go online and complete the survey at www.surveymonkey.com/urbannature

Thank you for your time!

Amy Whiting - PhD Student <u>aewhi@deakin.edu.au</u> / 0423 155 899 School of Life and Environmental Sciences Deakin University, Burwood 3125 265

WILDLIFE GARDENER SAMPLE SURVEY DOCUMENTS

This appendix consists of all the materials delivered to the *Wildlife Gardener* sample which are:

- Initial email to wildlife gardening program members
- Plain Language Statement
- Survey (digitised and placed online)

EMAIL TO WILDLIFE GARDENING PROGRAM MEMBERS INVITING THEM TO PARTICIPATE:

The following text was used for the email, however other text from the programs themselves introduced this text, as the email was sent by the programs themselves to avoid the researcher having access to members details.

Dear 'insert wildlife gardening program name' member,

How do you feel about nature in your backyard? We want to know!

My name is Amy Whiting. I am contacting you as I am conducting research that may be of interest to you, as a member of *insert wildlife gardening program name*.

I am completing my PhD research degree at Deakin University and my research is concerned with urban biodiversity and people's relationship to it. I am trying to find out what causes some people to embrace urban nature and others not. I would be very grateful if you could please complete a voluntary, anonymous survey that takes approximately 20 minutes to complete. By doing so you will be in the running to win a \$100 voucher (your choice of a movie, book, or garden centre voucher).

To participate, go to www.surveymonkey.com/**** where you will find an introductory letter that explains the study. Have a read and if you are keen, proceed to the survey. Of course, if you would prefer to complete a paper copy of the survey you are welcome to - please contact me at the number or email address listed below and ask for a copy to be sent out.

Thank you very much for taking the time to consider participating.

Kind Regards

Amy Whiting - PhD Student School of Life and Environmental Sciences Deakin University, Burwood 3125 Phone: 0423 155 899 Email: <u>aewhi@deakin.edu.au</u>



Your invitation to contribute to the research project: Community views on nature in the backyard

TO: 'Insert wildlife gardening program name' member

Plain Language Statement

Date: DATE 2010
Full Project Title: Community views on nature in the backyard
Principal Researcher: Kelly Miller
Student Researcher: Amy Whiting
Associate Researcher(s): Dr John White and Associate Professor Geoff Wescott

My name is Amy Whiting. I am completing my PhD research degree at Deakin. I would like to invite you to participate in my research. I am conducting a survey which aims to investigate how the community feels about nature in backyards as well as their attitudes towards native vegetation and urban nature.

This is a Plain Language Statement and contains information about this research project. Its purpose is to explain to you as openly and clearly as possible all the procedures involved in this project so that you can make a fully informed decision whether you are going to participate. Please read the following information carefully if you understand what the project is about and agree to take part in it, please tick that you consent and complete the survey before **DATE 2010**.

This research will help inform future urban planning initiatives which will benefit human well-being and urban conservation. It is anticipated that the findings of the study will help in designing communities that meet peoples' expectations and inform education programs. You have been provided with a copy of this survey through the 'Insert wildlife gardening program name' program of which you are a member.

The anonymous survey has 47 questions and will take approximately 20 minutes to complete and your voluntary participation would be greatly appreciated. To be in the running to win a \$100 voucher (your choice of a movie, book, or garden centre voucher) simply fill out your preferred contact details at the end of the survey (these will be removed before data entry, so you will remain anonymous). There is not expected to be any stress or risk involved in your participation. However, as participation is voluntary, you can choose not to participate or not to answer particular questions if you wish. However, as the survey is anonymous, once you have completed the survey it will not be possible to withdraw from the study if you change your mind. Your decision to take part or not take part will not affect your relationship with Deakin University or the *'Insert wildlife gardening program name'* program.

Aggregated results will be used for research purposes and will contribute the development of my PhD thesis and may be reported in scientific journals or presented at academic conferences. Should you be interested in learning of the study's findings, please provide your contact details at the end of the survey in the space provided (these will be removed before data entry, so you will remain anonymous).

Thank you very much for taking the time to participate in this research. If you have any questions or concerns regarding any aspect of this research, please feel free to contact me at the number or email address listed below.

Amy Whiting - PhD Student School of Life and Environmental Sciences Deakin University, Burwood 3125 Phone: 0423 155 899 Email: aewhi@deakin.edu.au

This project will be carried out according to the National Statement on Ethical Conduct in Human Research (2007). It has been approved by the Human Research Ethics Committee of Deakin University as is being funded by Deakin University. If you have any complaints about any aspect of the project, or any questions about your rights as a research participant, then you may contact: The Manager, Office of Research Integrity, Deakin University, 221 Burwood Highway, Burwood Victoria 3125, Telephone: 9251 7129, Facsimile: 9244 6581; research-ethics@deakin.edu.au. Please quote project number EC.....

□ I have read the plain language statement and consent to participating in this research

Survey - Community views on nature in the backyard

SECTION A – Your Gardens for Wildlife experience

1. How long have you been involved in the Gardens for Wildlife program?yearsmonths

2. Had you already taken steps to create a wildlife garden before joining or hearing about the *Gardens for Wildlife* program?

□ Yes (Go to question 4)

No

3. Were you planning to create a wildlife garden before joining or hearing about the Gardens for Wildlife program?

Yes

🛛 No

4. How did you find out about the Gardens for Wildlife program?

U Word of mouth

General internet search for wildlife gardening

Searched for wildlife gardening on council website

Came across by accident on the internet

- Brochure/Pamphlet
- □ Other, please specify.....

5. Please identify your **top three** reasons for joining this wildlife gardening program by placing the numbers 1-3 in the boxes corresponding to your reasons in order of your preference.

Example - #1 reason	1
I like the look native plants create for my yard	
I wanted a water wise / drought tolerant garden	
I believe a native garden is 'right' for Australia	
I wanted to help increase biodiversity in the urban area	
I wanted to create a place to relax	
I wanted to create a place for my children to explore nature	
I wanted to be recognised for my wildlife gardening efforts	
I wanted to attract native wildlife to my yard	
\rightarrow If a particular type of wildlife, please specify	
Other, please specify	

6. Before joining the program were you aware that **native** gardens could take many forms, such as a cottage garden, formal garden, or contemporary garden?

Yes

🛛 No

7.	Has your participation in the program led to attracting desired native or non-native wildlife to your yard?
	Yes, please list species
	No

8.	Has your participation in the program led to attracting unwanted native or non-native wildlife to your yard?

Yes, please l	ist species	 	 	 	 •

🛛 No

9. Did you have an understanding of biodiversity issues before joining the Gardens for Wildlife program?

- Yes
- 🛛 No
- 10. Has the Gardens for Wildlife program increased your understanding of biodiversity issues?
- 🛛 No
- 11. Has the Gardens for Wildlife program increased your interest in biodiversity?
- Yes
- 🛛 No

12. When did you first become interested in nature?

- During Primary school (approx 5-12)
- During High School (approx 13-18)
- During University (approx 19-21)
- □ In young adulthood (22-35)

- □ In adulthood (36-49)
- \Box Later in life (after 50)
- □ I think I have always been interested in nature
- Unsure

13. Please identify your top three reasons why you believe you have an interest in connecting wi	th nature in your
daily life by placing the numbers 1-3 in the boxes corresponding to your reasons in order of your p	preference.
Example #1 reason	1

Example - #1 reason	1
I don't believe that I have a strong interest in connecting with nature in may daily life	
I have always felt an affinity with nature, I don't know why	
I grew up in a nature rich environment, so I like to be surrounded by nature	
I grew up without much nature, so this has influenced me to seek out nature	
I had some educational experiences as a child (under 13) that got me interested in nature	
I had some educational experiences as a teenager (13-18) that got me interested in nature	
I had some educational experiences as an adult that got me interested in nature	
As a child (under 13) I would visit wilderness areas for holidays and this got me interested in nature	
As a teenager (13-18) I would visit wilderness areas for holidays and this got me interested in nature	
An influential person (not a teacher) in my life inspired me to be interested in nature	
An influential teacher in my life inspired me to be interested in nature	
My parents were interested in nature and this influenced me to be interested in nature	
Other, please specify	

14. Please use the following space to provide any comments you would like to make about your involvement in the Gardens for Wildlife program.

 	 	 •••••

SECTION B – Nature in your yard

15.	Please tick any of the follow	wing	g that you have in your fron	t o	r backyard . Tick all that ap	ply	
	Paving or decking		Play equipment		Fish pond		Water feature
	Drive way		Chicken pen		Lawn		Clothes line
	Garage		Bird bath		Vegetable patch		BBQ
	Shed		Bird feeder		Fruit trees		Other, please
	Swimming pool		Nest box		Compost	spe	ecify
	Spa		Frog pond		Water tanks	••••	
17.			e of your block is taken up that best matches overall t				
	I have no plants (please skip Unsure what types of plants	l ha	Q20) Hostly Australian na ave Hostly indigenous pl Mostly fruit and/or ve	lant	s indigenous plan		tive, native and/or
	Do you have any Australia Unsure	an r	native plants in your front or	ba	ckyards (including indigeno	us	species)?
			p three reasons by placing er of your preference.	the	e numbers 1-3 in the boxes	cor	responding

Example - #1 reason	1	They produce food	
They look good		They provide shade	
They are water wise/ drought tolerant		They provide privacy	
They do not require much maintenance		They were already there when I moved in	
They provide homes for native wildlife		Other, please specify	
They are good for the environment			

□ No → Please identify your **top three** reasons by placing the numbers 1-3 in the boxes corresponding to your reasons in order of your preference.

Example - #1 reason	1	They don't produce food	
They are not attractive		They don't provide shade	
They create a messy garden		They don't provide privacy	
They will attract wildlife (in general) to my garden		Other species already there when moved in	
They will attract dangerous wildlife to my garden		Other, please specify	
They increase the risk of fire			

- 19. Do you have any non-native plants in your front or backyards?
- Unsure
- □ Yes → Please identify your **top three** reasons by placing the numbers 1-3 in the boxes corresponding to your reasons in order of your preference.

Example - #1 reason	1	They produce food	
They look good		They provide shade	
They are water wise/ drought tolerant		They were already there when I moved in	
They provide homes for native wildlife		Other, please specify	
They are good for the environment			
They provide privacy			

□ No → Please identify your **top three** reasons by placing the numbers 1-3 in the boxes corresponding to your reasons in order of your preference.

Example - #1 reason	1	They don't produce food	
They are not attractive		They don't provide shade	
They are not water wise/ drought tolerant		They don't provide privacy	
They require too much maintenance		Other species already there when moved in	
They do not provide homes for native wildlife		Other, please specify	
They are not good for the environment		-	

- 20. Would you ever consider planting any (or more) Australian native plants?
- ❑ Yes → Please identify your top three reasons by placing the numbers 1-3 in the boxes corresponding to your reasons in order of your preference.

Example - #1 reason	1	They produce food
They look good		They provide shade
They are water wise/ drought tolerant		They provide privacy
They do not require much maintenance		Other, please specify
They provide homes for native wildlife		
They are good for the environment		

□ No → Please identify your **top three** reasons by placing the numbers 1-3 in the boxes corresponding to your reasons in order of your preference.

Example - #1 reason	1	They don't produce food
They are not attractive		They don't provide shade
They create a messy garden		They don't provide privacy
They will attract wildlife (in general) to my garden		I don't have the finances
They will attract dangerous wildlife to my garden		I don't have the time
They increase the risk of fire		Other, please specify
I have no interest in gardening in general		

- 21. Are you a member of any gardening, conservation, wildlife or environmental groups?
- □ Yes, please specify which groups.....
- 🛛 No

22. Do you have any pets?

Yes, please list species and how many (e.g. 1 dog, 2 cats).....

🛛 No

23. Please rank the following garden descriptions by placing the numbers **1** - **6** in the boxes corresponding to your preferences.1 being the garden you **would most prefer** (from this list) for your backyard space.

Example – least preferred garden option	6
A backyard with a lawn surrounded by garden beds with non-native plants and/or trees. Such a backyard may also have space for entertaining people, such as decking.	
A backyard with a lawn surrounded by garden beds with Australian native plants and/or trees. Such a backyard may also have space for entertaining people, such as decking.	
A backyard with little or no lawn, instead lots of Australian native plants and/or trees organised in more of a bush setting. Such a backyard may also have space for entertaining people, such as decking.	
A backyard with little or no lawn, instead lots of non-native plants and/or trees organised in a cottage garden setting. Such a backyard may also have space for entertaining people, such as decking.	
A backyard with lots of fruit and vegetable species . Such a backyard may also have space for entertaining people, such as decking.	
A backyard that has little or no garden , but is mainly outdoor entertaining areas such as decking and/or a pool.	

24. Thinking about wildlife you currently see (or hear) in your yard, in the left column of the following table please list any wildlife (which can include mammals, birds, reptiles, amphibians, 'bugs') that you are **pleased** to see (or hear) in your yard (where possible list the species, for example you might write *Brushtail Possums* instead of *Possums*). Then for each of these types of wildlife, please indicate how often you see (or hear) them in your yard.

Type of wildlife	See occasionally	See often	See everyday
	1	2	3
	1	2	3
	1	2	3
	1	2	3
	1	2	3
	1	2	3
	1	2	3

25. Thinking about wildlife you currently see or hear in your yard, In the left column of the following table please list any wildlife (which can include mammals, birds, reptiles, amphibians, 'bugs') that you are **not happy** to see or hear in your yard (where possible list the species, for example you might write *Brushtail Possums* instead of *Possums*). Then for each of these types of wildlife, please indicate how often you see (or hear) them in your yard.

Type of wildlife	See occasionally	See often	See everyday
	1	2	3
	1	2	3
	1	2	3
	1	2	3
	1	2	3
	1	2	3
	1	2	3

26.	Are there any types of wildlife that you do not currently see (or hear) in your yard that you would like to?
	Yes, please list species
	No

SECTION B - Opinions and attitudes

30. Please indicate the extent to which you agree or disagree with the following statements about nature in your yard. There are **no** right or wrong answers.

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a)	I think Australian native gardens are fashionable these days	1	2	3	4	5
b)	Having a garden that is water wise is important to me	1	2	3	4	5
c)	I think Australian native gardens look messy	1	2	3	4	5
d)	I think formal European gardens look out of place in Australia	1	2	3	4	5
e)	I think gum trees are dangerous in suburban backyards	1	2	3	4	5
f)	Having a garden that is neat and tidy is important to me	1	2	3	4	5
g)	A garden that minimises fire risk is important to me	1	2	3	4	5
h)	Having a garden that requires minimal maintenance is important to me	1	2	3	4	5
i)	A home where there is no chance of falling trees is important to me	1	2	3	4	5
j)	I would like a garden that would encourage native wildlife to my yard	1	2	3	4	5
k)	I think native gardens encourage dangerous wildlife (e.g. snakes)	1	2	3	4	5
I)	Having a garden that will be admired by other people is important to me	1	2	3	4	5
m)	Being someone who is recognised as caring for the environment is important to me	1	2	3	4	5
n)	Having a backyard with space for entertaining (e.g. decking) is important to me	1	2	3	4	5
0)	I think you can really feel at one with nature in an Australian native garden	1	2	3	4	5
p)	I think native gardens increase the risk of fire	1	2	3	4	5
q)	A home that is safe from dangerous wildlife (e.g. snakes) is important to me	1	2	3	4	5

31. Please answer each of these questions in terms of the way you generally feel. There are no right or wrong answers. Using the following scale, in the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a)	I often feel a sense of oneness with the natural world around me	1	2	3	4	5
b)	I think of the natural world as a community to which I belong	1	2	3	4	5
c)	I recognize and appreciate the intelligence of other living organisms	1	2	3	4	5
d)	I often feel disconnected from nature	1	2	3	4	5
e)	When I think of my life, I imagine myself to be part of a larger cyclical process of living	1	2	3	4	5

f) I often feel a kinship with plants and animals	1	2	3	4	5
g) I feel as though I belong to the earth as equally as it belongs to me12345				5	
h) I have a deep understanding of how my actions affect the natural world	1	2	3	4	5
i) I often feel part of the web of life	1	2	3	4	5
j) I feel that all inhabitants of Earth, human, and nonhuman, share a common 'life force'	1	2	3	4	5
k) Like a tree can be part of a forest, I feel embedded within the broader natural work	d 1	2	3	4	5
 When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature 	1	2	3	4	5
m) I often feel like I am only a small part of the natural world around me and that I am no more important than the grass on the ground on the birds in the trees	1	2	3	4	5
n) My personal welfare is independent of the welfare of the natural world	1	2	3	4	5
SECTION C - General informat 32. Please indicate your age group 18-29	ion □ 7()-79		80+	
33. Are you? □ Male □ Female					
34. What is your highest level of education? □ High School □ University undergraduate degree □ Other, please specify □ Tafe / Technical College □ University postgraduate degree					
35. Were you born in Australia? ❑ Yes ❑ No, please indicate which country you were born in	and yc	our year	of arriv	al	
36. What is the main language spoken at home?					
 37. Do have any children under the age of 13? □ Yes □ No 					
 38. Which of the following best describes your housing situation? Renting Owned (mortgage or outright) Understand Underst					
39. What is your postcode?					

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	How long have you lived at your cu Less than 1 year 1 - 5 years	rrent address? G - 10 years I 11 - 20 years		Over 20 years	
	Please tick the response that best in Separate house Separate unit or townhouse Semi-detached unit or townhouse	matches your hom	Flat, unit or apaFlat, unit or apa	artment in a small block artment in a high rise specify	
	Please tick the response that best in Smaller suburban block (less than a Average suburban block between (500sqm)	Large suburba	n block (more than 1000sqm) specify	
	What is the annual gross (i.e. befo \$1 - \$6,000 \$6,001 - \$34,000	re tax) income tha \$34,001 - \$80 \$80,001 - \$18),000	usually receives from all sources?	
		-			
·····					
·····					
·····					
45.	If you are interested in learning abo	out the results of th	nis study, please en	iter your email or postal address.	

46. If you would be interested in giving a 30 minute interview to further discuss your views on nature in the backyard please provide your preferred contact details (email address or phone number).

.....

.....

47. To be in the running to win a \$100 voucher (your choice of a movie, book, or garden centre voucher) please provide your preferred contact details (email address, postal address, or phone number).

.....

Thank you very much for your time.

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WILDLIFE GARDENER INTERVIEW DOCUMENTS

This appendix consists of all the materials associated with the *Wildlife Gardener* interviews which are:

- Plain Language Statement
- Consent form
- Interview questions (semi structured so subject to change)



Your invitation to contribute to the research project: Community views on nature in the backyard

Plain Language Statement

Date: DATE 2010

Full Project Title: Community views on nature in the backyard

Principal Researcher: Kelly Miller

Student Researcher: Amy Shaw

Associate Researcher(s): Dr John White and Associate Professor Geoff Wescott

Dear Interviewee

My name is Amy Whiting. I am completing my PhD research degree at Deakin University. This letter is to invite you to participate in a research project, which aims to investigate how the community feels about nature in backyards as well as their attitudes towards native vegetation and urban nature. This research is totally funded by Deakin University and is being undertaken as part of my PhD research degree.

You have elected to participate in this interview, by indicating your interest on the 'Community views on nature in the backyard survey' you recently completed. Whether you agree to take part in the project is completely up to you; your decision to take part or not take part will not affect your relationship with Deakin University or the 'Insert wildlife gardening program name' program. Please read the following information carefully if you understand what the project is about and agree to take part in it, please sign the consent form.

This research will help inform future urban planning initiatives which will benefit human well-being and urban conservation. It is anticipated that the findings of the study will help in designing communities that meet peoples' expectations and inform education programs. The interview will take approximately 30 minutes to complete and you will be asked about your views on nature in backyards as well as your attitudes towards native vegetation and urban wildlife. There is not expected to be any stress or risk involved in your participation. However, as participation is voluntary, you can choose not to participate or not to answer particular questions if you wish. If you decide to withdraw from the study please contact the researcher.

Pseudonyms will be assigned in any reporting of this research; as such you will remain completely anonymous. Interview transcripts will be kept for at least 6 years then destroyed. Results will be used for research purposes and will contribute the development of my PhD thesis and may be reported in scientific journals or presented at academic conferences. Should you be interested in learning of the study's findings, please indicate this at your interview.

Thank you very much for taking the time to participate in this research. If you have any questions or concerns regarding any aspect of this research, please feel free to contact me at the numbers below.

Amy Shaw - PhD Student School of Life and Environmental Sciences Deakin University, Burwood 3125 Phone: 0423 155 899 Email: <u>aewhi@deakin.edu.au</u>

This project will be carried out according to the National Statement on Ethical Conduct in Human Research (2007). It has been approved by the Human Research Ethics Committee of Deakin University. If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then you may contact: The Manager, Office of Research Integrity, Deakin University, 221 Burwood Highway, Burwood Victoria 3125, Telephone: 9251 7129, Facsimile: 9244 6581; research-ethics@deakin.edu.au. Please quote project number 201X-*[number]*



PLAIN LANGUAGE STATEMENT AND CONSENT FORM

TO: The Participant

Consent Form

Date:

Full Project Title: Community views on nature in the backyard

I have read and I understand the attached Plain Language Statement.

I freely agree to participate in this project according to the conditions in the Plain Language Statement.

I have been given a copy of the Plain Language Statement to keep.

The researcher has agreed not to reveal my identity and personal details, including where information about this project is published, or presented in any public form.

Indicative Questions

Interviews will be semi-structured; therefore depending on the responses from the interviewee the questions asked will differ in order and may include questions that are not specifically listed here. However, any questions asked will relate to the participants attitudes towards native urban biodiversity. No questions will relate to personal information or information of a sensitive nature.

- 1. Can you please describe your backyard / and or front yard?
- 2. Do you prefer native vegetation or exotic in your garden? Why?
- 3. What experiences, if any, do you think have contributed to your preference for native or exotic vegetation in your garden?
- 4. What species of plants do you have in your backyard / and or front yard? Why have you chosen these species?
- 5. How do you feel about native wildlife in the suburbs? Why?
- 6. What experiences, if any, do you think have contributed to your attitude about native wildlife in the suburbs?
- 7. What species of wildlife do you have in your backyard / and or front yard? Which species of plant are these attracted to?
- 8. Are you happy with the types of wildlife you have in your backyard / and or front yard? Why or why not?
- 9. What type of wildlife would you like to have in your backyard? Why?
- 10. What would be your ideal backyard? Please describe it.
- 11. Why did you join your wildlife gardening program?
- 12. How long have you been involved in this program?
- 13. Do you feel this program has been successful in encouraging wildlife to your yard? Why, why not?
- 14. Have the species encouraged been desired or not desired species? Please explain.

WILDLIFE GARDENER INTERVIEW DOCUMENTS

This appendix chronologically lists the scientific names for the species listed in results tables throughout the thesis. However, due to the self report nature of the data presented in this thesis, many animals were not reported using their full, or correct common names. This table only lists the scientific names for animals that were identified to species level, as it was not possible to determine which species was being referred to in other cases. For example, some respondents reported birds, others reported Cockatoos, and others reported Sulphur Crested Cockatoos, but only the scientific name for Sulphur Crested Cockatoo appears in this table.

Common Name	Scientific name
Bell Miner	Manorina melanophrys
Eastern Spinebill	Acanthorhynchus tenuirostris
Yellow Wattlebird	Anthochaera paradoxa
New Holland honeyeater	Phylidonyris novaehollandiae
Noisy miner	Manorina melanocephala
Red wattlebird	Anthochaera carunculata
White-plumed Honeyeater	Lichenostomus penicillatus
Kookaburra	Dacelo novaeguineae
Lyre bird	Menura novaehollandiae
Magpie	Cracticus tibicen
Raven	Corvus coronoides
Tawny frogmouth	Podargus strigoides
Sulphur crested cockatoo	Cacatua galerita
Cockatiel	Nymphicus hollandicus
Galah	Eolophus roseicapillus
Gang Gang	Callocephalon fimbriatum
King Parrot	Alisterus scapularis
Rainbow Lorikeets	Trichoglossus haematodus
Crimson Rosella	Platycercus elegans
Eastern Rosella	Platycercus eximius
Night Jar	Aegotheles cristatus
Powerful Owl	Ninox strenua
Wedge-tailed eagle	Aquila audax
Rufous Fantail	Rhipidura rufifrons

Table A.1. Chronological list of scientific names for the species listed in results tablesthroughout the thesis (that were appropriately reported)

SilvereyeZosterops lateralisWillie wagtailRhipidura leucophrysBlue WrenMalurus cyaneusWeebillSmicrornis brevirostrisBlackbirdTurdus merulaMagpie-larkGrallina cyanoleucaIndian MynaSturnus tristisCrested pigeonOcyphaps lophotesTop-Knot pigeonsLopholainus antarcticusStarlingSturnus vulgarisWhip birdPsophodes olivaceusWood duckChenonetta jubataSolver GullChroicocephalus novaehollandiaeCommon / Eastern FrogletCrinia signiferaGreen tree frogLitoria caeruleaSpotted marsh frogLimnodynastes tasmaniensisStriped Marsh FrogLimnodynastes peroniiRedback spiderLatrodectus hasseltiiWhite-tailed spiderPseudocheirus peregrinusSugar GilderPseudocheirus peregrinusFat tailed dunnartSmithopsis crassicaudataEastern Grey KangarooMacropus giganteusKoalaPhoscolarctos cinereusPlatypusOrrithorhynchus anatinusSwamp wallabyWallabia bicolorWombatNombatus ursinusBlue tongue LizardHilgua scincoides scincoidesFrogDindymus versicolorCabbage mothMaemstra brassicaeAltona Skipper ButterflyHesperilla flavescens flavescensHarlequin bugDindymus versicolorCabbage mothMaemstra brassicaeSaterScivppoa australisSilverfishLepisma asccharina<	Firetail	Stagonopleura bella
Willie wagtailRhipidura leucophrysBlue WrenMalurus cyaneusWeebillSmicrornis brevirostrisBlackbirdTurdus merulaMagpie-larkGrallina cyanoleucaIndian MynaSturnus tristisCrested pigeonOcyphaps lophotesTop-Knot pigeonsLopholainus antarcticusStarlingSturnus vulgarisWhip birdPsophodes olivaceusWood duckChenonetta jubataSilver GullChroicocephalus novaehollandiaeCommon / Eastern FrogletCrinia signiferaGreen tree frogLitoria caruleaStriped Marsh FrogLimodynastes tasmaniensisVhite-tailed spiderLatmodynastes peroniiRedback spiderPseudocheirus peregrinusSugar GliderPetaurus brevicepsEchinaTachyglosus aculeatusSwamp wallabyWallabia bicolorWombatNombatus ursinusBlue tongue LizardTiliqua scincoides scincoidesBrown snakePseudonaja textilisTiger snakeNotechis scutatusAltona Skiper ButterflyHesperilla flavescens flavescensHarlequin bugDindynus versicolorCabage mothMamestra brosicaeCase mothMater aelongatusSitorerishScippopa australis	Silvereye	
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	Passionvine hopper	
Slater Armadillidium vulgare	Silverfish	Lepisma saccharina
	Slater	Armadillidium vulgare

Witchetty grub	Endoxyla leucomochla
Black headed honeyeaters	Melithreptus affinis
Brown honeyeater	Lichmera indistincta
Budgerigar	
	Melopsittacus undulatus
Crescent honeyeater	Phylidonyris pyrrhopterus
Yellow-faced honeyeater	Lichenostomus chrysops
Yellow-throated honeyeater	Lichenostomus flavicollis
Yellow wattlebirds	Anthochaera paradoxa
White naped honeyeater	Melithreptus lunatus
Strong-billed Honeyeater	Melithreptus validirostris
Brush Turkey	Alectura lathami
Channel Billed Cuckoo	Scythrops novaehollandiae
Pheasant Coucal	Centropus phasianinus
Forest Raven	Corvus tasmanicus
Little Raven	Corvus mellori
Pacific Black Duck	Anas superciliosa
Barn owl	Tyto alba
Boobook owl	Ninox novaeseelandiae
Brown Goshawk	Accipiter fasciatus
Pacific Baza	Aviceda subcristata
Powerful Owl	Ninox strenua
Black-faced Cuckoo Shrike	Coracina novaehollandiae
Western bowerbird	Ptilonorhynchus guttatus
Fig bird	Sphecotheres vieilloti
Grey -crowned Babbler	Pomatostomus temporalis
Grey shrike-thrush	Colluricincla harmonica
Pallid Cuckoo	Cacomantis pallidus
Bronzewing pigeon	Phaps chalcoptera
Wonga Pigeon	Leucosarcia picata
Spangled Drongo	Dicrurus bracteatus
King Parrot	Alisterus scapularis
Musk lorikeet	Glossopsitta concinna
Major Mitchell	Lophochroa leadbeateri
Mulga Parrot	Psephotus varius
Red Rump parrot	Psephotus haematonotus
Ring neck parrot	Barnardius zonarius
Pale-headed rosella	Platycercus adscitus
Yellow-Tailed Black-Cockatoo	Calyptorhynchus funereus
Bronze Cuckoo	Chalcites basalis
Fairy Martin	Petrochelidon ariel

Gold finch	Carduelis carduelis
Red-browed Finch	Neochmia temporalis
Grey Fantail	Rhipidura albiscapa
Sacred kingfisher	Todiramphus sanctus
Spotted pardalote	Pardalotus punctatus
Flame Robin	Petroica phoenicea
Scarlet robin	Petroica boodang
Satin Flycatcher	Myiagra cyanoleuca
Welcome Swallow	Hirundo neoxena
Brown Thornbill	Acanthiza pusilla
Tasmanian Thornbill	Acanthiza ewingii
Golden Whistler	Pachycephala pectoralis
Superb Fairy Wren	Malurus cyaneus
Eastern-barred bandicoot	Perameles gunnii
Long nosed Potoroo	Potorous tridactylus
Tasmanian devil	Sarcophilus harrisii
Bennett's wallaby	Macropus rufogriseus rufogriseus
Carpet snake	Morelia Spilota
Copper head snake	Austrelaps superbus
Red bellied black snake	Pseudechis porphyriacus
White lipped snake	Drysdalia coronoides
Striped Marsh Frog	Limnodynastes peroni
Sudell painted frog	Neobatrachus sudelli
Tasmanian Tree frog	Litoria burrowsae
Bearded Dragons	Genus: Pogona
Marbled gecko	Christinus marmoratus
Monitor lizard	Genus: Varanus
Lace monitors	Varanus varius
Long-nosed dragon	Amphibolurus longirostris
Fire-tail skink	Morethia taeniopleura
Eastern Water Dragon	Physignathus lesueurii
Blue banded bee	Amegilla cingulata
Painted Lady Butterfly	Vanessa cardui
Saltbush Blue Butterfly	Theclinesthes serpentata
Teddy bear bee	Amegilla bombiformis